The "15 minutes" city
A data science project

JULY 2020

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Background

The city of Paris wants to make key services available

within a 15 minutes walk or bike ride from home

WHY?

- Improve quality of life and ease of access to services

- Reduce need for car trips ➔ reduce pollution and improve air quality

- Reconnect people with their neighborhoods

Project goals

Is the "15 minutes" goal realistic and how far is the city of Paris from achieving this goal?

Specifically, let's try to answer **2 questions**:

1. What is the overall current state of readiness of the city and the districts within it in respect to this "15 minutes" goal?

2. Can we identify neighborhoods that share similar characteristics and group them together so that specific dedicated action plans can be defined to enable the "15 minutes" vision in these neighborhoods?

Assumptions and decisions

Challenges or constraints	Assumptions and decisions
Data volume	Limit our project to **3 districts of Paris** (17th, 18th and 19th)* Limit our project to **key medical services**: • Doctor's office • Dentist's office • Hospital • Medical center • Optical shop
Data availability	Foursquare for Medical Services data Private residences (apartments, condos, houses) not available via Foursquare ➔ use social residences lists available via Paris open data website
Access to free APIs	Could not find free API to calculate true walking times ➔ use a Python library for calculating distances between 2 coordinates and divide by walking time of 5 km/h

The city of Paris includes 20 districts

Approach

Data retrieval & cleanup
- Retrieve medical services venues from Foursquare
- Retrieve social residences from Paris open data website
- Remove duplicates, select districts, select relevant medical service categories
- Prepare dataframes for next steps

Travel time calculations
- From each residence to each medical service venue
- Identify shortest trips for each residence/medical service pair
- Prepare dataframes for next step to enable statistical calculations, visualizations and mapping

Exploratory data analysis & mapping
- Calculations, visualizations ➜ interpretations and conclusions
- Plotting of residences on map of Paris with color indicators and pop-up boxes

Clustering & interpretation
- Cluster residences using 15 minutes status specific to each type of medical service
- Identify potential clusters characteristics
- Interpretations and conclusions
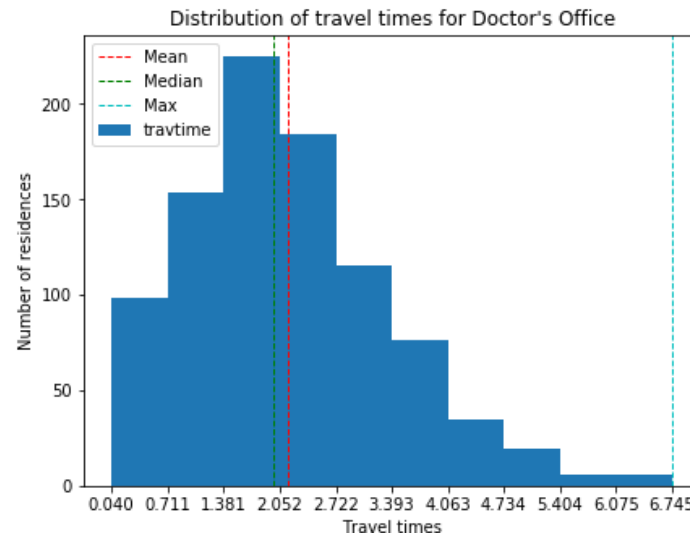
Findings and interpretation
Walking times across all 3 districts

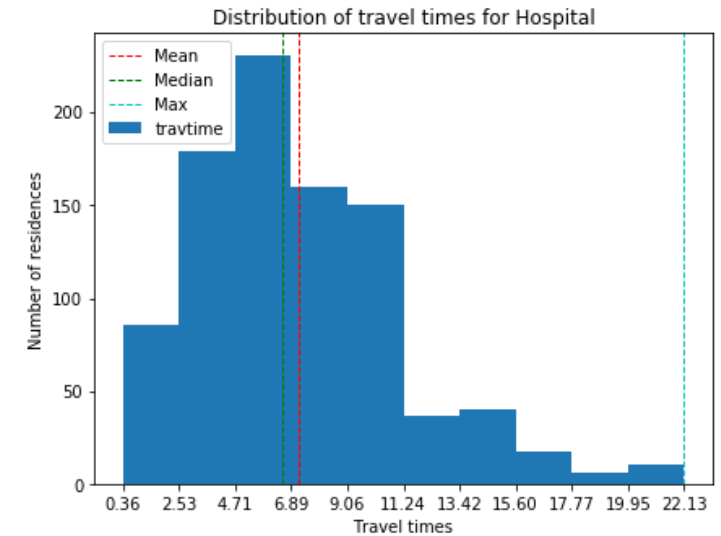All residences in all 3 districts are within a 15 minutes walk from a Doctor's Office and a Dentist's Office.

A majority of residences are within 15 minutes of a Hospital
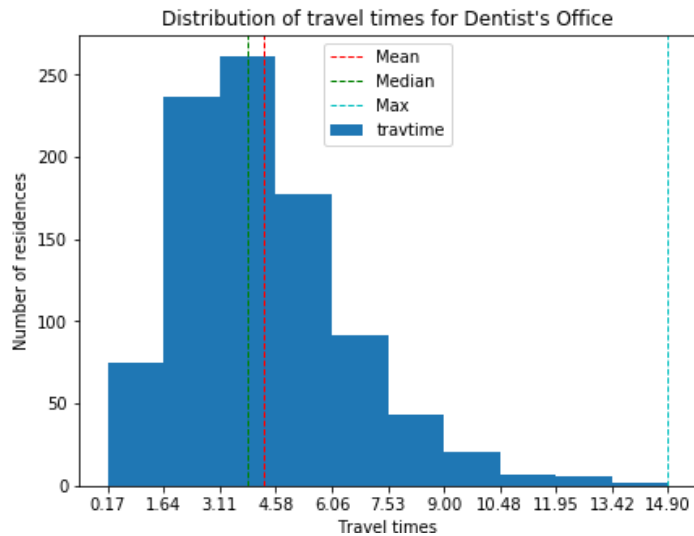
Histogram of walking times for all residences in all 3 districts, to doctor's offices and dentist's offices

Max values < 15 minutes

Histogram of walking times for all residences in all 3 districts, to hospitals

Similar types of histograms show that for Medical Centers and Optical Shops a majority of residences are NOT within a 15 minutes walk. *(see detailed report)*
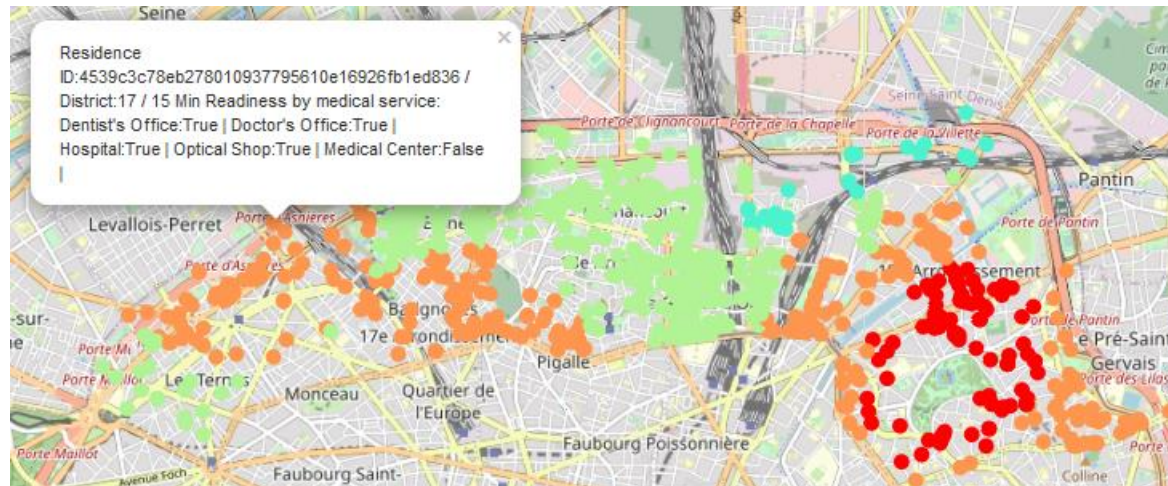
Findings and interpretation
Overall districts comparison

Only in the 19th district do we find residences (96) that are within a 15 minutes walk of **all** medical services
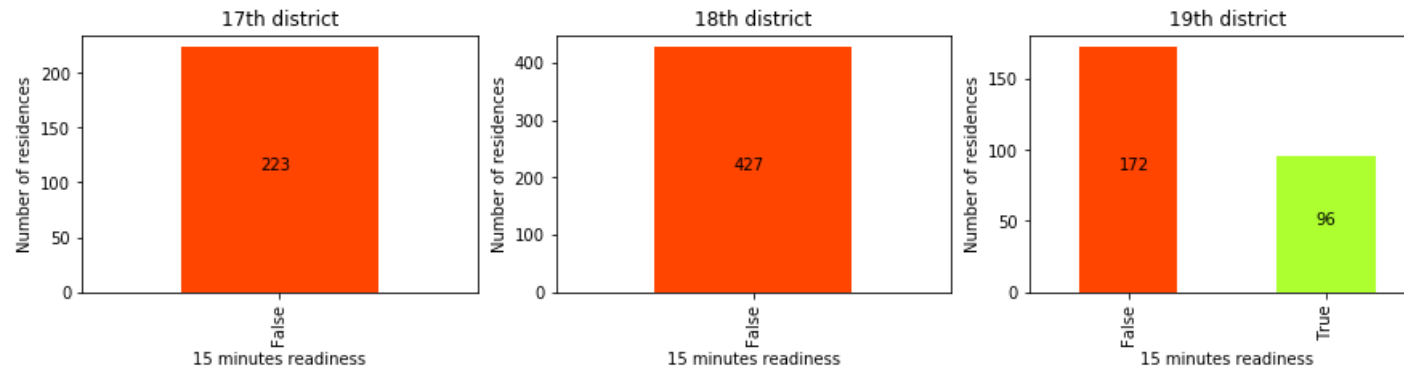
A clickable map enables to visualize residences and the number and type of medical services within 15 minutes (in Jupyter notebook)
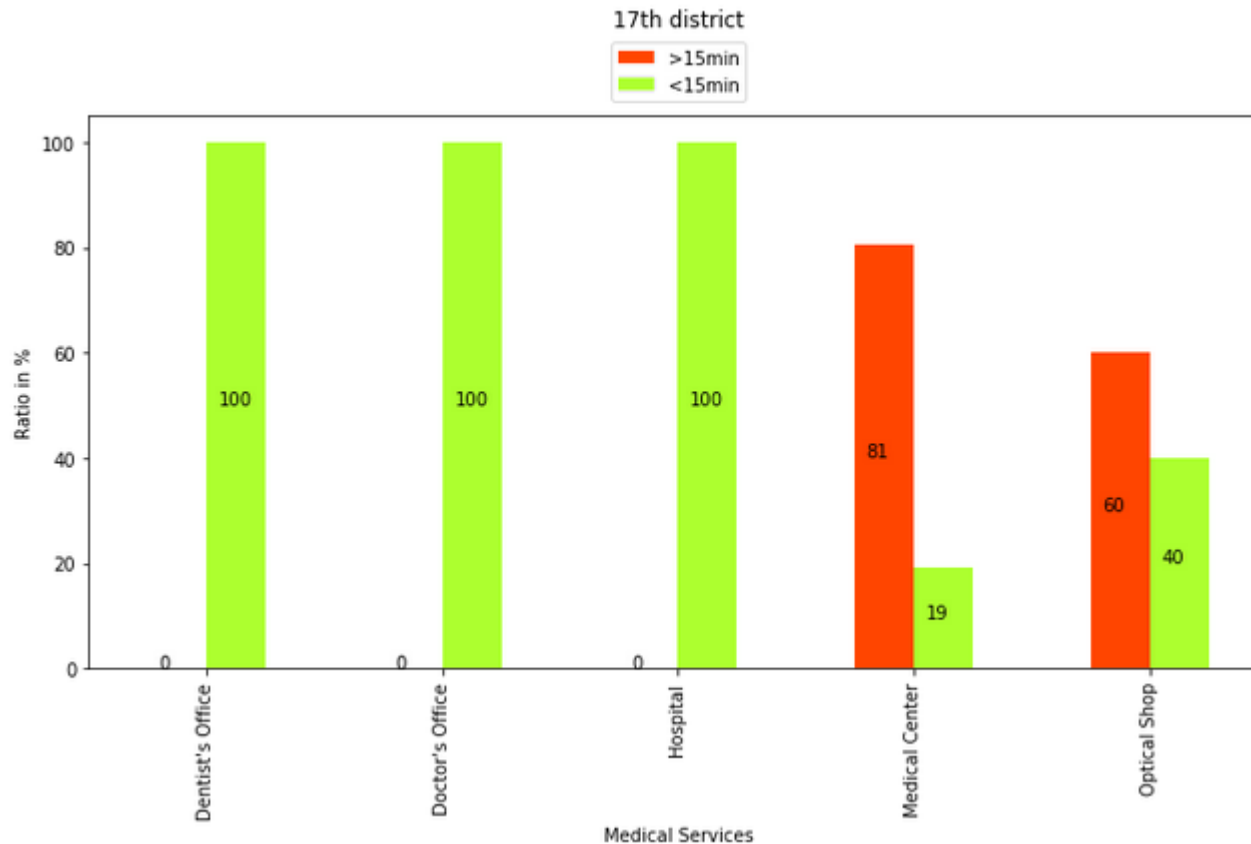
Findings and interpretation
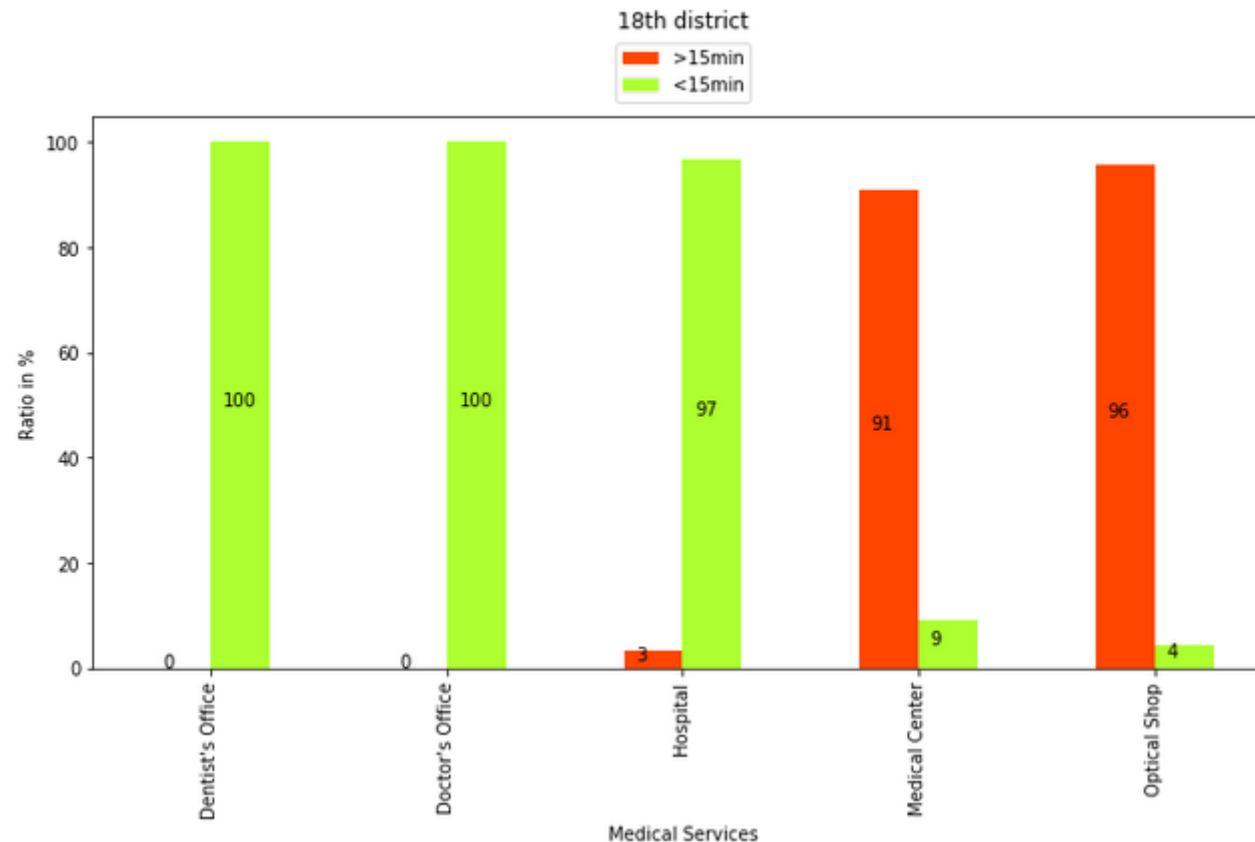## Analysis by medical services in 17th district

- All residences are within 15 minutes of a doctor's office, a dentist's office or a hospital

- A majority are NOT within 15 minutes of a medical center (81%) or an optical shop (60%)

Findings and interpretation
Analysis by medical services in 18th district

- All residences are within 15 minutes of a doctor's office or a dentist's office

- A large majority of residences are within 15 minutes of a hospital (97%)

- A large majority are NOT within 15 minutes of a medical center (91%) or an optical shop (96%).

Findings and interpretation
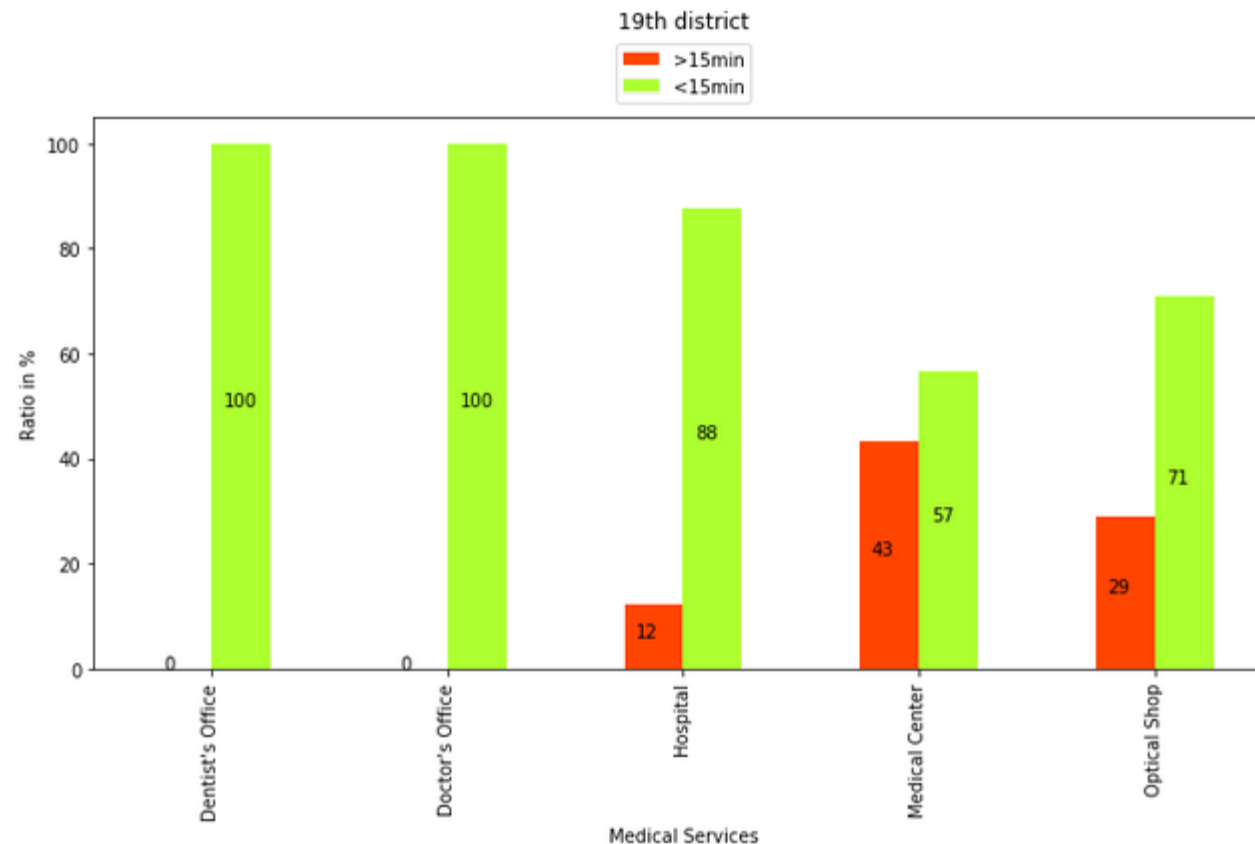## Analysis by medical services in 19th district

- All residences are within 15 minutes of a doctor's office or a dentist's office

- A large majority of residences are within 15 minutes of a hospital (88%)

- A majority of residences are within 15 minutes of a medical center (57%) or an optical shop (71%).

Findings and interpretation
Clustering

Clustering applied to residences after converting their boolean 15 minutes status by type of medical service into clustering parameters

KEY OBSERVATIONS

- Residences are clustered in fairly distinct areas on the map, with almost no mixing of residences from distinct clusters in the same area

- Some clusters are split into 2 areas on the map, but these areas are fairly well delimited and do not include residences from other clusters (except 1 outlier)
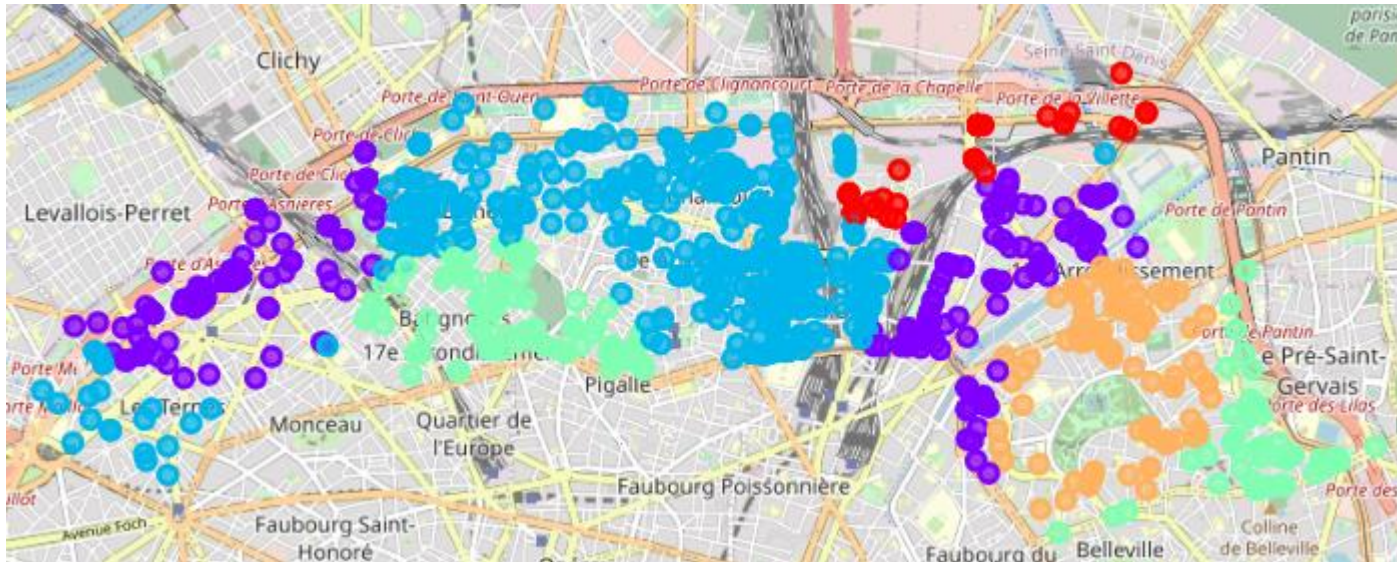
Easier to come up with specific strategies for neighborhoods because of limited dispersion of clusters on the map

But we need to understand the meaning of these clusters ➜ do residences in a given cluster share common <u>interpretable</u> characteristics?
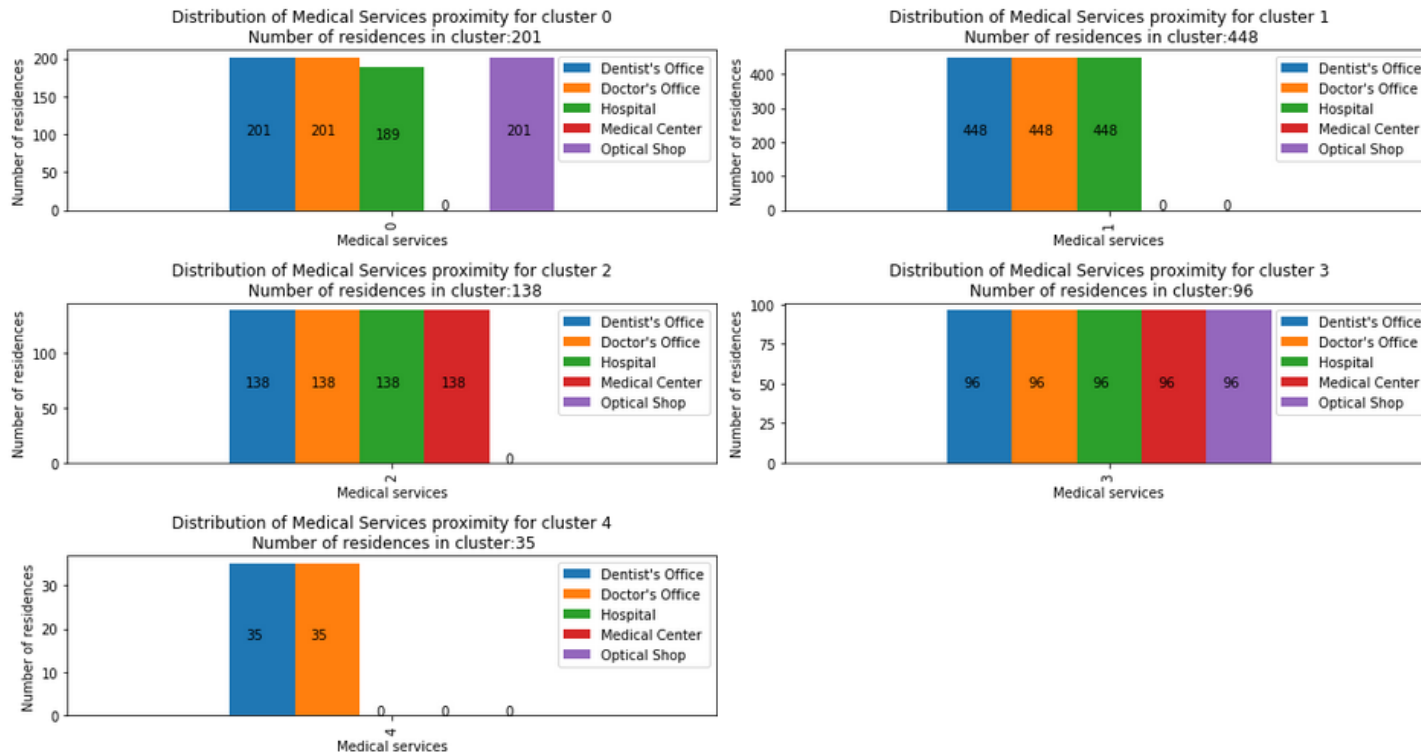
Findings and interpretation
Clustering interpretation

Analysis of clusters based on ratio of residences within 15 minutes of each type of medical service

KEY OBSERVATIONS

- Clusters have clear characteristics in terms of which medical services are within 15 minutes of residences in these clusters.

This enables to define a common approach to address potential gaps within each cluster

Cluster 3 does not need any remediation (all residences within 15 minutes of all types of medical services)

12 residences in cluster 0 will require an adhoc approach regarding access to hospitals

Conclusion & opportunities

We have been able to answer our 2 initial questions:

1. **What is the overall current state of readiness of the city and the districts within it in respect to this "15 minutes" goal?**

   - For the districts that we included we could determine "15 minutes" readiness overall and by residence, and by medical service.

   - We identified some differences of readiness that can help determine appropriate action plans.

2. **Can we identify neighborhoods that share similar characteristics and group them together so that specific dedicated action plans can be defined to enable the "15 minutes" vision in these neighborhoods?**

   - Our clustering process yielded some interpretable groupings of residences, in well defined areas, and each cluster was defined by clear characteristics.

   - This enables the definition of strategies specific to each cluster.

Conclusion & opportunities

Opportunities for improvement and scalability

Generic approach which requires minimal coding adjustments to:

include more or all districts	modify 1 line of code where we specify the districts retained in our residences dataframe
include more services	specify additional Foursquare Venue Category IDs in our Foursquare data retrieval code
include all types of residences	modify the function retrieving residences (e.g point to a different API or import a list and convert it to a dataframe)
use true walking times	1 function to change, with inputs and outputs remaining the same

Opportunities for additional outputs

neighborhood selector	if we include more services, depending on someone's priorities in terms of services they could identify where to move to benefit the most from a "15 minutes" convenience
baseline for progress tracking	15 minutes readiness statistics obtained can be used as a baseline to track the progress and effectiveness of measures introduced to address access gaps.