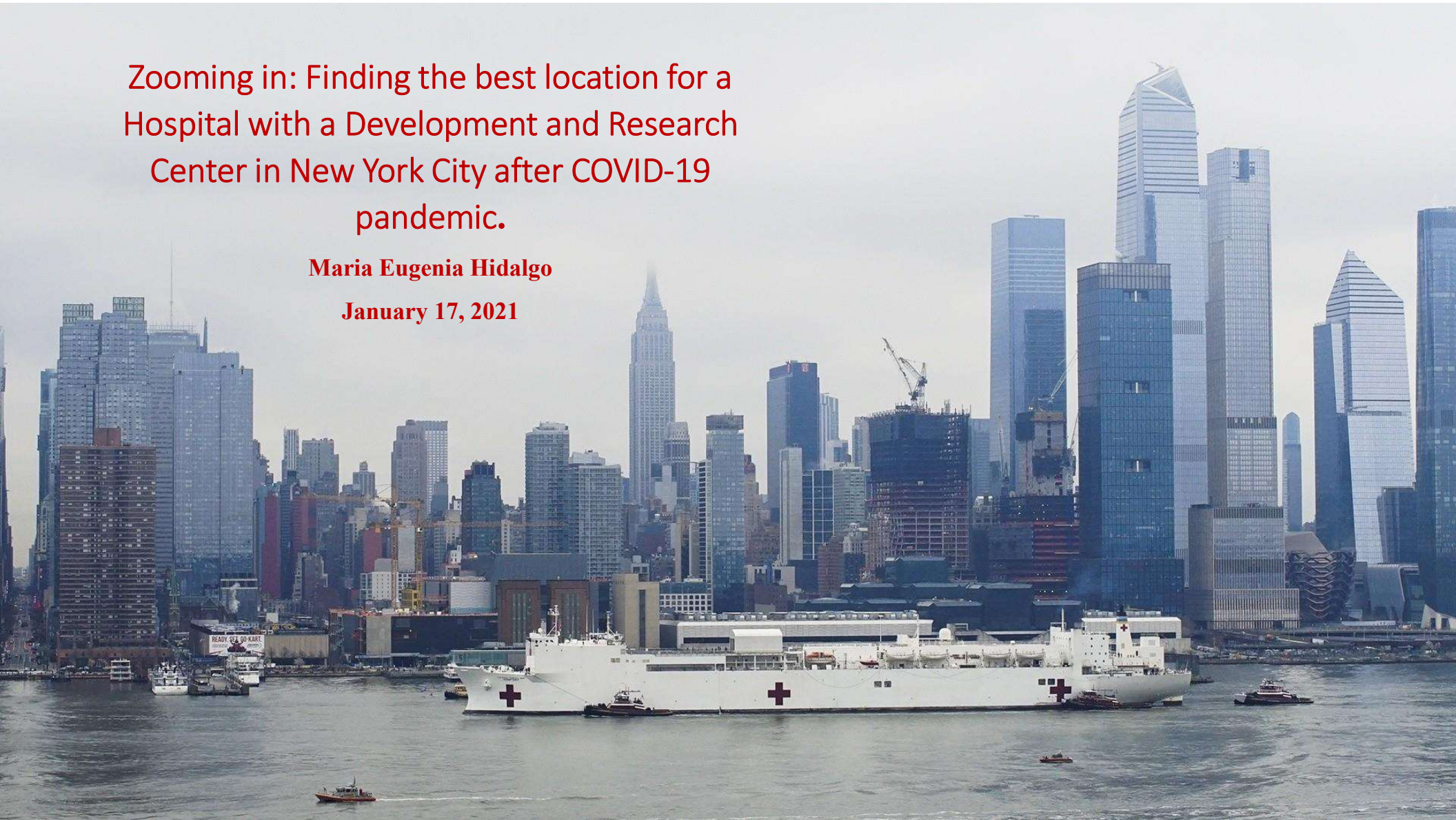


Zooming in: Finding the best location for a
Hospital with a Development and Research
Center in New York City after COVID-19
pandemic.

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Introduction

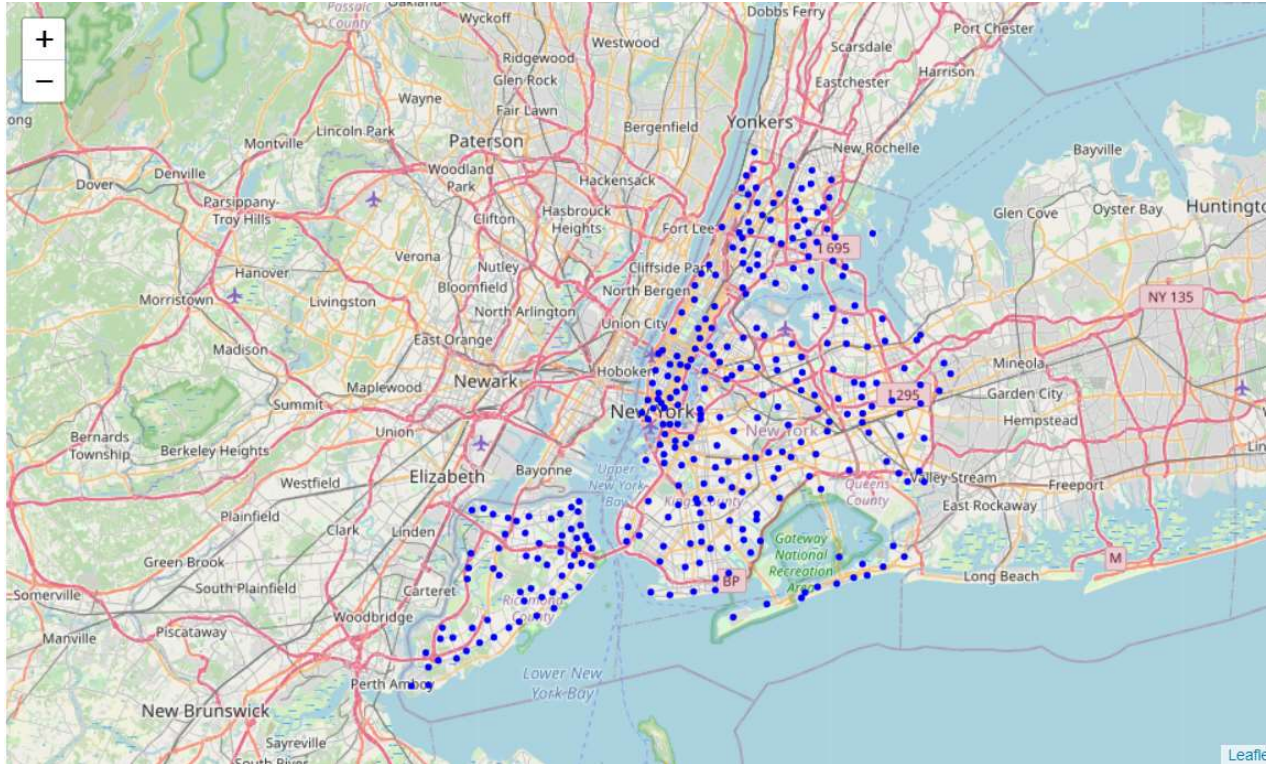


COVID-19 is one of the worst pandemics the world has faced. There have been 80,155,187 confirmed cases, including 1,771,128 deaths, notified to the WHO at the end of 2020.

Many hospitals collapsed from the large number of patients arriving every hour, and some cities were hit harder than others.

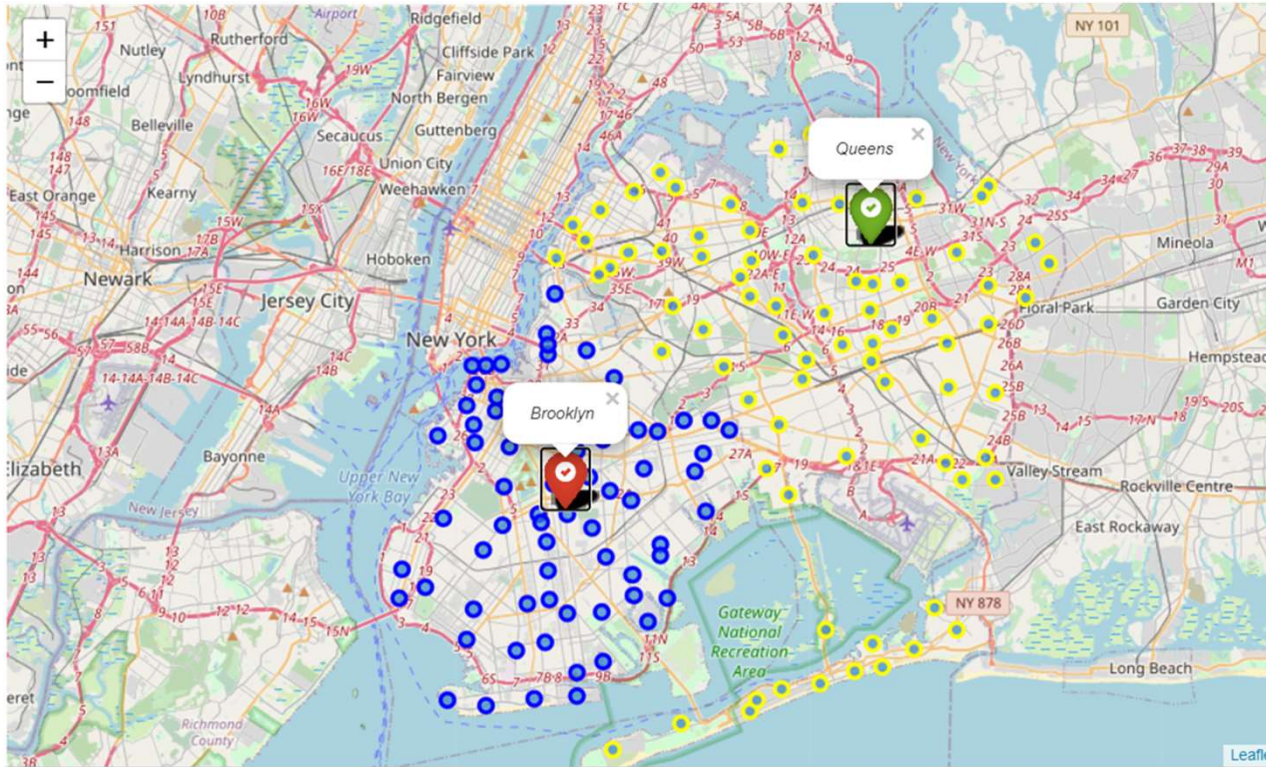
With this outlook came the idea of using the tools learned in this course to find the best location to build a Hospital that includes a development and research center in one of the most affected cities in the world during this pandemic, such as New York City.

Problem Statement



What is the best location to build a Hospital and a Development and Research Center (H&DRC) in NYC based on post-pandemic needs? In what borough should the authorities or private organization open the H&DRC?

Data & Methodology



The data to be used will be obtained from the following web address: https://geo.nyu.edu/catalog/nyu_245134572.

Using Nominatim and geocode, locate New York City on the map. Then, locate the boroughs most affected by the pandemic within New York City, which were Brooklyn and Queens. In this way, the study focused on these two Boroughs.

Using the Foursquare Credentials and Version were exploring and segmented the neighborhoods inside each borough (Queens and Brooklyn) using Foursquare API.

Result and Discussion

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Astoria	40.768509	-73.915654	Favela Grill	40.767348	-73.917897	Brazilian Restaurant
1	Astoria	40.768509	-73.915654	Orange Blossom	40.769856	-73.917012	Gourmet Shop
2	Astoria	40.768509	-73.915654	Titan Foods Inc.	40.769198	-73.919253	Gourmet Shop
3	Astoria	40.768509	-73.915654	CrossFit Queens	40.769404	-73.918977	Gym
4	Astoria	40.768509	-73.915654	Simply Fit Astoria	40.769114	-73.912403	Gym
5	Astoria	40.768509	-73.915654	Off The Hook	40.767200	-73.918104	Seafood Restaurant
6	Astoria	40.768509	-73.915654	Al-sham Sweets and Pastries	40.768077	-73.911561	Middle Eastern Restaurant
7	Astoria	40.768509	-73.915654	Sitan Muay Thai	40.766108	-73.913224	Martial Arts School
8	Astoria	40.768509	-73.915654	Noisette	40.768544	-73.911248	Dessert Shop
9	Astoria	40.768509	-73.915654	The Gully	40.766719	-73.912410	Indian Restaurant

Creating the url request and cataloging the venues for Queens using the Foursquare tool, a total of 81 neighborhoods were detected, indicating their coordinates (latitude and longitude). Also, were found 2089 venues, displayed according to the type of venue, giving their coordinates, and category (270 unique categories).

Result and Discussion

----Fresh Meadows----

	venue	freq
0	Bus Station	0.21
1	Pharmacy	0.14
2	Chinese Restaurant	0.14
3	Food Truck	0.07
4	Vegetarian / Vegan Restaurant	0.07

----Jamaica Hills----

	venue	freq
0	Pharmacy	0.09
1	Grocery Store	0.09
2	Fast Food Restaurant	0.09
3	Indian Restaurant	0.09
4	Donut Shop	0.09

----Queens Village----

	venue	freq
0	Bank	0.11
1	Bus Stop	0.11
2	Donut Shop	0.06
3	Grocery Store	0.06
4	Pedestrian Plaza	0.06

----Glen Oaks----

	venue	freq
0	Pharmacy	0.17
1	Bank	0.06
2	Grocery Store	0.06
3	Park	0.06
4	Gift Shop	0.06

----Oakland Gardens----

	venue	freq
0	Korean Restaurant	0.14
1	Yoga Studio	0.09
2	Pharmacy	0.09
3	Chinese Restaurant	0.09
4	Bagel Shop	0.05

----Cambria Heights----

	venue	freq
0	Cosmetics Shop	0.14
1	Caribbean Restaurant	0.14
2	Jewelry Store	0.07
3	Moving Target	0.07
4	Flower Shop	0.07

Foursquare provided the frequency of occurrence for each category. This is valuable information from which you can infer cause of patterns, need for places or services, among others.

An important point that I call attention to the Queen neighborhoods where COVID-19 cases were alarming corresponding to Fresh Meadows, Jamaica, Elmhurst, Queens Village and Cambria Height. Most of these neighborhoods have a wide variety of restaurants, shops, and general places where people meet.

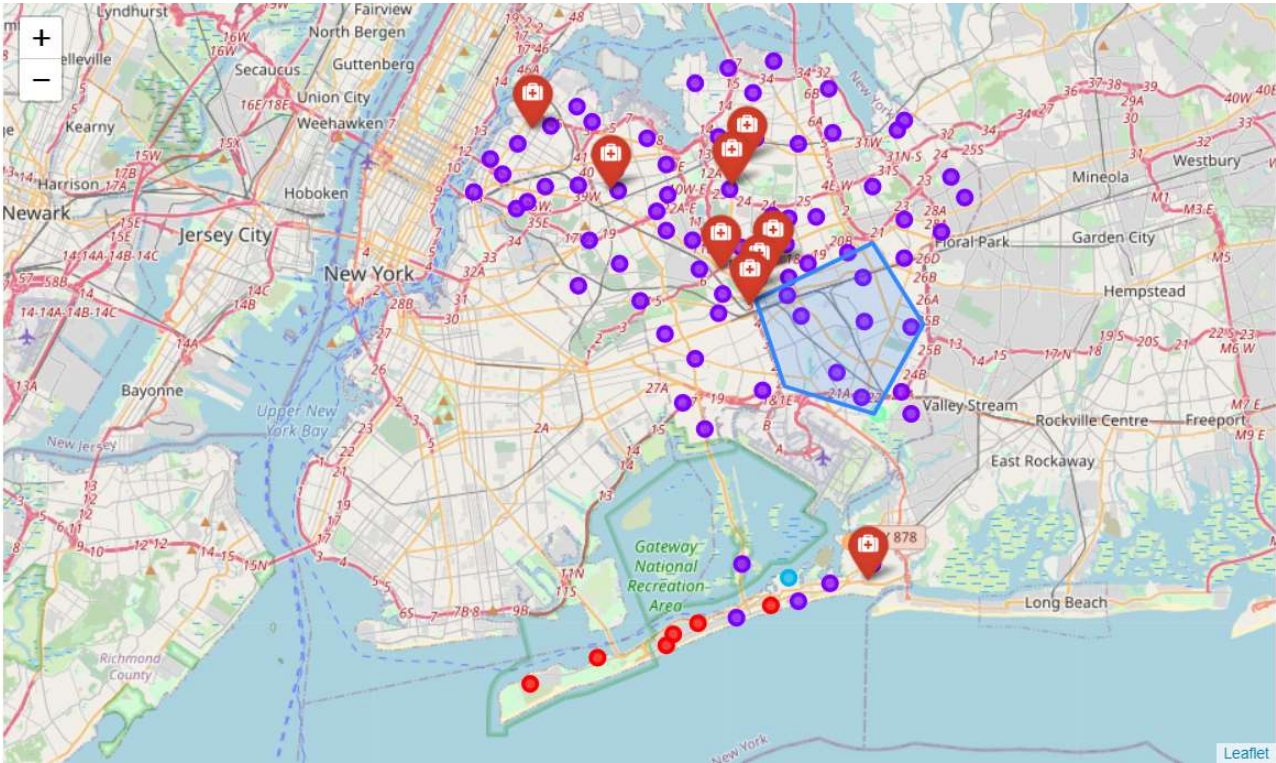
Despite distancing measures and wearing a mask to avoid spreading the virus, it was difficult to prevent it at least at the beginning. So, it is possible that many people self-medicate going to the pharmacy, and much more if there were no hospitals nearby

Result and Discussion

	Borough	Neighborhood	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Queens	Astoria	40.768509	-73.915654	1	Bar	Middle Eastern Restaurant	Hookah Bar	Café	Bakery
1	Queens	Woodside	40.746349	-73.901842	1	Grocery Store	Thai Restaurant	Bakery	Latin American Restaurant	Filipino Restaurant
2	Queens	Jackson Heights	40.751981	-73.882821	1	Latin American Restaurant	Peruvian Restaurant	South American Restaurant	Bakery	Thai Restaurant
3	Queens	Elmhurst	40.744049	-73.881656	1	Thai Restaurant	Mexican Restaurant	Chinese Restaurant	Vietnamese Restaurant	Snack Place
4	Queens	Howard Beach	40.654225	-73.838138	1	Italian Restaurant	Pharmacy	Sandwich Place	Fast Food Restaurant	Ice Cream Shop
5	Queens	Corona	40.742382	-73.856825	1	Sandwich Place	Mexican Restaurant	Supermarket	Ice Cream Shop	Bakery
6	Queens	Forest Hills	40.725264	-73.844475	1	Gym / Fitness Center	Gym	Yoga Studio	Thai Restaurant	Pharmacy
7	Queens	Kew Gardens	40.705179	-73.829819	1	Chinese Restaurant	Bus Station	Pizza Place	Bank	Donut Shop
8	Queens	Richmond Hill	40.697947	-73.831833	1	Pizza Place	Bank	Lounge	Latin American Restaurant	Pet Store
9	Queens	Flushing	40.764454	-73.831773	1	Hotpot Restaurant	Chinese Restaurant	Korean Restaurant	Bakery	Bubble Tea Shop
10	Queens	Long Island City	40.750217	-73.939202	1	Hotel	Coffee Shop	Pizza Place	Bar	Café

Creating a data frame displaying the top 5 venues for each neighborhood.

Result and Discussion



Using the polygon tool, it was possible to highlight the neglected area where the presence of a hospital with its associated research center is necessary.

	Latitude	Longitude
Queens	40.70277	-73.813
	40.66996	-73.7987
	40.65969	-73.7542
	40.69381	-73.7295
	40.72422	-73.7545

Result and Discussion

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Bay Ridge	40.625801	-74.030621	Pilo Arts Day Spa and Salon	40.624748	-74.030591	Spa
1	Bay Ridge	40.625801	-74.030621	Bagel Boy	40.627896	-74.029335	Bagel Shop
2	Bay Ridge	40.625801	-74.030621	Cocoa Grinder	40.623967	-74.030863	Juice Bar
3	Bay Ridge	40.625801	-74.030621	Leo's Casa Calamari	40.624200	-74.030931	Pizza Place
4	Bay Ridge	40.625801	-74.030621	Pegasus Cafe	40.623168	-74.031186	Breakfast Spot
5	Bay Ridge	40.625801	-74.030621	Ho' Brah Taco Joint	40.622960	-74.031371	Taco Place
6	Bay Ridge	40.625801	-74.030621	The Bookmark Shoppe	40.624577	-74.030562	Bookstore
7	Bay Ridge	40.625801	-74.030621	Mimi Nails	40.622571	-74.031477	Spa
8	Bay Ridge	40.625801	-74.030621	Brooklyn Market	40.626939	-74.029948	Grocery Store
9	Bay Ridge	40.625801	-74.030621	Georgian Dream Cafe and Bakery	40.625586	-74.030196	Caucasian Restaurant

Creating the url request and cataloging the venues for Brooklyn using the Foursquare tool, a total of 70 neighborhoods were detected, indicating their coordinates (latitude and longitude). Also, were found 2722 venues, displayed according to the type of venue, giving their coordinates, and category (289 unique categories).

Result and Discussion

```
----Borough Park----
      venue  freq
0      Bank  0.15
1  Pizza Place 0.12
2  Pharmacy  0.08
3 Fast Food Restaurant 0.08
4      Restaurant 0.04

----East Flatbush----
      venue  freq
0 Chinese Restaurant 0.17
1 Department Store  0.08
2      Supermarket  0.08
3 Caribbean Restaurant 0.08
4      Liquor Store  0.08

----Williamsburg----
      venue  freq
0  Pizza Place  0.06
1      Bar      0.06
2  Bagel Shop   0.06
3  Coffee Shop  0.06
4 Grocery Store 0.03
```

Based on the frequency of occurrence for each category given by Foursquare, we can see that most of the places in the neighborhoods most affected by COVID-19 in Brooklyn, are made up of restaurants, stores, and few pharmacies.

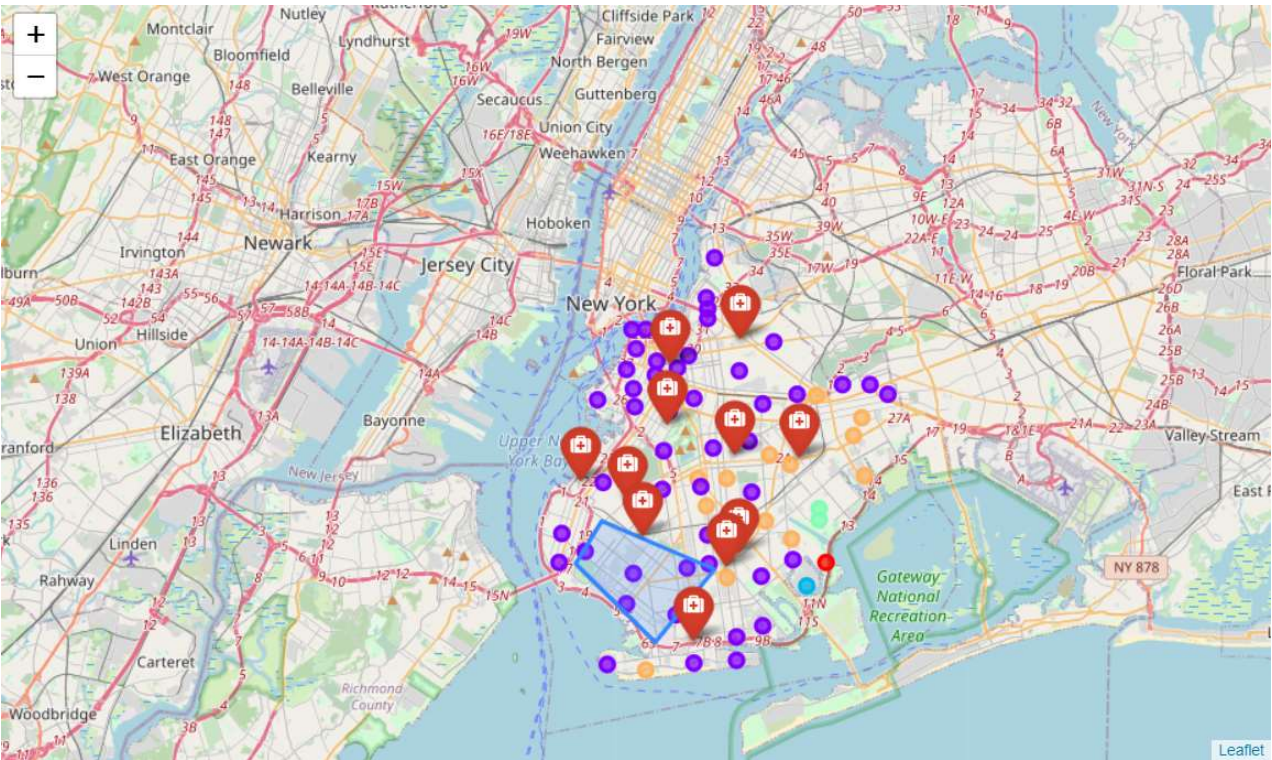
This confirms the high number of infections, as well as the collapse of existing hospitals. Thus, there is a need for a health center to help manage the situation of the population during the pandemic and in future times.

Result and Discussion

	Borough	Neighborhood	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Brooklyn	Bay Ridge	40.625801	-74.030621	1	Spa	Italian Restaurant	Pizza Place	Bagel Shop	Bar
1	Brooklyn	Bensonhurst	40.611009	-73.995180	1	Chinese Restaurant	Sushi Restaurant	Ice Cream Shop	Grocery Store	Donut Shop
2	Brooklyn	Sunset Park	40.645103	-74.010316	1	Bank	Latin American Restaurant	Mexican Restaurant	Bakery	Pizza Place
3	Brooklyn	Greenpoint	40.730201	-73.954241	1	Pizza Place	Bar	Coffee Shop	Cocktail Bar	Grocery Store
4	Brooklyn	Gravesend	40.595260	-73.973471	1	Lounge	Pizza Place	Bakery	Chinese Restaurant	Italian Restaurant
5	Brooklyn	Brighton Beach	40.576825	-73.965094	1	Eastern European Restaurant	Russian Restaurant	Restaurant	Pharmacy	Beach
6	Brooklyn	Sheepshead Bay	40.586890	-73.943186	1	Dessert Shop	Turkish Restaurant	Yoga Studio	Buffet	Café
7	Brooklyn	Manhattan Terrace	40.614433	-73.957438	1	Pizza Place	Donut Shop	Ice Cream Shop	Convenience Store	Organic Grocery
8	Brooklyn	Flatbush	40.636326	-73.958401	4	Mexican Restaurant	Coffee Shop	Caribbean Restaurant	Bank	Pharmacy
9	Brooklyn	Crown Heights	40.670829	-73.943291	1	Pizza Place	Museum	Café	Coffee Shop	Playground

Cluster 1 includes many places where people meet, these being places with a high probability of contagion, few places to attend to in case of illness (hospitals) and few places to self-medicate (pharmacies). In clusters 1 and 4 there are an average of 5 pharmacies in each one. However, in clusters 0, 2 and 3, there are none.

Result and Discussion



Using the polygon tool, it was possible to highlight the affected area where the presence of a hospital with its associated research center is necessary.

	Latitude	Longitude
Brooklyn	40.63044	-74.0111
	40.61472	-74.0241
	40.58489	-73.9841
	40.61258	-73.9548

Conclusion

After performing the analysis, both boroughs have a lack with respect to health centers and research places. In this way, if possible, it would be opportune to build an H & DRC in both Queens and Brooklyn at the coordinates specified in this document.

In the case that construction can only be done in one place, this should be Queens, since it has a greater number of neighborhoods, fewer hospitals, and the existing ones are far from the affected area during the pandemic.

Another advantage that the construction of these centers would give is the generation of direct and indirect jobs, during the planning, construction, start-up, and operation of H&DRC.