

Choosing a place to live in Rio de Janeiro during the COVID-19 Pandemic

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Introduction

- How to choose a safe place to live in Rio de Janeiro during the COVID-19 pandemic?
- Criterion of a safe place: Low death rate neighborhood with good medical infrastructure
- The quantity of hospitals, emergency rooms and urgent care centers, obtained via the Foursquare API, will be used to determine the medical infrastructure of the region

Data Source

The medical location will come from the Foursquare API. The geospatial and COVID-19 data will come from the local government repository:

- http://dadosabertos.rio.rj.gov.br/apiUrbanismo/apresentacao/csv/bairros_.csv
- <https://www.data.rio/datasets/cep-dos-casos-confirmados-de-covid-19-no-munic%C3%ADpio-do-rio-de-janeiro>
- <https://www.data.rio/datasets/limite-de-bairros?geometry=-44.899%2C-23.138%2C-41.992%2C-22.695> (The geoson file with the neighborhood limits)

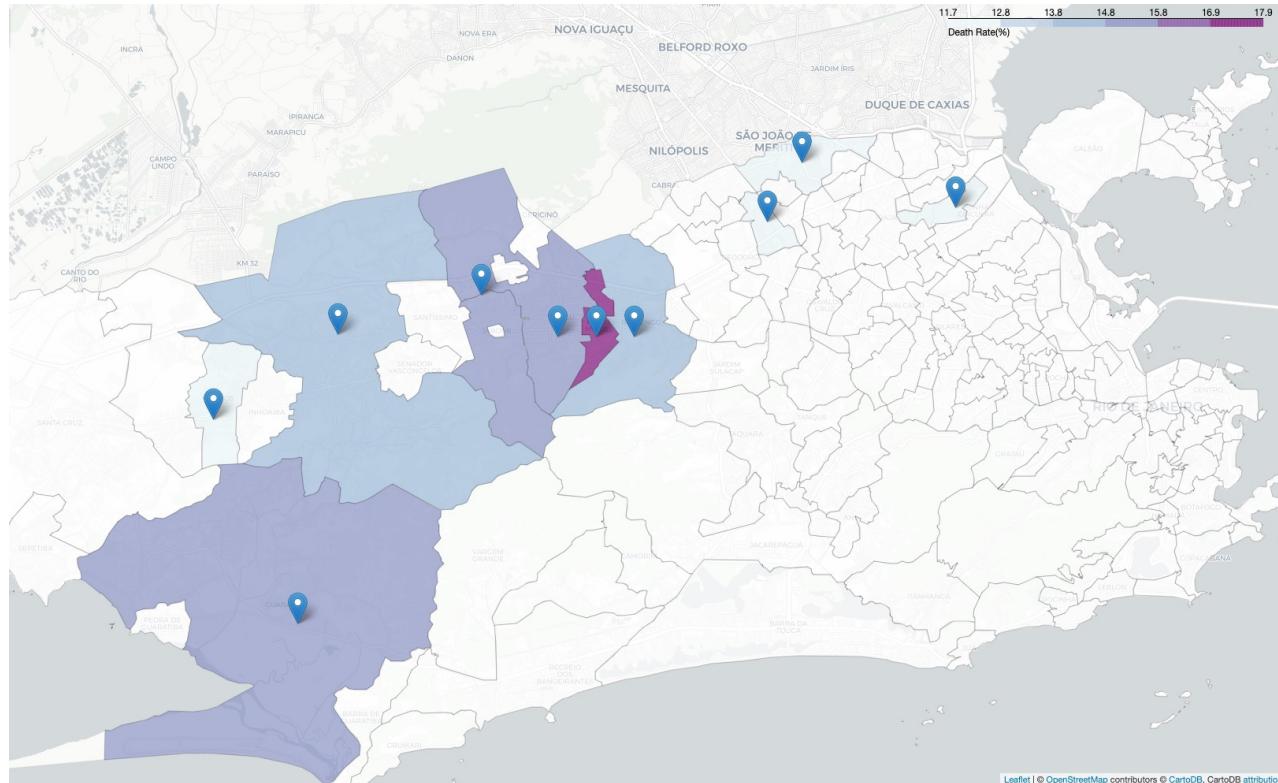
Methodology

- Data cleansing and merging all the information in a single dataframe
- New dataframe with all the medical venues
- Clustering the neighborhoods in 3 groups, using the K-Means algorithm – using the medical venues as features
- Inspect all the clusters and its relationship with the COVID-19 Death Rate
- Analyze the final result, via a Choropleth Map

Exploratory Data Analysis

Top Ten regions with more than 1000 cases of COVID-19,
ordered by its death rate

ID	Neighborhood	Latitude	Longitude	Death	Recovered	Total Cases	Death Rate	Recovery Rate	Death Rate(%)	
54	378	PADRE MIGUEL	-22.8833333	-43.45	207.0	950.0	1157.0	0.178911	0.821089	17.891098
159	511	BANGU	-22.883333	-43.466667	634.0	3517.0	4151.0	0.152734	0.847266	15.273428
123	450	GUARATIBA	-22.9984858	-43.5799151	215.0	1206.0	1421.0	0.151302	0.848698	15.130190
63	389	SENAOR CAMARA	-22.8666667	-43.5	224.0	1273.0	1497.0	0.149633	0.850367	14.963260
6	370	REALENGO	-22.8833333	-43.4333333	492.0	2906.0	3398.0	0.144791	0.855209	14.479105
158	510	CAMPO GRANDE	-22.8825	-43.5625	943.0	5716.0	6659.0	0.141613	0.858387	14.161285
29	356	GUADALUPE	-22.8372222	-43.3752778	140.0	959.0	1099.0	0.127389	0.872611	12.738854
82	406	COSMOS	-22.9166667	-43.6166667	129.0	927.0	1056.0	0.122159	0.877841	12.215909
31	351	BRAS DE PINA	-22.8316343	-43.293239299999996	150.0	1082.0	1232.0	0.121753	0.878247	12.175325
15	337	PAVUNA	-22.8136111	-43.3602778	164.0	1232.0	1396.0	0.117479	0.882521	11.747851



Initial Choropleth Map

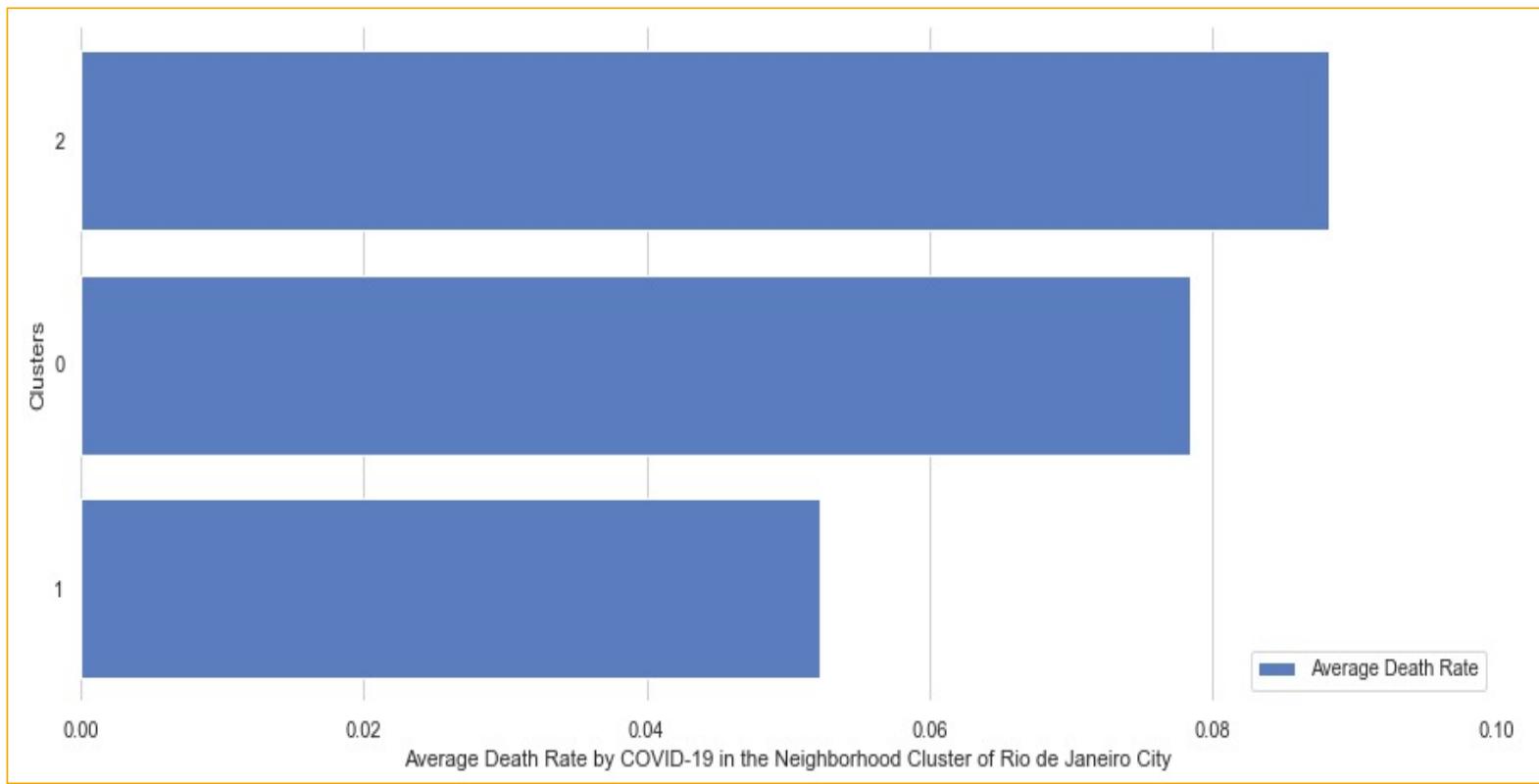
Showing the death rate in the top ten neighborhoods

Grouping the clusters after fitting the data

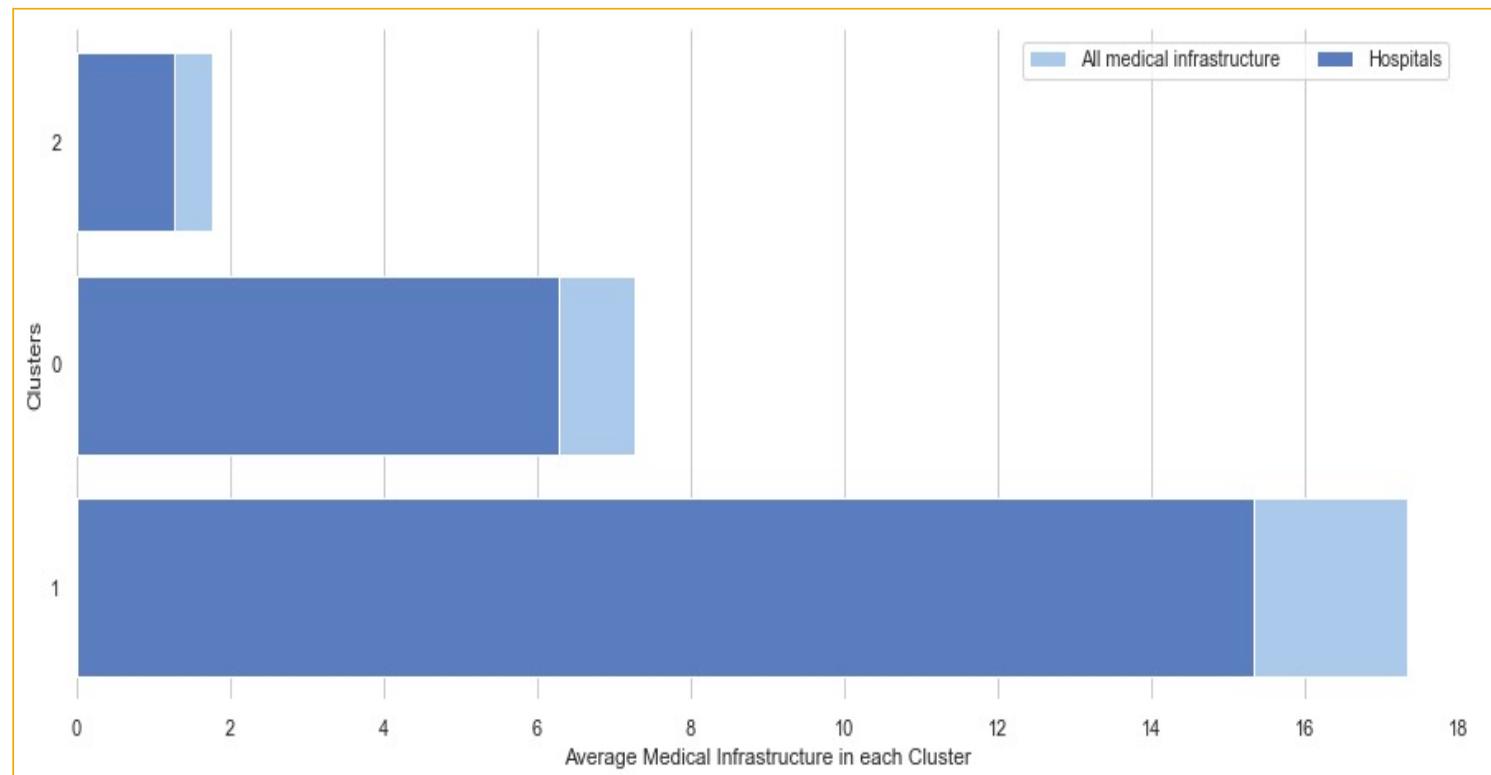
Sorted by Death Rate in descending order

Cluster Labels	Death	Recovered	Total Cases	Death Rate	Recovery Rate	Death Rate(%)	Doctor's Office	Emergency Room	Hospital	Medical Center	Urgent Care Center	Total Infra
2	2	101.406250	1177.203125	1278.609375	0.088240	0.911760	8.824015	0.015625	0.375000	1.265625	0.000000	0.109375
0	0	132.636364	1288.727273	1421.363636	0.078337	0.921663	7.833678	0.181818	0.727273	6.272727	0.000000	0.090909
1	1	81.000000	1541.166667	1622.166667	0.052210	0.947790	5.221032	0.000000	1.500000	15.333333	0.333333	0.166667

Studying the cluster properties



Studying the cluster properties



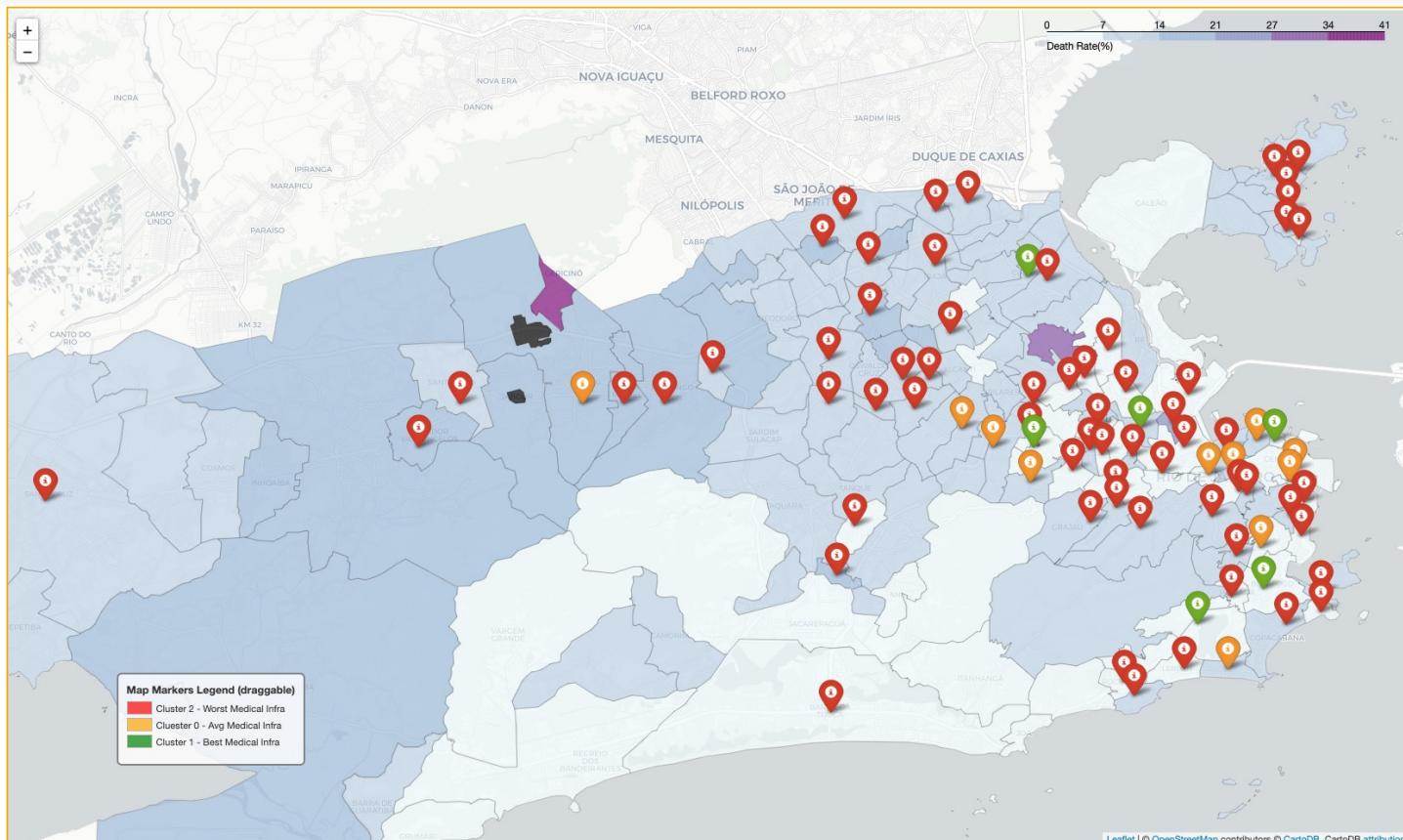
Results

- Cluster 2 has the larger death rate and worst medical infrastructure overall;
- Cluster 0 has a medium death rate and average medical infrastructure, with few hospitals;
- Cluster 1 has the smallest death rate and best medical infrastructure of all above.

The west zone of the city has the largest death rate by COVID-19. It consists of several neighborhoods, such as Campo Grande, Bangu, Realengo, Padre Miguel and many others.

Final Choropleth Map

Clusters distribution



Conclusion

- many of the light-colored areas (low death rate) with bad medical infrastructure have low demographic density, such as Vargem Grande and Jacarepagua (areas with vast chunks of native rainforest), Galeao (the intl airport of Rio) and Cidade Universitaria (the region where the Federal University of Rio is situated);
- All the west area of the city, places such as Padre Miguel, Senador Camara, Senador Vasconcelos, Campo Grande (the most populous neighborhood) and some others, support the results of the study since these are regions with high death rate and lacks medical infrastructure of all kinds.

The best neighborhoods to live (part of cluster 1, in areas with low death rate) should be: **Jardim Botânico, Botafogo, Saude and Meier.**