Identifying candidate locations for a new Chinese food restaurant in the Washington DC metro

Benji Gee

June 11, 2019

Contents

Background

The restaurant industry is extremely competitive. According to a study by Ohio University, of failed restaurants about 65% fail within the first year and 80% fail within 5 years. Therefore, it would behoove individuals who are thinking about entering this competitive market to understand the landscape of competition and conduct through market research in the area they are interested in. For this case study, we will focus on Washington DC and use a data-driven approach to identify high opportunity areas to establish a new Chinese food restaurant based on supply of currently available restaurants.

- **Question**: Where should a chef open up a new Chinese food restaurant in the Washington DC area based on the current supply of similar restaurants?
- **Audience**: Chefs and or prospective restaurant owners who are interested in opening up a restaurant in Washington DC.
- **Why do they care**: Chinese restaurants are common restaurants across Washington DC. Where should a chef who is interested in opening up a new Chinese restaurant open one based on the **current supply of existing restaurants?**

Data and Approach

The data for this Capstone comes from two primary sources. The FourSquare API and the US Census Bureau.

- *FourSquare API*: The main source of restaurant data will come from the Four Square API. To address the outlined above, I will be searching for locations of Chinese restaurants from the Foursquare Venues Search Endpoint. This analysis will take into consideration 4 locations within Washington DC area
    - Dupont Circle
    - Bethesda
    - Arlington
    - Silver Spring

- *US Census Bureau – American Community Survey 2018.* One of the limitations posed by this analysis is the comparison of results across different cities. The fact that there are different number of people living in the areas we analyze will bias the results if we just analyze count data. To adjust for this, we will leverage data coming from the US Census Survey. that we can calculate rate per 1000 residents living in the area. This will allow our findings to be compared with each other.

To summarize, these data sources will help us understand the concentrations of Chinese food restaurants in different areas of Washington DC. Using these insights we can pinpoint areas of high and low demand for a new Chinese food restaurant.

Methodology

This analysis will primarily use descriptive statistics to answer the question: *where are the low and high concentrations of Chinese restaurants in areas of Washington DC?* To accomplish this, several exploratory analytic techniques were employed that calculate the counts of Chinese food restaurants in various areas of DC. These analyses consist of:

- *Descriptive statistics* to calculate and summarize the total number of Chinese food restaurants in each area. This will done in the form of bar charts.
- *Data calculations* to allow us to compare across areas of varying population size. The analysis adjusted for population count living in each by dividing by the count of restaurants by the number of people who live in the area
- *Geospatial analytics* to visualize the locations of these restaurants in relation to each other on a map

Data Cleaning

Data were collected and processed in the following steps:

- Restaurants were collected via FourSquare API in separate search queries for Arlington, Silver Spring, Bethesda, and Dupont Circle
- Once the XML collected, it was parsed and cleaned into a data frame
- The separate tables for each area were aggregated into a final table

- The populations of each neighborhood were loaded and then combined with the final data via join
- The population adjusted rate was calculated by dividing the restaurant count by the population of the area and then multipled by 100,000.
- Seaborn was used to visualize the counts of restaurants in each area in a bar chart
- Seaborn was used to visualize the population adjusted rate by area in a bar chart
- Folium was used to plot the locations of the restaurants using the latitude and longitude coordinates

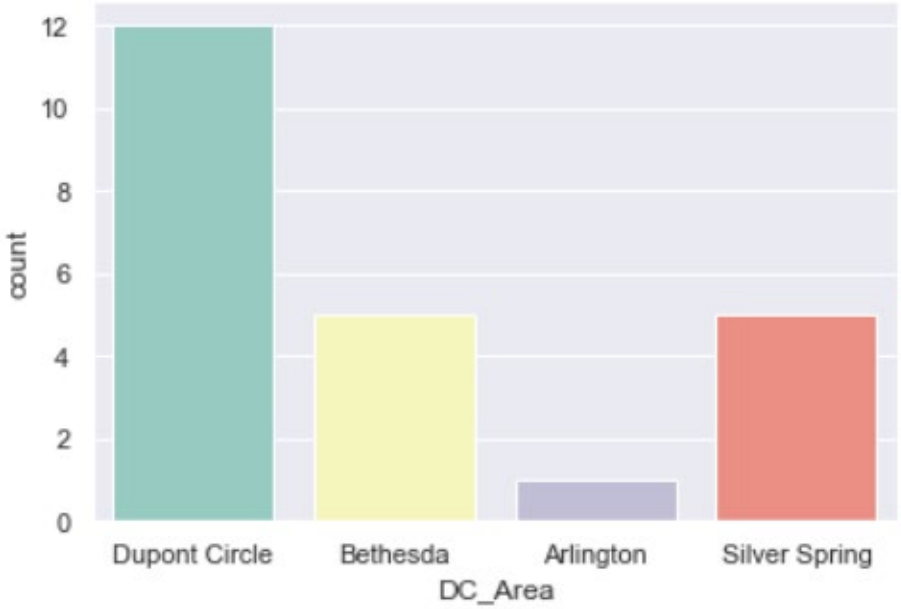
Results

The number of Chinese restaurants were determined across four areas in the Washington DC metro area and shown in the below table.

Table 1. Results table

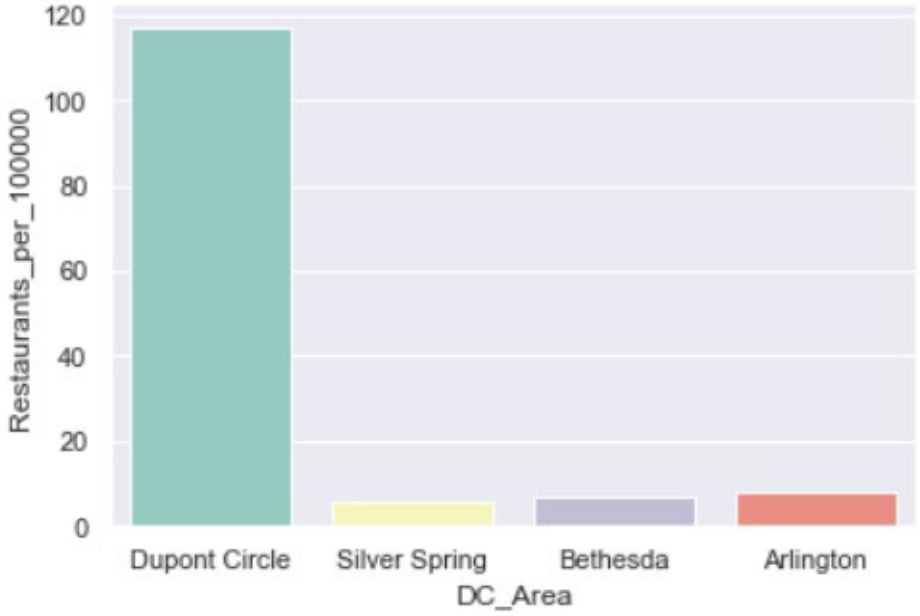
Neighborhood	**Restaurant Count**	**Population-adjusted (per 100,000)**
Dupont Circle	12	117
Bethesda	5	6
Silver Spring	5	7
Arlington	1	8

Figure 1. Count of Chinese Restaurants by Neighborhood



Based purely on raw counts, Dupont Circle had the most number of Chinese food restaurants (12), followed by Bethesda and Silver Spring (tied at 5) and Arlington (1).

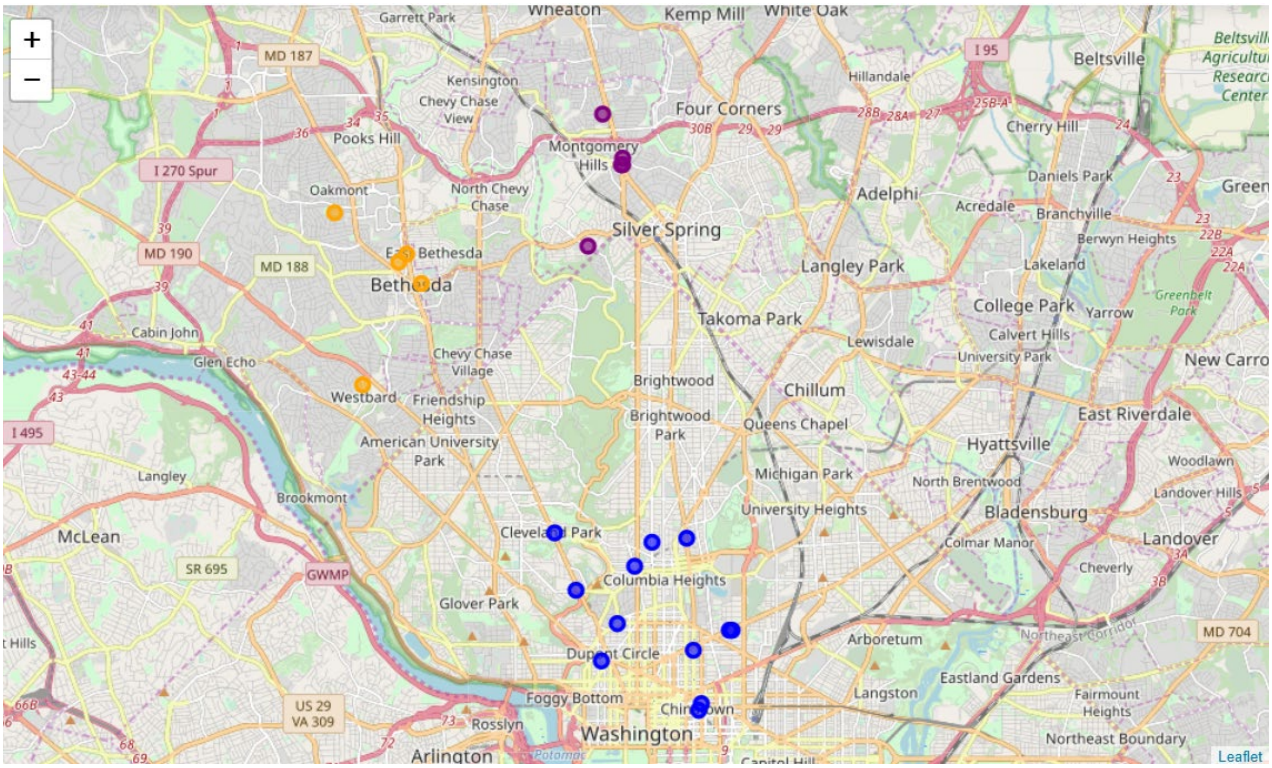
Figure 2. Population Adjusted Rates by Neighborhood



After adjusting for population, the results were stayed mostly consistent with the previous frequency analysis – Dupont Circle had a significantly higher rate than the other areas studied. However, when ranked highest to lowest, the order of the remaining three areas changed from Arlington, Bethesda and then Silver Spring. Interestingly, after adjusting for population both Bethesda and Silver Spring turned out to have a lower supply of restaurants relative to the current population.

A map was also generated to visualize the locations of restaurants in these 3 areas. While not helpful in quantifying which area would be best to invest in a new restaurant, the map confirms that the locations of the restaurants are indeed in the correct geographic areas and that the 4 studied in this analysis are represented (Arlington only had 1 restaurant and not visible in the map).

Figure 3. Map of Chinese restaurant locations in the DMV area. The orange locations correspond to Bethesda; Blue locations correspond to Dupont Circle; and the Purple locations correspond to Silver Spring.



Discussion

This analysis aimed to address the question: *where is the ideal location to establish a new Chinese food restaurant?* The main criteria to answer this question is the supply of restaurants currently available in the area – in other words, areas with a low current number of Chinese food restaurants relative to the population of individuals who live in the area may be strong opportunities to establish one based on the lack of current supply. To adjust for the number of individuals living in the area, we divided the number of restaurants by the current population of the area. The areas considered for this analysis were:

- Dupont Circle
- Bethesda
- Silver Spring
- Arlington

There are two key recommendations in this analysis:

- Silver Spring, Bethesda and Arlington all have a low supply of Chinese food restaurants in the area relative to current population estimates. **Therefore, they are strong candidates to consider opening up a new Chinese food restaurant.**
- Dupont Circle has a high supply of Chinese food restaurants. **Therefore, Dupont Circle may not be a strong candidate for opening up a new Chinese food restaurant.**

There are 2 primary limitations in this analysis that can be improved in the future. These limitations include:

- While this analysis takes into consideration supply, it does not factor in the demand of a new Chinese food restaurant area. To fully assess the best opportunity areas, demand must be assessed – such as looking at the sentiment of current residents on social media, looking at the current sales or revenue of existing restaurants, or the number of Chinese people living in the area.

- The FourSquare API may not return complete results or outdated results based on API rate limits or other data restrictions. Hence, we may not be capturing all of the available restaurants in the area
- Other areas outside of the 4 analyzed here should be considered in future iterations.

Despite these limitations, this analysis still discovered one key insight: Dupont Circle seems to be saturated with Chinese food restaurants while Bethesda, Arlington, and Silver Spring are not.

Conclusion

In conclusion, we recommend that Arlington, Silver Spring and Bethesda be considered as strong candidate areas to establish a new Chinese restaurant. Dupont Circle may not be the best location due to strong current supple of Chinese restaurants.