New Dental Office

Optimal neighborhood for establishing new dental practice in the Greater Miami Area

The Business Problem

- According to American Dental Association each year the number of practicing dentists in Florida grows by average by 170.

- Most new dentists start as Associates in the established practices, but finally they want to open their own offices.

Here comes the question- what is the best place to open the new dental practice?

The Business Problem

This exercise tests a naïve approach of comparing population in a given neighborhood to number of existing dental practices. Places with least dental practice density per population will be considered as candidate spots.

This approach was further expanded by comparing additional data as wealth (median household income).

The scope of the exercise is Miami Metropolitan Area, with focus on Miami-Dade county.

Data Acquisition

The exercise is based on the following data sets:

1. Foursquare (the business type `Dentist's Office`) - names, exact geolocation and addresses

2. Geographical / geocoding data of ZIP code boundaries from gis-mdc.opendata.arcgis.com

3. Demographics by zip code from worldpopulationreview.com/zips/florida/

4. Zip Code Characteristics: Mean and Median Household Income from

   psc.isr.umich.edu/dis/census

   Due to data availability the ZIP code areas have been chosen for the analysis

Data Cleaning

1. Geographical data was acquired in **KLM** format, it was converted to **.tsv** file with a bash script.

2. Additionally for presentation purposes second conversion to **.topojson** using https://mygeodata.cloud/ converter was performed.

3. Demographical data sets were converted from **.XLSX** format to **.csv**

4. The important issue with Foursquare data is that it returns maximum of 50 venues in a single query, so a loop over ZIP areas was constructed to get Dental Offices in each particular area.

Visualization

Choropleth map of Greater Miami has been constructed using the combination of ZIP boundaries data in **.topojson** format, population by ZIP and 495 Dental Offices acquired from Foursquare.

The darker areas notify more population.

The map alone gives some clues to where Dental Office density is lower, but more detailed calculations are necessary.


Acadia Medical Center, ZIP:33055
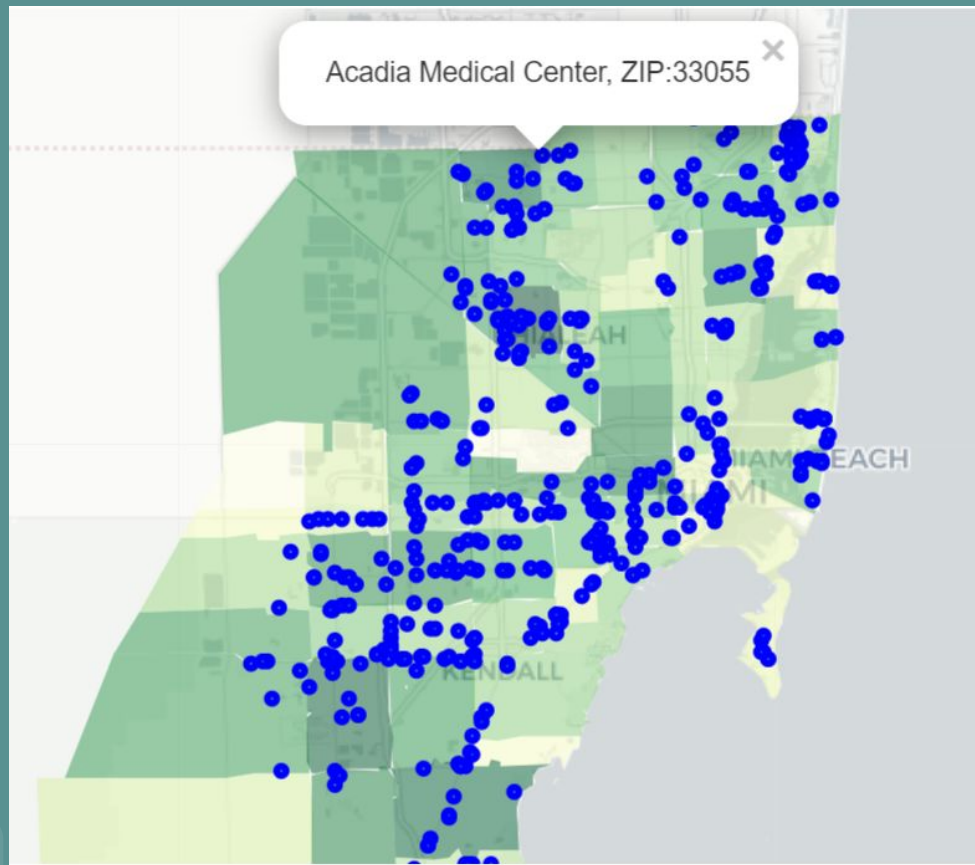
Data Model

The following hypothesis was considered: number of Dental Offices in a given area is in relation to this area population and median household income.

The hypothesis was checked using multi linear regression.

Number of dentist offices by median income in ZIP areas
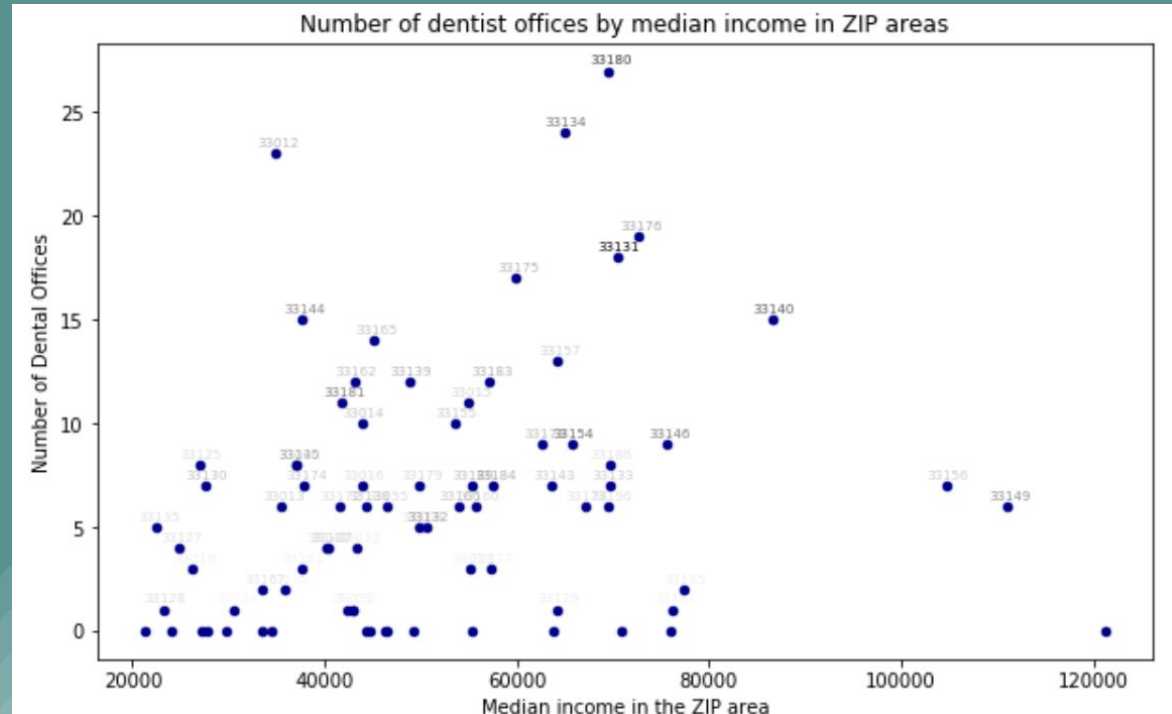
Data Model

Although variance score of the regression model is very low (0.22), the predicted number of Dental Offices per ZIP area can be used to roughly select best zip codes for consideration.

Number of dentist offices by median income in ZIP areas
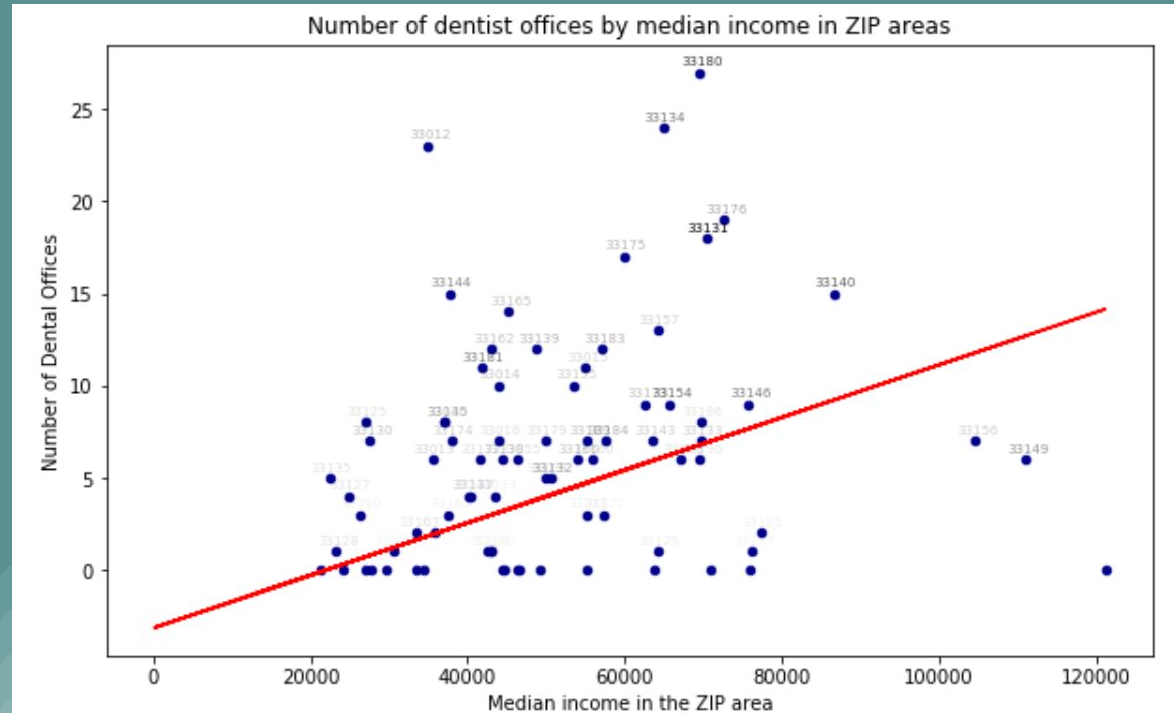
Prospective Areas

The "result" column shows the prediction of the model with regards to how many Dental Offices should be in the area. "-7" means the model predicts 7 additional offices.

Top 5 prospective areas are listed.

zip	pop	dentists	income	ratio	result
33193	51378	0	55287	0.000000	-9
33158	6641	0	121193	0.000000	-8
33142	58574	0	24024	0.000000	-7
33177	58129	3	57246	0.516094	-7
33147	47834	0	29739	0.000000	-6

Result Presentation

Dark color in the map denotes areas where new Dental Offices are the most needed, accordingly to the proposed model, based on area population and median household income.

There are only 3 existing offices in these areas and new ones should be welcome.
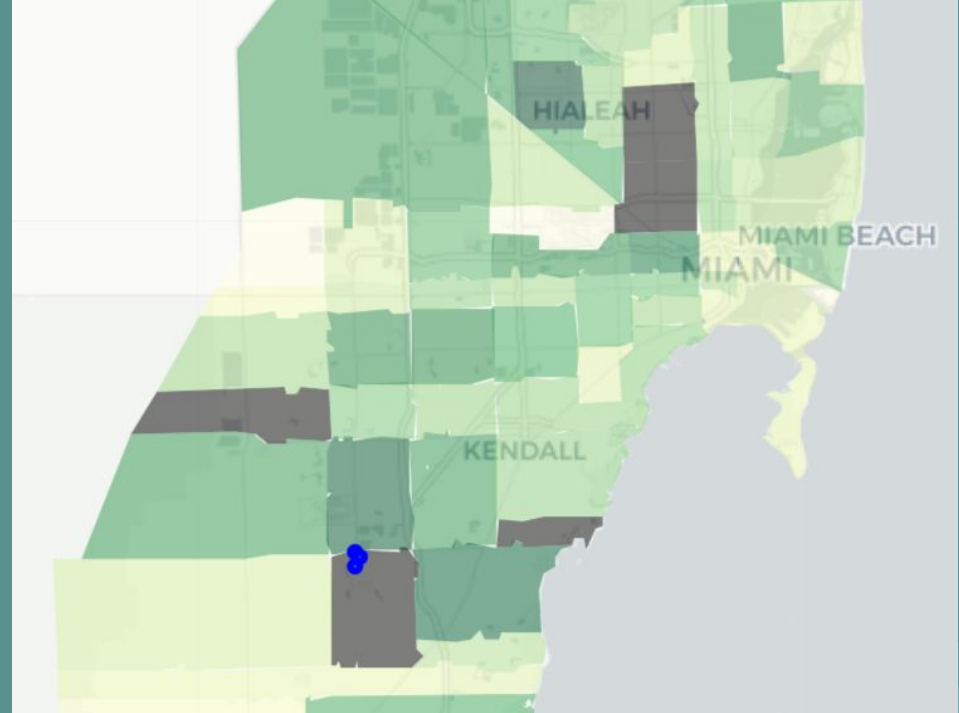
Conclusions and future directions

- The used model is too simple to accurately predict the number of Dental Offices per area, but still may have a value for a quick assessment of the neighborhoods.

- Accuracy of the models has a room for improvement.

- Capture more information on Dental Practices for further exploration:
  - Number of Doctors
  - Number of Patients
  - Review score
  - Financial data