Locating HOSPITALS in SÃO PAULO

Agenda

- Introduction & Business Problem
- Data
- Methods
- Results
- Discussion
- Limitations

Introduction & Business Problem

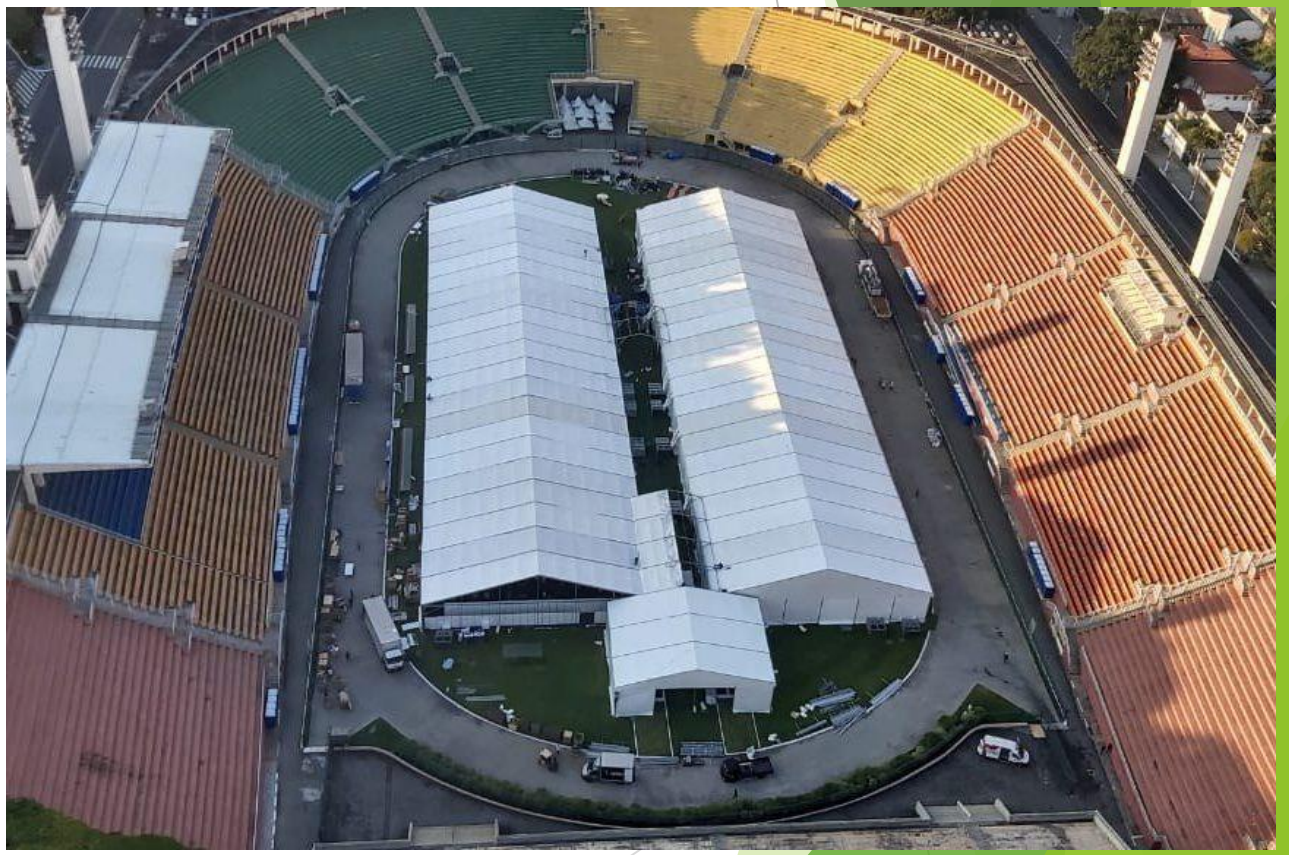
- São Paulo (SP) is the largest city in Latin America and the economic heart of Brazil.
- It is also one of the most international hubs of the continent.
- Altogether, it makes SP one of the most important cities of Brazil but also one of the most susceptible to contagious of different types of international crisis.
- During the current pandemic of COVID-19, SP is the epicentre of Brazilian transmission of COVID-19 and its most acute health risk as result. Estimates point to several hundreds of thousands of people infected and another dozens of thousands in need of hospital services.
- SP has around 29,000 hospital beds as of 2018 (municipality records) and an average of 2.4688 beds per 1,000 habitants. Even though this is slightly lower than the target, these facilities are not evenly available in town and understanding needs is critical for the COVID-19 preparedness efforts.

Introduction & Business Problem

- The city has been ongoing different preparation for the epidemic peak in the next month, including the installation of temporary medical facilities to support the existing system.

Project Goals:

- 1. Identifythe profile of existing hospitals in SP,
- 2. Compare needs based on socioeconomical data per region of the city,
- 4. Suggest the locations with higher need of temporary augmentation.



Data

- Several data sets will have to be used. SP is divided in Subprefectures which can be loosely compared with Toronto boroughs and it is the main internal administrative division of the city. This also means that several datasets are available based on this structure and SP maintain open access databases or indicators that can be used for this exercise. The following databases will be used:
- 1. The subdistrict population and size was collected from the municipality:
- https://www.prefeitura.sp.gov.br/cidade/secretarias/subprefeituras/subprefeituras/dados_demograficos/index.php?p=12758
- 2. The list of health units and number of beds were collected from the secretary of health from SP:
- http://dados.prefeitura.sp.gov.br/dataset/f944b957-2193-48a4-9068-72a26e6ee577/resource/fd72d932-fc65-43cc-a74f-f309225f74e8/download/deinfosacadsau2014.csv
- 3. The subprefectures shapefile was collected from the municipality:
- http://geosampa.prefeitura.sp.gov.br/PaginasPublicas/downloadIfr.aspx?orig=DownloadCamadas&arq=01_Limites%20Administrativos%5C%5CSubprefeituras%5C%5CShapefile%5C%5CSIRGAS_SHP_subprefeitura&arqTipo=Shapefile
- 4. The Socioeconomic data was collected from the municipality:
- http://dados.prefeitura.sp.gov.br/dataset/f944b957-2193-48a4-9068-72a26e6ee577/resource/fd72d932-fc65-43cc-a74f-f309225f74e8/download/deinfosacadsau2014.csv

Methods

- As methodology, the available data will be first treated and uniformed in order to allow comparison of different subprefs in terms of health facility availability and needs.
- A combination of data visualisation, in particular scatter plots and bar charts, will be used to understand the profile of each subpref and the availability of health facilities will be then analysed with the support of maps.

Results

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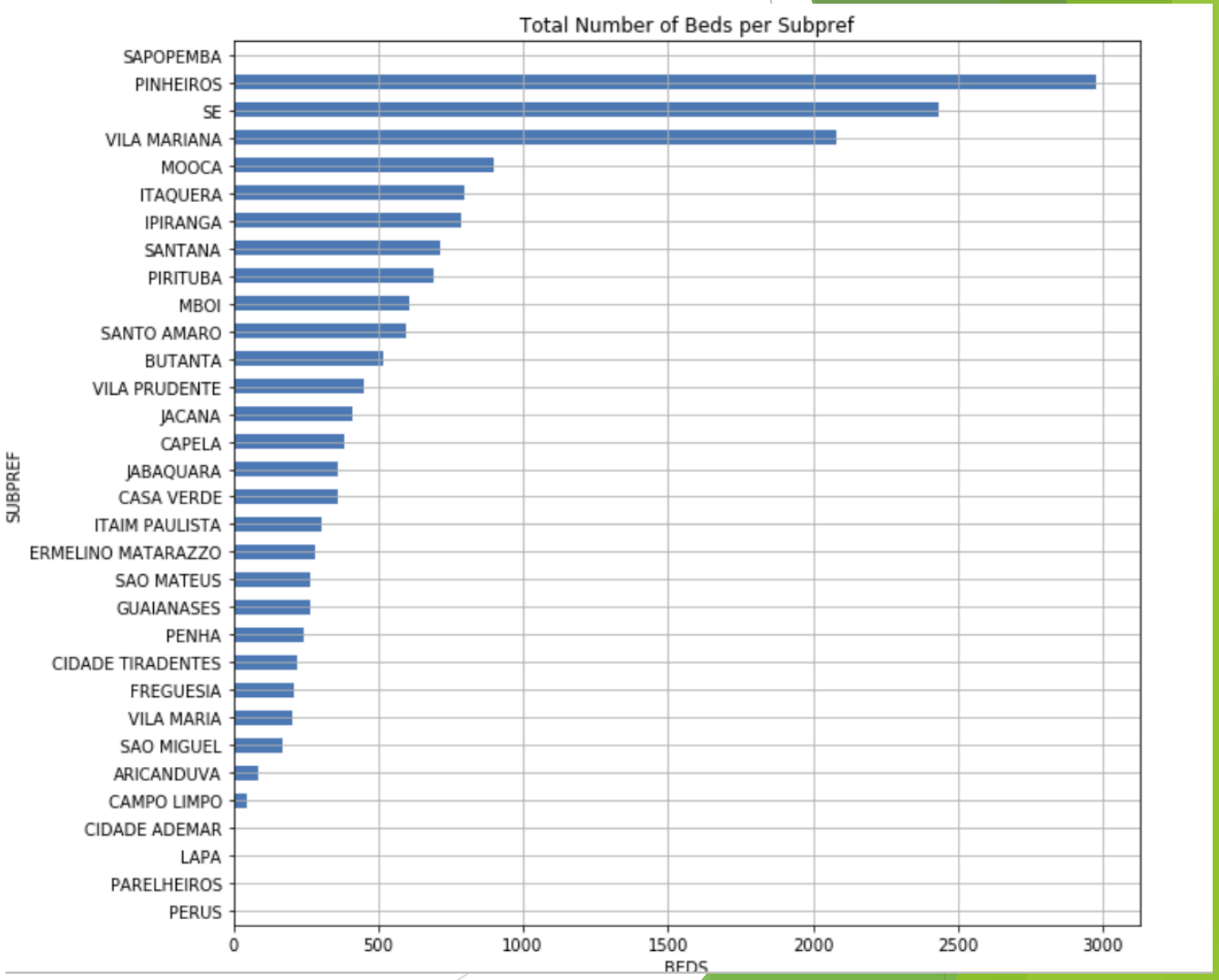
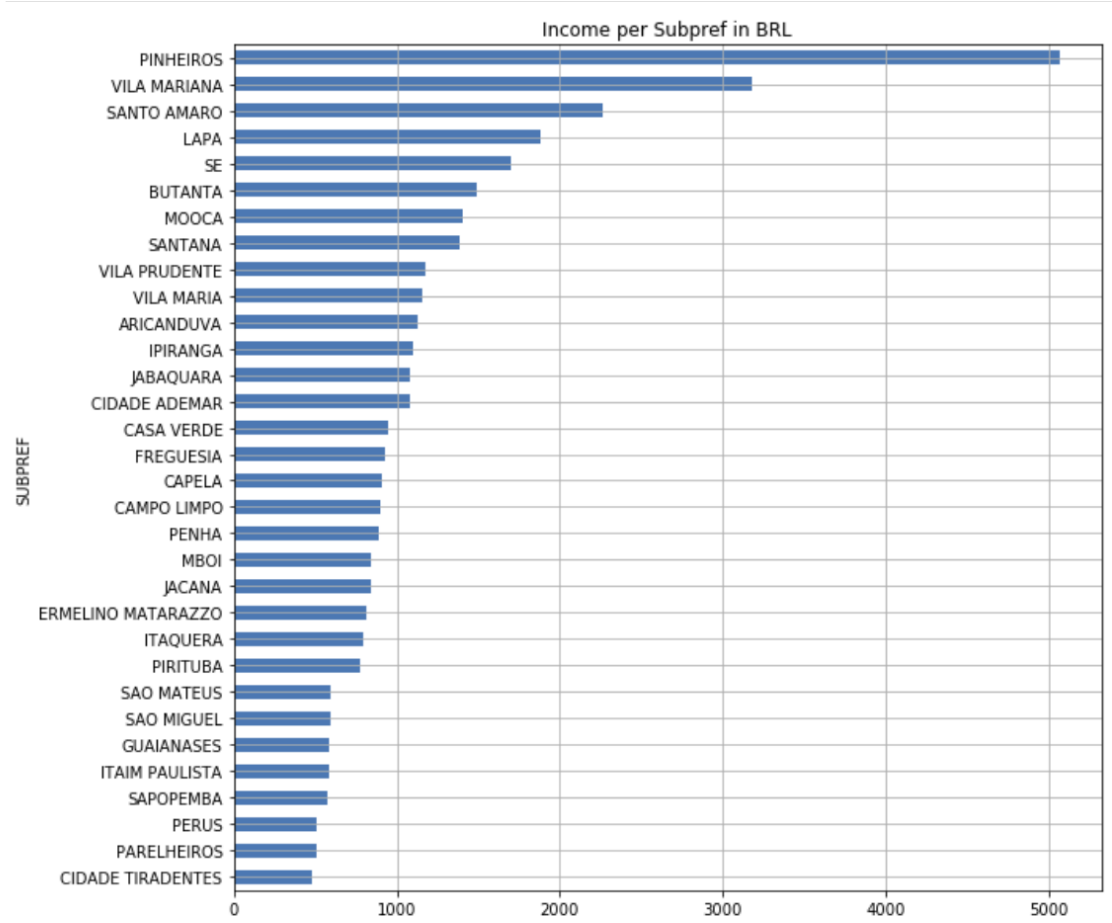
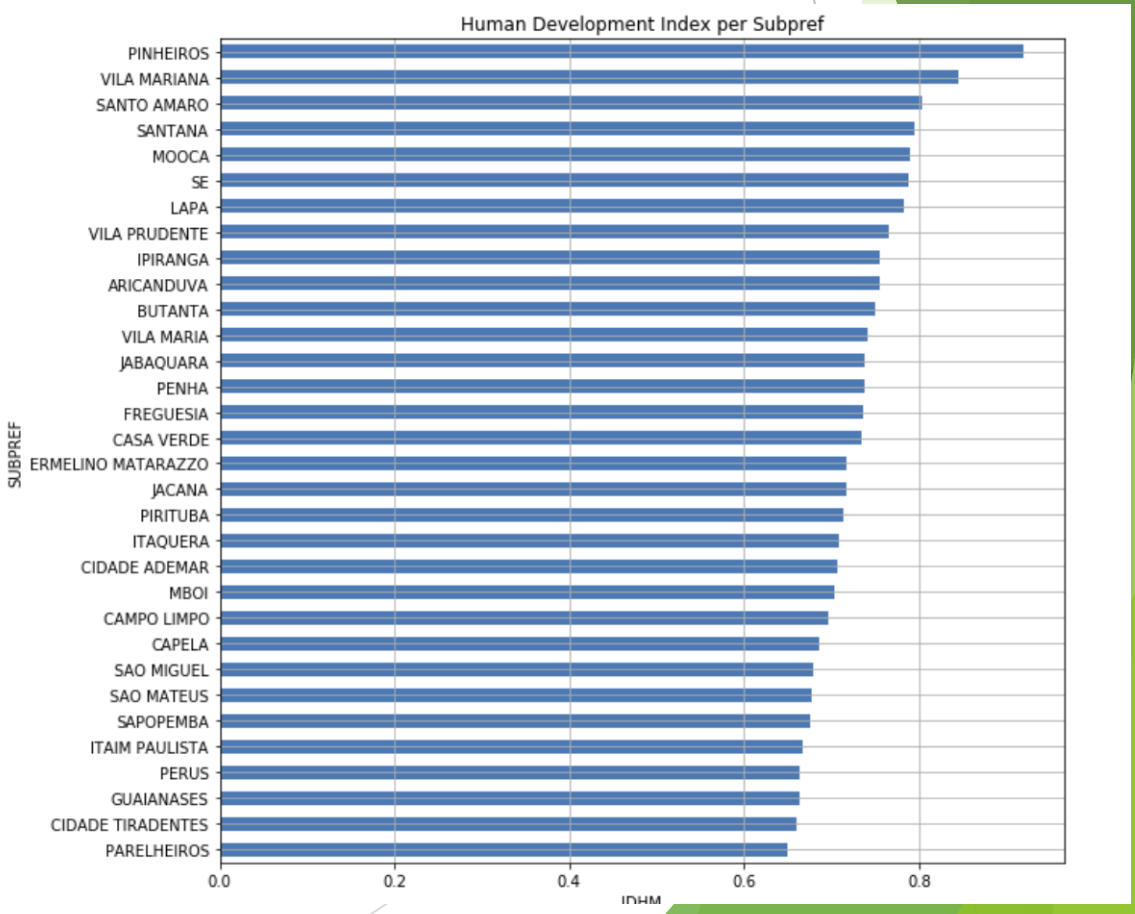
Results

- The city has subprefs with high level of beds while other virtually have no access to hospital capacity.
- For example, Pinheiros in the west has almost 3,000 beds compared with no bed in Perus in the extreme north.



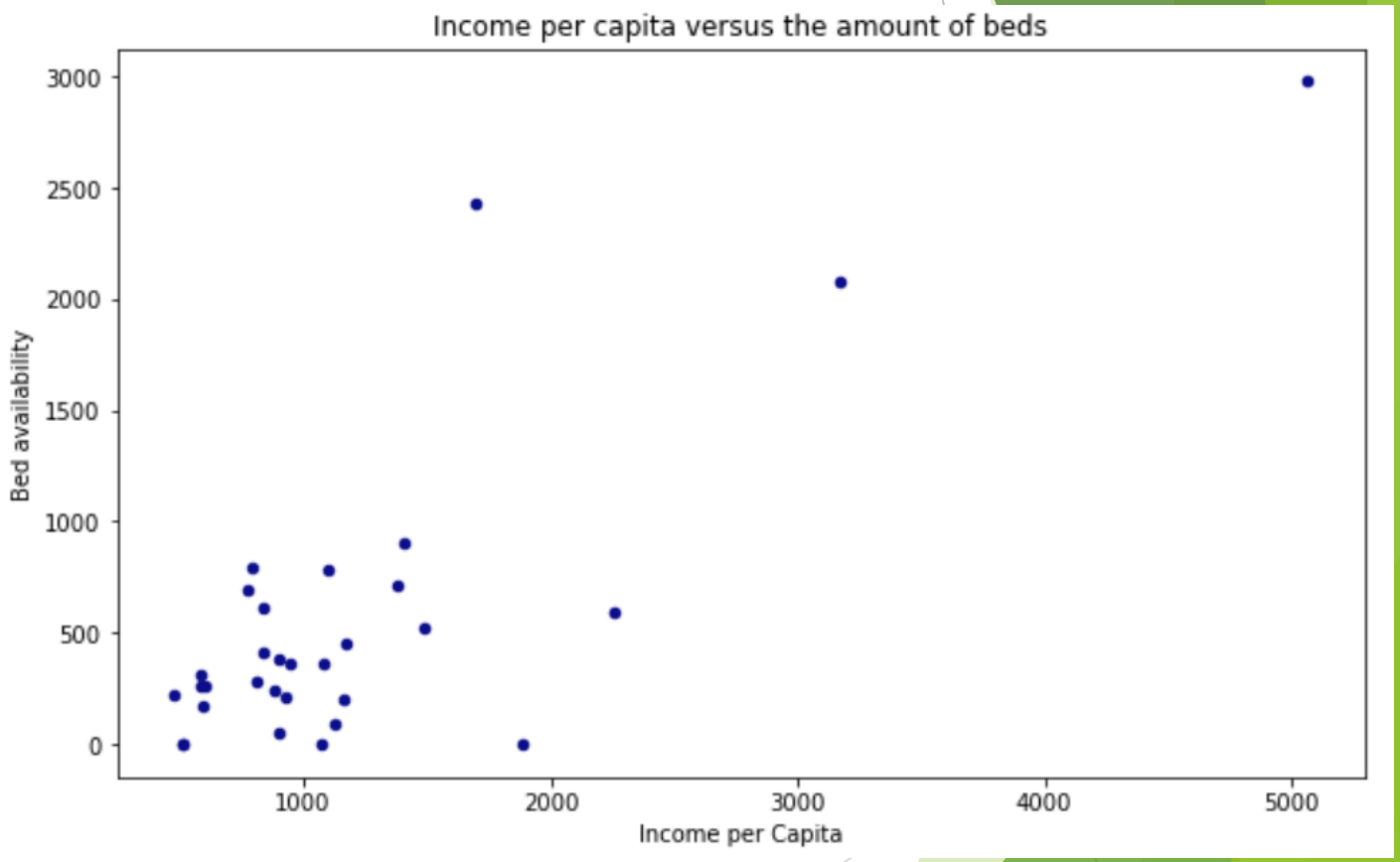
- The subprefs have little HDI variation but they have a large disparity in terms of income.
- Rich subprefs have also the high number of beds.





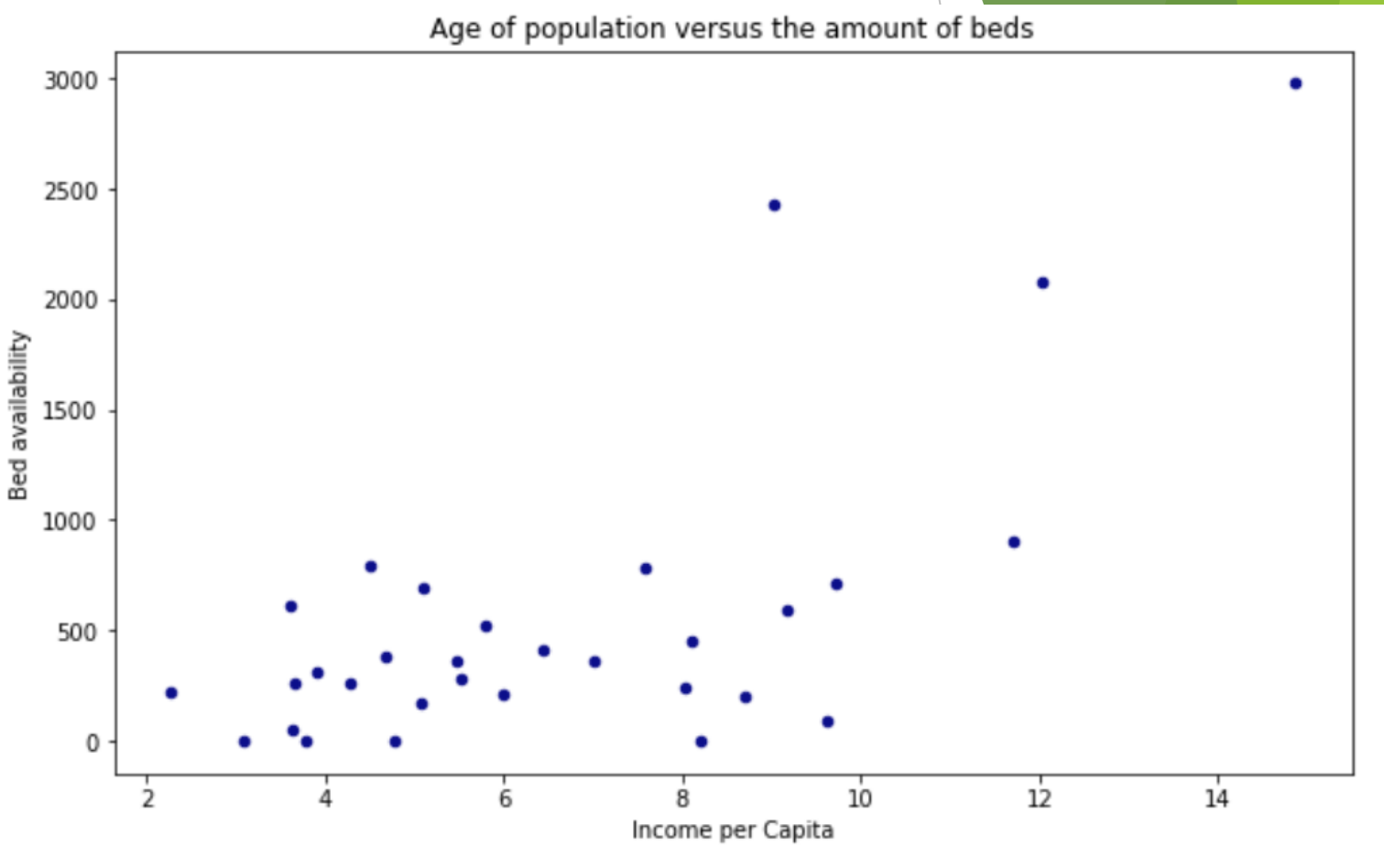
Results

- The disparity is evident with the scatter plot in which feel subprefs have a high level of bed availability.
- The vast majority of subprefs have the same low level of beds regardless of their income.
- This concentration reflects the inequalities of the citiy.



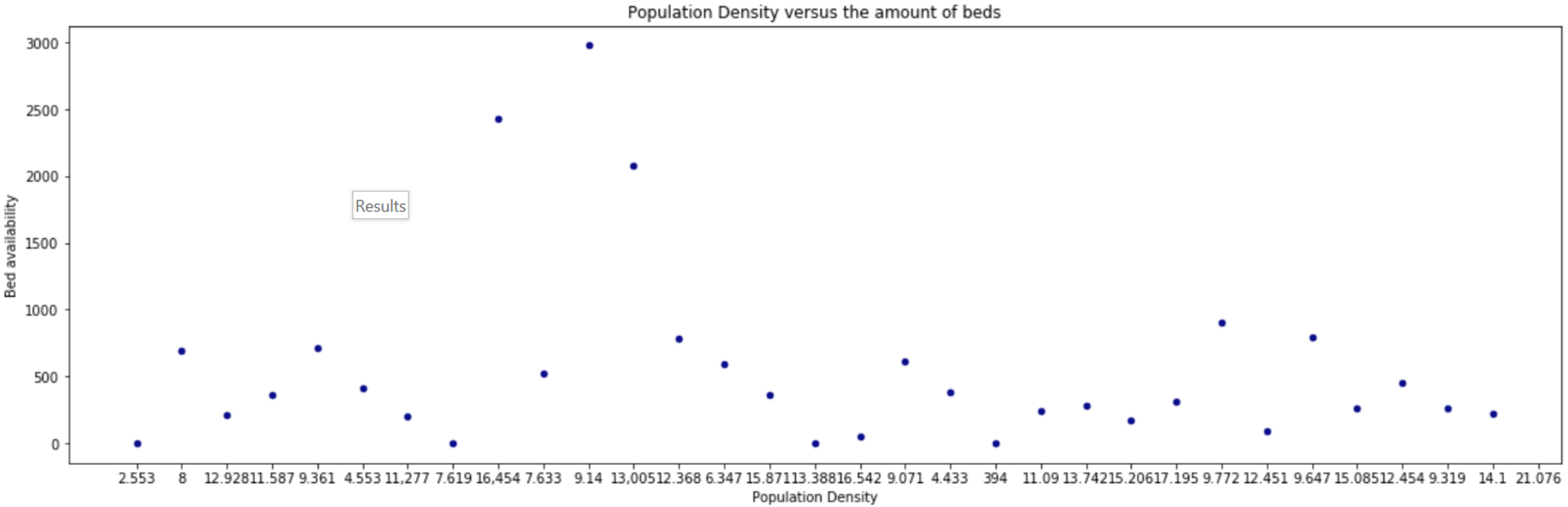
Results

- The age of population did not affect much the availability of beds with subprefs with a high ratio of elderly having the same amount of beds than those with younger population.



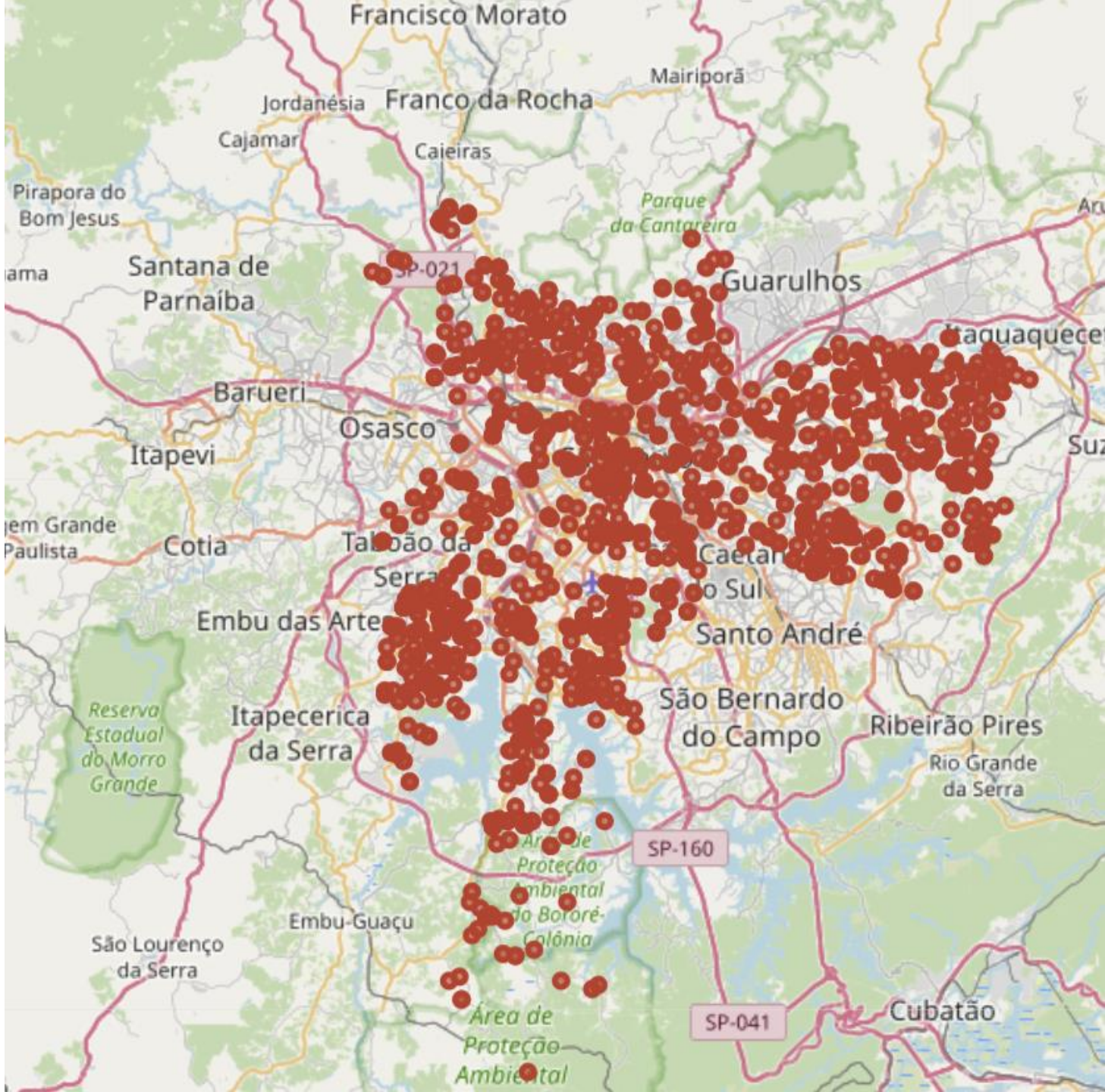
Results

- Finally, the population density in town does not reflect the availability of hospitals beds thus some districts are far better off than other and we can expect localized distress.



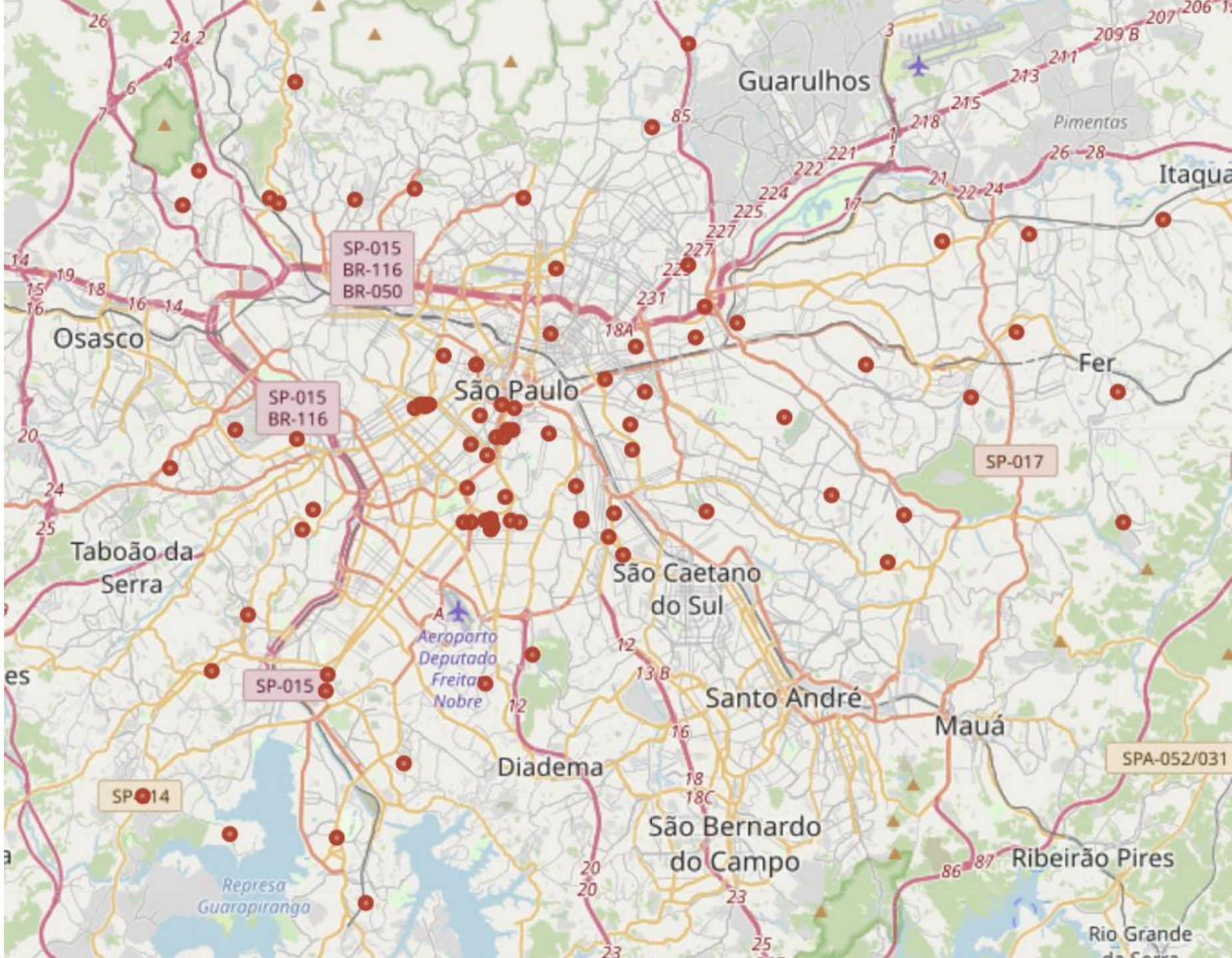
Results

- The map shows all the medical facilities in town



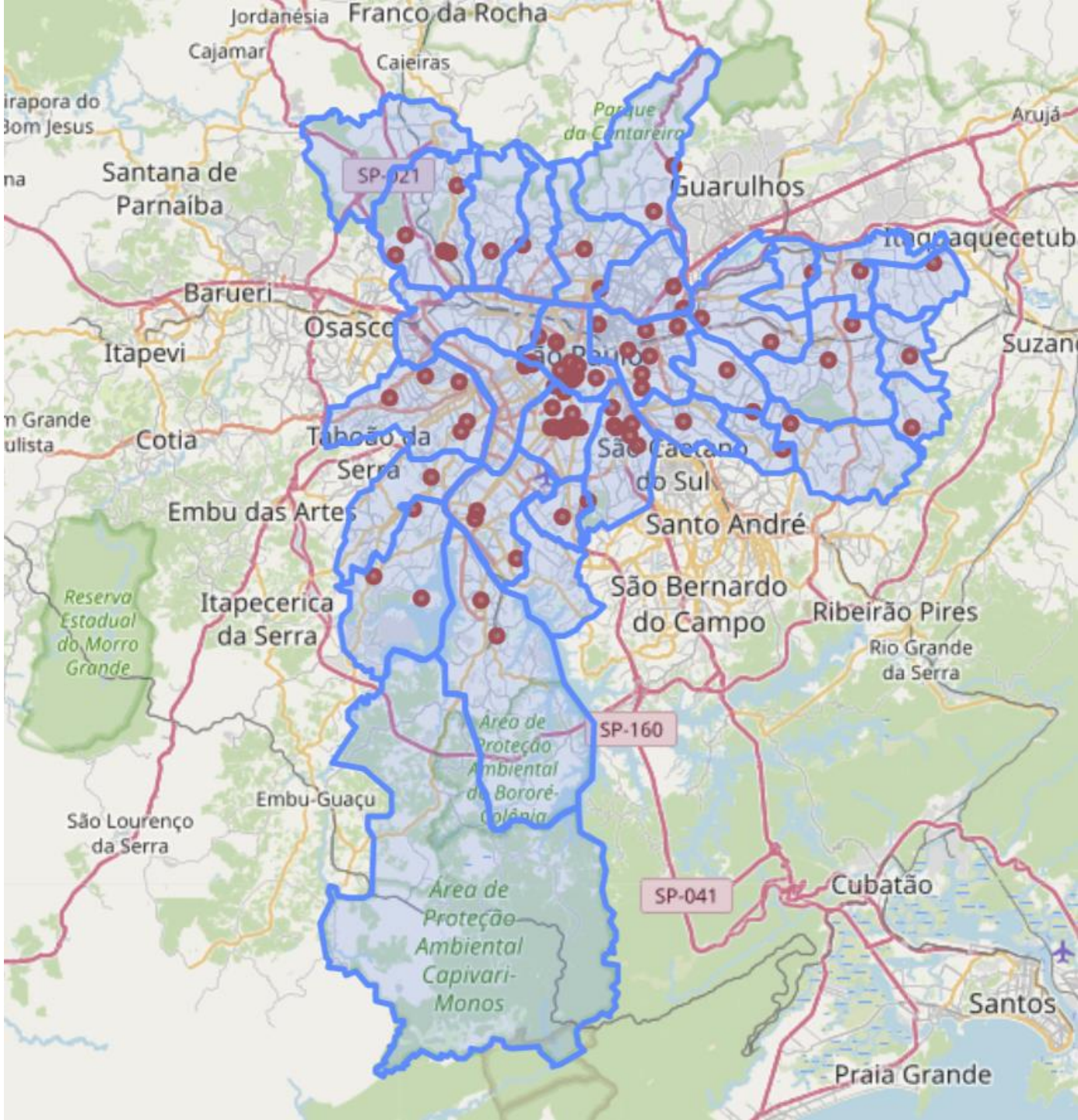
Results

- While there are far less facilities with beds such as hospitals,
- The remaining facilities are primary health care ones thus not suitable for COVID-19.



Finally

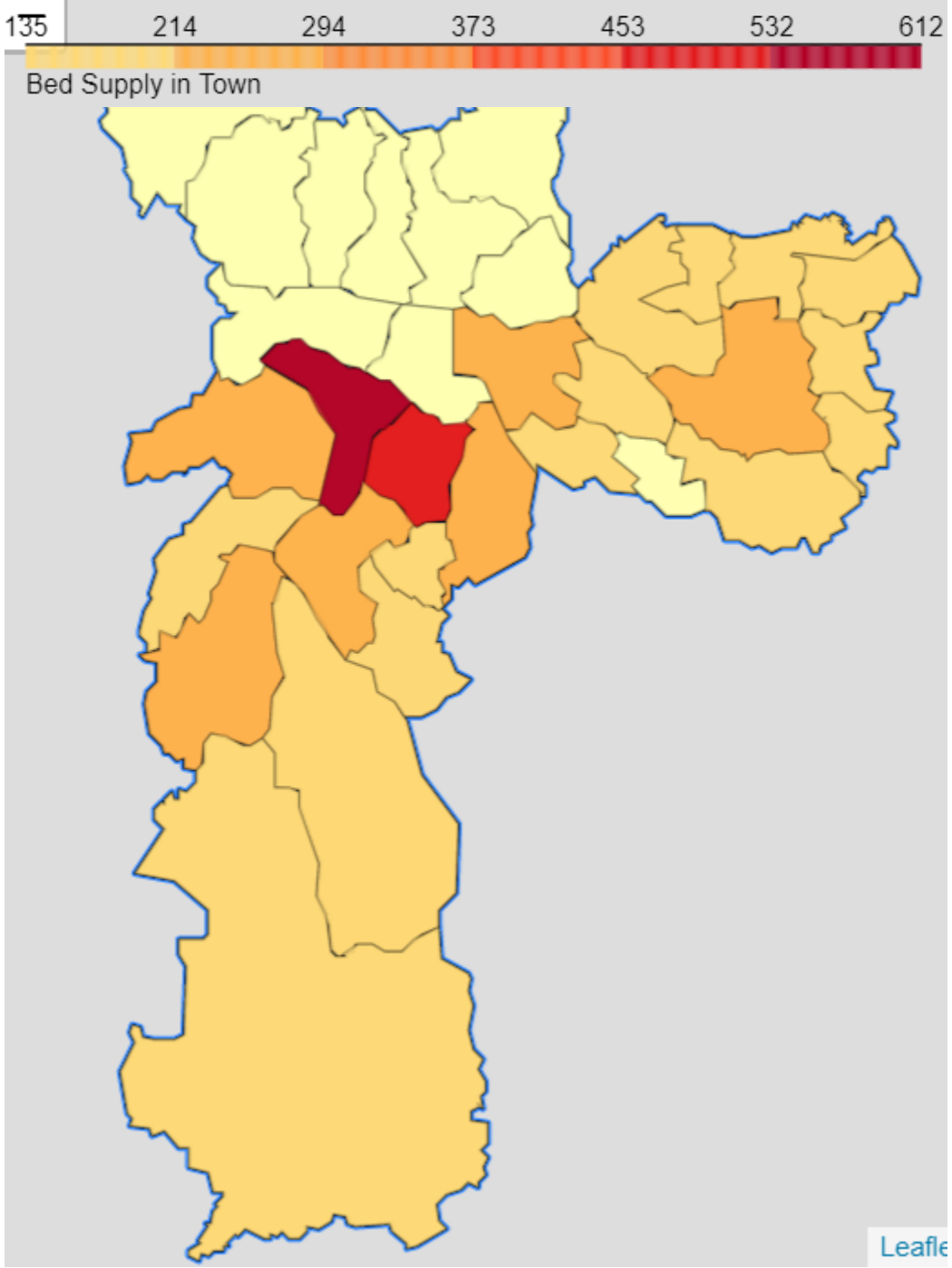
- The facilities are overlapped with the subprefs limits and the discrepancy is evident from a geographical distribution standpoint.



Discussion

- Several interesting relations can be seem from the results in the code below:
  - Results indicate a highly concentrated hospitalar capacity in the centre-west parts of town with large highly densed areas being poorly served by hospitals.
  - The hospitals are concentrated in high income areas thus reflecting the innequality in SP.
  - Age was not factored in the installation of hospital capacity over time and some aging subprefs are not fully served. Mooca is a good example of this inbalance.
  - Age in particular is an important variable in this debate as those are the ones with higher chances of complications as result of COVID-19.

- In order to demonstrate the results, the following maps show the availability of beds per subpref and the total population, the inequality is evident and the augmentation should be in the highly populated east and south center of the city.


135
214
294
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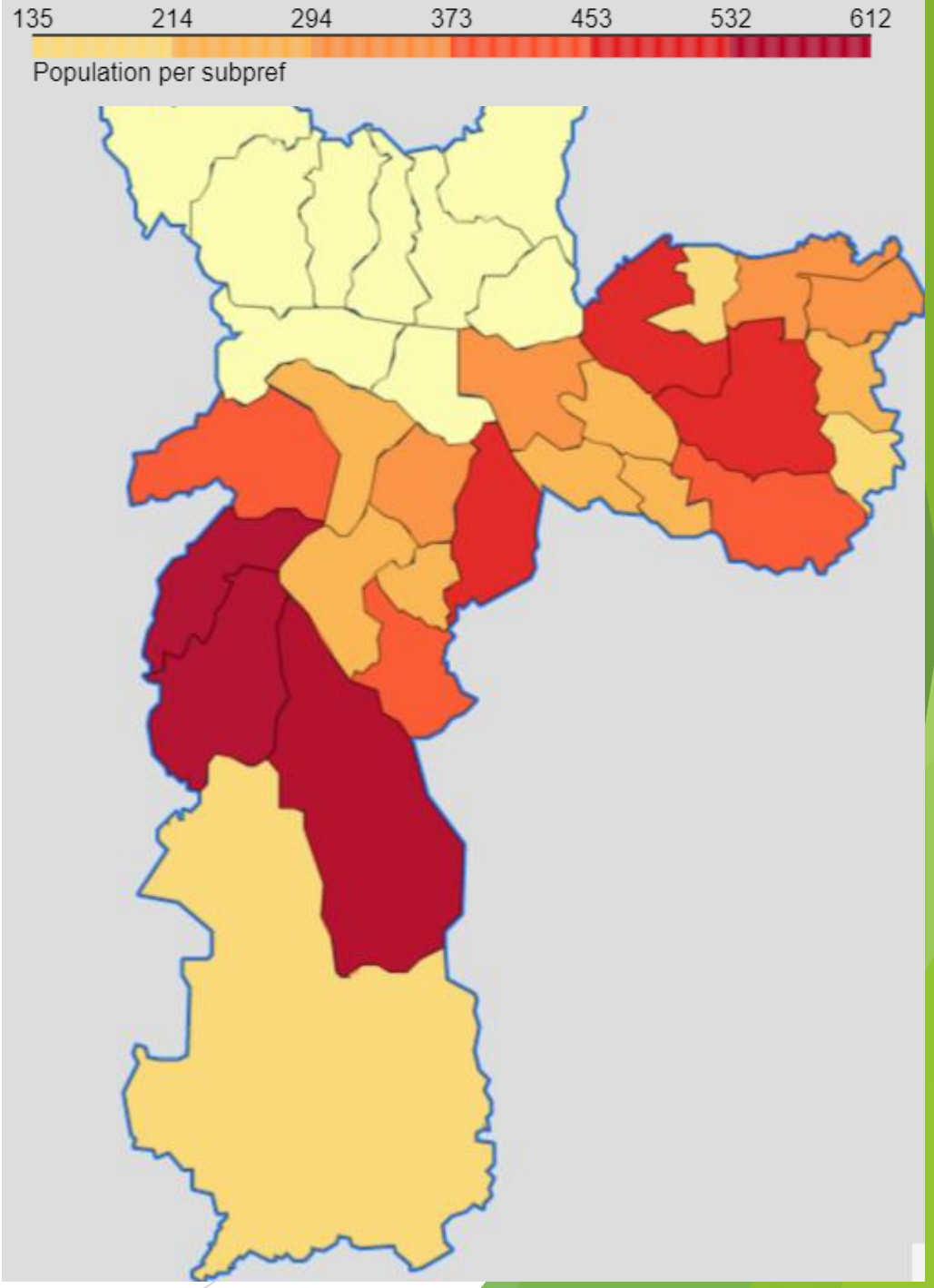
Bed Supply in Town
Leafl


135
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Population per subpref

Limitations

- The analysis does not take into consideration the synergies of existing facilities and how the scale up can benefit from it.
- A multivariate analysis also could be relevant as the situation is complex.
- The transport network also could be used in further analysis.