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Google Trend Analysis of Public Interest in Cafés and Restaurants on Thailand Infected Covid-19 Cases

Introduction

Thailand has been impacted by the Coronavirus pandemic substantially. The first reported locally transmitted case occurred on 31 January. From January to March, the case count increased gradually, then quickly rose to over 3,000 cases, until plateauing from May onward. The source of many of these infections was presumed to have been boxing stadiums and entertainment venues. In January of 2020, Thailand became the second country to record a case of COVID-19. As a result of an early lockdown and an effective contact tracing technique, the Thai government was able to keep the number of COVID-19 cases low for as late as September 2020. While the government's actions halted the pandemic's spread in Thailand, they also cost families employment, income, companies, and food security, as well as children's education. Unfortunately, succeeding waves and emerging new variations have provided a significant economic problem for the country, with the number of COVID-19 cases surging to over 2,000 per day in May 2021, necessitating more tight containment measures.

Because of the virus's rapid spread, identifying effective explanations can help to shape prevention efforts. It is feasible to analyze the impact of various occurrences on time series data using data mining and time series analysis methodologies. Google search trends might be valuable for capturing public interest and concerns over time. Several research looked into the relationship between web-based data and COVID-19 cases during the outbreak. Furthermore, Google Trends has been used to anticipate and track COVID-19 cases all around the world. These investigations, however, did not take into account the ability of search patterns to forecast future verified instances.

It is plausible that the sources of these infected Covid-19 cases come from restaurants and cafés around the popular cities of Thailand so the objective of this paper is to find if there is any correlation between search terms related to restaurants and cafés on the infected Covid-19 cases in different regions of Thailand with high and low rate of infections using linear correlation analysis and to further suggest policy recommendations to help predict the outbreak of Covid-19.

Literature Review

This research focuses on the search queries trend of restaurants and cafés correlation with number of infected Covid-19 cases in Thailand. There are many related research google trend search queries and Covid-19 cases which can be separated into 2 main categories;

1. Literature related to the research topic
    - ❖ Roni Rabin, NY times (2021) found that countries that opened restaurant for indoor or outdoors dining saw an increase in daily infections about six weeks later and a rise in Covid-19 death rates in about two months later. The research does not prove cause and effect, but the findings are consistent with other studies that suggest masks protect infection and that interior environments promote the spread of the virus via aerosols, which are small respiratory particles that persist in the air.
    - ❖ Karen Byrd (2021) showed that: (1) Consumers were less concerned about contracting COVID-19 from food in general than from restaurant food and packaging, with consumer restaurant concern highest for food served in restaurants and lowest for hot/cooked restaurant food followed by restaurant food from carry-out; and consumer risk perceptions varied with financial concern for food, gender, and being in a COVID-19 high-risk category.
    - ❖ Chang, S., Pierson, E., Koh, P.W. et al. (2021) The epidemiological model used anonymized mobile phone data in 10 of the largest American cities, including New York, Los Angeles, and Chicago, to track 98 million users' movements and infection rates from March to May to accurately predict where and when outbreaks of the disease might happen. There is a direct tradeoff between new infections risk and capacity limitations at indoor venues like full-service restaurants, cafes, and bars. Adding 10% of the "point-of-interest" businesses studied accounted for 80% of all infections.
2. Literature related to the research methodology

- Salathé M. (2012) stated that A new sort of epidemiology has emerged as a result of the continuous upheaval in the way people interact. When used properly, digital data sources may give local and immediate information about illness and health patterns in people all over the world. The tremendous growth in the availability of relevant data from a variety of digital sources poses significant technological and computational problems.
- Maria E. (2021) When the number of newly infected patients in China began to rise dramatically, global public interest in COVID-19 grew. Soon after COVID-19 was designated a pandemic in mid-March 2020, global curiosity peaked. The number of newly reported COVID-19 cases corresponds with public interest in the virus, with the maximum level of interest occurring on average 11.5 days before the peak of newly reported COVID-19 cases.
- Ciaffi J. (2020) used google search term such as “Cough” and “Fever” in Italian and lag the data one week prior the result was a weak but positive relationship with Covid-19 Infected case in Italy suggest that COVID-19 might have a substantial impact on the occurrence of respiratory symptoms in the general population, thus corroborating the theory of a role for Google Trends in monitoring the dynamics of future COVID-19 evolution.
- Mavragani A. (2019) The Google search terms used for the analysis were "coronavirus", "COVID", "COVID 19", "corona", and "virus" revealed Google Trends may predict outbreaks of COVID-19, 2 to 3 weeks earlier than the routine disease surveillance, in India.

Sources of Data

The data used in this analysis is Thailand Infected Covid cases obtained from the Ministry of Health Thailand which include accumulated monthly number of infected Covid case for this study we will consider the data starting from 1 January 2020 to 1 October 2021 of Bangkok and Chonburi infected Covid-19 cases.

And we used the search terms “ร้านอาหาร” and “คาเฟ่” to obtain public interest in cafés and restaurants with monthly resolution with the most popular query for each search term from 1 January 2020 to 1 October 2021 for Bangkok and Chon Buri region in Google Trends.

Date	Infected Covid case	Normalized Infected Case	Restaurant	Café
Jan-20	14	0.00080	74	24
Feb-20	13	0.00000	76	23
Mar-20	953	0.74884	46	15
Apr-20	545	0.42381	23	5
May-20	29	0.01275	42	26
Jun-20	44	0.02470	71	46
Jul-20	45	0.02549	89	50
Aug-20	31	0.01434	91	48
Sep-20	96	0.06612	94	48
Oct-20	104	0.07249	87	43
Nov-20	98	0.06772	100	48
Dec-20	340	0.26050	95	40
Jan-21	806	0.63174	60	34
Feb-21	363	0.27882	81	45
Mar-21	1075	0.84603	81	44
Apr-21	11243	8.94628	66	38
May-21	41150	32.7714	35	22
Jun-21	33331	26.54250	49	37
Jul-21	72606	57.83059	27	12
Aug-21	125540	100.00000	23	13
Sep-21	84086	66.97603	52	43
Oct-21	27819	22.15141	72	56

Table 1 Raw Data Bangkok

Date	Infected Covid case	Normalized Infected Case	Restaurant	Café
Jan-20	1	0.00000	65	20
Feb-20	2	0.00256	66	26
Mar-20	43	0.10763	51	21
Apr-20	49	0.12300	18	4
May-20	22	0.05381	36	23
Jun-20	23	0.05638	79	49
Jul-20	63	0.15888	92	55
Aug-20	67	0.16913	83	47
Sep-20	33	0.08200	100	50
Oct-20	59	0.14863	84	49
Nov-20	59	0.14863	95	54
Dec-20	198	0.50483	78	40
Jan-21	494	1.26336	33	21
Feb-21	95	0.24088	62	40
Mar-21	83	0.21013	76	53
Apr-21	2,333	5.97596	63	39
May-21	2,322	5.94777	32	18
Jun-21	3,795	9.72247	44	40
Jul-21	17,129	43.89206	22	18
Aug-21	39,024	100.00000	14	12
Sep-21	24,742	63.40107	50	38
Oct-21	12,082	30.95867	74	67

Table 2 Raw Data Chon Buri

To be consistent with Google trend values, we normalized the Thailand infected Covid-19 cases between 0 and 100 in our analysis.

Methodology

The Pearson correlation was used to examine the linear correlation of two time series. This correlation's value runs from –1 to 1, indicating negative and positive correlations, respectively. In Bangkok and Chon Buri, we calculated the Pearson correlation between the trends of search queries (cafés and restaurants) and COVID-19 infected cases.

1. **Pearson correlation coefficient** is a test statistic for determining the statistical connection (or association) between two continuous variables. Because it is based on the concept of covariance, it is recognized as the best approach for quantifying the relationship between variables of interest. It provides information on the amount and direction of the relationship's link, or correlation.

$$r = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum (x_i - \bar{x})^2 \sum (y_i - \bar{y})^2}}$$

r = correlation coefficient

x_i = values of the x-variable in a sample

$\bar{x}$ = mean of the values of the x-variable

y_i = values of the y-variable in a sample

$\bar{y}$ = mean of the values of the y-variable

Results

Bangkok

1. Model Summary

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.666[a]	.444	.385	26796.26081

a. Predictors: (Constant), Cafe, Restaurant

From the result obtained from the SPSS program, the Adjusted R^2 is 0.385, that is the numbers of searches restaurants and café in Google can explain 38.5% of Infected COVID 19 cases in Bangkok.

2. ANOVA

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10882730838.061	2	5441365419.031	7.578	.004[b]
	Residual	13642752276.530	19	718039593.502		
	Total	24525483114.591	21			

a. Dependent Variable: Infected COVID cases in Bangkok

b. Predictors: (Constant), Cafe, Restaurant

From the result obtained from the SPSS program, the P-Value was 0.004, which was less than the 0.05 level of significance. The numbers of searches restaurants and café in Google affect Infected COVID 19 cases in Bangkok.

3. Coefficients

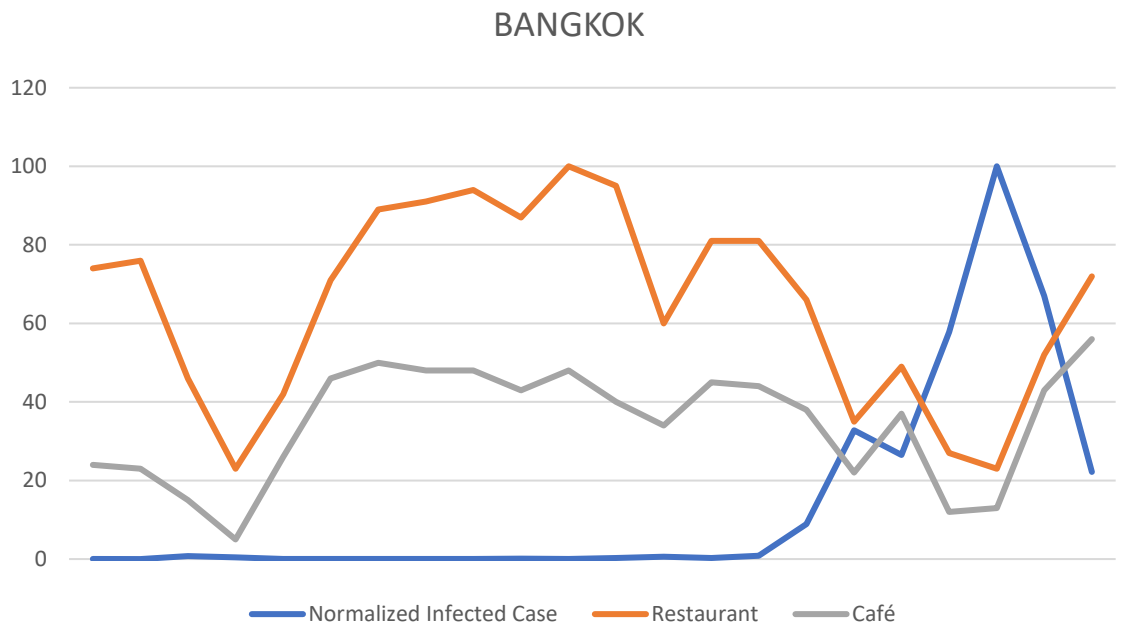
Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	69643.119	16679.927		4.175	.001
	Restaurant	-1349.896	398.824	-.972	-3.385	.003
	Cafe	1057.806	672.942	.451	1.572	.132

a. Dependent Variable: Infected COVID cases in Bangkok

It was found that the numbers of searches restaurant had P-Value of 0.003, respectively, which was less than the 0.05 level of significance. The numbers of searches restaurant in Google affects Infected COVID 19 cases in Bangkok.

4. Graphs



It was found that the numbers of searches for restaurants and cafes with Infected COVID 19 cases in Bangkok was inversely related. During the low numbers of Infected COVID 19 cases in Bangkok, the numbers of searches for restaurants and cafes was high. In the other hand, during high number of Infected COVID 19 cases in Bangkok, the numbers of searches for restaurants and cafes has decreased, show that there are a lot of infection. The government has lockdown and curfew to control the opening and closing hours of restaurants, causing people to not be able to eat at restaurants or cafes. As a result, the numbers of searches for restaurants and cafes has decreased.

Chonburi

1. **Model Summary**

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.588[a]	.346	.277	8542.75006

a. Predictors: (Constant), Cafe, Restaurant

From the result obtained from the SPSS program, the Adjusted R^2 is 0.277, that is the numbers of searching restaurants and café in Google can explain 27.7% of Infected COVID 19 cases in Chonburi.

2. **ANOVA**

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	733790700.109	2	366895350.054	5.027	.018[b]
	Residual	1386592991.891	19	72978578.521		
	Total	2120383692.000	21			

a. Dependent Variable: Infected COVID cases in Chonburi

b. Predictors: (Constant), Cafe, Restaurant

From the result obtained from the SPSS program, the P-Value was 0.018, which was less than the 0.05 level of significance. The numbers of searching restaurants and café in Google affect Infected COVID 19 cases in Chonburi.

3. **Coefficient**

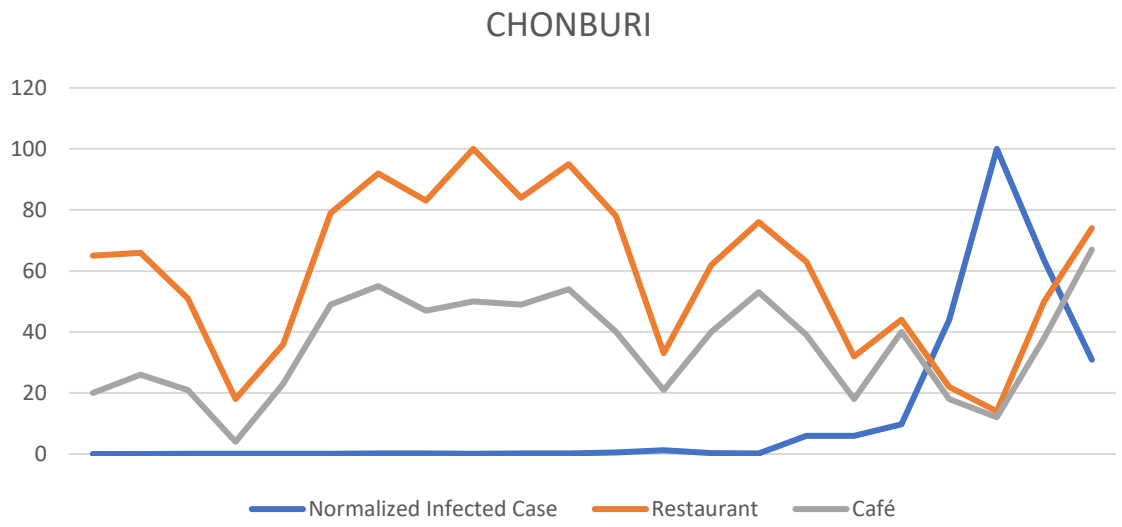
Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	14818.893	4726.562		3.135	.005
	Restaurant	-394.701	135.073	-1.015	-2.922	.009
	Cafe	378.218	208.690	.629	1.812	.086

a. Dependent Variable Infected COVID cases in Chonburi

It was found that the numbers of searching restaurant had P-Value of 0.009, respectively, which was less than the 0.05 level of significance. The numbers of searching restaurant in Google affects Infected COVID 19 cases in Chonburi.

4. **Graphs**



It was found that the numbers of searches for restaurants and cafes with Infected COVID 19 cases in Chonburi was the same Bangkok.

Policy recommendations

There are two main issue occur as a result. Firstly, the numbers of searches for restaurants and cafes in Bangkok describes 38.5% of Infected COVID 19 cases in Bangkok, which is more than in Chonburi. That explains only 27.7%, probably as a result of living in Bangkok, there is a risk of COVID-19 more than in Chonburi. Whether it's the numbers of restaurants and cafes that are more denser restaurants and cafes. As a result, from restaurants and cafe searches in Bangkok describe more Infected COVID 19 cases than in Chonburi. And the correlation between Infected COVID 19 cases and the number of restaurant and café searches has the opposite correlation: as the numbers of infections increases. The numbers of searches for restaurants and cafes will decrease. This maybe because people are aware of the severity of the outbreak, and avoiding eating out. So the numbers of searches is decreased.

Therefore, it is my policy to propose that the government should use different measures to control the spread of COVID-19 between the high and low pandemic areas.

That's in high pandemic area should take more strict measure than low pandemic area, for most people of country can use their life. From the result of analysis in the area with a lot of outbreaks, search counts can describe more Infected COVID 19 cases.

Conclusion

Infected COVID 19 cases were correlated with the opposite numbers of searches for restaurants and cafes in Bangkok and Chonburi, during high numbers of Infected COVID 19 cases, the numbers of searches for restaurants and cafés will be less, while during the low numbers of Infected COVID 19 cases, the numbers of searches are high. This may be a result lockdown and curfew to control the opening and closing hours of restaurants, preventing people from eating out, resulting in low searches. The numbers of searching restaurants and café in Bangkok can explain the Infected COVID 19 cases more than Chonburi. As a result, governments should implement more intensive measures in high pandemic areas than in low pandemic areas to enable the majority of people to survive in this situation.

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FAQ about Google Trends data. Trends Help. URL: https://support.google.com/trends/answer/4365533?hl=en

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