Does Lockdown Affect Online Health Information-Seeking Behaviour of COVID-19 Preventive Measures among Indonesians? A Google Trends Analysis

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Abstract

The government's policies to respond to the rapidly spreading COVID-19 pandemic may influence the community's health-related behaviours, including the information-seeking behaviour. This study's primary objective was to compare the popularity of online searches among Indonesians using related terms relevant to COVID-19 preventive measures before and during/after the first Jakarta's partial lockdown. Identification of primary search terms was conducted based on WHO's public advice and Indonesian MOH's relevant information. Three selected terms related to commercial commodities were "masker", "hand sanitizer", and "vitamin" and two terms associated with a healthy lifestyle were "cuci tangan" and "jaga jarak". Term variations for each primary term were identified and checked for the highest hits using google.co.id website, limited to all searches, country: Indonesia, and between 30 January and 4 October 2020. The primary terms were entered into Google Trends to retrieve the term popularity during the period of 30 January-9 April 2020 and

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of 10 April-30 September 2020, representing the period before and during/after the first Jakarta's partial lockdown. The results show that "masker" and "vitamin" remained the two most popular terms before and during/after the lockdown. The term "jaga jarak" reached its highest peak three days before the lockdown and then decreased and levelled off afterwards. Only two search terms resulted in statistically significant differences of popularity across all 34 Indonesia's provinces before and during/after the lockdown, namely "vitamin" (p<0.001) and "cuci tangan" (p=0.001). The term "vitamin" was less popular during/after the forced lockdown, with mean difference d -13.7 (95% CI -17.8, -9.6), while "cuci tangan" gained more popularity, with d 10.8 (95% CI 4.8, 16.7). In conclusion, this study demonstrates that the community's health information-seeking behaviour about the preventive measures for the on-going pandemic can be affected by the government's action to force a lockdown.

1. Introduction

The emergence of coronavirus disease (COVID-19) due to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection is marked as the third pandemic caused by *Betacoronavirus* genus in the 21st century (El Zowalaty & Järhult, 2020; WHO, 2020f; Zhou et al., 2020). COVID-19 heavily affect most countries across the globe and within 30 days after the World Health Organization (WHO) declared the disease as a public health emergency of international concern (PHEIC) by 30 January 2020, 53 countries had announced the presence of the first case in their jurisdiction (WHO, 2020g, 2020b), implying the rapid spread of this novel communicable disease. The first two cases of COVID-19 in Indonesia were made known to the public on 2 March 2020 (WHO, 2020e). By 27 March 2020, the disease had been reported from 27 out of 34 Indonesian provinces (WHO, 2020c).

Halting the growth of COVID-19 infection in its early spread, many governments, such as the China's City of Wuhan, where the first cases were reported, and the northern provinces of Italy, implemented a travel restriction within a specific area and time period, popularly termed as a lockdown (Su et al., 2020; Vaughan, 2020). As of March 2020, the government of Indonesia was not in favour of taking a nationwide lockdown measure, but enacted policy No. 21 of 2020 regulating large-scale social restriction (PSBB) (Djalante et al., 2020; Purnama & Susanna, 2020). As the epicenter of COVID-19 outbreak in Indonesia, Jakarta imposed the country's first partial lockdown starting from 10 April 2020 for 14 days (WHO, 2020d).

As a new policy in Indonesia, the imposition of Jakarta's partial lockdown may potentially attract more public attention to have more understanding of COVID-19. At the beginning of COVID-19 outbreak, the observed surge of online searches related to the disease in the Big Data, for instance by using the "coronavirus" term (Szmuda et al., 2020), and its preventive measures, for instance the "wash hands" term (Lin, Liu, & Chiu, 2020) may indicate people engagement to the emerging issue. Increased understanding may lead to increased awareness. Understanding the change of awareness in the general population can be approached using the number of online searches as a proxy because these activities are part of today's lifestyles. Furthermore, knowledge of how Indonesians gather health information from the Internet in preventing the current pandemic remains limited and warrants further study. This study's primary objective was to compare the popularity of online searches among Indonesians using related terms relevant to COVID-19 preventive measures before and during/after the first Jakarta's partial lockdown.

2. Material and Methods

Primary Search Terms Determination

To identify search terms that were relevant to COVID-19 preventive measures, public advice from WHO (WHO, 2020a) and information from the Indonesian Ministry of Health (MOH) (Indonesia MOH, 2020b, 2020a) were used. Five terms were deliberately selected including "masker", "hand sanitizer", "vitamin", "cuci tangan", and "jaga jarak". In English, "masker", "cuci tangan", and "jaga jarak" mean "face mask", "hand wash", and "social distancing" or "physical distancing", respectively. The first three terms are associated with commercial commodities, and the other two terms are related to a healthy lifestyle.

Among many search engines, Google dominates the market in Indonesia with a 98% share as of August 2020 (Statista.com, 2020). Therefore, after term variations were identified for each primary search term, each variant was tested for the volume of search results using Google Search (google.co.id), limited to all searches, country: Indonesia, and between 30 January and 4 October 2020. Term variants with the largest volume of search results were selected for further data collection (Table 1).

Data Collection Using Google Trends

The identified five terms were simultaneously entered into Google Trends (trends.google.com) to retrieve the popularity of terms in Indonesia during two periods of time. The first period was between 30 January 2020 when the WHO declared the COVID-19 outbreak a Public Health Emergency of International Concern (PHEIC) and 9 April 2020, a day before the first Jakarta's partial lockdown. The second period was during and after the first Jakarta's partial lockdown, which was between 10 April and 30 September 2020. The search was limited to the Health category and Web Search as a search target and initially was conducted to collect popularity across the country level (Indonesia), followed by the provincial level (34 provinces). Data was downloaded as the CSV file format.

Data Preparation

Google Trends algorithms provide three types of downloadable data, namely interest over time, interest by sub-region, and comparison breakdown by sub-region. Only the first two datasets were used for analysis. Depending on the amount of search during a specified timeframe and region, the popularity for interest over time and interest by sub-region is calculated on a scale between 0 and 100. A value of zero means that there was not enough data for a term. A value of 50 means the term is half popular, and a value of 100 indicates the peak of popularity. For the interest over time dataset, in particular, Google Trends may yield a value of <1. Because this value cannot be analyzed using a statistical procedure, imputation was applied by assigning a value of 0.5.

Table 1: Term Variations and Search Results

Primary Search Terms	Term Variants	Search Results from Google Search
masker	masker	32,600,000
	masker medis	9,450,000
	masker standar who	4,280,000
	masker scuba	387,000
	masker 3 lapis	264,000
	masker 3 ply	172,000
	masker n95	139,000
	masker sensi	105,000
	masker buff	97,900
hand sanitizer	hand sanitizer	6,440,000
	alkohol	382,000
	antiseptik	213,000
	hand sanitiser alami	84,300
	hand sanitizer alami	78,500
	hand sanitiser	19,300
vitamin	vitamin	14,000,000
	vitamin anak	6,650,000
	vitamin c	4,440,000
	vitamin e	1,080,000
	vitamin suplemen	260,000

	multivitamin	132,000
	suplemen	4
jaga jarak	jaga jarak	3,990,000
	social distancing	313,000
	physical distancing	298,000
	jauhi kerumunan	10,100
cuci tangan	cuci tangan	18,000,000
	cuci tangan covid	7,770,000
	cuci tangan dengan sabun	6,170,000
	cuci tangan yang benar	173,000
	cuci tangan 6 langkah	102,000

Statistical Analysis

A systematic review summarizes that both parametric and non-parametric statistical procedures were applied by studies using Google Trends data (Mavragani, Ochoa, & Tsagarakis, 2018). In this study, paired sample t-tests were used to ascertain the difference of search term popularity before and during/after the first Jakarta's partial lockdown at country and provincial levels. Alpha was set at 0.05. JASP statistical software version 0.14 was used to perform statistical analysis (JASP Team, 2020). Illustrations were generated using Observable (observablehq.com) with D3.js JavaScript library.

Ethical Consideration

This study did not acquire data directly from human subjects and the open data were anonymous.

3. Results

The Patterns of Search Term Popularity

Overall, "masker" and "vitamin" were the two most popular terms over the two periods (Figure 1). The popularity of all terms was stable after the PHEIC announcement until President Joko Widodo's declaration on 2 March 2020 that the first two COVID-19 cases were found in Indonesia. All terms, except "jaga jarak", showed a subtle increase in popularity on that day, notably the "masker" term that peaked two days later and then decreased for a few days before climbing up gradually. Just a few days before the first Jakarta's partial lockdown, "masker", "cuci tangan", and "jaga jarak" gained sharp popularity. During 14 days of Jakarta's partial lockdown, only "vitamin" showed stable popularity. After the lockdown, all terms remained stable, except for "masker" that jolted for a few days in the mid-September 2020.
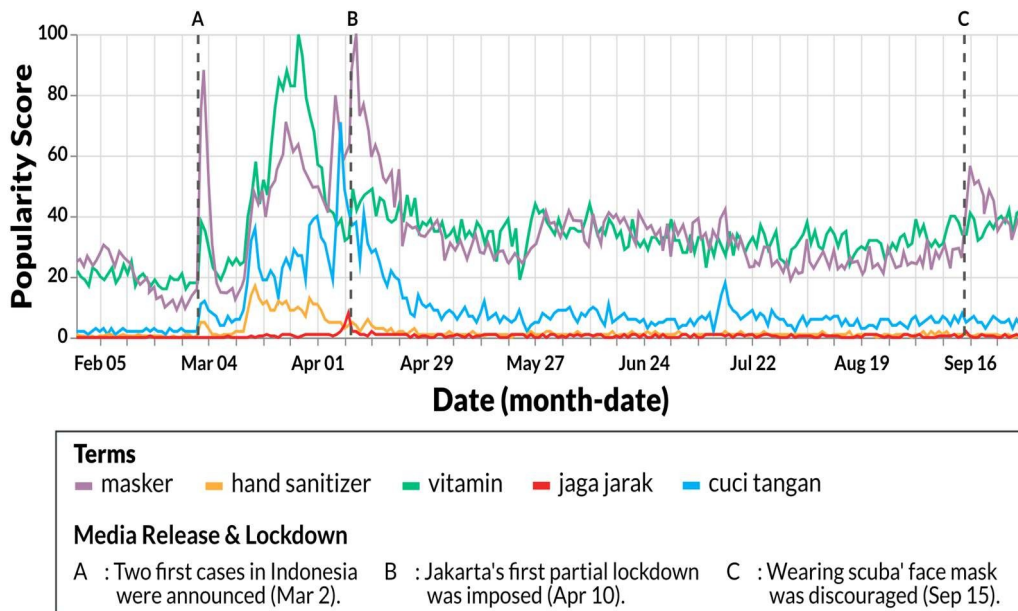

Figure 1: The popularity of five search terms in Indonesia between 30 January and 30 September 2020

The Differences in Popularity among Search Terms

Across all 34 provinces of Indonesia, only "vitamin" ($p<0.001$) and "cuci tangan" ($p=0.001$) showed statistically significant differences in popularity before and during/after the first Jakarta's partial lockdown was imposed (Table 2). The term "vitamin" was less popular during/after the lockdown as shown by mean difference d -13.7 (95% CI 17.8, -9.6), while "cuci tangan" was more popular, with mean difference d 10.8 (95% CI 4.8, 16.7).

Closer examination at provincial level showed that all five terms had statistically significant differences only in Bangka-Belitung (Figure 2). No statistically significant difference was detected for all terms in Maluku, North Kalimantan, and North Sulawesi. The term "jaga jarak" showed statistically significant differences only in three provinces, namely Bangka-Belitung, Central Kalimantan, and East Java. Even in Jakarta itself, where the partial lockdown was enforced, and its two neighboring provinces, West Java and Banten, "jaga jarak" had no change in popularity. The terms "cuci tangan", "masker", "hand sanitizer", and "vitamin" demonstrated significant differences in 18, 22, 14, and 16 provinces, respectively.

Table 2: Differences of Search Term Popularity across All Provinces of Indonesia

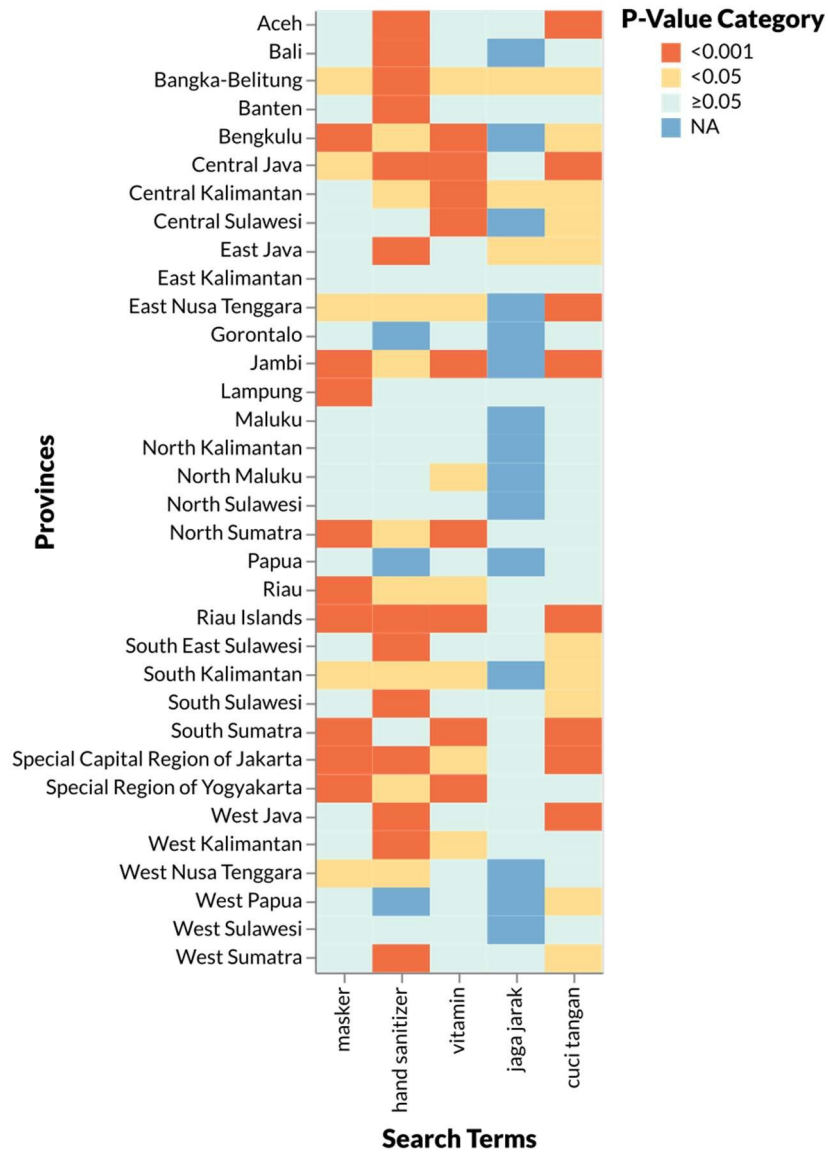| Search Terms	Mean Difference d (95% CI)	P-value
masker	3.440 (-2.119, 8.999)	0.214
hand sanitizer	0.040 (-9.373, 9.453)	0.993
vitamin	-13.720 (-17.799, -9.641)	<0.001
jaga jarak	3.320 (-1.498, 8.138)	0.168
cuci tangan	10.760 (4.815, 16.705)	0.001

Figure 2: Paired samples t-test results of five online search terms before and during/after the first Jakarta's partial lockdown in every province of Indonesia

4. Discussion

This study was performed to understand the changes in online health information seeking behaviour due to a partial lockdown policy in Indonesia using five primary search terms related to COVID-19 preventive measures entered into Google Trends. The partial lockdown firstly imposed in Jakarta, the capital city of Indonesia, during 10-24 April 2020 was found to significantly increase the online

search for health information about handwashing, decrease the search for vitamin, but did not change the search for the face mask, hand sanitizer, and social/physical distancing.

Lockdown enforcement of a region can negatively affect the mental health of the general population as it may rise mass anxiety (Rehman et al., 2020; Rossi et al., 2020; Singh et al., 2020; Su et al., 2020), but it appears to be effective to reduce the number of new cases (Cauchemez et al., 2020). Moreover, lockdown can also create opportunities toward a healthier lifestyle at the community level (Di Renzo et al., 2020; Ding et al., 2020; Lin et al., 2020). The increased interest in gaining more health information about handwashing over the Internet search for a period of time was found to be negatively correlated (p <0.001, r = -0.70) with the increase of COVID-19 cases among 21 countries (Lin et al., 2020). Unfortunately, albeit our study found an increase of community interest in handwashing that may indicate people's commitment to hand hygiene, the number of new cases in Indonesia has kept on increasing after the first partial lockdown. This could be in part due to the non-compliance to public health advice for social/physical distancing, which was reflected in our study by the low popularity of online search for "jaga jarak" during all periods. The low popularity of "jaga jarak" could be explained by the fact this term is not difficult to understand. However, it may not be easy to practice in a society with more communal than individual characteristics such as in Indonesia. Recently, the National Task Force for COVID-19 (Satgas COVID-19) admitted that even after eight months of the pandemic in Indonesia, the Indonesians remained reluctant to practice social/physical distancing and to avoid the crowds (Aditya, 2020). Recent heated political circumstances at the national level by the enactment of the Job Creation Law, widely known as the Omnibus Law, (The Jakarta Post, 2020) and at the regional level by some regional election campaigns lead to a mass gathering that frequently disobeys the social distancing rules (Ghaliya, 2020). Previous research found several factors associated with non-compliance to public health advice for COVID-19 prevention among young adults (Nivette et al., 2021).

In this study, three search terms were associated with commodities, namely the face mask ("masker"), hand sanitizer, and vitamin. Similar to the online search for two other terms, the increase of Google search activities may indicate community engagement in preventive measures for the rapid spread of COVID-19. On the other hand, the online search for these commodity-related terms may also indicate the community's anxiety of the possible temporal supply shortage (Lin et al., 2020). This is contextual to Indonesia, where online trading and delivery service sectors have been part of the community lifestyle in recent years. The partial lockdown could potentially delay the supply chain of consumer goods.

Findings from our study should be interpreted cautiously. It is generally agreed that the observed surge in the popularity of search terms related to lifestyle from Google Trends may not directly translate into behavioral change, although they account for important immediate factors of behavioral change (Ding et al., 2020). Therefore, although this study found a significant increase of national popularity for handwashing during/after the partial lockdown, it cannot measure the increase of real practice of handwashing as a representation of behavioral change.

Many studies suggest that online search activities may serve as a supporting tool to the traditional surveillance system for 'nowcasting' the spread of infectious diseases (Husnayain, Fuad, & Lazuardi, 2019; Pervaiz et al., 2012; Santangelo et al., 2019). Nonetheless, the influence of media coverage on online health information-seeking behaviour should also be taken into account. Google searches on "coronavirus" among 40 European countries in the early stages of COVID-19 pandemic in Europe were found to be strongly associated with media coverage, but not with the

epidemiological parameters at each nation (Szmuda et al., 2020). In this present study, visual inspection of the popularity pattern of four search terms may reveal the influence of media coverage. For example, the announcement of the first COVID-19 cases in Indonesia by 2 March 2020 increased the volume of "googling" activities to find all search terms, except for social/physical distancing. Another example was the surge of online searches for face mask after the press release by Indonesian Task Force for COVID-19 that wearing face mask made from neoprene fabric, or locally known as "scuba" face mask, was not advised by 15 September 2020 (Figure 1) (Adjie, 2020).

In several provinces, the first Jakarta's partial lockdown did not change the volume of online search of the terms. Access to the Internet is considered unequal across the Indonesian archipelago, and this can explain that Google Trends yielded insufficient data that cannot be analyzed. During COVID-19 pandemic, however, the Indonesian government collaborated with private telecommunication providers to improve Internet access as this infrastructure is inevitable for current education that is widely delivered using an online mode (Eloksari, 2020).

Several studies focusing on online information-seeking behaviour related to the current pandemic did not employ Google Trends, but used self-administered online questionnaires (Ebrahim et al., 2020; Li & Zheng, 2020; Moreno, Fuentes-Lara, & Navarro, 2020) and a social media platform, i.e. Weibo (Zhao et al., 2020). Interestingly, the study among parents in Bahrain indicates that preventive and protection measures from COVID-19 were ranked three of the most important information subjects (Ebrahim et al., 2020). Moreover, the study in China indicates that online information-seeking can be linked to the prevention intent, using the risk information seeking and processing (RISP) model (Li & Zheng, 2020).

Several limitations were identified in this study. Firstly, Google Trends only allows a user to enter five key terms at once. As a consequence of this limited access, in this study, we had to carefully select five key terms and ignore other search term candidates. Secondly, because the data presented by Google Trends are aggregate and access to sociodemographic information of Google's users cannot be obtained, several sociodemographic factors that may influence the online information-seeking behaviour, such as age groups and gender, cannot be assessed, in relation to the trends. Lastly, although Google is the most popular online search engine in Indonesia, it is possible that some sub-population, especially young adults, prefer to use the social media for seeking health information. Some social media such as Twitter, Instagram, and Facebook offer the hashtag search to track similar information on their platforms. Therefore, results from our study may not thoroughly reflect the online information-seeking behavior for all Indonesians.

5. Conclusion

This study reveals that the Indonesian community's health information-seeking behaviour about the preventive measures for COVID-19 can be changed by the government's action to force a lockdown. As the increase in online search behaviour could potentially lead to increased awareness, this study may add one more potential benefit coming from lockdown enforcement.

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