**Alternative Healthcare Business Expansion to Underserved Cities**

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### **Introduction**

For any business that is seeking to grow and expand their operations, there's a tried and true mantra: "Location, Location, Location". Where and when to expand is an essential knowledge asset in the marketplace, which can in turn benefit customers with competition and innovation while reducing cost. This, however, is a challenge when the markets differ from one another, depending on the population and the market saturation of a product.

### **Business** **Problem**

The example to be used will be of an Acupuncture business looking to open a chain of offices around the country in different states and markets. Key metric is the number of offices per zip code per city, which will be used to determine not only the best cities to open new offices but also the best area in these cities where the population may be underserved. This will drive stakeholder's decisions on the future steps for further expansion.

### **Data Gathering and Cleaning**

For this purpose, three sources of information will be used: the top 50 cities in the United States based on population size, from infoplease.com (<https://www.infoplease.com/us/cities/top-50-cities-us-population-and-rank>), Google Map's API (<https://maps.googleapis.com/maps/api/>) to retrieve the coordinates for each city, which will then be passed along to Foursquare's API (<https://api.foursquare.com/v2/venues/search>) to retrieve a sample of locales around each city, with their exact location, and their zip codes.

First, the information collected from infoplease.com contains previous census data used for their 2019 estimate. The previous census data can be discarded since it's not used for the scope of this project. This will be our "cities" table.

Next, using iterative tools, a new table will be created from the "cities" and append the latitude and longitude coordinates of each city. This will be the "top cities" table. Using the iterative tools once more, we will use each record for each city's latitude and longitude to grab a sample of locales in each city for a radius of 60 miles from the coordinates given. The coordinates usually give the center-most point of a city, or the most downtown point. This will yield our "locales" table, containing city and locale exact locations, including their latitude and longitude coordinates, as well as the zip code they belong. The zip code feature here will be used to generate a second map classifying each zip in the major cities based on the amount of acupuncturist offices in them.

Once this information is put together in the locales table, the following data transformations and their respective analysis are performed:

1. Density of Acupuncturist offices per City

To achieve this, a summary of each city’s records (as per Foursquare) is done to gather the total number of acupuncturist offices per city. The city’s coordinates are used to plot into a United States map, showing each city’s density with bubbles adjusted for their counts. The higher the number, the bigger the bubble. Further, we will use an inversed ROYGBIV color spectrum to show this correlation.

Figure 1. Density per City for the 50 most populous cities in the US

Figure 1. Density per City


1. Density of Acupuncturist offices per Zip Code

Using the data from the “locales” table, a transformation is done to it to yield a count per zip code along with the zip code’s coordinates to further group the data. To classify each zip code based on the office count, we will use the *k-Means* cluster method to the data, thus grouping zip codes based on the count. We can see trends for each city and how saturated some areas may be where the business decision to open could be impacted by.

An example on how the *k-Means* clustering technique can help us visualize how each city is being serviced. In Fig. 2, Austin, TX’s serviced zip codes, and the amount of acupuncture offices in each of them is represented by each mark and color denotation. The ones highlighted purple, just like in the City Density model, refer to low office numbers, whereas the highlighted ones represent zip codes with high numbers of acupuncturists. It is then concluded Austin is a well serviced city and may not be as suitable for new market incursion.

Fig. 2 Austin, TX serviced zip codes

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By contrast, comparing Austin’s results to New Orleans, LA’s results can show even populous cities may not have great options in Acupuncture services. Figure 3 below shows a great need for this type of Alternative Health services, and may be a point of consideration for stakeholders in these business decisions.

Fig 3. New Orleans, LA serviced zip codes

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**Observations and Conclusion**

It is important to mention that these observations are in light of a sampling of the data provided by Foursquare and would need a larger dataset to further evaluate how well-served by Alternative Medicine practitioners each major city is, and how it impacts the public at large. From a preliminary standpoint, it is clear that even in large population centers, this kind of care is not readily available as an alternative to more conventional Western approach to medicine, which can impact patients foremost, but in the health system as a whole.

It is also see that in certain instances, like for example in the figure below for Miami, that while the city at large may have many offices, they may not be within reach by means other than automobiles, and thus make it difficult for lower income patients to seek these offices.

Fig. 4. Miami, FL serviced zip codes

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By making these services available and affordable to more patients, the impact in the current healthcare model may be of benefit in the long run, lowering costs (discrete and non-discrete), as well as providing safer options to the public at large.