INTRODUCTION

Problem background:

Until 06/24/2020, the pandemic affected 9,392,847 cases, with 2% is serious and 480,559 deaths or 9% from the closed cases (1). The USA is the leading country damaged by this virus.

- In that tragedy, New York city is the : > 200 000 cases and 17 600 deaths in 117 days (3).

- High risk: _ High density of population

  _ Very quick transmission from person to person

  _ Lack of protect medical equipment such as masks, protective cloths … and ventilators play the key role to push the big apple to the chaos.

- New Yorker stepped to the second phase of re-opening in June 22nd, 2020 (3), with no available cures and vaccines

- Mental and material help is never enough in this period.

- How can an organization or an individual support the New York city resident?

- A reasonable strategy and good understanding the pandemic impact on NYC are important steps for successful support service.

INTRODUCTION

- Problem description:

- A non-profit organization has a project to support the New York City (NYC) hospitals and residents. There are 2 questions need to be resolved:

    1. Where is the Pandemic epicenter of NYC?

    2. where are the reasonable places to open office or storage? Because the supplies such as Mask, Vitamin ... are the same as pharmacy supply, the places should locate far from pharmacies.

- To resolve the problems, various factors need to be considered and analyzed to figured out the right solution such as:

    1. NYC population and demographics

    2. The Covid 19 virus affected cases, hospitalized cases and death until re-opening phase in June 22nd, 2020.

    3. Location of Hospitals in NYC.

    4. Clusters of pharmacy in accordance to Neighborhoods.

    5. And the other data related need to be analyzed.

- Interested Audience

- The objective is to evaluate the most affected borough, and to locate the location of hospitals, the neighborhoods are lack of medical supply or pharmacy. This project is applicable to all profit and non-profit organizations who are interested in medical supply or even individual who want to do business in medical field, especially the distribution of hospitals and pharmacies in New York City.

DATA

Data source

1. New York City population, demographics data will be collected from website: https://www.mapsofworld.com/usa/states/new-york/nyc-boroughs-map.html#

2. Dataset of Covid-19 virus disease in five NYC boroughs from beginning until re-opening phase 2 in June 22nd, 2020 will be collected from NYChealth github: https://github.com/nychealth/coronavirus-data

3. Use Foursquare API to get:
   _ NYC Boroughs, Neighborhoods and all venues

   _ The hospitals location in 5 boroughs of NYC, with the Hospital ID: "4bf58dd8d48988d196941735"

   _ NYC Boroughs, Neighborhoods and all venues

   _ NYC Pharmacy location and associated neighborhood clusters

4. Coordinate of New York City will be obtained using Google Maps API geocoding, which is downloaded at the IBM Coursera: https://cocl.us/new_york_dataset .
   All data are open-source and available to download.

DATA

- Acquisition and Processing NYC_C0V-19 data

```
# The final step to get NYC Cov-19 virus table
df_CoV=df_total.loc[:5]
df_CoV
```

	Borough	Cases	Hospitalizations	Deaths
0	Manhattan	26540.0	7817.0	2401.0
1	Queens	64311.0	16579.0	5352.0
2	Brooklyn	58444.0	14771.0	5350.0
3	Staten Island	13876.0	2267.0	858.0
4	Bronx	47338.0	11834.0	3720.0

DATA

- Web scrapping NYC_C0V-19 demographic data

```
# Selecting 5 rows only, because of repeating
df2=df1.drop(columns='County')
df3=df2.loc[0:4]
df3
```

|	Borough	Area_sq_miles	Population
0	Manhattan	23	1636268.0
1	Queens	109	2321580.0
2	Brooklyn	71	2621793.0
3	Staten Island	58	473279.0
4	The Bronx	42	1438159.0

```
# Combination of Demographic table and Covid-19 table
df_uni=pd.merge(df4,df_CoV, on='Borough')
df_uni
```

	Borough	Area_sq_miles	Population	Density	Cases	Hospitalizations	Deaths
0	Manhattan	23.0	1636268.0	71142.086957	26540.0	7817.0	2401.0
1	Queens	109.0	2321580.0	21298.899083	64311.0	16579.0	5352.0
2	Brooklyn	71.0	2621793.0	36926.661972	58444.0	14771.0	5350.0
3	Staten Island	58.0	473279.0	8159.982759	13876.0	2267.0	858.0
4	Bronx	42.0	1438159.0	34241.880952	47338.0	11834.0	3720.0

DATA

NYC DEMOGRAPHIC AND COV-19 VIRUS DATA

Figure1:Total Covid_19 impact in NYC until June 21st
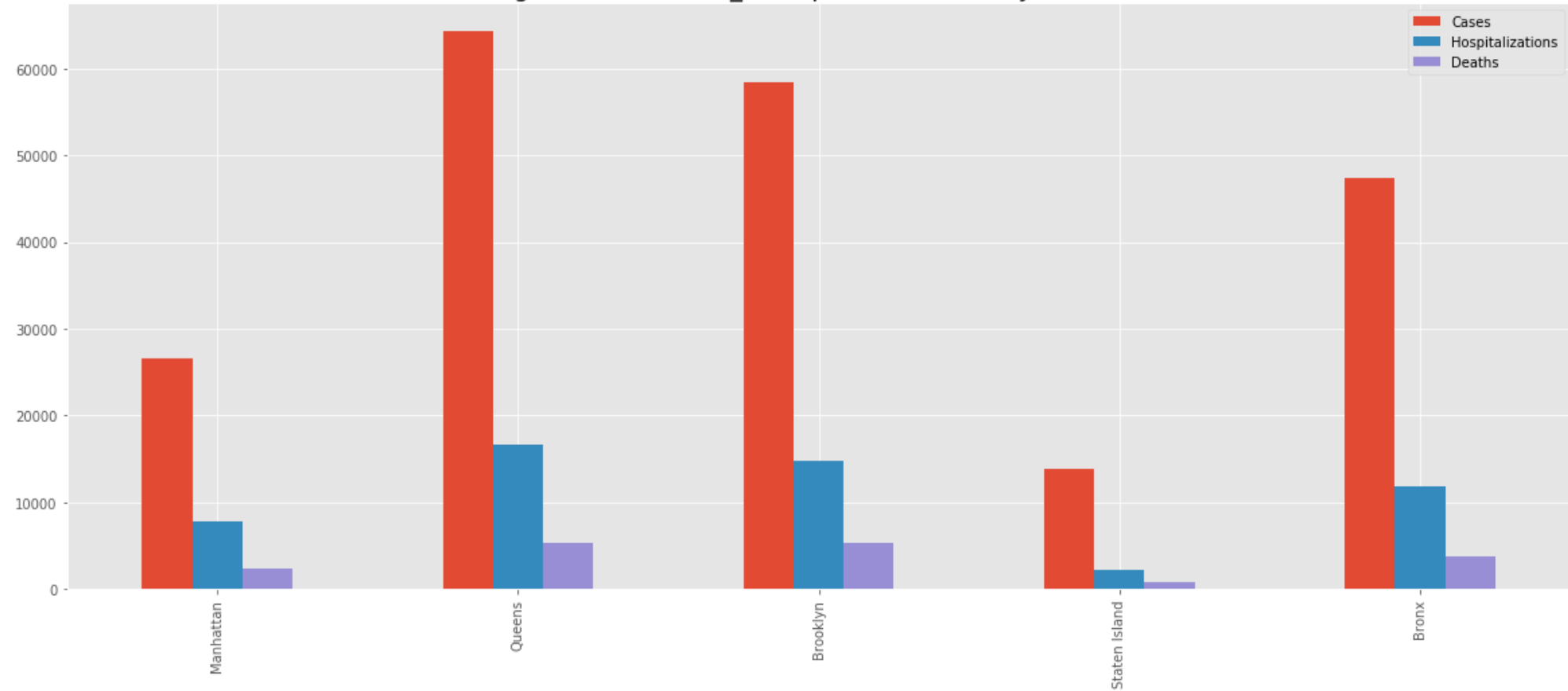
DATA & RESULT

```
df_zone.sort_values(by='Cases_100000_sqmile', inplace=True, ascending=False)
df_zone.reset_index(drop=True, inplace=True)
df_zone
```

	Borough	Cases_100000_sqmile	Hospitalizations_100000_sqmile	Deaths_100000_sqmile
0	Bronx	78.370697	19.591847	6.158667
1	Manhattan	70.521030	20.771021	6.379841
2	Staten Island	50.549756	8.258597	3.125662
3	Brooklyn	31.396641	7.935114	2.874068
4	Queens	25.414122	6.551612	2.114978

DATA & RESULT

NYC VIRUS CASES PER SQUARE MILE AND ON 100000 POPULATION

DATA & RESULT

- Bronx and Manhattan: approximately having 70 cases per square mile, on population of 100000.

  Apparently, Bronx is the most affected borough by the virus.

  From these 2 points, 2 groups are selected for further evaluation:

Group 1 with dominant cases per square includes Bronx and Manhattan

  Group 2 with higher cases includes Brooklyn and Queens.

 Staten Island stands in the third category.

Figure2:Covid-19 Cases per square miles and per 100000
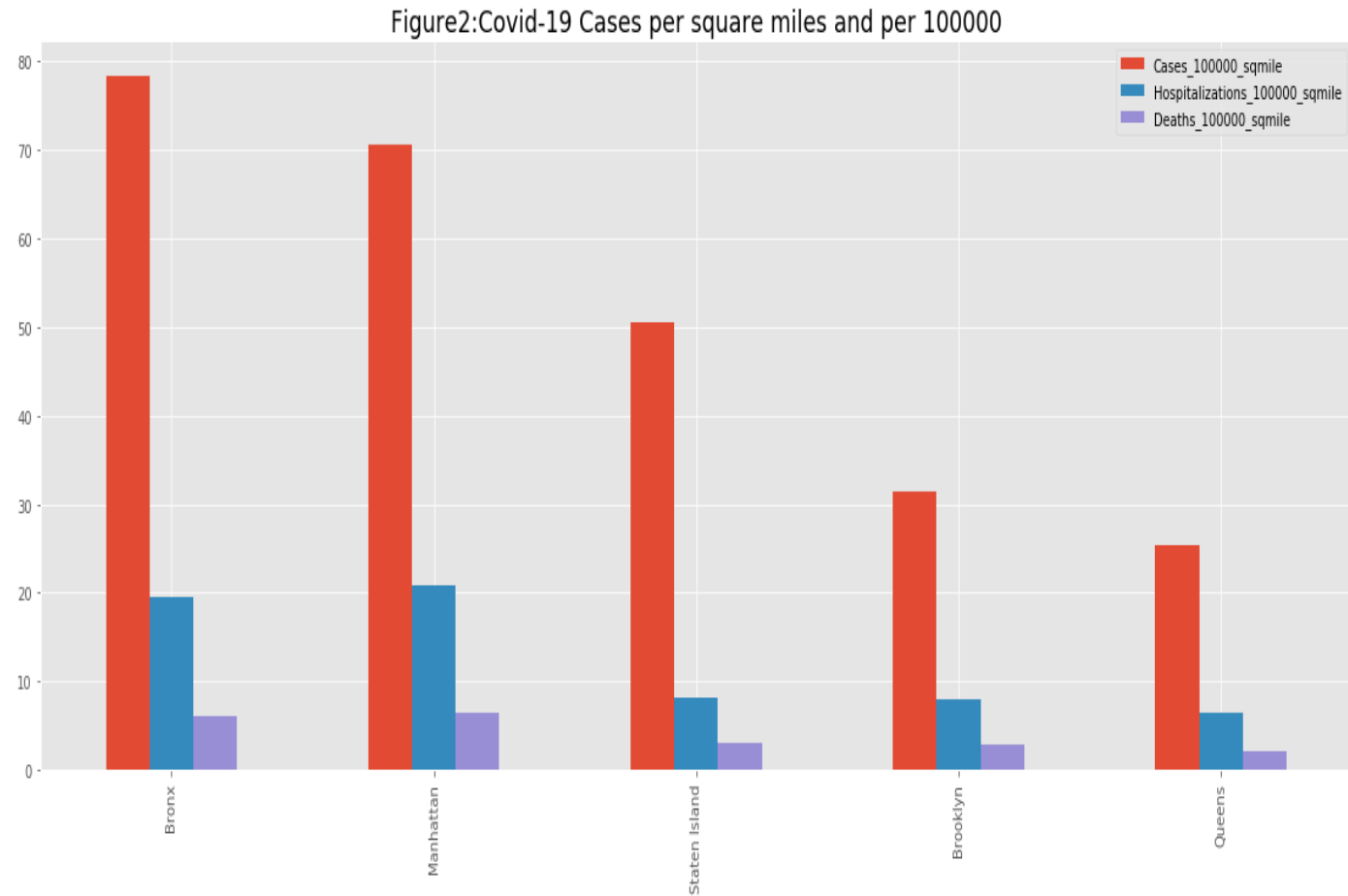
DATA & RESULT

	Bronx_Manhattan	Queens_Brooklyn
Neighborhoods	92	151
Venue Shape	7240	10917
Venue Category	374	410
Hospital	378	376
Pharmacy	121	199
No Pharmacy Neighborhood	39	25

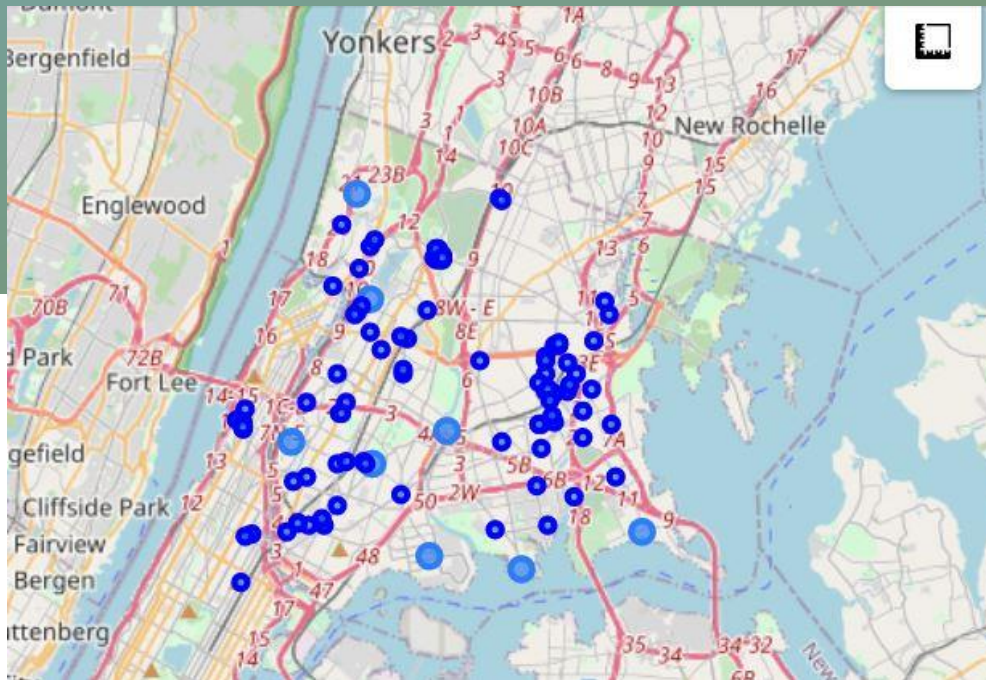Number of Neighborhood for each Borough in New York City
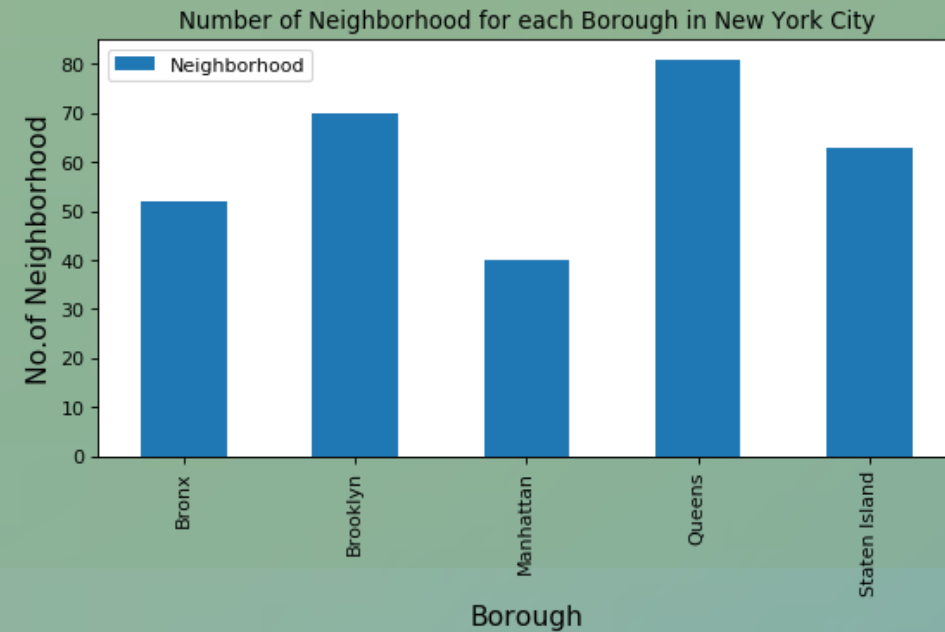
Comparison 2 groups: Bronx-Manhattan and Queens-Brooklyn

DATA & RESULT
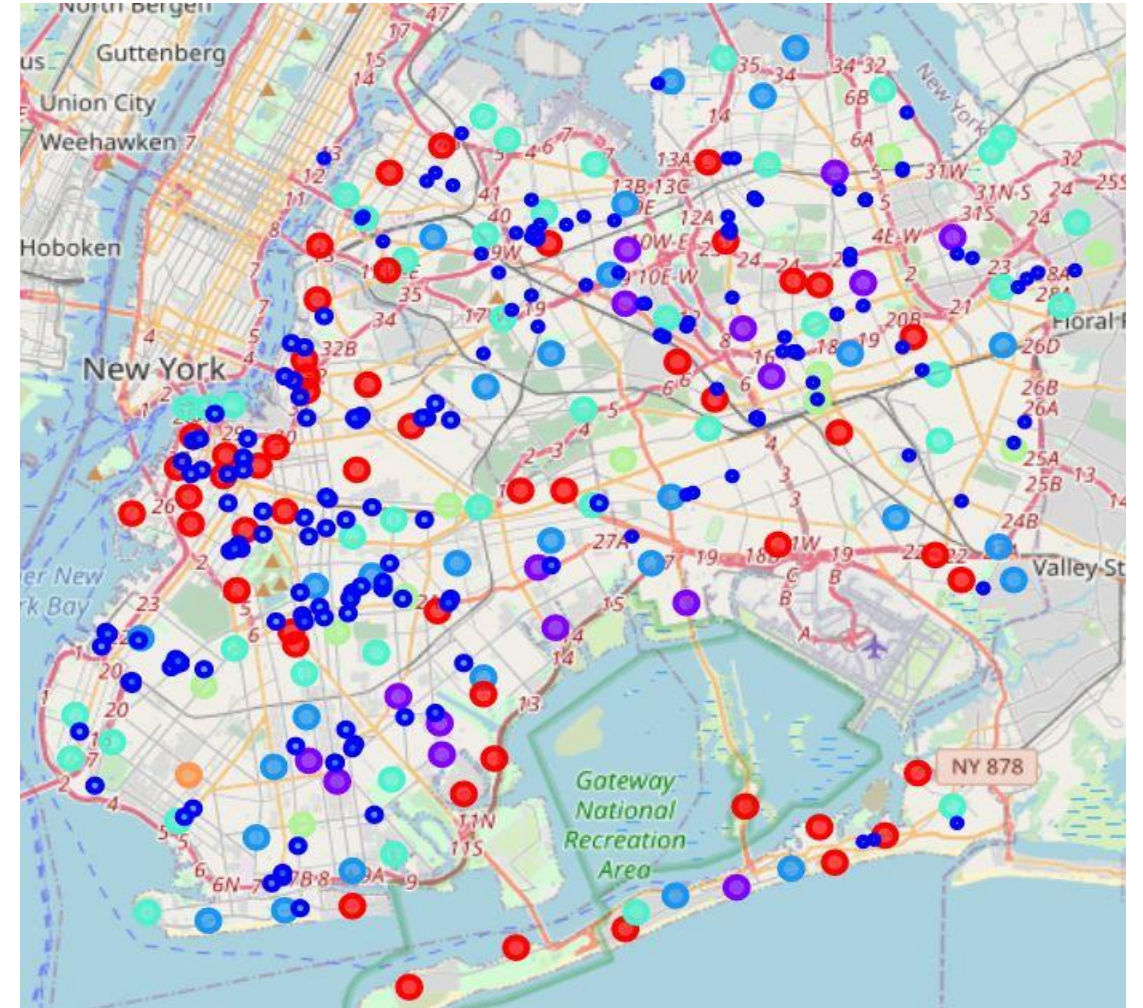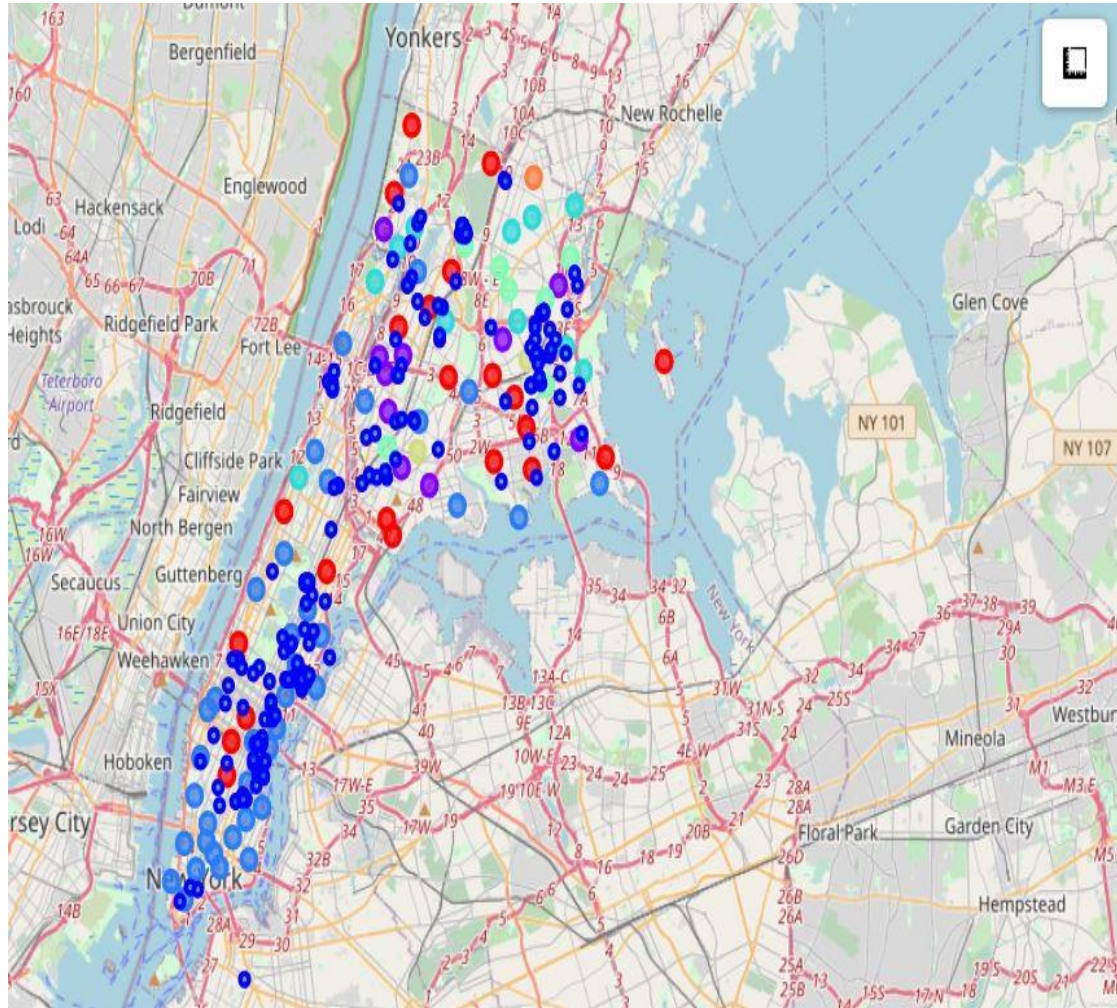
Hospitals and Pharmacy clusters in 2 groups: BM & QBK

2.8 Bronx Neighborhoods do not have Pharmacy

```
Bronx=BM_No_Pharmacy[BM_No_Pharmacy['Borough'] == 'Bronx'].reset_index(dr
Bronx
```

	Borough	Neighborhood	Latitude	Longitude	Total	Cluster_Labels
0	Bronx	Fieldston	40.895437	-73.905643	0	2
1	Bronx	West Farms	40.839475	-73.877745	0	2
2	Bronx	High Bridge	40.836623	-73.926102	0	2
3	Bronx	Hunts Point	40.809730	-73.883315	0	2
4	Bronx	Clason Point	40.806551	-73.854144	0	2
5	Bronx	Throgs Neck	40.815109	-73.816350	0	2
6	Bronx	Claremont Village	40.831428	-73.901199	0	2
7	Bronx	Kingsbridge Heights	40.870392	-73.901523	0	2

DATA & RESULT

8-No-pharmacy neighborhoods and hospitals location

DATA & RESULT

- Linear measurement from West Farms to Saint Barnabas Hospital nearby
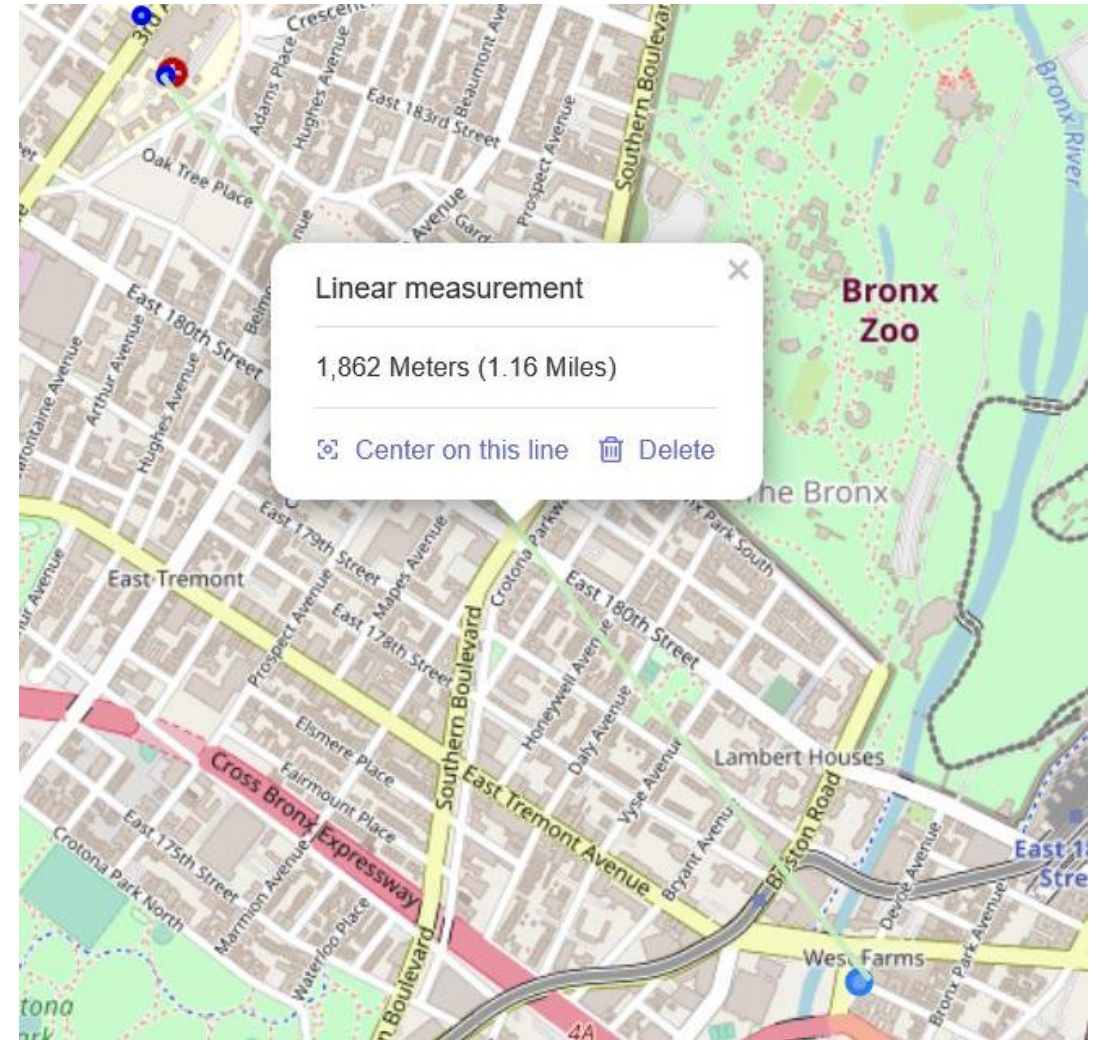
METHODOLOGY

- This project is retrospective to looking for a place to open support center to help residents and hospitals in pandemic. The local pharmacy is the counterpart to avoid.
  _ The answer is straight forward to locate the neighborhood with no pharmacy store.
  _ In order to collect and process data, Python 3 is unique tool to use. Cloud IBM Watson is used to process the Foursquare API and for sharing.
  _ Machine learning IBM coursera knowledge and free Dual core-8Gb ram IBM cloud are the key roles to successfully complete the target.
  _ sklearn is used to cluster the neighborhoods with pharmacy to locate the neighborhoods need support most.
  _ Visualization is the key to compare the outcome and map all pharmacy cluster, hospitals with measurement tool.

DISCUSSION

- The purpose of project is looking for the place to open office or storage to supply materials to help Residents and Hospitals fighting virus pandemic. All the result depends on only Foursquare API.
  _ Limitation: free version, hospital data.

- If the purpose for profit business, further information needs to be collected for market decision.

- However, with the Visualization mapping, it is clear to recognize the distribution the "vacant" neighborhoods.

- Folium with MesureControl is valuable tool in this situation to estimate the distance from place to place.

- In contrary to hospital information, Pharmacy data is good enough to synchronize with Neighborhood in clustering analysis.

- It is helpful to locate the "vacant" areas. It is quite satisfied to answer the question.

- There is one good example is West Farm in the center of Bronx. There is no pharmacy and no hospital existing around radius of 1 mile. 1 mile is not significant in a routine distance to hospital nearby. But in quarantine condition, small offices or no urgent care will be closed, that becomes a problem to be considered.

- In comparison Bronx-Manhattan to Queens-Brooklyn, only approximately equal to one third of Queens-Brooklyn area, but the number of all venues, pharmacy and hospitals are almost the same. The higher density of population may be is the condition for virus transmission by air and the social distance is difficult to keep.

- Staten Island is in between 2 groups, needs to get more analysis to understand the insight of relationship neighborhood, hospital and pharmacy.

CONCLUSION

- Combination of IBM coursera knowledge, Foursquare API and Python is a robust system to build valuable models in business research.

- Foursquare database is so impressive and especially useful to resolve the problem.

- In this project, the essential purpose can be achieved, but for profitable business or investment, more information needs to be considered and carefully analyzed such as hospital information, neighborhood income, traffic condition.