# Finding Ideal Location to Start Restaurant in Toronto, Canada

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## 1. Introduction

### 1.1 Background

Toronto is North America's fourth largest city with approximately 2.8 million people and it was considered the most multicultural city in the world by BBC Radio in 2016 with 51% of its population not born in Canada and about 230 different nationalities represented within the city. Hence, each neighborhood can have a vastly different ethnic characteristic. Also, being Canada's largest city, the income level can also be very different between neighborhoods. As a result, the location where a new restaurant is set up and the ethnic type of food being served can greatly determine the success of the business. The City of Toronto divides itself into 25 different wards so detailed data for each ward is available from the city. This information can be used to uncover information about the demographic and economic characteristic of each ward. Therefore, it is extremely important to understand the demographic and economic characteristics of a neighborhood in Toronto before choosing the location and type of restaurant to set up.

### 1.2 Problem

Any data that might assist in understanding the demographic and economic characteristics of Toronto's wards will help in choosing the right neighborhood to set up a new restaurant. Setting up a business in Toronto without researching the characteristics of Toronto's diverse wards can lead to failure of the restaurant if the wrong neighborhood or wrong type of cuisine is chosen. This project will determine the best ward in the city to set up a new restaurant and the type of cuisine to focus on based on demographic and economic data of Toronto's wards. In addition, these days the competitors for a restaurant not only consists of other restaurants, but can also consist of any source that provides food such as food trucks, supermarket cafeterias, food courts and take-out-only businesses just to name a few. It is necessary to get a clear picture of all the food service establishments, not only restaurants in each ward. Also, setting up a restaurant in a ward with a growing population is preferable over one with a decreasing population so a restauranteur should know the growth trend of a neighborhood before establishing a new location. Lastly, the income demographic of the neighborhood can also determine the average resident's purchasing power in the neighborhood which can determine whether a restaurant should sell cheap-priced food or sell expensive-priced food. This project will determine the best location to set up a restaurant in Toronto and the type of restaurant based on data analysis. As well, the study will determine the target price range for a new restaurant.

### 1.3 Target Audience:

This report is targeted to investors looking to set up a new restaurant in Toronto but who do not yet know what area to locate in or what type of product to offer. Once the investor finishes reading this report, the investor will know which neighborhood, what type of cuisine, and what pricing to use for his/her new restaurant.

## 2. Data

### 2.1 Data Sources

Most of the datasets have been obtained from the City of Toronto website Open Data Portal:

The following datasets were obtained and used from the City of Toronto Open Data Portal:

#### 2.1.1 City Wards Data:

This dataset contains the name and corresponding ward number for all 25 administrative wards of the City of Toronto. The different Ward Names and their corresponding Ward Numbers were used to form a dataframe of the 25 wards and their corresponding names. Data from other datasets on the City of Toronto Open Data Portal were combined with this basic dataframe to classify all demographic, economic, and geographic data to specific wards.

#### 2.1.2 2018-ward-profiles-25-ward-model-geographic-areas:

This dataset contains the land area size in square kilometers of each Ward. The data from this dataset was used to determine the radius size of each ward when mapping each ward's circle marker on Folium maps and to estimate ward boundaries geographically.

#### 2.1.3 Food Inspection Dataset (City of Toronto):

According to the City of Toronto, every eating and drinking establishment in Toronto receives a minimum of 1 to 3 inspections each year. Hence, this dataset contains the names, latitude, and longitude of every food establishment in Toronto. As a result, the data extracted from this dataset was used to determine how many food service establishments there are in each ward of Toronto and their geographic location.

#### 2.1.4 2018-ward-profiles-2011-2016-census-25-ward-model-data:

This dataset contains demographic, social and economic information for each ward in Toronto. The information is obtained from 2016 and 2011 Census data for the 25 wards of Toronto. The types of data extracted from this dataset were:

**Total Population:** this data was used to understand the absolute number of people and population density of each ward.

**Population Based on Country Ethnic Origin**: this data was used to understand the largest ethnic groups per ward. Knowing this could help determine what type of food would be in high demand in the neighborhood.

**Population Segmented by Income**: income brackets for each ward were used to understand what price point restaurant could do well in wards we were interested in. For example, if the neighborhood has many residents with a high level of income, a restaurant serving high priced food may do well.

**Difference between 2011 and 2016 population**: this data was used to determine which ward among wards of interest have population growth. Ideally, we would want to set up

a restaurant in a ward with a growing population as opposed to one with a decreasing population.

In addition to extracting data from City of Toronto Open Data Portal, Google Maps was used to determine the latitude and longitude of each ward.

**2.1.5 Google Maps latitude and longitude data:** Each ward's geographic profile map is provided on the City of Toronto website such as in the image displayed in **Figure 1**. Since the geographic center of an irregular shaped object such as a city ward cannot be defined absolutely, it was necessary to look at the profile map of each ward on the City of Toronto website and estimate an arbitrary center point using road intersection or major landmark around the center of each ward. For example, in figure 1, the geographic center would be around the area of Dundas Street a bit east of Sherbourne Street. By finding and clicking the same intersection or landmark of the center point of the ward on Google Maps, the corresponding Latitude and Longitude of the location is displayed on Google Maps. This process was repeated for each of the 25 wards to determine an arbitrary center point latitude and longitude of each ward.

**2.1.6 Foursquare API:** Search was conducted to find what the most common type of venues were for each ward. This information was used to get an idea of what type of restaurants were the most common in each ward. If a certain type of restaurant is common to a ward, it can indicate that restaurants of those type can do well in the area.

### 2.2 Data Cleaning

Since there is no official center point of each ward, it was necessary to assume a center point based on approximation. Profile map of each ward like the one in **Figure 1** was used to approximate the center of each ward based on an intersection or landmark. Then, the exact same intersection or landmark center point was searched for on Google Maps which returned a latitude and longitude of the point. This latitude and longitude were added to the dataframe that consists of Ward # and Ward Name. This process was repeated for each ward resulting in latitudes and longitudes of the center point of each ward.

Next, each ward's radius was calculated based on data about the ward's land area from Open Portal. It was necessary to assume that each ward had a circular shape in order to calculate a radius. In reality, each ward is not circular but instead a polygon shape with no defined center. However, for the purpose of this project, the actual shape of each ward was not important. It was most important to determine a reasonable estimation of the ward's center point and coordinates around the center point that fall within a circular area equal to its actual area so that we could determine whether a food establishment should be classified as belonging to the ward. In addition, to do a search for common venues on Foursquare, a center starting point latitude and longitude are necessary as well as a radius around which to do the venue search.

Since City of Toronto can conduct more than one inspection per year for food establishments and food inspection data is kept in the dataset for two years, the same food establishment can be listed multiple times in the dataset. It was necessary to eliminate duplicate entries of the same establishment from the

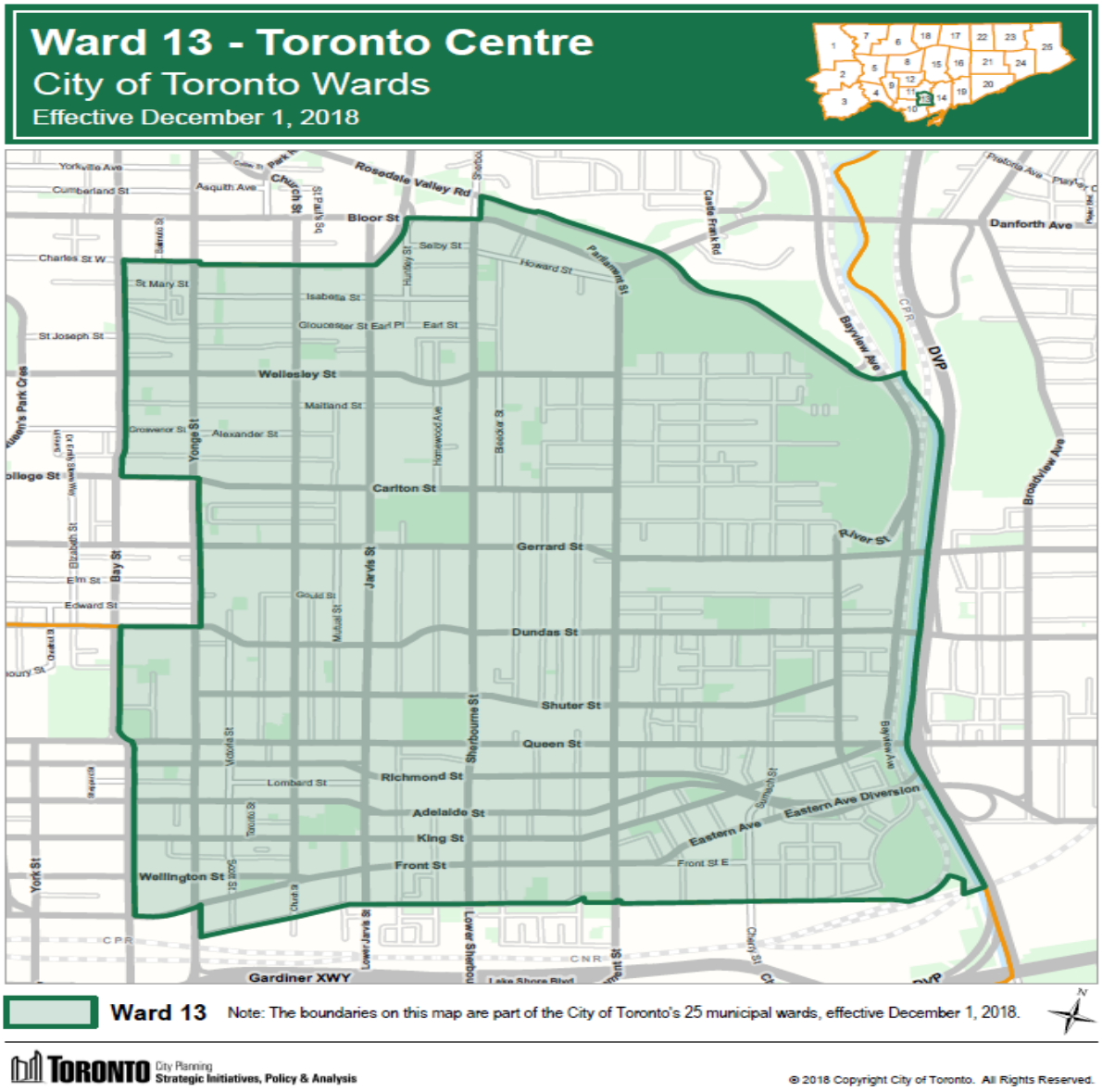


**Figure 1.** Ward 13 Geographic Profile. Source: City of Toronto Open Data Portal.

dataset. Furthermore, the dataset contains data on food establishments such as food manufacturers and nursing homes that do not compete with restaurants so these were eliminated from the data.

The definition of "restaurant competitor" was kept broad since these days supermarkets and food carts can compete with restaurants so "any establishment that the general public may buy ready-to-eat food from" was used as the definition of competitor. The key distinguishing terms in the definition are accessibility to the general public and ready-to-eat food which eliminates establishments such as nursing homes and food manufacturing plants (**Table 1**, **Table 2**).

Before screening, the dataset contained 62,271 food service establishments. After eliminating duplicate entries and screening for only food service establishments that meet the restaurant competitor criteria,

14,569 food service establishments remained. This would be the number of food establishments I used when performing analysis.

Food establishments dataset also contained latitude and longitude of each food service establishment. This data was used to determine the ward in which each food service establishment belonged to.

| | **Types Before Screening** | | |
|---|---|---|---|
| **0** | Food Store (Convenience/Variety) | **29** | Other Educational Facility Food Services |
| **1** | Restaurant | **30** | Institutional Food Services |
| **2** | Food Take Out | **31** | Commissary |
| **3** | Food Caterer | **32** | Nursing Home / Home for the Aged |
| **4** | Hot Dog Cart | **33** | Refreshment Stand (Stationary) |
| **5** | Retirement Homes(Licensed) | **34** | Elementary School Food Services |
| **6** | Boarding / Lodging Home - Kitchen | **35** | Bed & Breakfast |
| **7** | Bakery | **36** | Chartered Cruise Boats |
| **8** | Banquet Facility | **37** | Rest Home |
| **9** | Cocktail Bar / Beverage Room | **38** | Brew Your Own Beer / Wine |
| **10** | Cafeteria - Public Access | **39** | Hospitals & Health Facilities |
| **11** | Supermarket | **40** | Ice Cream Plant |
| **12** | Mobile Food Preparation Premises | **41** | Church Banquet Facility |
| **13** | Private Club | **42** | Locker Plant |
| **14** | Bake Shop | **43** | College / University Food Services |
| **15** | Food Bank | **44** | Food Cart |
| **16** | Community Kitchen (Meal Program) | **45** | Flea Market |
| **17** | Serving Kitchen | **46** | Bottling Plant |
| **18** | Butcher Shop | **47** | Meat Processing Plant |
| **19** | Food Depot | **48** | Food Recovery Program |
| **20** | Child Care - Food Preparation | **49** | Food Vending Facility |
| **21** | Food Court Vendor | **50** | Fairs / Festivals / Special Occasions |
| **22** | Food Processing Plant | **51** | Milk Products Plant |
| **23** | Child Care - Catered | **52** | Catering Vehicle |
| **24** | Cafeteria - Private Access | **53** | Milk Pasteurization Plant |
| **25** | Fish Shop | **54** | Ice Manufacturing Plant |
| **26** | Ice Cream / Yogurt Vendors | **55** | Cheese Plant |
| **27** | Student Nutrition Site | **56** | Retirement Homes(Un-licensed) |
| **28** | Secondary School Food Services | **57** | Cannery |

**Table 1.** Food Types in dataset of Licenced Food Establishments in City of Toronto

| | Types After Screening | |
|---|---|---|
| **0** | Food Store (Convenience/Variety) | |
| **1** | Restaurant | |
| **2** | Food Take Out | |
| **3** | Food Caterer | |
| **4** | Hot Dog Cart | |
| **5** | Bakery | |
| **6** | Cocktail Bar / Beverage Room | |
| **7** | Cafeteria - Public Access | |
| **8** | Supermarket | |
| **9** | Mobile Food Preparation Premises | |
| **10** | Private Club | |
| **11** | Bake Shop | |
| **12** | Food Court Vendor | |
| **13** | Refreshment Stand (Stationary) | |
| **14** | Bed & Breakfast | |
| **15** | College / University Food Services | |
| **16** | Food Cart | |
| **17** | Flea Market | |

**Table 2.** Food Types that meet requirement of "any establishment that the general public may buy ready-to-eat food from".

### 2.3 Feature Selection

From the datasets, a number of features can be extracted. Some of the key features are explained below:

***1) Radius of Wards:*** land area data was used to determine radius of each ward. The radius of the ward was assumed to be the square root of the actual Area of each Ward divided by the value of Pi:

For example, the land area of Ward 1 is 48.38 square km, so the radius of the ward would be assumed to be the square root of the Area of the Ward divided by the value of Pi:

r = Square Root of (Area of Ward / pi)

r = Square Root of (48.38 / 3.14)

r = 3.92km

This radius calculation was used to draw circular markers on the map of Toronto to visualize each ward's location and size. The final result represents well the Toronto wards with only a few wards overlapping and small areas that are not covered (**Figure 2**). In reality, the shape of each ward is not circular, but the actual shape is not relevant to the analysis of data for this project the radius was only used as a way to estimate each ward's area coverage when conducting venue search with Foursquare API.

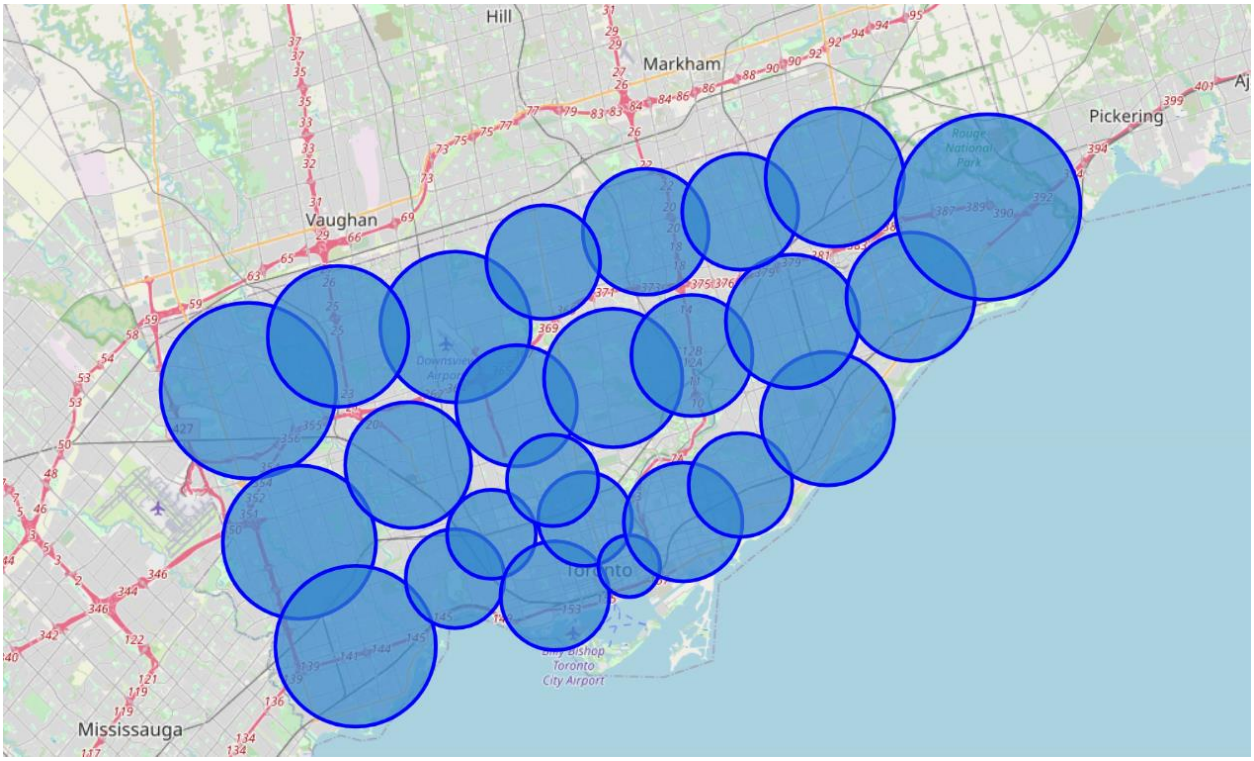


**Figure 2**. Representation of Toronto's 25 wards. Each circle equals the actual area of the ward. The center point of each ward is an approximation of the ward's center point.

***2) Population Density of Wards:*** land Area data was used to calculate population density calculations for each ward (Population of Ward / Land Area of Ward)

***3) # of food service establishments in each ward of Toronto:*** the latitude and longitude of every food service establishment in Toronto allows us to assign each food service establishment to a specific ward. This allowed the creation of the feature named "# of food service establishments" in each ward. The center point of each ward was used to determine how many food service establishments each ward has. For example, knowing the latitude and longitude coordinates for every food service establishment, each establishment was categorized as belonging to the ward whose center point that it is closest to. Assigning each restaurant to a ward based on distance to ward center point instead of the actual ward it belongs to is arguably the best way to categorize each establishment's ward category since each restaurant is affected by the demographics of the ward that it is geographically closest to even though it may administratively belong to a different ward. Ideally, we would like to set up a restaurant in a ward where the number of food service establishments are very few relative to population density of the ward. Knowing how many food service establishments are in each ward will help us achieve this.

***4) Density of Food Service Businesses in each Ward***: land Area data was also used to calculate density of food service businesses in each ward. The 'Restaurants per Square km' was determined by dividing the "# of food service establishments in each ward" by the land area of the ward.

***5) # Customers/Restaurant/Sq km***: perhaps one of the most important features is the number of residents per restaurant in the ward per square km. This feature measures the potential demand for restaurants (Population Density) compared to the supply of restaurants (Restaurants per Sq km or restaurant density). Ideally, we want an imbalance of high demand (high population density) and low supply (low restaurant density).

**5)** ***Ward Ethnicity:*** data on the number of people from each ethnicity was selected to determine if there is a predominant ethnic group in wards of interest. It can be assumed that people will seek out food from their ethnic background so restaurants catering to the predominant ethnic group will have higher likelihood of success.

***6) Ward Population Growth:*** data on growth of population in 2016 compared to 2011 was used to understand if a ward has positive or negative growth. Positive growth is preferred in most cases.

***7) Income Brackets:*** data on the income brackets per ward was used to determine how expensive a new restaurant should be.

***8) Most Common Venues:*** data on the most common venues returned by Foursquare API search for venues in each ward was used to determine the predominant type of restaurant in wards of interest. Seeing what restaurants currently are most common can give hints on what type of restaurant would do well.

## 3. Methodology and Exploratory Data Analysis

### 3.1 Determining the Ideal Location for Restaurant and Type of Restaurant

The methodology to determine the ideal ward for a restaurant was based on population density, number of potential customers per restaurant per square km, ethnicity of the ward, population growth of ward, income demographics, and most common venues. The ideal ward would be one with the highest population density, highest number of potential customers per restaurant per square km, a predominant ethnic group, a growing population, a high number of high-income earners, and a specific type of restaurant among the most common venues in the ward.

First, wards were screened to find candidate wards that have relatively high population density and relatively high # Customers per Restaurant per Square km. Second, the ethnic composition of the candidate wards was uncovered to determine the predominant ethnic groups to determine if there is an ethnic type of cuisine that would likely have many customers. Third, the income of the candidate wards was uncovered to determine how expensive a new restaurant should be. Fourth, the population growth of the candidate wards was determined to know which wards are showing growth. Lastly, Foursquare API search for most common venues of the candidate wards was performed to see if there is a type of restaurant that is most common to the ward. A certain type of restaurant among most common venues would give clues as to what type of restaurant should do well in the area.

### 3.2 Population Density and # of Customers per Restaurant per Square km

Since restaurants need many customers to be successful, it is important to search for wards with high population density. Second, it is important to choose a location that has a high number of customers per restaurant per square km. In general, the Toronto wards with the highest population density also have the lowest number of customers per restaurant per square km (**Figure 3**). This may reflect the fact that high density neighborhoods attract many restauranteurs to set up in those neighborhoods to the point where the ratio of residents / restaurants becomes very low. Many restaurants in this case would have to compete fiercely for customers. This may be the case for Ward 13 in the Figure 3.

At the opposite end is the case where the population density is very low. These wards tend to have a high # of customers per restaurant (per Square km). Although there are few competitors in a ward with few restaurants, if population density is too low, the area may have too few customers to be sustainable. This may be the case for Ward 25.

The ideal situation is to find wards with relatively high population density that have not yet been oversupplied with restaurants so that the # of Customers per Restaurant per Sq km is still relatively high. To uncover these wards, k Means clustering was performed.

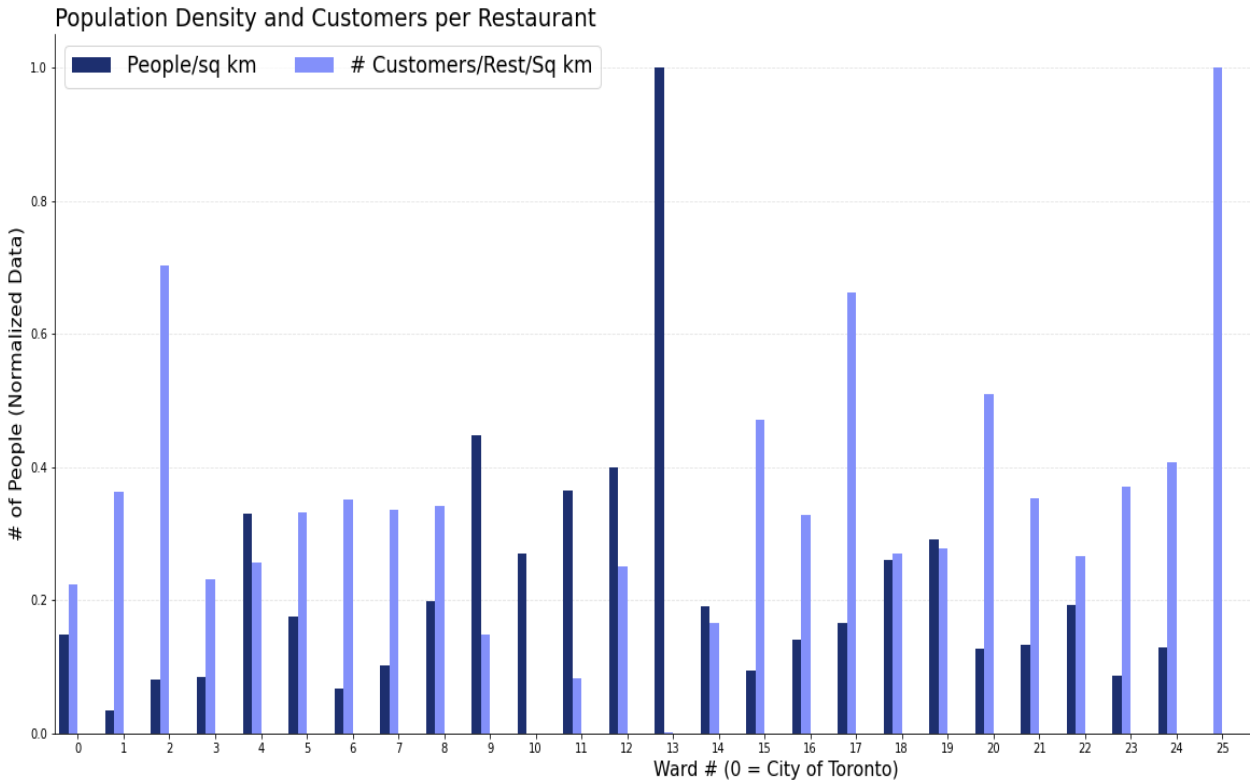


**Figure 3.** Ward Population Density and # of Customers per Restaurant (per Square km).

### 3.2.1 K Means Clustering

The first analysis included all wards and used 3 clusters based on Elbow Method to determine optimal 'k'. The results are shown in **Figure 4** and **Figure 5**.

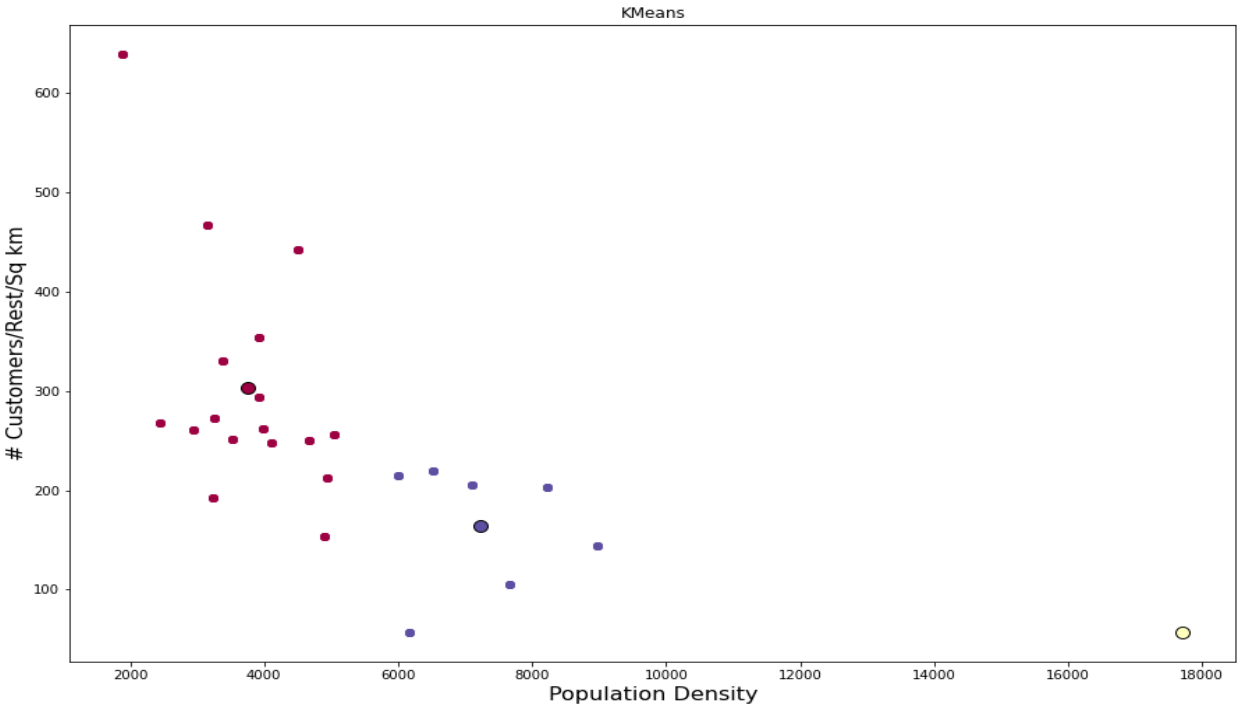


**Figure 4**. k Means Clustering of all 25 Toronto wards with 3 clusters.

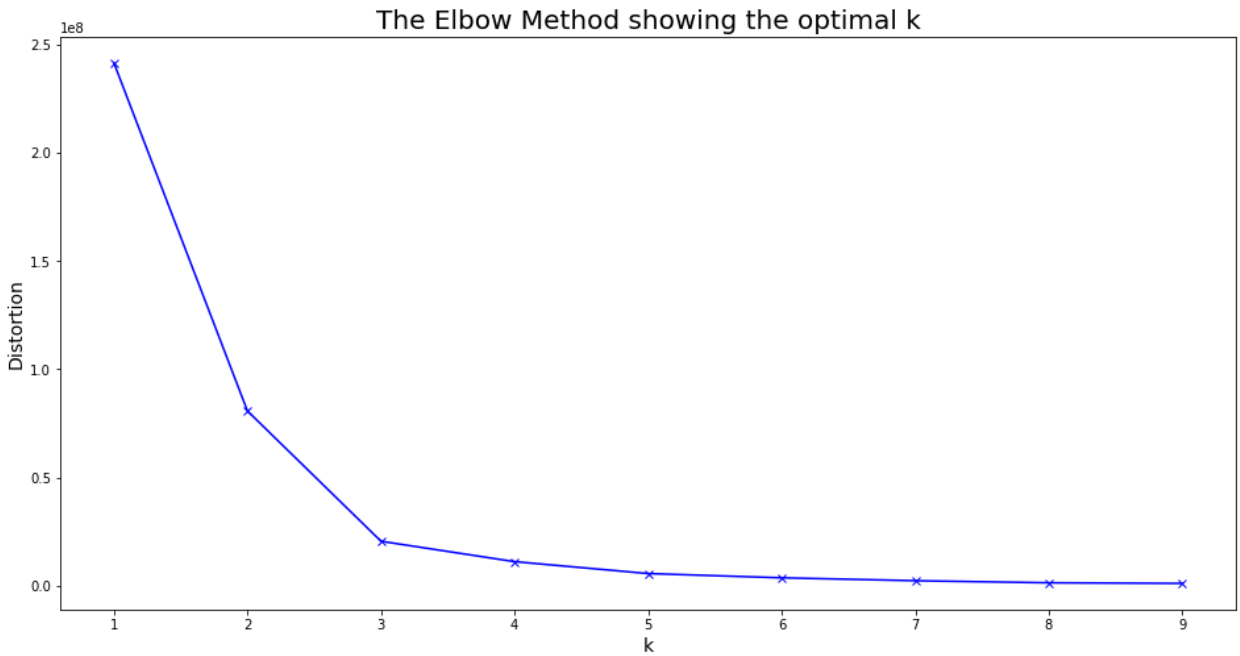


**Figure 5**. Elbow Method for optimal k. Elbow is at k = 3.

In **Figure 4**, the effect of the outlier wards seems to have distorted the clusters. The yellow cluster in the bottom right of the figure only has one point. It makes little sense to keep the wards that are at extremes within the analysis so Ward 13 (bottom right yellow point with highest population density and lowest # Customers per Restaurant per Sq km) and Ward 25 (top left point with lowest population density and highest # Customers per Restaurant per Sq km) were removed from the list of wards since they are extreme outliers.

K Means was performed a second time without Ward 13 and Ward 25. The effect of removing the outliers allowed the k Means analysis to uncover more meaningful clusters (**Figure 6**). Clustering was performed using 4 clusters as a result of Elbow Method for optimal k (**Figure 7**).

The analysis uncovered a pattern that may be expected among the clusters: population density and # Customers per Restaurant per Sq km tend to have a negative relationship. However, within the red cluster and purple clusters, there are wards that exhibit higher # Customers per Restaurant per Sq km than the others in their respective clusters.

Based on this k Means Clustering, Ward 2, Ward 15, Ward 17, and Ward 20 were chosen as Candidate Wards to focus the rest of the analysis on.

The # of Food Service Businesses per ward, population density, and # Customers per Restaurant per Sq km for the candidate wards are shown in **Table 3**.

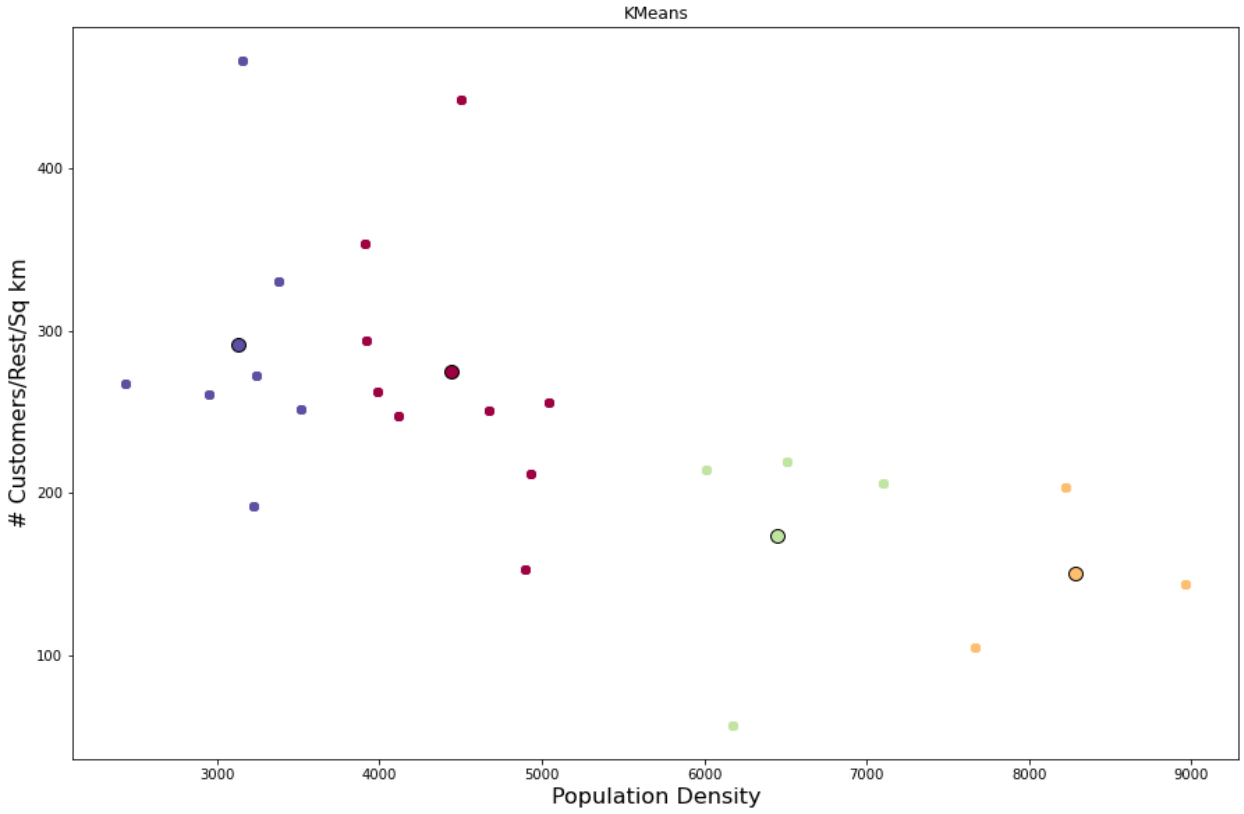


**Figure 6**. k Means Clustering without outliers (Ward 13 and Ward 25). Red and purple clusters have two wards each (Ward 2, Ward 15, Ward 17, Ward 20) that have high # Customers per Restaurant per Sq km.

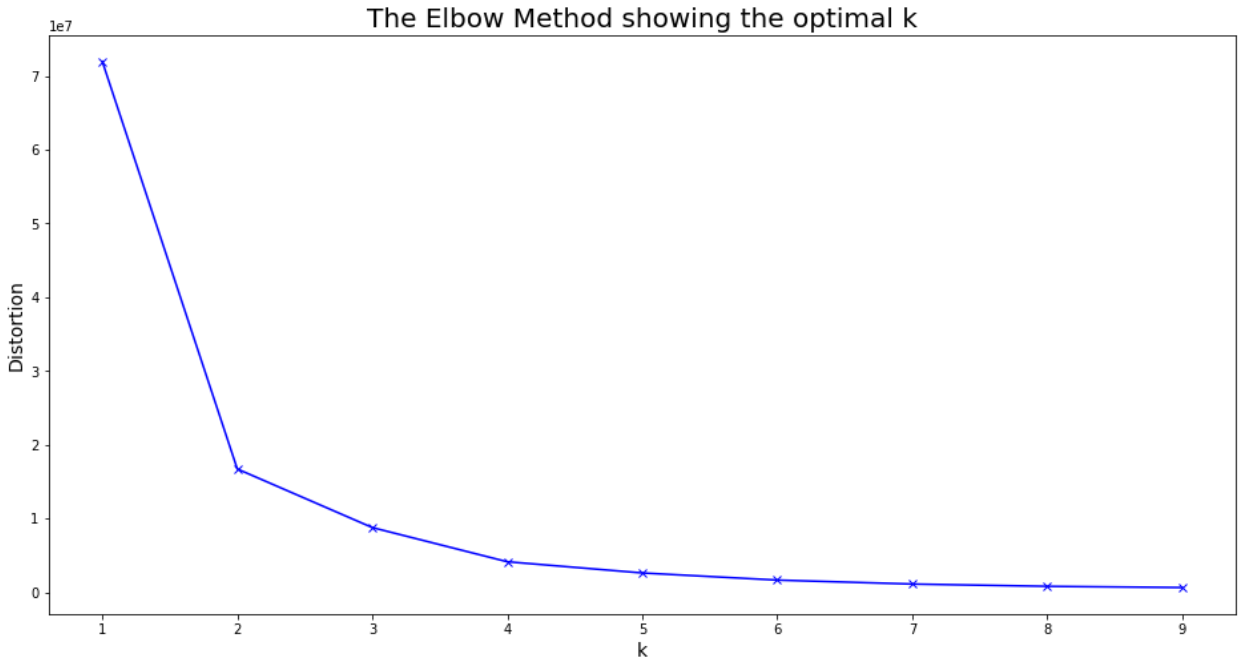


**Figure 7**. Elbow Method for optimal k. Elbow is at k = 4.

| Ward # | Cluster Labels | # of Food Service Businesses | Area (sq km) | Total - Age | People/sq km | rest_per_1000 | rest_per_sqkm | # Customers/Rest/Sq km |
|---|---|---|---|---|---|---|---|---|
| 2 | 1 | 253 | 37.36 | 118020 | 3158.993576 | 2.143704 | 6.771949 | 466.482213 |
| 15 | 1 | 310 | 30.30 | 102510 | 3383.168317 | 3.024095 | 10.231023 | 330.677419 |
| 17 | 2 | 249 | 24.43 | 110080 | 4505.935325 | 2.261991 | 10.192386 | 442.088353 |
| 20 | 2 | 312 | 28.20 | 110280 | 3910.638298 | 2.829162 | 11.063830 | 353.461538 |

**Table 3**. Candidate Wards Population Density and # of Customers per Restaurant per Sq km.

### 3.3 Candidate Wards Ethnicity

After screening the 25 Toronto wards to 4 candidate wards based on favorable combination of population density and customers per restaurant, ethnicity demographics of each candidate ward was examined. Dataset from the City of Toronto contains ethnicity of all 25 wards. A dataframe containing ethnicity of only the 4 candidate wards was created. Then the top 5 ethnicities of each ward and the percentage of total ward population was calculated. 'Canadian' ethnicity is ambiguous in the data since all individuals with Canadian citizenship are Canadian. This ethnic group may represent 2$^{nd}$,3$^{rd}$, or 4$^{th}$ generation Canadians who no longer identify with their ancestral origin. The results are shown in **Figure 8**, **Figure 9**, **Figure 10**, and **Figure 11**.

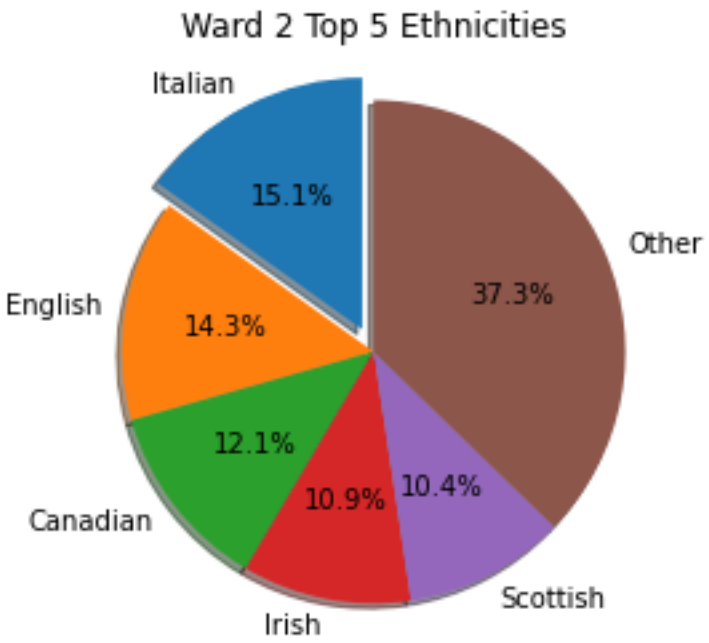


**Figure 8**. Ward 2 Top 5 Ethnicities by percentage of total population. Ward 2 total population = 116,055.

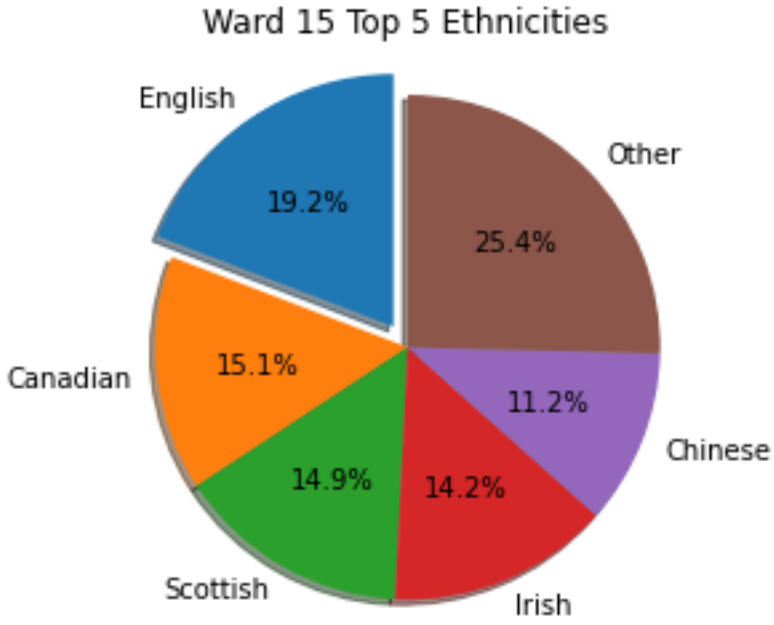


**Figure 9**. Ward 15 Top 5 Ethnicities by percentage of total population. Ward 15 total population = 101,795.

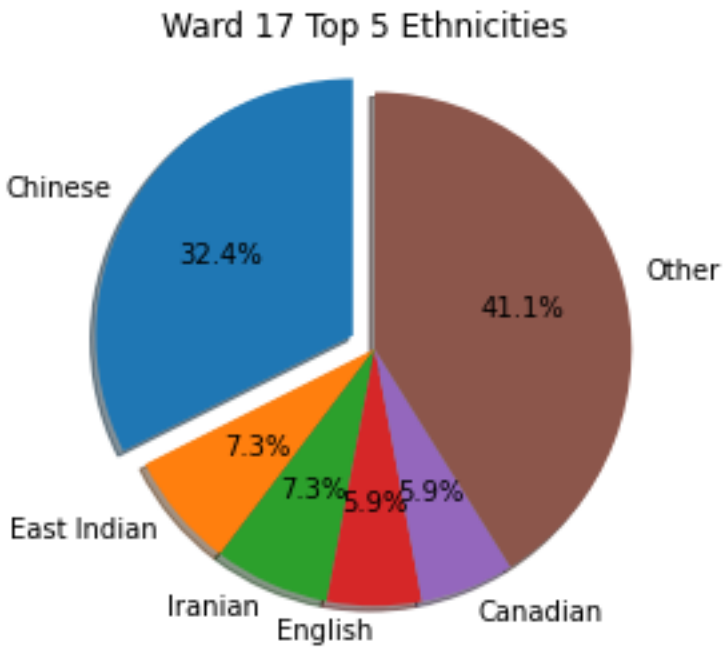


**Figure 10**. Ward 17 Top 5 Ethnicities by percentage of total population. Ward 17 total population = 109,055.

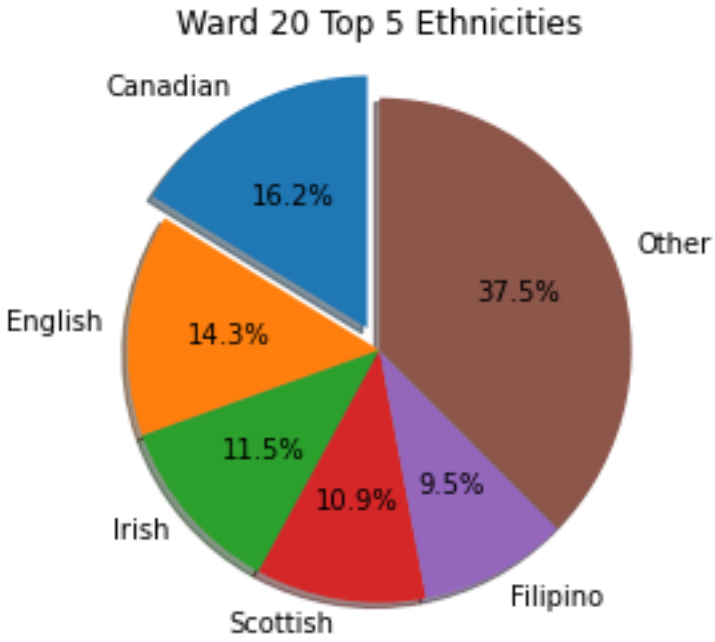


**Figure 11**. Ward 20 Top 5 Ethnicities by percentage of total population. Ward 20 total population = 108,290.

### 3.4 Candidate Wards Income Level

Income data of the wards from the City of Toronto was reorganized to look at only our candidate wards (Ward 2, Ward 15, Ward 17, and Ward 20). Income data from City of Toronto is segmented by $10,000 brackets. For example, the lowest brackets are 'No Income', '< $10,000', '$10,000 to $19,999', and so on up to '$90,000 to $99,999. Above this level the bracket is '$100,000 and over'. There is also detail of the segments greater than $100,000 as '$100,000 to $149,999' and the highest bracket is '$150,000 and over'. The number of income brackets in the data were too segmented to learn useful information about the income characteristics of each ward so it was necessary to segment each ward into fewer number of segments.

Statistics Canada looks at the top 10% of income earners as high-income earners. From the data, it was observed that the top 10% of income earners in Toronto earned more that $100,000 annually. Therefore, we can use income greater than $100,000 as the definition of high income.

In contrast, the Ontario government considers individual income below $38,500 as low income. The closest number in the data to the low-income threshold is $39,999, so we can use income from 0 to $39,999 as the definition of low income.

As a result, income from $40,000 to $99,999 could be considered as middle income. Using these definitions for low-income, middle-income, and high-income, the income data was segmented for the candidate wards into 3 segments (**Figure 12**). To understand what percent of each ward's total population was made up of individuals from each income bracket, the percentage of individuals in each income bracket was also calculated (**Figure 13**).

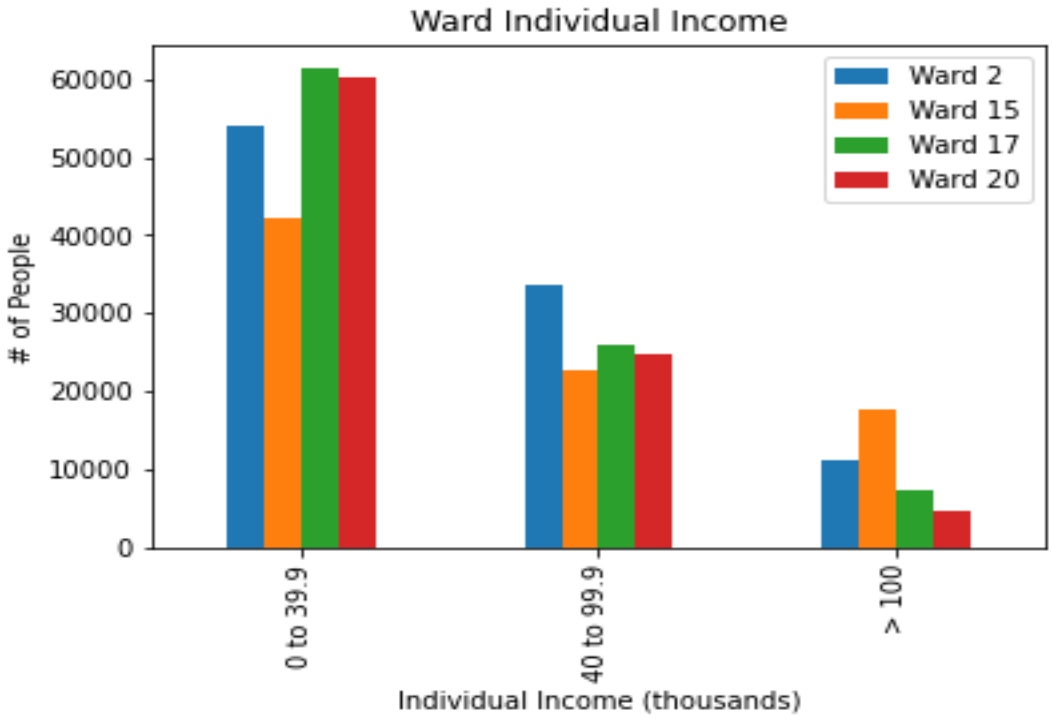


**Figure 12**. The number of people in each individual income bracket for each candidate ward.

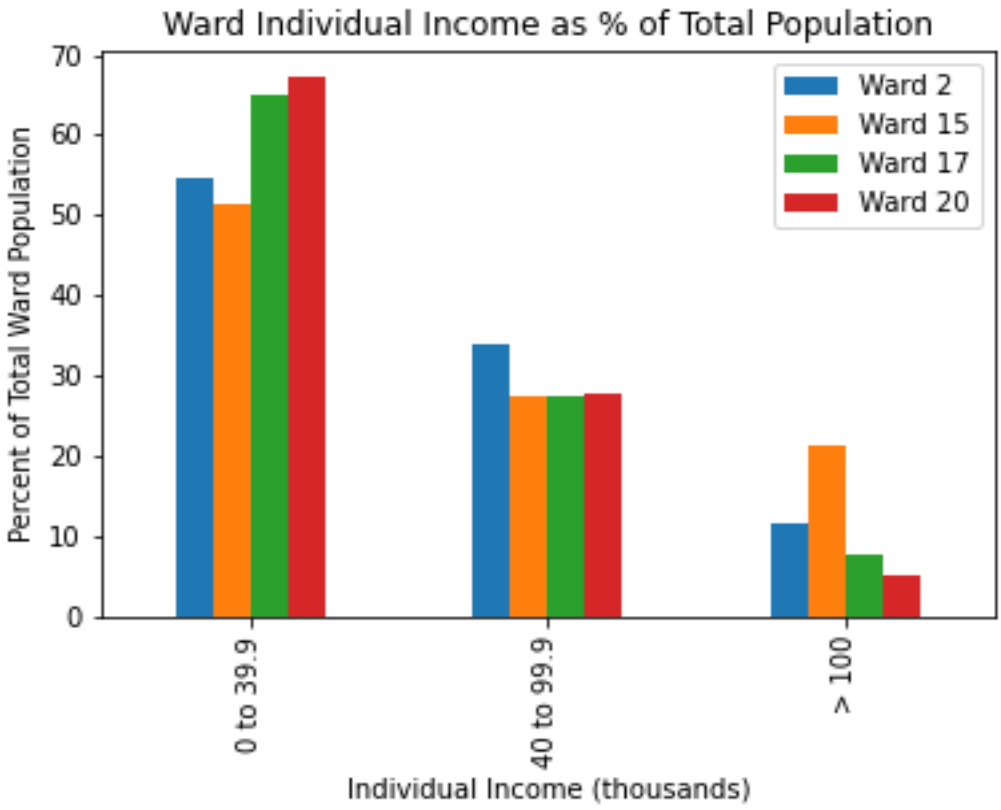


**Figure 13**. Percentage of people in each individual income bracket for each candidate ward.

### 3.5 Candidate Wards Population Growth

Since ward total population data from Open Data Portal was available for 2011 and 2016, the change in population from 2011 to 2016 for the candidate wards was calculated to determine the growth characteristics of each ward (**Figure 14**). During the period, the City of Toronto grew 4.46%.

### 3.6 Candidate Wards Venue Search Using Foursquare API

Search for venues for each of the candidate wards was performed using Foursquare API to uncover what the most common venues were for each ward. The information obtained from this search would be used to determine the most common restaurants in each of the candidate wards and as a result this would give an indication of the type of restaurants that are in demand in each of the wards.

Nearby venues were searched for around the center point latitude and longitude coordinates of each candidate ward. The radius of each ward was determined by calculating the square root of the actual Area of each Ward divided by the value of Pi as explained in Section 2.3 Feature Selection of this report. **Table 4** shows the geographical information used for each ward when doing venue search using Foursquare API. The geographical area of each ward with corresponding search area are also illustrated in **Figure 15**.

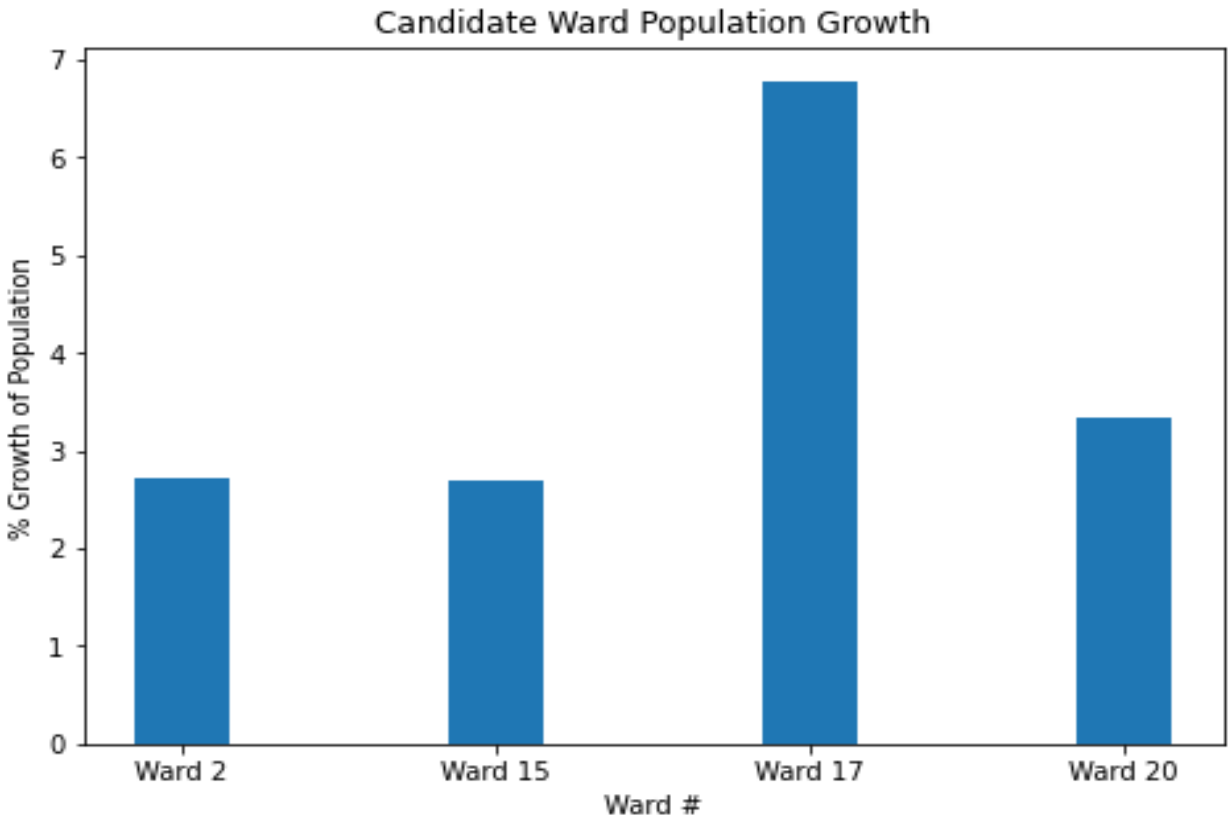


**Figure 14**. Population growth from 2011 to 2016 of Candidate Wards. Entire City of Toronto population growth during the period was 4.46%.

Nearby venues were searched for around the center point latitude and longitude coordinates of each candidate ward. The radius of each ward was determined by calculating the square root of the actual Area of each Ward divided by the value of Pi as explained in Section 2.3 Feature Selection of this report. **Table 4** shows the geographical information used for each ward when doing venue search using Foursquare API. The geographical area of each ward with corresponding search area are also visually in **Figure 15**.

| Ward # | Ward | Latitude | Longitude | Area (sq km) | Radius |
|---|---|---|---|---|---|
| 2 | Etobicoke Centre | 43.664601 | -79.550374 | 37.36 | 3.448486 |
| 15 | Don Valley West | 43.730530 | -79.375921 | 30.30 | 3.105606 |
| 17 | Don Valley North | 43.789172 | -79.357859 | 24.43 | 2.788604 |
| 20 | Scarborough Southwest | 43.714206 | -79.256889 | 28.20 | 2.996054 |

**Table 4**. Latitude, Longitude, Area, and Radius of Candidate Wards.


**Figure 15**. Blue circles represent the area of Foursquare venue search for each of the Candidate Wards.

For each ward, 100 venue search results were returned with 110 unique categories. The frequency of each venue category was calculated for each ward and the 10 most frequently occurring venues were tabulated (**Table 5**).

-Ward 2---

| venue | freq % |
|---|---|
| Coffee Shop | 11.0 |
| Bank | 7.0 |
| Pharmacy | 7.0 |
| Sandwich Place | 6.0 |
| Grocery Store | 5.0 |
| Pizza Place | 3.0 |
| Bakery | 3.0 |
| Restaurant | 3.0 |
| Beer Store | 3.0 |
| Liquor Store | 3.0 |

-Ward 15---

| venue | freq % |
|---|---|
| Italian Restaurant | 6.0 |
| Coffee Shop | 6.0 |
| Bakery | 5.0 |
| Café | 5.0 |
| Sushi Restaurant | 4.0 |
| Ice Cream Shop | 4.0 |
| Park | 3.0 |
| Grocery Store | 3.0 |
| Sporting Goods Shop | 3.0 |
| Burger Joint | 2.0 |

-Ward 17---

| venue | freq % |
|---|---|
| Coffee Shop | 10.0 |
| Sandwich Place | 6.0 |
| Bakery | 6.0 |
| Bank | 6.0 |
| Chinese Restaurant | 6.0 |
| Pharmacy | 3.0 |
| Pizza Place | 3.0 |
| Middle Eastern Restaurant | 3.0 |
| Japanese Restaurant | 3.0 |
| Caribbean Restaurant | 2.0 |

-Ward 20---

| venue | freq % |
|---|---|
| Coffee Shop | 9.0 |
| Sandwich Place | 7.0 |
| Pizza Place | 5.0 |
| Pharmacy | 4.0 |
| Grocery Store | 4.0 |
| Ice Cream Shop | 4.0 |
| Fast Food Restaurant | 4.0 |
| Park | 4.0 |
| Discount Store | 3.0 |
| Burger Joint | 3.0 |

**Table 5**. Frequency of Most Common Venues of the Candidate Wards.

## 4. Results

| | Pop Density per km | # Customers/Rest/Sq km | Ethnicities Greater Than 15% of Total Ward Population | Income Level | Population Growth | Most Common Restaurant |
|---|---|---|---|---|---|---|
| **Ward 2** | 3159 | 466 | Italian | Middle | 2.71% | Sandwich Place, Pizza Place |
| **Ward 15** | 3383 | 331 | English, Canadian | High | 2.69% | Italian Restaurant, Sushi Restaurant |
| **Ward 17** | 4506 | 442 | Chinese | Low to Mid | 6.79% | Sandwich Place, Chinese Restaurant |
| **Ward 20** | 3911 | 353 | Canadian | Low to Mid | 3.33% | Sandwich Place, Pizza Place, Fast Food |
| | | | | | | |
| *** City of Toronto average population density = 4,250** | | | | | | |
| *** City of Toronto average # Customers / Rest / Sq km = 188** | | | | | | |
| *** City of Toronto average Ward Population Growth = 4.46%** | | | | | | |

**Table 6**. Summary of Results.

The results of analysis are displayed in **Table 6**. We would like to select wards with high population density. Ward 17 is the only ward with a population density greater than the average for the City of Toronto which is 4,250 people per km.

Regarding '# of Customers per Restaurant per Square km', all wards are greater than the City of Toronto average of 188 customers per restaurant per square km. However, Ward 2 and Ward 17 have considerably more customers per restaurant than Wards 15 and 20. Ward 2 has 41% more customers per restaurant per sq km than Ward 15 and 32% more than Ward 20. Ward 17 has 33% more customers than Ward 15 and 15% more than Ward 20. Ward 2 has 5% more customers per restaurant than Ward 17, a marginal difference between the two. Overall, Ward 2 and Ward 17 have the best ratio of customers per restaurant among the 4 candidate wards.

From the ethnicity data, 'Canadian' ethnicity is unclear since all people with Canadian citizenship are Canadian. This may mean that many residents who identify themselves as 'Canadian' are 2nd, 3rd, or higher generation Canadians. Unfortunately, determining a type of restaurant that appeals to people who identify themselves as Canadians is not as easy as someone who identifies themselves as an ethnicity with a unique style of cuisine. Excluding 'Canadians', the ethnic groups with greater than 15% of the total ward population among the candidate wards were Italians who are 15.1% of Ward 2, Chinese who are 32.4% of Ward 17, and English who are 19.2% of Ward 15. If we consider people of United Kingdom ancestry, English, Scottish, and Irish make up 48.3% of the ethnicity of Ward 15. Likewise, people from the United Kingdom make up 36.7% of the ethnicity of Ward 20. The data does not specify if the Irish in the dataset identify with the United Kingdom or not.

We can determine a general income description of the residents of each ward from the income brackets people belong to. Ward 2 can be classified as generally middle-income level with the highest percentage of people (34% of total population) in the $40,000 to $99,999 middle-income bracket. It also has the second highest percentage of people (11%) earning more than $100,000. Ward 17 and Ward 20 have a high percentage of people in the low-income bracket (65% and 67% respectively) and their percentage of people earning middle-income (27% and 28% respectively) is comparable to that of Ward 15 (28%). Ward 17 and Ward 20 also have less percentage of their population earning greater than $100,000 (only 8% and 5% respectively). Ward 15 is the wealthiest ward with 21% of its population earning greater than $100,000, almost twice the percentage of people earning greater than $100,000 in Ward 2.

Even though all 4 candidate wards showed positive growth from 2011 to 2016, only Ward 17 has population growth greater than the City of Toronto average. In fact, the 6.79% population growth of Ward 17 is the 5th highest growth among all 25 Toronto wards.

Among the most common restaurants returned from Foursquare API that can help us decide on type of restaurant were 'sandwich place', 'pizza place', 'Italian Restaurant', 'Sushi Restaurant', 'Chinese Restaurant', and 'Fast Food'. I have chosen not to consider results returned that had less than 4% frequency since such a low frequency does not indicate that there are many of that type of restaurant. Among the common restaurants results, it is very difficult to decide a type of restaurant to establish based on general descriptions such as 'Sandwich place', 'pizza place', or 'fast food'. However, 'Italian restaurant', 'Sushi Restaurant', and 'Chinese Restaurant' are more specific descriptions. It should not be

surprising that Italian restaurants and sushi restaurants are common to Ward 15 which has many high-income earners. Italian and Japanese restaurants are ranked among the top 5 for expensive meals according to Krishnendu Ray's analysis of Zagat NYC mentioned in an article by Jenny Ye and The WNYC Data News Team. The other 3 cuisines in the top 5 for a high-price reputation are French, American, and Continental. As a result, it would make sense to refer to Ray's study to determine what type of restaurant would be able to charge a high price in addition to Italian or Japanese if one chose to open a high-priced restaurant. In Ward 17 unsurprisingly, Chinese restaurants are the most common restaurant in which has nearly 33% of its population of Chinese ethnicity.

## 5. Discussion: Observations and Recommendation

Depending on the access to resources that the investor reading this report has, Ward 15 and Ward 17 possess the clearest data for setting up a restaurant.

Ward 15 can be summarized as a ward with many high-income individuals with United Kingdom ethnicity. Furthermore, high-priced ethnic cuisine such as Italian and Japanese cuisine would do well as evidenced from the commonality of these restaurants among venues. If the investor reading this report has access to chefs who can prepare high-end Italian or Japanese food, Ward 15 would be ideal to set up a high-priced restaurant specializing in Italian or Japanese food. Other ethnic foods with a reputation for high-price are French, American, and Continental. One seeking to set up a restaurant in Ward 15 could also consider these types of cuisine even though this project did not find that there were many French, American or Continental restaurants in the ward.

Ward 17 is a ward with a mainly low to middle income population. There are a little more than 7,000 individuals earning more than $100,000 which is less than half the number in Ward 15. The predominant ethnic group is by far Chinese with almost 33% of the total population so a mid-priced Chinese restaurant should do well as evidenced by the commonality of Chinese restaurants within in the ward. Also, the ward is likely not yet saturated with Chinese restaurants since there are 442 Customers per Restaurant in the ward which is the 3$^{rd}$ highest number of customers per restaurant ratio among all 25 Toronto wards. Furthermore, Ward 17 has the highest population density and the highest growth rate among our 4 candidate wards so it probably offers the best opportunity for people who have access to chefs who can cook Chinese food.

Ward 2 and Ward 20 also offer some favorable characteristics and were originally included in the candidate wards list but the most common restaurants returned which were 'sandwich place', 'pizza place' and 'fast food' are not specific enough to come up with as strong a recommendation as could be done for Ward 15 and Ward 17.

## 6. Conclusion

Choosing the ideal location for a new restaurant is not very simple. The most attractive locations tend to be ones with high population density, a population with high disposable income, and population growth. However, the most attractive locations also attract the most competitors. As a result. the goal of this study was to find attractive locations that have not yet been saturated by over-competition. Sometimes

the ideal location may seem counter-intuitive as was the case in this project's analysis which found that the two best locations for a new restaurant were in wards with medium density and away from the city's downtown core.

## 7. Next Steps

Despite this project's analysis, this project does not consider commercial rental prices in the wards mentioned and the cost of labor. Also, this project has not looked into specific intersections or neighborhoods within the ideal wards where a restaurant would do well. As well, high-level research should be complemented by field research by physically visiting the neighborhoods and visiting some of the existing businesses and talking to the locals who live in the area. This deeper level of analysis is beyond the scope of the project and should be undertaken within a business plan before making an investment decision. However, the information learned from this project's analysis should help an investor start his or her journey to becoming a successful restauranteur in Toronto.

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