Capstone Project - The Battle of Neighborhoods

The Hospital in Bangkok and Handle with pandemic Covid-19

A. Introduction: Problem Statement

This time in Bangkok city, The COVID-19 pandemic occurred and have been area partial lockdown. Therefore the trend of hospitals will be able to handle it.

In this project, we would like to determine which district is suitable for handling pandemic COVID-19, with some factor by finding out the ratio of hospital beds per hundred people for the district and expected to help indicate areas in other hospitals. but in many situations, there are still many factors to consider this project is simulated by some factors not suitable for these situations.

B. Data Description

Data sources used for the analysis:

a) Bangkok Distract List and Population: The information obtained i.e. the table of postcodes

Source: https://en.wikipedia.org/wiki/List_of_districts_of_Bangkok

b) List of Hospital in Thailand: to getting hospital bed information.

Source: https://en.wikipedia.org/wiki/List_of_hospitals_in_Thailand

c) Hospital information in Bangkok city.

Source: Using “Foursquare” to getting the list and location

d) Coordinate data for each district in Bangkok

Source: “Geocoder” from “Google Map API” to getting the location.

C. Methodology

1) Collect information about the Bangkok city by BeautifulSoup to scrape District and Population from Wikipedia page(Fig.1).

	District	Postcode	Population
0	Bang Bon	10150	105161
1	Bang Kapi	10240	148465
2	Bang Khae	10160	191781
3	Bang Khen	10220	189539
4	Bang Kho Laem	10120	94956

Fig.1

2) Using Geocoder from Google Map API to getting the Latitude and Longitude coordinates for each district of Bangkok city(Fig.2).

	District	Postcode	Population	Latitude	Longitude
0	Bang Bon	10150	105161	13.659204	100.399141
1	Bang Kapi	10240	148465	13.762759	100.645597
2	Bang Khae	10160	191781	13.709761	100.395891
3	Bang Khen	10220	189539	13.864387	100.614643
4	Bang Kho Laem	10120	94956	13.689616	100.509478

Fig.2

3) Collect Hospital information. by BeautifulSoup to scrape Beds for each hospital from Wikipedia page(Fig3).

	Name	Province	District	Beds
0	Bang Khun Thian Hospital	Bangkok	Bang Khun Thian	300
1	Bangkok Metropolitan Administration General Ho...	Bangkok	Bang Khun Thian	408
2	Bangkok Metropolitan Administration Lat Kraban...	Bangkok	Pom Prap Sattru Phai	30
3	Bhumibol Adulyadej Hospital	Bangkok	Lat Krabang	774
4	Burachat Chaiyakorn Hospital	Bangkok	Sai Mai	120

Fig.3

4) Utilized Foursquare API to get the list, district, the Latitude, and Longitude coordinates of each hospital(Fig.4) then processes hospital name to change the English language(Fig.5).

	ID	Name	Latitude	Longitude	District
0	4cef946bed62721e1a1361fd	Bangpakok 8 Hospital (โรงพยาบาลบางปะกอก 8)	13.662666	100.407112	Bang Bon
1	51f0e26f498ea0e8d6adee35	รพ. บางไผ่ บางแค	13.662179	100.403584	Bang Bon
2	4d60de825b276dcb06021cc6	คลินิกใจดีรักษาสัตว์	13.661813	100.404190	Bang Bon
3	4f39b3ebe4b03d7830f73e43	โรงพยาบาลจุฬา ดึก ภปร.ชั้น6	13.660062	100.402185	Bang Bon
4	599cdb319b04732d83b5a93f	แผนกทันตกรรม รพ บางประกอก 8	13.662671	100.407075	Bang Bon
5	4bc410ef2a89ef3bb7e5f588	Romrawin Clinic	13.765557	100.641770	Bang Kapi
6	4cedb9200acea35d39bae5ae	แผนกผิวหนังและศัลยกรรมเลเซอร์ ร.พ.รามคำแหง	13.761435	100.636195	Bang Kapi

Fig.4

	Name	Latitude	Longitude
0	Bangpakok 8 Hospital	13.662666	100.407112
1	Ramkhamhaeng Hospital	13.759078	100.636793
2	Kasemrad Hospital Bangkae	13.709839	100.398444
3	Central General Hospital	13.856397	100.614852
4	Thai Eye Center	13.690577	100.508874
5	Bangkok Christian Hospital	13.728621	100.531188

Fig.5

5) Combining all the data based on hospital name and district location will get a new dataframe(Fig.6).

	District	Postcode	Population	Name	Province	Beds	Latitude	Longitude
0	Bang Bon	10150	105161	Bangpakok 8 Hospital	Bangkok	35	13.662666	100.407112
1	Bang Kapi	10240	148465	Ramkhamhaeng Hospital	Bangkok	486	13.759078	100.636793
2	Bang Khae	10160	191781	Kasemrad Hospital Bangkae	Bangkok	500	13.709839	100.398444
3	Bang Khen	10220	189539	Central General Hospital	Bangkok	200	13.856397	100.614852
4	Bang Kho Laem	10120	94956	Thai Eye Center	Bangkok	5	13.690577	100.508874
5	Bang Khun Thian	10150	165491	Bang Khun Thian Hospital	Bangkok	300	13.699126	100.470104

Fig.6

6) Exploring data and have some Statistical analysis about population (Fig.7) and bed hospital (Fig.8) using a bar chart.

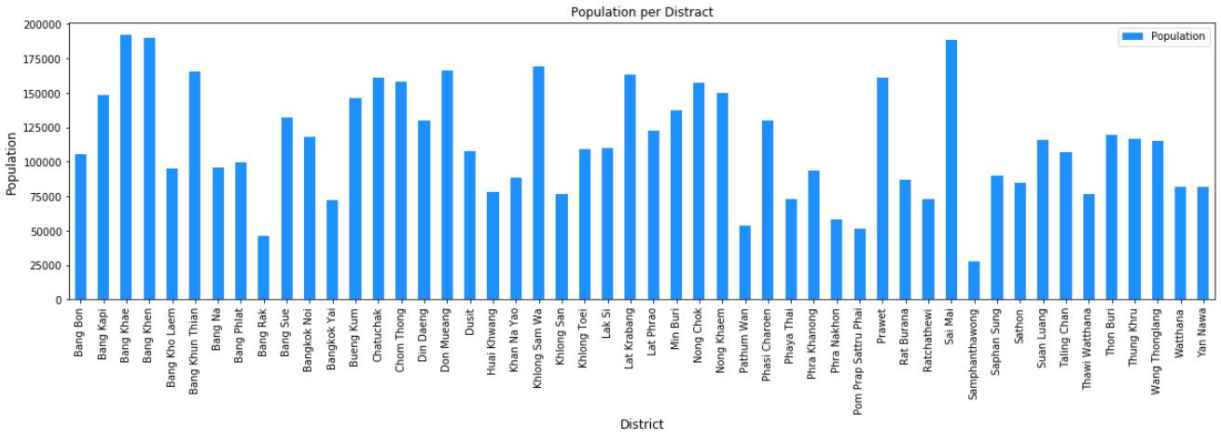

Fig.7

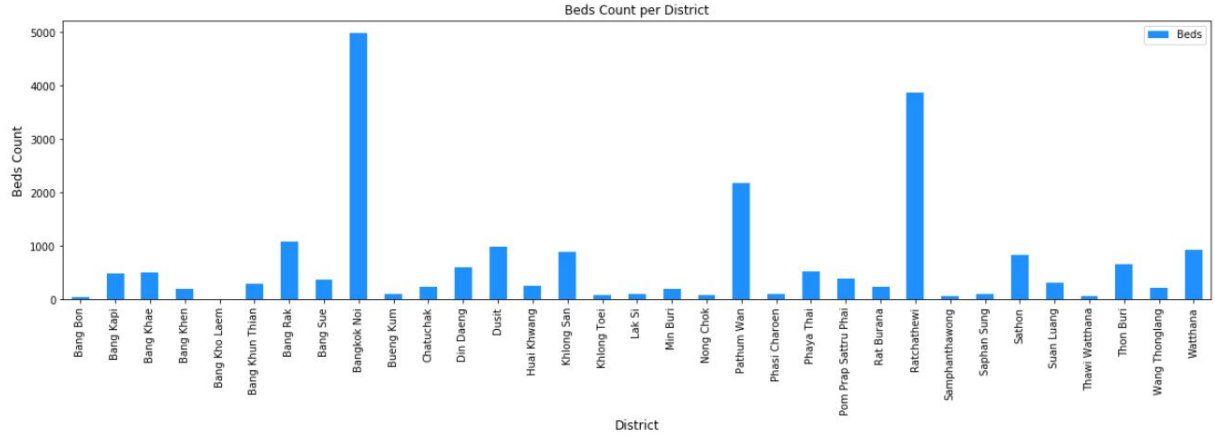

Fig.8

7) Data Analyzing using silhouette score values to find the best value of K for utilized K-Means Clustering(Fig.9), then combine Cluster label(Fig.10).

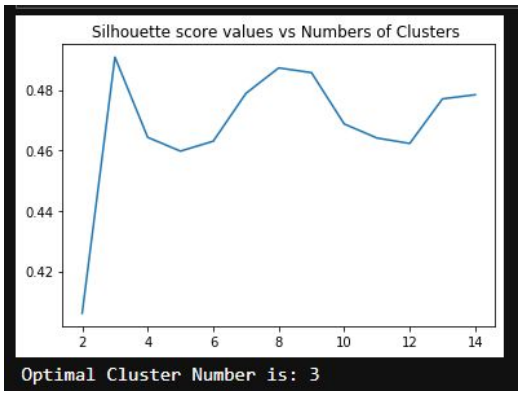

Fig.9

	Cluster Labels	District	Postcode	Population	Name	Province	Beds	Latitude	Longitude	Bed Per Hundred People
0	2	Bang Bon	10150	105161	Bangpakok 8 Hospital	Bangkok	35	13.662666	100.407112	0.033282
1	2	Bang Kapi	10240	148465	Ramkhamhaeng Hospital	Bangkok	486	13.759078	100.636793	0.327350
2	2	Bang Khae	10160	191781	Kasemrad Hospital Bangkae	Bangkok	500	13.709839	100.398444	0.260714
3	2	Bang Khen	10220	189539	Central General Hospital	Bangkok	200	13.856397	100.614852	0.105519
4	0	Bang Kho Laem	10120	94956	Thai Eye Center	Bangkok	5	13.690577	100.508874	0.005266

Fig.10

D. Result

Data Visualization results from clustering Bed per 100 people by Map using Folium(Fig.11). Define 3 cluster group Cyan, Purple, and Red color

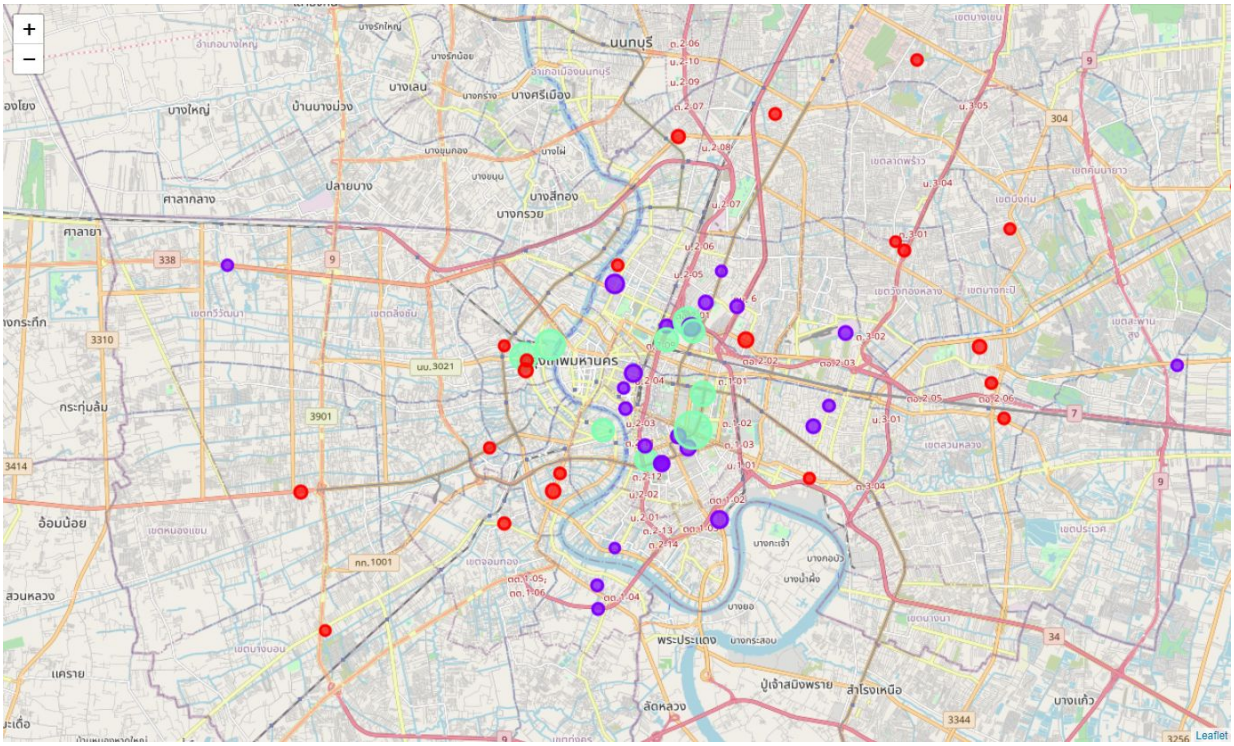

Fig.11

Scatter plot Bed per 100 people(Fig.12). The red circle marker on the plot that is the centroid of each cluster and have 3 clusters group.

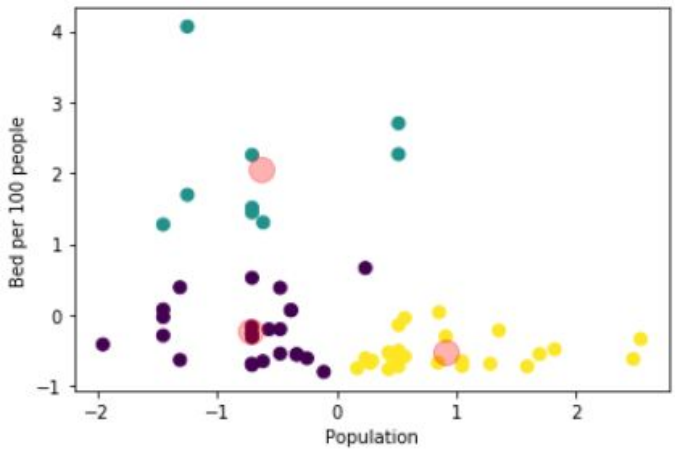

Fig.12

Then analyzed each hospital belonging to which clusters(Fig.13-15)

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df_bkk[(df_bkk['Cluster Labels'] == 0)]
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	Cluster Labels	District	Postcode	Population	Name	Province	Beds	Latitude	Longitude	Bed Per Hundred People
4	0	Bang Kho Laem	10120	94956	Thai Eye Center	Bangkok	5	13.690577	100.508874	0.005266
7	0	Bang Rak	10500	45875	Bangkok Christian Hospital	Bangkok	198	13.728621	100.531188	0.431608
8	0	Bang Rak	10500	45875	BNH Hospital	Bangkok	225	13.724777	100.534582	0.490463
9	0	Bang Rak	10500	45875	Mahesak Hospital	Bangkok	132	13.725361	100.519471	0.287738
20	0	Dusit	10300	107655	Vajira Hospital	Bangkok	875	13.780436	100.508891	0.812782
21	0	Huai Khwang	10310	78175	Bangkok Hospital	Bangkok	263	13.763624	100.589900	0.336425
31	0	Phaya Thai	10400	72952	Prasarnmit Hospital	Bangkok	50	13.784857	100.546187	0.068538
32	0	Phaya Thai	10400	72952	Veterans General Hospital	Bangkok	223	13.772797	100.551712	0.305680
33	0	Phaya Thai	10400	72952	Phyathai 2 Hospital	Bangkok	260	13.773949	100.540689	0.356399
34	0	Pom Prap Sattru Phai	10100	51006	Hua Chiew Hospital	Bangkok	338	13.750052	100.515379	0.662667
35	0	Pom Prap Sattru Phai	10100	51006	Kwongsiew Foundation Hospital	Bangkok	50	13.744901	100.511999	0.098028
36	0	Rat Burana	10140	86695	Bangpakok 1 Hospital	Bangkok	120	13.669978	100.502867	0.138416
37	0	Rat Burana	10140	86695	Rajburana Hospital	Bangkok	124	13.678021	100.502729	0.143030
38	0	Ratchathewi	10400	73035	Institute of Dermatology	Bangkok	43	13.764901	100.534844	0.058876
39	0	Ratchathewi	10400	73035	National Cancer Institute	Bangkok	200	13.765968	100.526948	0.273841
42	0	Ratchathewi	10400	73035	Queen Sirikit National Institute of Child Health	Bangkok	538	13.765808	100.535374	0.736633
44	0	Samphanthawong	10100	27452	Thian Fah Foundation Hospital	Bangkok	60	13.738091	100.512450	0.218563
45	0	Saphan Sung	10240	89825	Kasemrad Hospital Sukhapibal 3	Bangkok	100	13.752725	100.706177	0.111328
46	0	Sathon	10120	84916	Saint Louis Hospital	Bangkok	412	13.719300	100.525148	0.485185
47	0	Sathon	10120	84916	Saint Louis Hospital	Bangkok	412	13.719300	100.525148	0.485185
50	0	Thawi Watthana	10170	76351	Thonburi 2 Hospital	Bangkok	67	13.786727	100.372777	0.087753
55	0	Watthana	10110	81623	Bumrungrad International Hospital	Bangkok	538	13.700440	100.545548	0.659128
56	0	Watthana	10110	81623	Camillian Hospital	Bangkok	120	13.739182	100.583963	0.147017
57	0	Watthana	10110	81623	Samitivej Sukhumvit Hospital	Bangkok	275	13.732141	100.578573	0.336915

Fig.13 Cluster 0

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df_bkk[(df_bkk['Cluster Labels'] == 1)]
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	Cluster Labels	District	Postcode	Population	Name	Province	Beds	Latitude	Longitude	Bed Per Hundred People
6	1	Bang Rak	10500	45875	Lerdsin Hospital	Bangkok	528	13.720588	100.519804	1.150954
11	1	Bangkok Noi	10700	117793	Siriraj Hospital	Bangkok	2000	13.755876	100.476901	1.697894
12	1	Bangkok Noi	10700	117793	Siriraj Piyamaharajkarun Hospital	Bangkok	2283	13.759713	100.485982	1.938146
22	1	Khlong San	10600	76446	Somdet Chaopraya Institute of Psychiatry	Bangkok	892	13.730675	100.504683	1.166837
28	1	Pathum Wan	10330	53263	King Chulalongkorn Memorial Hospital	Bangkok	1433	13.730627	100.536371	2.690423
29	1	Pathum Wan	10330	53263	Police General Hospital	Bangkok	736	13.743215	100.539761	1.381822
40	1	Ratchathewi	10400	73035	Phramongkutklao Hospital	Bangkok	1236	13.767671	100.534262	1.692339
41	1	Ratchathewi	10400	73035	Priest Hospital	Bangkok	937	13.761338	100.526910	1.282947
43	1	Ratchathewi	10400	73035	Rajavithi Hospital	Bangkok	909	13.764362	100.536239	1.244609

Fig.14 Cluster 1

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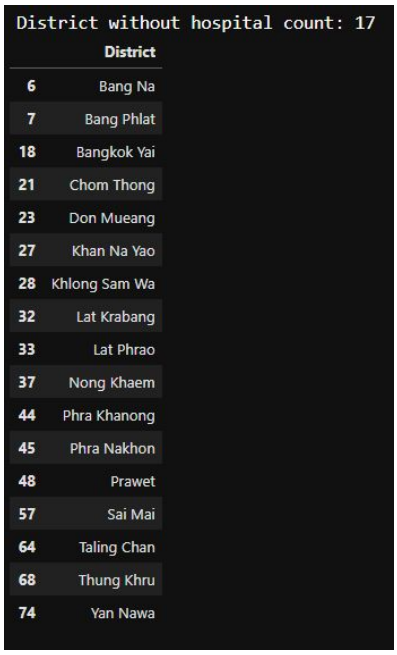
df_bkk[(df_bkk['Cluster Labels'] == 2)]
```

	Cluster Labels	District	Postcode	Population	Name	Province	Beds	Latitude	Longitude	Bed Per Hundred People
0	2	Bang Bon	10150	105161	Bangpakok 8 Hospital	Bangkok	35	13.662666	100.407112	0.033282
1	2	Bang Kapi	10240	148465	Ramkhamhaeng Hospital	Bangkok	486	13.759078	100.636793	0.327350
2	2	Bang Khae	10160	191781	Kasemrad Hospital Bangkae	Bangkok	500	13.709839	100.398444	0.260714
3	2	Bang Khen	10220	189539	Central General Hospital	Bangkok	200	13.856397	100.614852	0.105519
5	2	Bang Khun Thian	10150	165491	Bang Khun Thian Hospital	Bangkok	300	13.699126	100.470104	0.181279
10	2	Bang Sue	10800	132234	Kasemrad Hospital Prachachuen	Bangkok	373	13.830310	100.531246	0.282076
13	2	Bangkok Noi	10700	117793	Chaophya Hospital	Bangkok	200	13.754266	100.477839	0.169789
14	2	Bangkok Noi	10700	117793	Srivichai Hospital	Bangkok	59	13.759501	100.469918	0.050088
15	2	Bangkok Noi	10700	117793	Thonburi Hospital	Bangkok	435	13.751144	100.477477	0.369292
16	2	Bueng Kum	10240	145830	Nawamin 2 Hospital	Bangkok	100	13.799206	100.647510	0.068573
17	2	Chatuchak	10900	160906	Vibhavadi Hospital	Bangkok	230	13.838034	100.565046	0.142941
18	2	Din Daeng	10400	130220	Rajanukul Institute	Bangkok	610	13.761304	100.554600	0.468438
19	2	Dusit	10300	107655	Metropolitan Electricity Authority Hospital	Bangkok	120	13.786824	100.509932	0.111467
23	2	Khlong Toei	10110	109041	Theptarin Hospital	Bangkok	80	13.714278	100.576996	0.073367
24	2	Lak Si	10210	109770	Mongkutwattana General Hospital	Bangkok	100	13.893606	100.561836	0.091100
25	2	Min Buri	10510	137251	Navaminthra 9 Hospital	Bangkok	121	13.813520	100.726972	0.088160
26	2	Min Buri	10510	137251	Seriruk Hospital	Bangkok	71	13.810447	100.729754	0.051730
27	2	Nong Chok	10530	157138	Wetchakarunrasm Hospital	Bangkok	76	13.857226	100.858774	0.048365
30	2	Phasi Charoen	10160	129827	Bang Phai Hospital	Bangkok	100	13.724631	100.464976	0.077026
48	2	Suan Luang	10250	115658	Samitivej Srinakarin Hospital	Bangkok	154	13.746737	100.641099	0.133151
49	2	Suan Luang	10250	115658	Vibharam Hospital	Bangkok	150	13.734812	100.645322	0.129693
51	2	Thon Buri	10600	119708	Somdet Phra Pinklao Hospital	Bangkok	507	13.709994	100.487094	0.423531
52	2	Thon Buri	10600	119708	Krungdhon 1 Hospital	Bangkok	150	13.716022	100.489624	0.125305
53	2	Wang Thonglang	10310	114768	Ladprao General Hospital	Bangkok	180	13.791696	100.610345	0.156838
54	2	Wang Thonglang	10310	114768	Passarapiban Nursing Home	Bangkok	30	13.794787	100.607177	0.026140

Fig.15 Cluster 2

Check each district without the hospitals(Fig.16). That Is an indicator that there are 17 districts that without a large hospital.



District without hospital count: 17

	District
6	Bang Na
7	Bang Phlat
18	Bangkok Yai
21	Chom Thong
23	Don Mueang
27	Khan Na Yao
28	Khlong Sam Wa
32	Lat Krabang
33	Lat Phrao
37	Nong Khaem
44	Phra Khanong
45	Phra Nakhon
48	Prawet
57	Sai Mai
64	Taling Chan
68	Thung Khru
74	Yan Nawa

Fig.16

E. Discussion

According to this analysis, we define the optimal 3 clusters. group cluster 1 is high hospital beds, this group is proper to handle this pandemic. lowest hospital beds per person are clusters 0 and 2. Especially group 0 has many populations in districts that each hospital should be supported bed, including various equipment.

In addition to that, we have 17 districts without hospitals(only fetch hospital data from foursquare) in this area should be careful. May provide replacement facilities and equipment in high-risk situations.

Data from Wikipedia It could lack some hospital information and patient data is treating a COVID-19. this project, We are only discussing hospitals. and Don't bring various clinics to process. of course, In a real situation, there are still other factors to handle this pandemic.

F. Conclusion

As a result, The area that has a hospital suitable for handle this Pandemic COVID-19 Pandemic should be select district, Pathum Wan, Ratchathewi, Bangkok Noi, Khlong San, and Bang Rak because the hospital has the best tools such as the number of hospital beds.