# Capstone Project - The Battle of Neighborhoods Report
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**Introduction**
In 2019 the conservative government won the general election running on their main manifesto of getting Brexit done. If or when the Brexit process is complete, EU migrants will not have the automatic right to settle in the UK. As a result of this many EU nationals including EU doctors and nurses are returning to their countries of origin.Another Key promise of the conservative government during the 2019 general election campaign was to improve the NHS, promising thousands more nurses and doctors. The government aim to attract thousands of foreign nurses and doctors from all over the world especially from commonwealth countries.

**Business Problem**
 I have been approached by a marketing company employed by the London NHS trust (Stakeholder) to produce a report about London to help sell the City to potential foreign doctors and nurses who may be considering coming to work in the UK. This marketing material is to help entice these potential health workers (Target Audience) to choose settling and working in London and also help decide which London Borough to settle.

**The Location**
London is the capital and largest city of England and the United Kingdom. Standing on the River Thames in the south-east of England, at the head of its 50-mile (80 km) estuary leading to the North Sea, London has been a major settlement for two millennia. London is considered to be one of the world's most important global cities and has been termed the world's most powerful, most desirable, most influential, most visited, most expensive, innovative, sustainable, most investment friendly, and most popular for work city in the world. London exerts a considerable impact upon the arts, commerce, education, entertainment, fashion, finance, healthcare, media, professional services, research and development, tourism and transportation.

London ranks 26 out of 300 major cities for economic performance. It is one of the largest financial centers and has either the fifth or sixth largest metropolitan area GDP. It is the most-visited city as measured by international arrivals and has the busiest city airport system as measured by passenger traffic. It is the leading investment destination hosting more international retailers and ultra-high-net-worth individuals than any other city.

**Objectives**
I intend to explore London to show what London has got to offer our target audience in terms of venues and show the crime rates of each borough. I also intend to explore the various boroughs to help the potential NHS health worker to decide on which neighborhood he/she would like to settle based on the venues or amenities important to him/her. The stakeholder is willing to provide a good resettlement package which includes taking care of rent for the first three years hence no need to look at rent or housing cost

in this project. London has a very developed underground trains and Buses network that link every part of London. Transport for London information pack will be provided to our stakeholders to provide detailed transport information to enable the target audience get a total view of London.

**Data Acquisition and Preprocessing**

In this project, I will be using the following datasets to help solve my problem:

- The London borough data was scrapped from London Borough Wikipedia page
- Foursquare and geopy data to list various selected venues that I believe will be important for our target audience.
- The downloaded crime data for London was from https://data.london.gov.uk/dataset/recorded_crime_summary
- I will then filter the top 10 most common venue types of each neighborhoods.
- The target audience will be given the top ten venues of each neighborhood so they could look at them in determining which neighborhood/borough to settle
- Neighborhoods or Boroughs will be clustered into different groups based on common attributes.

**Methodology**

- The crime data will be trimmed and converted from number of crimes per borough per month to crimes per 1000 people per month for better comparison.
- I will mainly rely on Foursquare API to retrieve all venues of each neighborhoods.
- I will then filter the top 10 most common venue types of each neighborhoods or Borough.
- The neighborhoods will be then put in different clusters based on similar or common attributes or venues using K-means clustering.
- I will also explore and analyze the crime data and show the crime rate (crime per 1000 people) for each Borough.
- The target audience will be given the top ten venues of each neighborhood so they could look at them in determining which neighborhood to settle.
- The target audience will be shown the crime levels of all the boroughs.
- To make things easier for our target audience, the boroughs will be put into clusters or groups based on their venue's characteristics.

| | MajorText | MinorText | Borough | Sum | 201801 | 201802 | 201803 | 201804 | 201805 | 201806 | ... | 201903 | 201904 | 201905 | 201906 | 201907 | 201908 | 201909 | 201910 | 201911 | 201912 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | Arson and Criminal Damage | Arson | Barking and Dagenham | 125 | 2 | 3 | 6 | 3 | 4 | 12 | ... | 5 | 5 | 11 | 3 | 5 | 3 | 6 | 9 | 8 | 5 |
| 1 | Arson and Criminal Damage | Criminal Damage | Barking and Dagenham | 2818 | 135 | 111 | 115 | 122 | 126 | 123 | ... | 138 | 130 | 138 | 113 | 134 | 118 | 109 | 109 | 100 | 114 |
| 2 | Burglary | Burglary - Business and Community | Barking and Dagenham | 748 | 38 | 33 | 38 | 36 | 24 | 33 | ... | 29 | 27 | 22 | 27 | 31 | 35 | 37 | 30 | 30 | 24 |
| 3 | Burglary | Burglary - Residential | Barking and Dagenham | 2472 | 143 | 134 | 122 | 75 | 93 | 77 | ... | 99 | 96 | 114 | 96 | 71 | 67 | 80 | 97 | 114 | 131 |
| 4 | Drug Offences | Drug Trafficking | Barking and Dagenham | 145 | 4 | 5 | 7 | 3 | 8 | 6 | ... | 6 | 4 | 8 | 6 | 7 | 6 | 6 | 9 | 10 | 2 |

5 rows × 28 columns

Table 1 : Recorded London Crime Data for the past 24 months.

Table 1 represent the top 5 rows of all crimes reported in London in the past 24 months per borough. The table has 28 columns and 1577 rows making up the crimes. This table will be later merged with other information to produce Table 4, which will show the average crime per Borough per 1000 people population, Population, Latitudes and Longitudes

The London boroughs, population, Latitude and Longitude information (image 1) was scrapped from London Wikipedia's page using python's libraries Beautiful soup, Lxml and Requests. This information on London boroughs will be made up of their population & coordinates -Population can be used to calculate the ratio of reported crime to population for better comparison and coordinates can be used to get neighborhood data from Foursquare.

## List of boroughs and local authorities  [edit]

| Borough | Inner | Status | Local authority | Political control | Headquarters | Area (sq mi) | Population (2013 est)[1] | Co-ordinates | Nr. in map |
|---|---|---|---|---|---|---|---|---|---|
| Barking and Dagenham [note 1] | | | Barking and Dagenham London Borough Council | Labour | Town Hall, 1 Town Square | 13.93 | 194,352 | 51.5607°N 0.1557°E | 25 |
| Barnet | | | Barnet London Borough Council | Conservative | North London Business Park, Oakleigh Road South | 33.49 | 369,088 | 51.6252°N 0.1517°W | 31 |
| Bexley | | | Bexley London Borough Council | Conservative | Civic Offices, 2 Watling Street | 23.38 | 236,687 | 51.4549°N 0.1505°E | 23 |
| Brent | | | Brent London Borough Council | Labour | Brent Civic Centre, Engineers Way | 16.70 | 317,264 | 51.5588°N 0.2817°W | 12 |
| Bromley | | | Bromley London Borough Council | Conservative | Civic Centre, Stockwell Close | 57.97 | 317,899 | 51.4039°N 0.0198°E | 20 |
| Camden | ✓ | | Camden London Borough Council | Labour | Camden Town Hall, Judd Street | 8.40 | 229,719 | 51.5290°N 0.1255°W | 11 |
| Croydon | | | Croydon London Borough Council | Labour | Bernard Weatherill House, Mint Walk | 33.41 | 372,752 | 51.3714°N 0.0977°W | 19 |
| Ealing | | | Ealing London Borough Council | Labour | Perceval House, 14-16 Uxbridge Road | 21.44 | 342,494 | 51.5130°N 0.3089°W | 13 |
| Enfield | | | Enfield London Borough Council | Labour | Civic Centre, Silver Street | 31.74 | 320,524 | 51.6538°N 0.0799°W | 30 |
| Greenwich [note 2] | ✓ [note 3] | Royal | Greenwich London Borough Council | Labour | Woolwich Town Hall, Wellington Street | 18.28 | 264,008 | 51.4892°N 0.0648°E | 22 |
| Hackney | ✓ | | Hackney London Borough Council | Labour | Hackney Town Hall, Mare Street | 7.36 | 257,379 | 51.5450°N 0.0553°W | 9 |
| Hammersmith and Fulham [note 4] | ✓ | | Hammersmith and Fulham London Borough Council | Labour | Town Hall, King Street | 6.33 | 178,685 | 51.4927°N 0.2339°W | 4 |
| Haringey | [note 3] | | Haringey London Borough Council | Labour | Civic Centre, High Road | 11.42 | 263,386 | 51.6000°N 0.1119°W | 29 |
| Harrow | | | Harrow London Borough Council | Labour | Civic Centre, Station Road | 19.49 | 243,372 | 51.5898°N 0.3346°W | 32 |
| Havering | | | Havering London Borough Council | Conservative (council NOC) | Town Hall, Main Road | 43.35 | 242,080 | 51.5812°N 0.1837°E | 24 |
| Hillingdon | | | Hillingdon London Borough Council | Conservative | Civic Centre, High Street | 44.67 | 286,806 | 51.5441°N 0.4760°W | 33 |
| Hounslow | | | Hounslow London Borough Council | Labour | Hounslow House, 7 Bath Road | 21.61 | 262,407 | 51.4746°N 0.3680°W | 14 |
| Islington | ✓ | | Islington London Borough Council | Labour | Municipal Offices, 222 Upper Street | 5.74 | 215,667 | 51.5416°N 0.1022°W | 10 |
| Kensington and Chelsea | ✓ | Royal | Kensington and Chelsea London Borough Council | Conservative | The Town Hall, Hornton Street | 4.68 | 155,594 | 51.5020°N 0.1947°W | 3 |
| Kingston upon Thames | | Royal | Kingston upon Thames London Borough Council | Liberal Democrat | Guildhall, High Street | 14.38 | 166,793 | 51.4085°N 0.3064°W | 16 |
| Lambeth | ✓ | | Lambeth London Borough Council | Labour | Lambeth Town Hall, Brixton Hill | 10.36 | 314,242 | 51.4607°N 0.1163°W | 6 |
| Lewisham | ✓ | | Lewisham London Borough Council | Labour | Town Hall, 1 Catford Road | 13.57 | 286,180 | 51.4452°N 0.0209°W | 21 |
| Merton | | | Merton London Borough Council | Labour | Civic Centre, London Road | 14.52 | 203,223 | 51.4014°N 0.1958°W | 17 |
| Newham | [note 3] | | Newham London Borough Council | Labour | Newham Dockside, 1000 Dockside Road | 13.98 | 318,227 | 51.5077°N 0.0469°E | 27 |
| Redbridge | | | Redbridge London Borough Council | Labour | Town Hall, 128-142 High Road | 21.78 | 288,272 | 51.5590°N 0.0741°E | 26 |
| Richmond upon Thames | | | Richmond upon Thames London Borough Council | Liberal Democrat | Civic Centre, 44 York Street | 22.17 | 191,365 | 51.4479°N 0.3260°W | 15 |
| Southwark | ✓ | | Southwark London Borough Council | Labour | 160 Tooley Street | 11.14 | 298,464 | 51.5035°N 0.0804°W | 7 |
| Sutton | | | Sutton London Borough Council | Liberal Democrat | Civic Offices, St Nicholas Way | 16.93 | 195,914 | 51.3618°N 0.1945°W | 18 |
| Tower Hamlets | ✓ | | Tower Hamlets London Borough Council | Labour | Town Hall, Mulberry Place, 5 Clove Crescent | 7.63 | 272,890 | 51.5099°N 0.0059°W | 8 |
| Waltham Forest | | | Waltham Forest London Borough Council | Labour | Waltham Forest Town Hall, Forest Road | 14.99 | 265,797 | 51.5908°N 0.0134°W | 28 |
| Wandsworth | ✓ | | Wandsworth London Borough Council | Conservative | The Town Hall, Wandsworth High Street | 13.23 | 310,516 | 51.4567°N 0.1910°W | 5 |
| Westminster | ✓ | City | Westminster City Council | Conservative | Westminster City Hall, 64 Victoria Street | 8.29 | 226,841 | 51.4973°N 0.1372°W | 2 |

## City of London  [edit]

Image 1:  Showing the London borough information on wikepedia

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| | Borough | Population | Coordinates |
|---|---|---|---|
| 0 | Barking and Dagenham [note 1] | 194,352 | 51°33'39"N 0°09'21"E / 51.5607°N 0.1557°E /... |
| 1 | Barnet | 369,088 | 51°37'31"N 0°09'06"W / 51.6252°N 0.1517°W /... |
| 2 | Bexley | 236,687 | 51°27'18"N 0°09'02"E / 51.4549°N 0.1505°E /... |
| 3 | Brent | 317,264 | 51°33'32"N 0°16'54"W / 51.5588°N 0.2817°W /... |
| 4 | Bromley | 317,899 | 51°24'14"N 0°01'11"E / 51.4039°N 0.0198°E /... |

Table 2: showing the top 5 rows of coordinates information obtain from scrapping Wikipedia.

After some data cleaning and wrangling the information in table 2 was converted into Table 3 below.

| | Borough | Population | Latitude | Longitude |
|---|---|---|---|---|
| 0 | Barking and Dagenham | 194352 | 51.5607 | 0.1557 |
| 1 | Barnet | 369088 | 51.6252 | -0.1517 |
| 2 | Bexley | 236687 | 51.4549 | 0.1505 |
| 3 | Brent | 317264 | 51.5588 | -0.2817 |
| 4 | Bromley | 317899 | 51.4039 | 0.0198 |

Table 3: showing top 5 rows of a leaner and tidier Table 2.

Table 4 show the combine information of the cleaner versions of the coordinate, population and crime data.
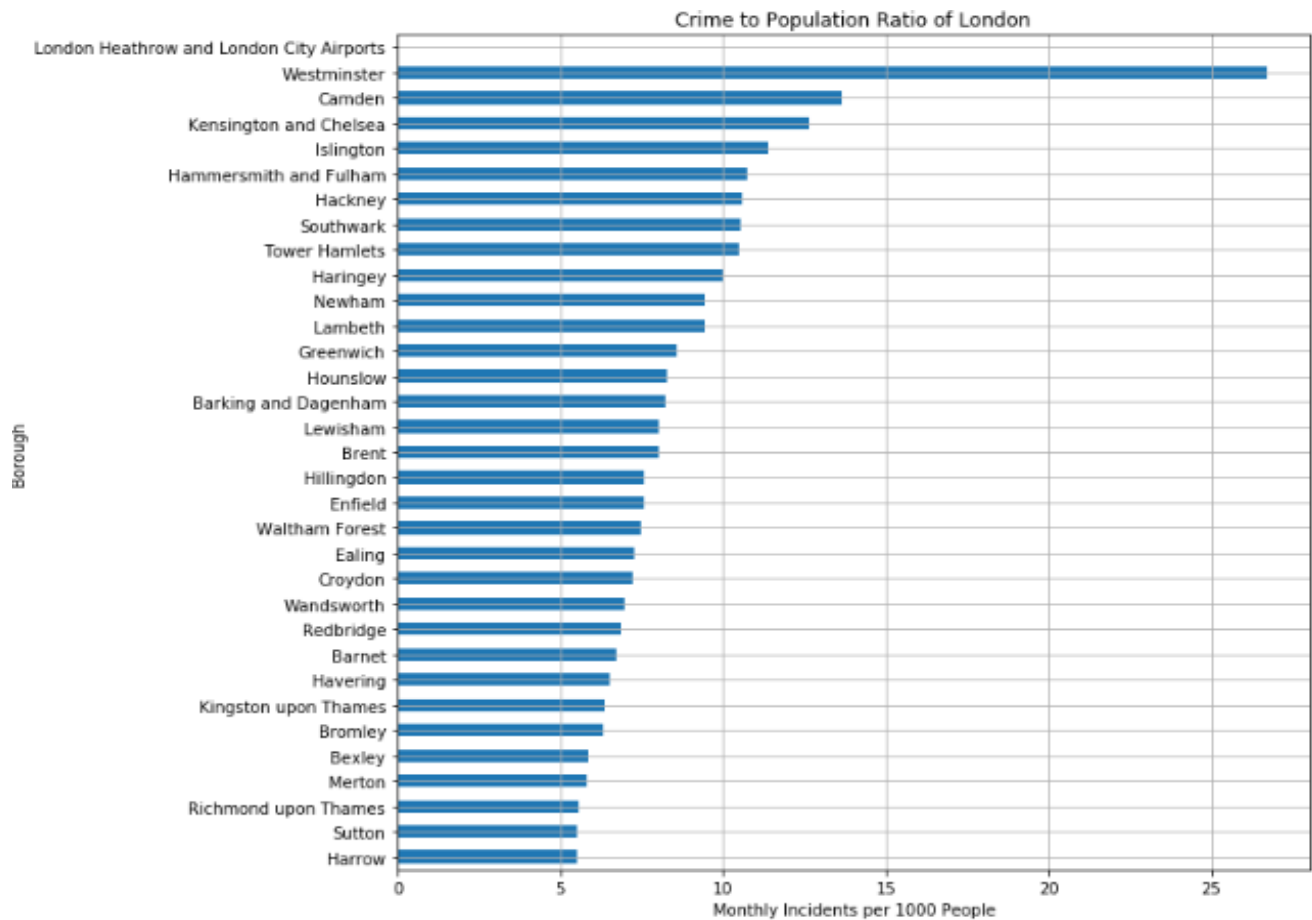
| | Borough | MonthlyAvg | Population | Latitude | Longitude | CrimeToPop |
|---|---|---|---|---|---|---|
| 0 | Barking and Dagenham | 1601.750000 | 194352.0 | 51.5607 | 0.1557 | 8.241490 |
| 1 | Barnet | 2486.500000 | 369088.0 | 51.6252 | -0.1517 | 6.736876 |
| 2 | Bexley | 1389.041667 | 236687.0 | 51.4549 | 0.1505 | 5.868686 |
| 3 | Brent | 2541.333333 | 317264.0 | 51.5588 | -0.2817 | 8.010153 |
| 4 | Bromley | 2009.333333 | 317899.0 | 51.4039 | 0.0198 | 6.320666 |
| 5 | Camden | 3133.208333 | 229719.0 | 51.5290 | -0.1255 | 13.639309 |
| 6 | Croydon | 2692.958333 | 372752.0 | 51.3714 | -0.0977 | 7.224531 |
| 7 | Ealing | 2496.041667 | 342494.0 | 51.5130 | -0.3089 | 7.287841 |
| 8 | Enfield | 2429.541667 | 320524.0 | 51.6538 | -0.0799 | 7.579906 |
| 9 | Greenwich | 2267.666667 | 264008.0 | 51.4892 | 0.0648 | 8.589386 |
| 10 | Hackney | 2724.000000 | 257379.0 | 51.5450 | -0.0553 | 10.583614 |
| 11 | Hammersmith and Fulham | 1915.083333 | 178685.0 | 51.4927 | -0.2339 | 10.717650 |
| 12 | Haringey | 2633.416667 | 263386.0 | 51.6000 | -0.1119 | 9.998317 |
| 13 | Harrow | 1342.750000 | 243372.0 | 51.5898 | -0.3346 | 5.517274 |
| 14 | Havering | 1574.958333 | 242080.0 | 51.5812 | 0.1837 | 6.505942 |
| 15 | Hillingdon | 2176.458333 | 286806.0 | 51.5441 | -0.4760 | 7.588608 |

Table 4

At this point the Foursquare API was used to explore 10 popular venues in or around each Neighborhood. The top 5 rows of the venues data are shown in the table below (Table 5), also Graph 1 visualizes the Monthly crime data in London.

| | Borough | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue | 6th Most Common Venue | 7th Most Common Venue | 8th Most Common Venue | 9th Most Common Venue | 10th Most Common Venue |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | Barking and Dagenham | Martial Arts Dojo | Pool | Bus Station | Park | Supermarket | Gym / Fitness Center | Golf Course | Yoga Studio | Fish & Chips Shop | Field |
| 1 | Barnet | Café | Bus Stop | Business Service | Yoga Studio | French Restaurant | Flea Market | Fish Market | Fish & Chips Shop | Field | Fast Food Restaurant |
| 2 | Bexley | Clothing Store | Coffee Shop | Pub | Italian Restaurant | Supermarket | Fast Food Restaurant | Pharmacy | Portuguese Restaurant | Bakery | Hotel |
| 3 | Brent | Coffee Shop | Hotel | Clothing Store | Sporting Goods Shop | Grocery Store | American Restaurant | Sandwich Place | Multiplex | Bubble Tea Shop | Burger Joint |
| 4 | Bromley | Clothing Store | Coffee Shop | Bar | Burger Joint | Pizza Place | Gym / Fitness Center | Furniture / Home Store | Burrito Place | Sandwich Place | Café |

Table 5: Popular venues in and around London boroughs (Top 5 rows of the Table)

Graph 1: Crime rates of the London borough.

By using the Foursquare data and K-means clustering, the different boroughs were grouped into different clusters based on similarities of their most popular venues. More detailed steps including one hot coding can be found in my data section. After the clustering was done, the boroughs or neighborhoods were put into 5 clusters i.e. 0 to 4. The tables below show the different boroughs and their clusters.

Cluster 0: showing the borough and top 10 popular venues

| | Borough | CrimeToPop | Cluster Labels | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue | 6th Most Common Venue | 7th Most Common Venue | 8th Most Common Venue | 9th Most Common Venue | 10th Most Common Venue |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16 | Hounslow | 8.291668 | 0.0 | Bed & Breakfast | Park | Metro Station | Chinese Restaurant | Café | Yoga Studio | Flea Market | Fish Market | Fish & Chips Shop | Field |

# Cluster 1: showing the boroughs and the top 10 popular venues

| | Borough | CrimeToPop | Cluster Labels | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue | 6th Most Common Venue | 7th Most Common Venue | 8th Most Common Venue | 9th Most Common Venue | 10th Most Common Venue |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | Brent | 8.010153 | 1.0 | Coffee Shop | Hotel | Clothing Store | Sporting Goods Shop | Grocery Store | American Restaurant | Sandwich Place | Multiplex | Bubble Tea Shop | Burger Joint |
| 5 | Camden | 13.639309 | 1.0 | Hotel | Café | Coffee Shop | Italian Restaurant | Hotel Bar | Pizza Place | Train Station | Breakfast Spot | Bakery | Modern European Restaurant |
| 12 | Haringey | 9.998317 | 1.0 | Café | Fast Food Restaurant | Italian Restaurant | Pharmacy | Sandwich Place | Pub | Portuguese Restaurant | Hotel Bar | Convenience Store | Park |
| 18 | Kensington and Chelsea | 12.621524 | 1.0 | Café | Gym / Fitness Center | English Restaurant | Burger Joint | French Restaurant | Bakery | Juice Bar | Clothing Store | Restaurant | Modern European Restaurant |
| 20 | Lambeth | 9.416575 | 1.0 | Caribbean Restaurant | Market | BBQ Joint | Beer Bar | Pub | Tapas Restaurant | Restaurant | Burger Joint | Indian Restaurant | Cocktail Bar |
| 23 | Merton | 5.798843 | 1.0 | Italian Restaurant | Supermarket | Park | Café | Bakery | Sandwich Place | Fast Food Restaurant | Garden Center | Burger Joint | Bar |
| 27 | Southwark | 10.535330 | 1.0 | Coffee Shop | Pub | Hotel | Art Gallery | English Restaurant | Hotel Bar | Bar | Theater | Gym / Fitness Center | Shopping Mall |
| 29 | Tower Hamlets | 10.505301 | 1.0 | Italian Restaurant | Pizza Place | Hotel | Coffee Shop | Gym / Fitness Center | Outdoor Sculpture | Chinese Restaurant | Grocery Store | Steakhouse | Asian Restaurant |

# Cluster 2: Showing the borough and the venues.

| | Borough | CrimeToPop | Cluster Labels | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue | 6th Most Common Venue | 7th Most Common Venue | 8th Most Common Venue | 9th Most Common Venue | 10th Most Common Venue |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Barnet | 6.736876 | 2.0 | Café | Bus Stop | Business Service | Yoga Studio | French Restaurant | Flea Market | Fish Market | Fish & Chips Shop | Field | Fast Food Restaurant |

# Cluster 3: showing the borough and the top 10 venues

| | Borough | CrimeToPop | Cluster Labels | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue | 6th Most Common Venue | 7th Most Common Venue | 8th Most Common Venue | 9th Most Common Venue | 10th Most Common Venue |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | Barking and Dagenham | 8.241490 | 3.0 | Martial Arts Dojo | Pool | Bus Station | Park | Supermarket | Gym / Fitness Center | Golf Course | Yoga Studio | Fish & Chips Shop | Field |
| 2 | Bexley | 5.868686 | 3.0 | Clothing Store | Coffee Shop | Pub | Italian Restaurant | Supermarket | Fast Food Restaurant | Pharmacy | Portuguese Restaurant | Bakery | Hotel |
| 4 | Bromley | 6.320666 | 3.0 | Clothing Store | Coffee Shop | Bar | Burger Joint | Pizza Place | Gym / Fitness Center | Furniture / Home Store | Burrito Place | Sandwich Place | Café |
| 6 | Croydon | 7.224531 | 3.0 | Pub | Coffee Shop | Indian Restaurant | Gym / Fitness Center | Asian Restaurant | Portuguese Restaurant | Italian Restaurant | Brewery | Burger Joint | Burrito Place |
| 7 | Ealing | 7.287841 | 3.0 | Coffee Shop | Italian Restaurant | Hotel | Vietnamese Restaurant | Park | Burger Joint | Pub | Pizza Place | Bar | Portuguese Restaurant |
| 8 | Enfield | 7.579906 | 3.0 | Coffee Shop | Clothing Store | Pharmacy | Department Store | Shopping Mall | Sandwich Place | Restaurant | Pub | Supermarket | Optical Shop |
| 9 | Greenwich | 8.589386 | 3.0 | Supermarket | Coffee Shop | Clothing Store | Pub | Plaza | Grocery Store | Fast Food Restaurant | Discount Store | Sandwich Place | African Restaurant |
| 10 | Hackney | 10.583614 | 3.0 | Pub | Café | Coffee Shop | Cocktail Bar | Bakery | Brewery | Hotel | Vietnamese Restaurant | Clothing Store | Grocery Store |
| 11 | Hammersmith and Fulham | 10.717650 | 3.0 | Pub | Indian Restaurant | Italian Restaurant | Gastropub | Café | Japanese Restaurant | Clothing Store | German Restaurant | Portuguese Restaurant | Polish Restaurant |

Cluster 4: Showing the borough and the top 10 venues

| | Borough | CrimeToPop | Cluster Labels | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue | 6th Most Common Venue | 7th Most Common Venue | 8th Most Common Venue | 9th Most Common Venue | 10th Most Common Venue |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24 | Newham | 9.427102 | 4.0 | Hotel | Light Rail Station | Pharmacy | Sandwich Place | Rafting | Chinese Restaurant | Airport | Airport Service | Dance Studio | Dumpling Restaurant |

**Results Section**

Cluster 0

As can be seen from the Cluster 0 (Healthy area) table, there is only one Borough which is Hounslow in this Cluster. Some of the most common venues in Hounslow are the metro station, café and the park. There is a yoga studio within the top ten common venues and the crime rate is relatively low at 8.3. Based on the most common venues in this cluster, this cluster could be described as an average area.

Cluster 1

Some of the Boroughs found in cluster 1 include Camden, Kensington and Chelsea, Westminster and Haringey. Common venues in this cluster include various kinds of restaurants, gym/fitness centers, coffee shops, pubs and grocery shops. This cluster can be seen as a cluster of boroughs with lots of lively venues hence this cluster could be described as a lively area. There is a massive difference between the crime rates in this cluster with crime rates ranging from 5.7 in Merton to 26.7 in Westminster.

Cluster 2

Like cluster 0, there is only one Borough found in Cluster 2. Popular venues includes cafe, business service area, flea and fish markets. The crime rate is among the lowest in London at 6.7. There seem to be lots of business and trading activities taken place in this borough hence describing this cluster as a business area

Cluster 3

Cluster 3 is made up of are Bexley, Barking and Dagenham, Brent, Bromley and Croydon Boroughs just to mention a few. Cluster 3 is the largest Cluster which is made up of 20 Boroughs. The common venues in this cluster include coffee shops, different types of restaurants, clothing store, bars and hotels. The crime rate range is not as wide as that for cluster 2, ranging from 5.5 in Sutton and Richmond up Thames and 11.4 in Islington. It is safe to say that this cluster is fairly safe as the crime rate of 11.4 in Islington is half the crime rate of Westminster in cluster 2. Like Cluster 2, based on the common venues found in this Cluster, Cluster 3 could also be described as a lively area.

Cluster 4
The only Borough in this cluster is Newham with a crime rate of 9.4. The most popular venues in Newham include hotels, airport services, duty free shop, light rail station and an airport. It can be deduce that Newham is near a London airport.

**Discussion Section**
The venues obtained from exploring the data for London boroughs, shows how lively and busy the city is as majority of the boroughs explored showed lots of lively and busy venues. When it comes to crime rates in the City, It could be very high in Westminster and low in Merton and Sutton

At the end of this project, London boroughs have been explored by using Foursquare API to give a picture about how each borough looks like in terms of the types and number of venues that exist in that borough. Although the decision to settle down in a particular location will not ultimately depend on how busy or how many restaurants or cinemas a particular neighborhood has but on other factors like, transport links, number of schools, types of schools hence additional information will be provided. Information about transportation and its links can easily be found on the transport for London website https://tfl.gov.uk/ and information about schools can also be found at the offsted's website https://www.gov.uk/government/organisations/ofsted. Any other information about London and United Kingdom as whole can easily be found at the direct gov website https://www.gov.uk/

Ultimately it depends on what our target audience finds important that will direct them towards a particular borough or place of settlement. If an individual is highly into fitness then it will be extremely likely than such an individual would like to settle in a Barking and Dagenham in cluster 3 (healthy area). Also, their attitude toward crime level will also play a role in determining which neighborhood they settle in. On the other hand, if an individual has got children and would like to settle in a family friendly location, then a quite Neighborhoods in Cluster 3 with the low crime rate will appeal to such individual.

The objective of my task was not to choose a Neighborhood or Borough in London for my target audience but rather show them what different parts of London has to offer and depending on their taste, they choose where to settle after making the decision to move to London.

**Conclusion**

In conclusion I believe the target audience in this case the potential NHS worker will have some information about the various neighborhoods/ boroughs in London. The crime rate data will also be vital in determining where he/she would like to settle. This project was done to provide some information about London to help the target audience make a decision and not done to choose settlement location for the target audience.

No matter the individual's preference, one thing all humans desire is safety as a result I will say the safest boroughs to live in London are Sutton and Harrow in cluster 3 and Richmond upon Thames in cluster 1 with crime rates of about 5.5 crimes per 1000 people per month. The two most dangerous places to live in London are Camden and Westminster both in cluster 1 with crime rates of 13.6 and 26.7 per 1000 people per month respectively.