Coursera Capstone Projects - The Battle of Neighborhoods

Child Care in Toronto

Table of contents

1. Introduction/Business Problem

The Approach I used to begin this Project is by searching through the web to takle major issues facing residence of Toronto, especially families which having working parents. As I research through this problem, The Canadian daycare market has a well-established surplus of demand, resulting in anxiety-inducing waitlists — joined as early as the day a couple learns they're expecting — and monthly fees that can amount to more than a mortgage payment. "It's worse than finding a house or looking for an apartment.

A. Daycare fees continue to rise across Canada

In the study, child care is divided into three categories – infant, toddler,preschooler, Kindergarten, and Gradelevel. The researchers define these categories as birth to two years for infants, 18 months to three years for toddlers, and two-and-a-half years to kindergarten age for preschoolers, which is age four or five, depending on the province.

These categories often see wildly different prices for full-time care, as a result of the smaller number of facilities available for infants, as well as the higher ratio of caregivers to children required by law. This means that while preschool age child care tends to be a lower figure overall, it gives the best idea of what the average family pays, since half of children in child care centres in Canada fall into this category.

B. The waitlist problem

But costs can be only half the battle for families when it comes to child care. The demand for child care greatly surpasses availability in most cases.

Researchers found that in almost three-quarters of the cities covered in the study, centres maintained lengthy waitlists of children waiting to enter care programs. Bigger cities see 80 to 90 per cent of centres maintaining a waitlist, while even smaller cities like St. John's are in the 79 per cent range.

Wait lists are one of the major hurdles keeping parents from accessing quality child care, with families having to start the process early if they want to get their child enrolled. "You have to apply basically while you're pregnant !!!

Source: https://www.ctvnews.ca/features/analysis-daycare-fees-continue-to-rise-across-canada-1.3940099

2. Approach to Solve The Issue

1. Help Individual (Parents) to find best Daycare Center for their child that match thier criteria.
2. Encourage Business owners to invest in such high demand business by leveraging them with the best location.
3. Benefits of growth of this business can be highly apprecaited by individuals and business owners. some are listed below:

   A. by relieving parents from lengthy wait list.

   B. cost reduction

B. cost reduction.

C. Good investment for Business owners as the subject is in High demand.

3. Description of the data

I. Data Collection

1. Licensed Day Care Centres
   (https://github.com/mkorogluNYC/NYC_Data_ScienceAcademy/blob/master/Shiny_project/toronto_cc.csv#L1008)
2. The venues in each neighborhood. (FourSquare API)
3. Postal codes in Toronto (https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M)
4. Toronto geospatial data (https://cocl.us/Geospatial_data)
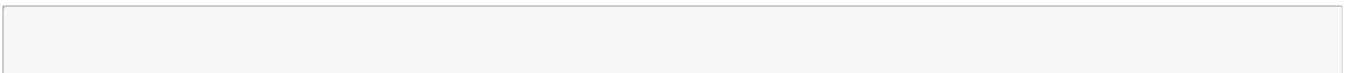

II. Data Importing

In [2]:
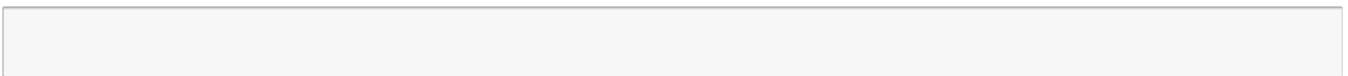
Out[2]:

	Postcode	Borough	Neighbourhood
0	M1A	Not assigned	Not assigned
1	M2A	Not assigned	Not assigned
2	M3A	North York	Parkwoods
3	M4A	North York	Victoria Village
4	M5A	Downtown Toronto	Harbourfront

In [7]:

Out[7]:

	Unnamed: 0	Unnamed: 1	loc_id	name	type	str_no	street	postal_code	ward	phone	building.type	bldgname	Infant
0	NaN	1	1013	Lakeshore Community Child Care Centre	Non-Profit	101	seventh st	M8V 3B5	6	416-394-7601	Public Elementary School	Seventh Street Public School	0
1	NaN	2	1014	Alternative Primary School Parent Group	Non-Profit	1100	spadina rd	M5N 2M6	16	416-322-5385	Public Elementary School	North Preparatory Public School	0
2	NaN	3	1015	Cardinal Leger Child Care Centre (Scarborough)	Non-Profit	600	morrish rd	M1C 4Y1	44	416-287-0578	Catholic Elementary School	Cardinal Leger Catholic School	0
3	NaN	4	1016	George Brown - Richmond Adelaide Childcare Centre	Non-Profit	130	adelaide st w	M5H 3P5	28	416-415-2453	Other	NaN	10
4	NaN	5	1017	Woodland Nursery School	Non-Profit	1	firvalley crt	M1L 1N8	35	416-694-1138x151	High Rise Apartment	NaN	0

III. Data Cleaning & Processing

In [9]:

```
#lets examine total number of childern enrolled on those centers
```

```
child_center['Total'].sum()
```

Out[9]:

68763

In [10]:

Out[10]:

	loc_id	name	type	str_no	street	postal_code	ward	phone	building.type	bldgname	Infant	Toddler	Preschooler
0	1013	Lakeshore Community Child Care Centre	Non-Profit	101	seventh st	M8V 3B5	6	416-394-7601	Public Elementary School	Seventh Street Public School	0	20	32
1	1014	Alternative Primary School Parent Group	Non-Profit	1100	spadina rd	M5N 2M6	16	416-322-5385	Public Elementary School	North Preparatory Public School	0	0	12
2	1015	Cardinal Leger Child Care Centre (Scarborough)	Non-Profit	600	morrish rd	M1C 4Y1	44	416-287-0578	Catholic Elementary School	Cardinal Leger Catholic School	0	10	16
3	1016	George Brown - Richmond Adelaide Childcare Centre	Non-Profit	130	adelaide st w	M5H 3P5	28	416-415-2453	Other	NaN	10	15	40
4	1017	Woodland Nursery School	Non-Profit	1	firvalley crt	M1L 1N8	35	416-694-1138x151	High Rise Apartment	NaN	0	10	0

4. Methodology

Child care cost is one of the key component of expenses of a family. It becomes more crucial for families, where each parent is not available to take care of their child and cannot afford to pay the full amount of the child care tuition. Child care fee subsidy in Canada is the main child care financing of each province introduced in the Canada Assistance Plan in 1972. Eligible families pay the child care cost depending on the income level. Certain conditions in terms of unavailability of each parent are listed in City of Toronto's website as the following.

Each parent is either:

- employed,
- looking for work,
- in school or planning to go to school, or
- if their child has a special need.

Eligible income range for child care fee subsidy in the City of Toronto is up to $73,000. Families with lower income ranges are eligible for larger amount of fee subsidy. This project aims to visualize the effectiveness of child care fee subsidy using dataset from the City of Toronto open data catalogue. The project has three purposes. First, the user can find the child care centre depending on his or her preferences on the location, subsidy choice, and the type of child care centre. Second, child care centres can be listed through the data clustering map, where the user can filter the results based on the location, subsidy, and type of child care centre choice. Finally, key insights from the dataset are provided to make the decision on how effective the fee subsidy program in the City of Toronto is at policy level.

5. Analysis

In [11]:

Out[11]:

name	subsidy	type	Borough	loc_id	ward	Infant	Toddler	Preschooler	Kindergarten	Gradelevel	Total	gc_geoid

	name	subsidy	type	Borough	loc_id	ward	Infant	Toddler	Preschooler	Kindergarten	Gradelevel	Total	gc_geoid
0	A & A Child Care Centre	Yes	Non-Profit	Scarborough	1288	41	20	25	48	0	45	138	2834434
1	A B C Day Nursery	Yes	Commercial	North York	1036	15	10	15	16	20	25	86	67882
2	A Place To Play Nursery School Of Bloor West V...	No	Non-Profit	Etobicoke York	6632	13	0	0	16	0	0	16	7985487
3	Abacus Day Care Centre (629735 Ontario Inc.)	Yes	Commercial	Scarborough	1301	40	0	10	24	0	0	34	319578
4	Abacus Montessori Learning Centre	No	Commercial	North York	9995	34	0	15	48	0	0	63	504128

In [12]:

```
#lets see how many centers provide fee_subsidy in Toronto
```

Out[12]:

```
fee_subsidy
Yes    677
No     330
dtype: int64
```

In [13]:

```
child_center.describe()
```

Out[13]:

	loc_id	ward	Infant	Toddler	Preschooler	Kindergarten	Gradelevel	Total	gc_geoid	lo
count	1007.000000	1007.000000	1007.000000	1007.000000	1007.000000	1007.000000	1007.000000	1007.000000	1.007000e+03	1007
mean	6878.050645	22.650447	3.464747	9.788481	22.910626	12.385303	19.735849	68.285005	6.099534e+06	-79
std	4719.244161	12.133328	5.967315	9.937576	17.022788	17.797639	26.052053	41.821418	6.010884e+06	0
min	1013.000000	1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	8.000000	1.759900e+04	-79
25%	1775.500000	13.000000	0.000000	0.000000	16.000000	0.000000	0.000000	39.000000	5.759305e+05	-79
50%	6551.000000	23.000000	0.000000	10.000000	24.000000	0.000000	0.000000	57.000000	6.355204e+06	-79
75%	12064.000000	32.000000	10.000000	15.000000	32.000000	26.000000	30.000000	88.000000	9.538058e+06	-79
max	13564.000000	44.000000	30.000000	56.000000	204.000000	100.000000	144.000000	280.000000	3.007298e+07	-79

In [14]:

```
#lets see how many categories of child care centers and how many center in each category
```

Out[14]:

```
center_type
Non-Profit       668
Commercial       286
City-Operated     53
dtype: int64
```
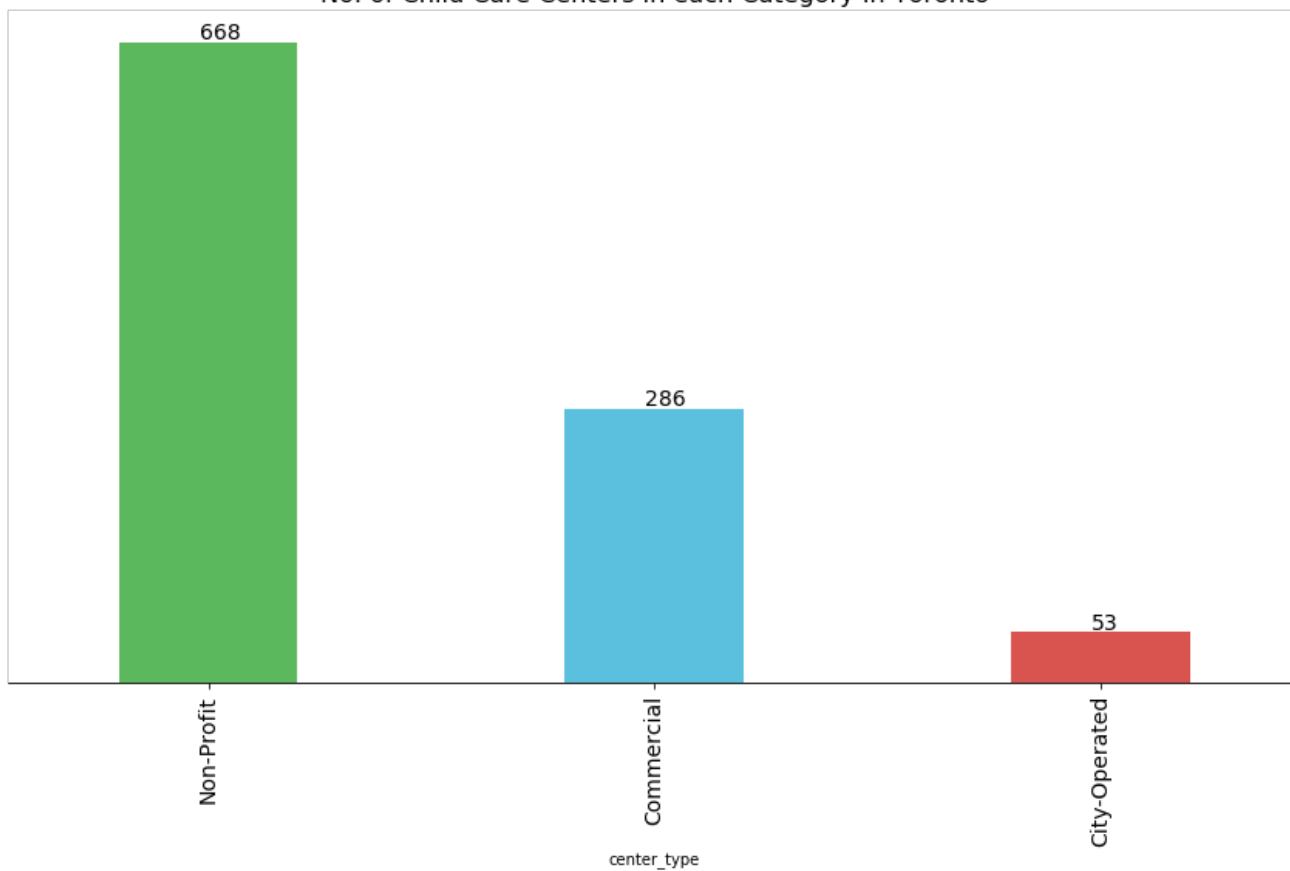
According to our data for the Liscensed child care center in Toronto, we found that:

- Non-Profit centers = 668
- Commercial Centers = 286
- City operated centers = 53

- City operated centers = 53

No. of Child Care Centers in each Category in Toronto

668

286

53

Non-Profit

Commercial

City-Operated

center_type

```
#lets see how many child care centers in each Borough
```

```
Borough
Toronto East York    318
North York           266
Etobicoke York       226
Scarborough          197
Name: Borough, dtype: int64
```
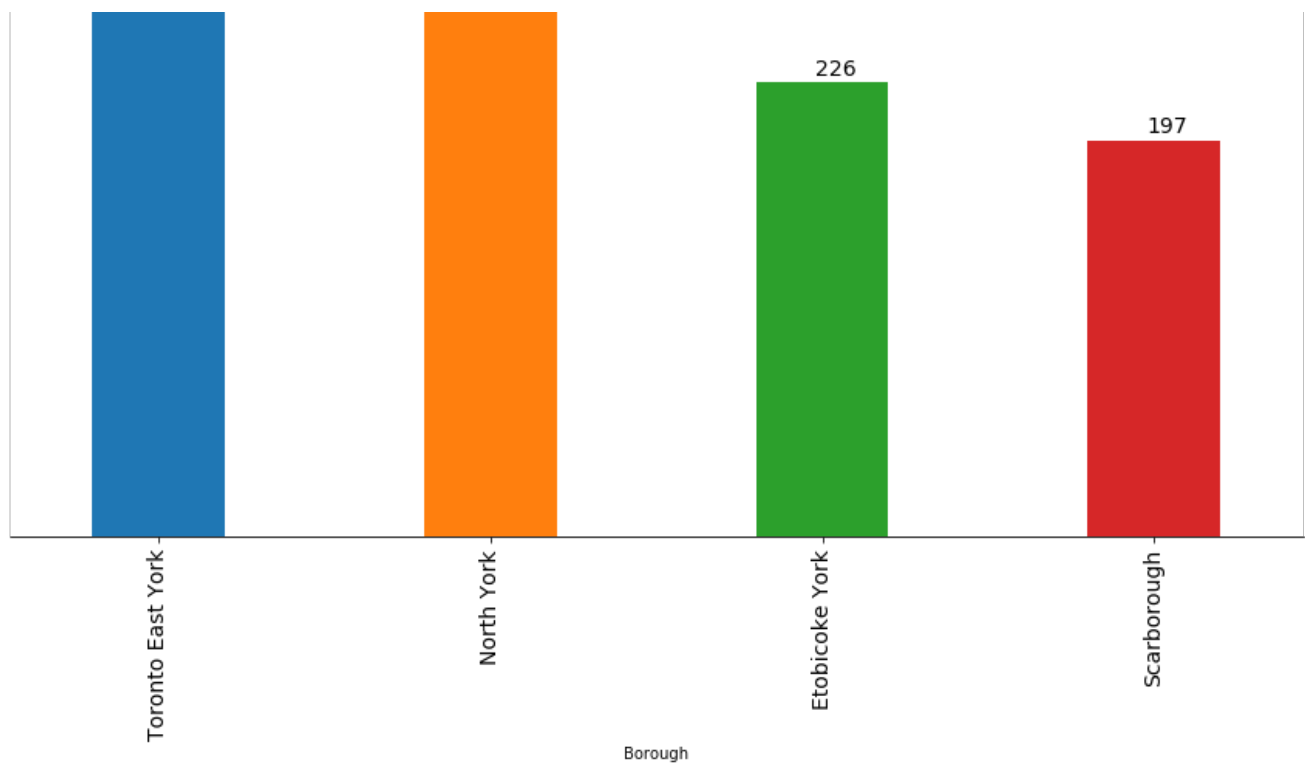
According to our data for the Liscensed child care center in Toronto again, we found that:

- child care centers in Toronto East York = 318
- child care centers in North York = 266
- child care centers in Etobicoke York = 226
- child care centers in Scarborough = 197

No. of Child Care Centers in Each Borough

318

266

	Toronto East York	North York	Etobicoke York	Scarborough
			226	197
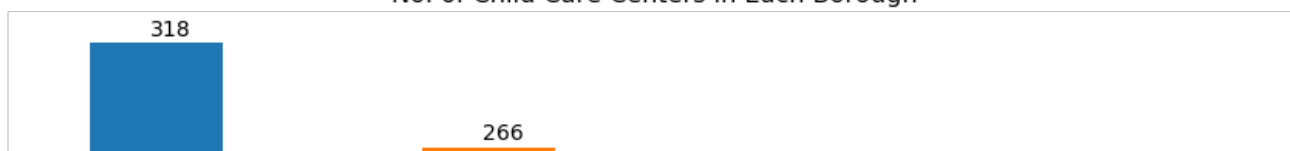
Borough

In [18]:

```
# lets see child distribution among each categories in each Bourough
```

Out[18]:

	Borough	subsidy	type	Infant	Toddler	Preschooler	Kindergarten	Gradelevel	Total
0	Etobicoke York	No	Commercial	165	539	1327	209	402	2642
1	Etobicoke York	No	Non-Profit	20	109	556	15	208	908
2	Etobicoke York	Yes	City-Operated	126	205	312	62	74	779
3	Etobicoke York	Yes	Commercial	116	275	633	248	459	1731
4	Etobicoke York	Yes	Non-Profit	306	770	1562	2334	3909	8881

In [20]:

Out[20]:

```
type           subsidy  Borough
City-Operated  Yes      Etobicoke York      779
                        North York          471
                        Scarborough         597
                        Toronto East York   815
Commercial     No       Etobicoke York     2642
                        North York         2866
                        Scarborough        1009
                        Toronto East York  3652
               Yes      Etobicoke York     1731
                        North York         2218
                        Scarborough        2559
                        Toronto East York   553
Non-Profit     No       Etobicoke York      908
                        North York         1995
                        Scarborough         933
                        Toronto East York  2004
               Yes      Etobicoke York     8881
                        North York        11795
                        Scarborough        6644
                        Toronto East York 15711
Name: Total, dtype: int64
```
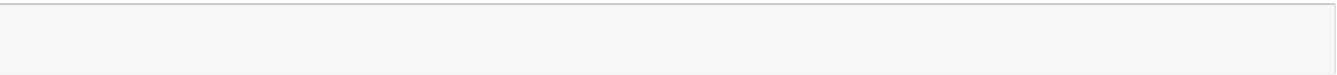
From above dataframe, we noticed that all city operated centers are eligible for fee subsidy. In contrast, commercial & Non-profit centers are eligible for both. Now, lets visualize number of children enrolled in each categories in each Borough

Child Distribution Among Each Categories in each Bourough
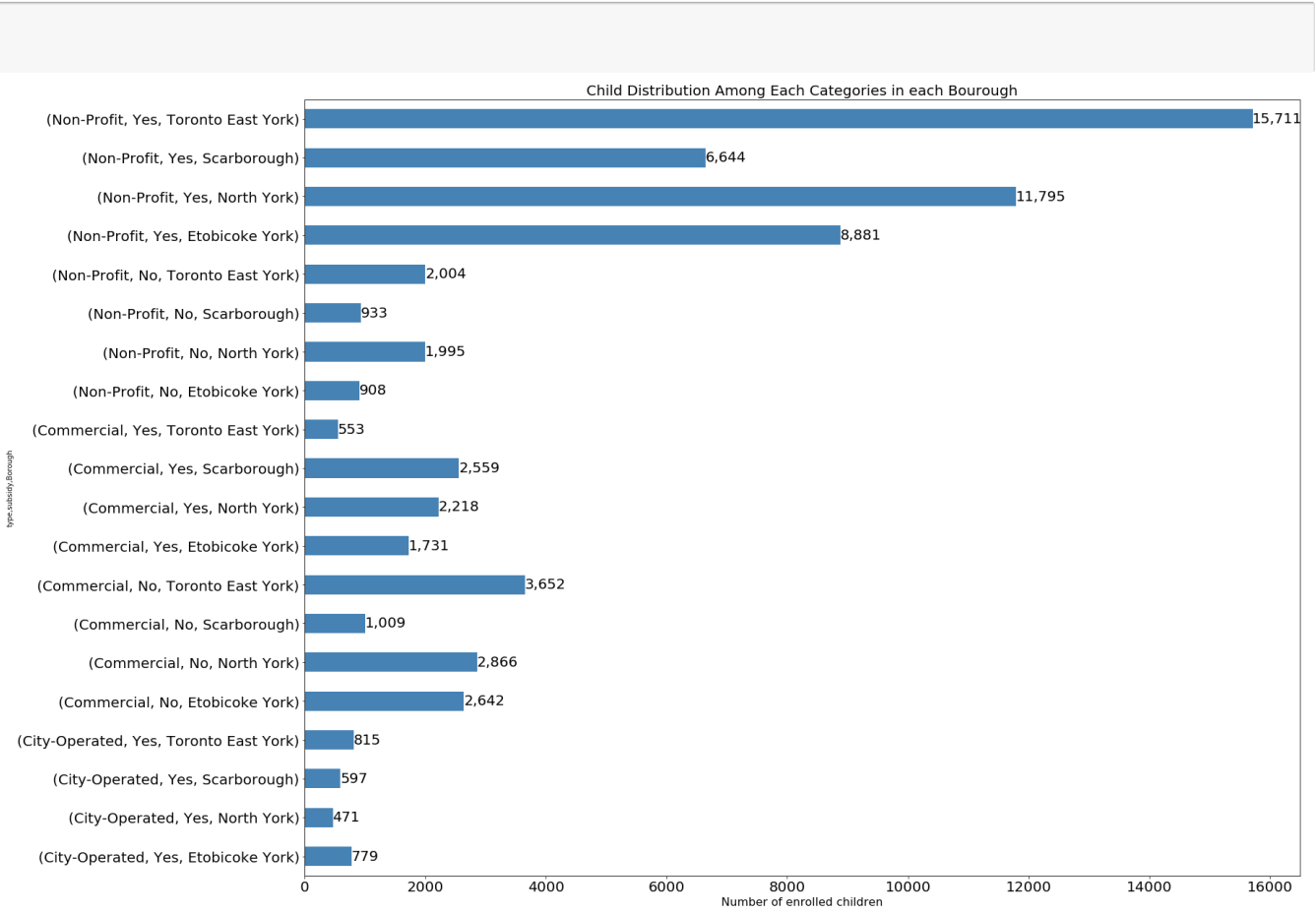
	Borough	type	Infant	Toddler	Preschooler	Kindergarten	Gradelevel	Total
0	Etobicoke York	City-Operated	126	205	312	62	74	779
1	Etobicoke York	Commercial	281	814	1960	457	861	4373
2	Etobicoke York	Non-Profit	326	879	2118	2349	4117	9789
3	North York	City-Operated	46	75	152	80	118	471
4	North York	Commercial	371	1206	2646	305	556	5084
5	North York	Non-Profit	422	1588	4034	2895	4851	13790
6	Scarborough	City-Operated	76	145	224	98	54	597
7	Scarborough	Commercial	251	658	1669	227	763	3568
8	Scarborough	Non-Profit	371	938	2118	1644	2506	7577
9	Toronto East York	City-Operated	110	180	280	100	145	815
10	Toronto East York	Commercial	434	1074	2226	272	199	4205
11	Toronto East York	Non-Profit	675	2095	5332	3983	5630	17715

```
df_grp2.type # returns a series
```

```
Out[34]:

0     City-Operated
1        Commercial
2        Non-Profit
3     City-Operated
4        Commercial
5        Non-Profit
6     City-Operated
7        Commercial
8        Non-Profit
9     City-Operated
10       Commercial
11       Non-Profit
Name: type, dtype: object
```

In [35]:

Out[35]:

	Borough	Infant	Toddler	Preschooler	Kindergarten	Gradelevel	Total
type							
City-Operated	Etobicoke York	126	205	312	62	74	779
Commercial	Etobicoke York	281	814	1960	457	861	4373
Non-Profit	Etobicoke York	326	879	2118	2349	4117	9789
City-Operated	North York	46	75	152	80	118	471
Commercial	North York	371	1206	2646	305	556	5084
Non-Profit	North York	422	1588	4034	2895	4851	13790
City-Operated	Scarborough	76	145	224	98	54	597
Commercial	Scarborough	251	658	1669	227	763	3568
Non-Profit	Scarborough	371	938	2118	1644	2506	7577
City-Operated	Toronto East York	110	180	280	100	145	815
Commercial	Toronto East York	434	1074	2226	272	199	4205
Non-Profit	Toronto East York	675	2095	5332	3983	5630	17715

city operated centers

lets see what is the total number of children in city_operated centers in Toronto

In [36]:

Out[36]:

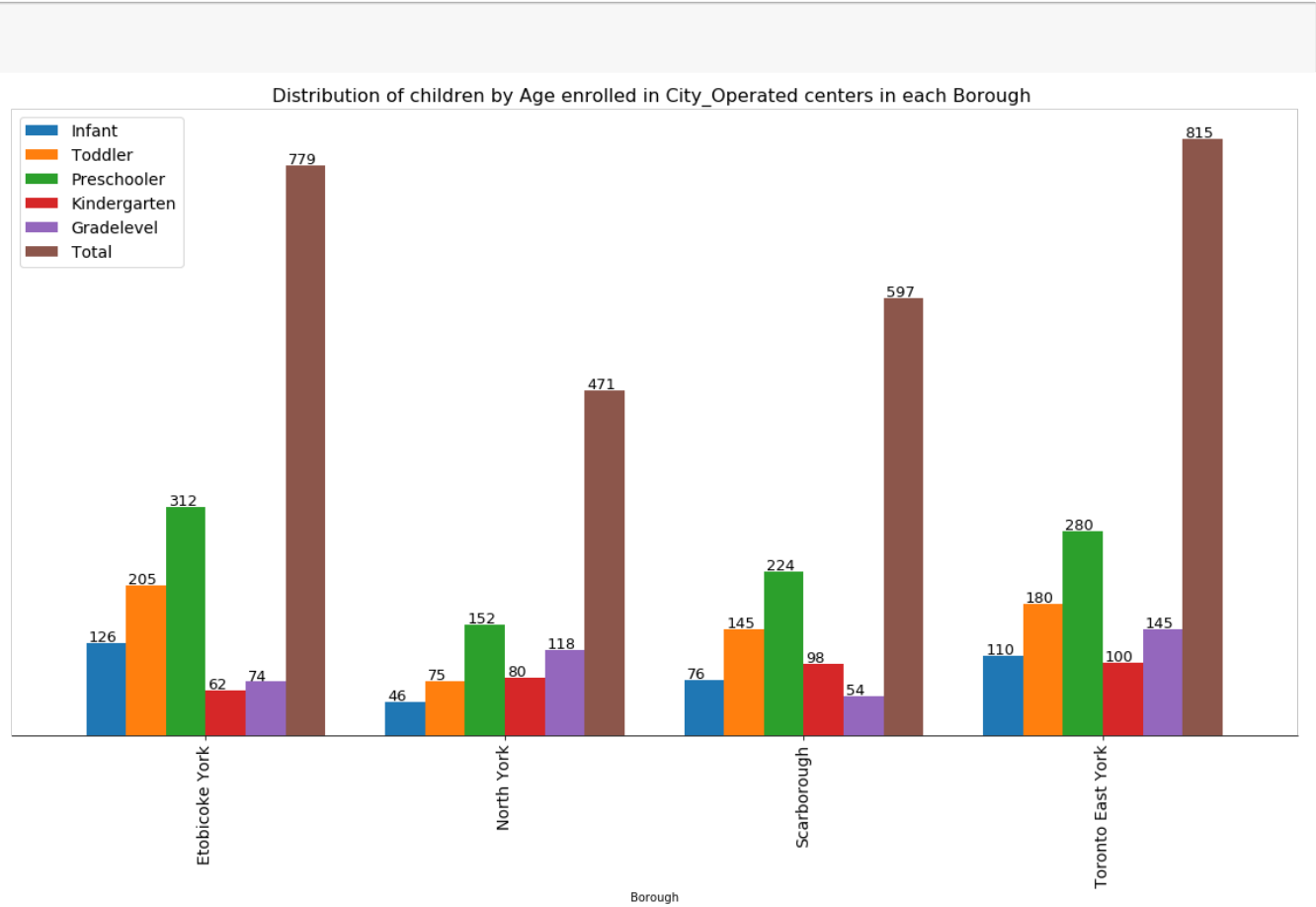|	Infant	Toddler	Preschooler	Kindergarten	Gradelevel	Total
Borough						
Etobicoke York	126	205	312	62	74	779
North York	46	75	152	80	118	471
Scarborough	76	145	224	98	54	597
Toronto East York	110	180	280	100	145	815

In [37]:

```
# lets see what is the total number of children in city_operated centers in Toronto
```

Out[37]:

```
2662
```

In [45]:

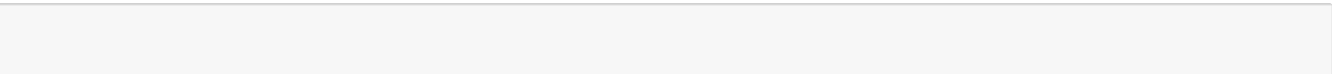Distribution of children by Age enrolled in City_Operated centers in each Borough

Commercial centers

lets see what is the total number of children in Commercial centers in Toronto

In [40]:

Out[40]:

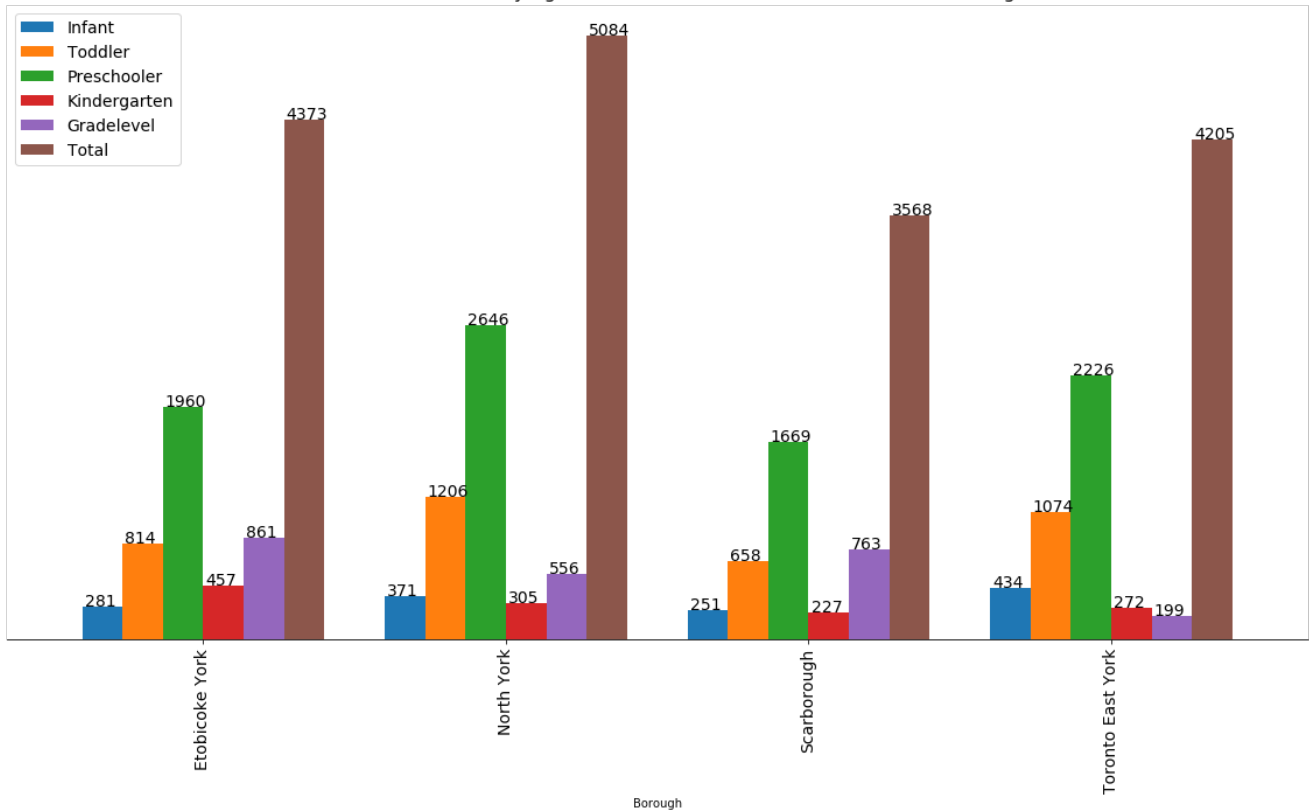|	Infant	Toddler	Preschooler	Kindergarten	Gradelevel	Total
Borough						
Etobicoke York	281	814	1960	457	861	4373
North York	371	1206	2646	305	556	5084
Scarborough	251	658	1669	227	763	3568
Toronto East York	434	1074	2226	272	199	4205

In [41]:

```
# lets see what is the total number of children in commercial centers in Toronto
```

Out[41]:

```
17230
```

In [44]:

Distribution of children by Age enrolled in Commercial centers in each Borough

Non-profit centers

lets see what is the total number of children in Non-profit centers in Toronto

In [46]:

Out[46]:

| Borough	Infant	Toddler	Preschooler	Kindergarten	Gradelevel	Total
Etobicoke York	326	879	2118	2349	4117	9789
North York	422	1588	4034	2895	4851	13790
Scarborough	371	938	2118	1644	2506	7577
Toronto East York	675	2095	5332	3983	5630	17715

In [47]:

```
# lets see what is the total number of children in Non-Profit centers in Toronto
```
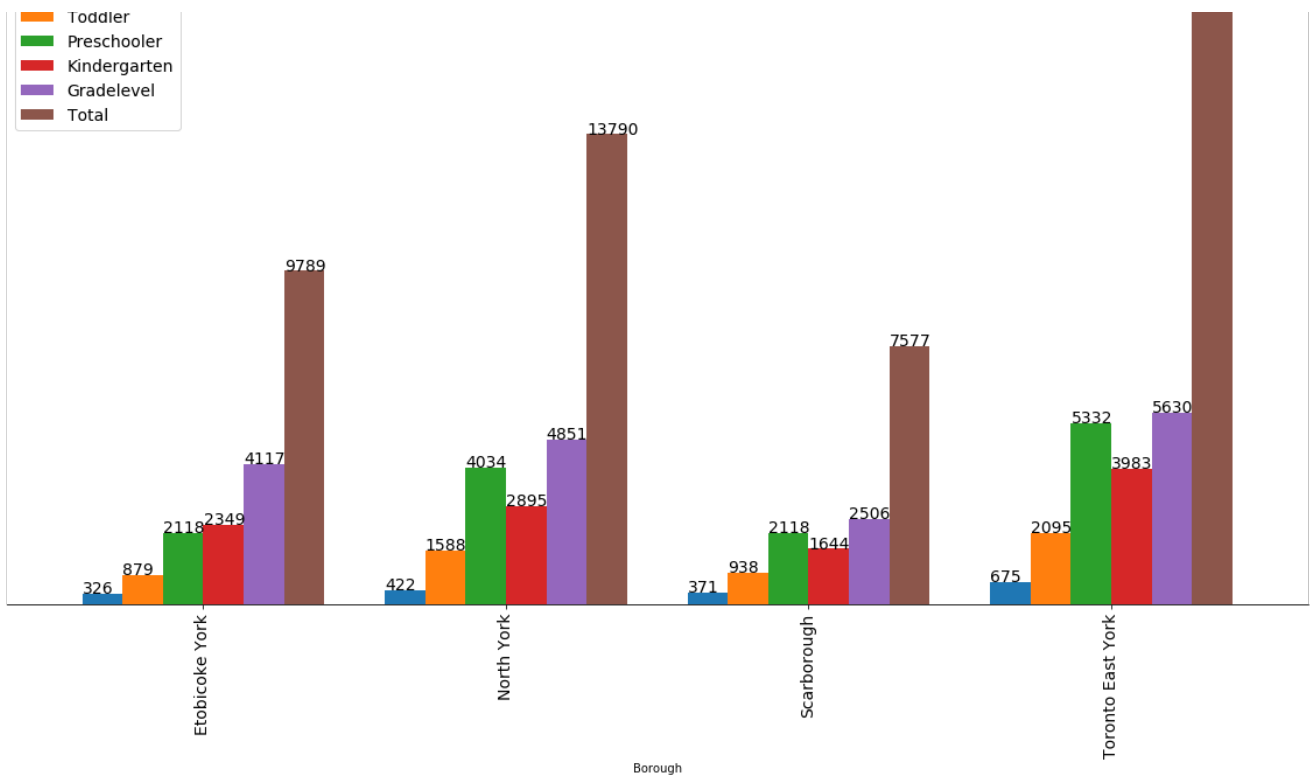
Out[47]:

```
48871
```

In [48]:

Distribution of children by Age enrolled in Non_Profit Centers in each Borough
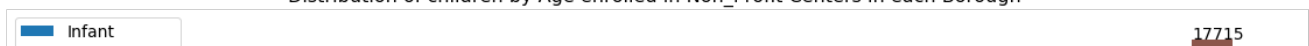
Percentage of child enrolled in Non-profit centers = 71.07165190582144%
Percentage of child enrolled in Commercial centers = 25.057080115759927%
Percentage of child enrolled in City-Operated centers = 3.8712679784186266%

	loc_id	name	type	str_no	street	postal_code	ward	phone	building.type	bldgname	Infant	Toddler	Preschooler
0	1013	Lakeshore Community Child Care Centre	Non-Profit	101	seventh st	M8V 3B5	6	416-394-7601	Public Elementary School	Seventh Street Public School	0	20	32
1	1014	Alternative Primary School Parent Group	Non-Profit	1100	spadina rd	M5N 2M6	16	416-322-5385	Public Elementary School	North Preparatory Public School	0	0	12
2	1015	Cardinal Leger Child Care Centre (Scarborough)	Non-Profit	600	morrish rd	M1C 4Y1	44	416-287-0578	Catholic Elementary School	Cardinal Leger Catholic School	0	10	16
3	1016	George Brown - Richmond Adelaide Childcare Centre	Non-Profit	130	adelaide st w	M5H 3P5	28	416-415-2453	Other	NaN	10	15	40
4	1017	Woodland Nursery School	Non-Profit	1	firvalley crt	M1L 1N8	35	416-694-1138x151	High Rise Apartment	NaN	0	10	0

Exploring and clustering neighborhoods in Toronto.

```
# Use geopy library to get the latitude and longitude values of Toronto
```

```
address = 'Toronto, Ontario Canada'
```

The geograpical coordinate of Toronto Canada are 43.653963, -79.387207.

In [55]:

```
# create map of Toronto using latitude and longitude values
```

In [56]

```
toronto
```

Out[56]
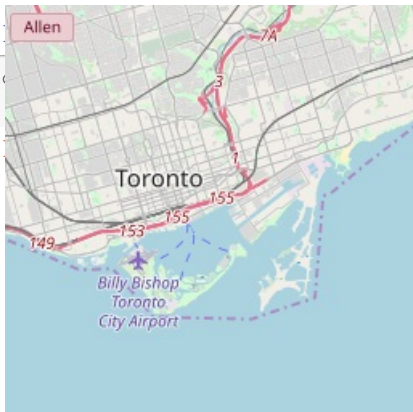
Using the Foursquare API to explore and segmented neighborhoods

In [100]:

```
# Credentials to be Omitted!!!
```

In [59]:

```
# Get the child care center's latitude and longitude values.
```

Latitude and longitude values of Lakeshore Community Child Care Centre are 43.59991069, -
79.50463054.
This child care center is in Etobicoke York and it is Non-Profit.

In [60]:

```
toronto_onehot = pd.get_dummies(child_center[['subsidy','type']], prefix="", prefix_sep="")
```

	name	No	Yes	City-Operated	Commercial	Non-Profit
0	Lakeshore Community Child Care Centre	0	1	0	0	1
1	Alternative Primary School Parent Group	0	1	0	0	1
2	Cardinal Leger Child Care Centre (Scarborough)	0	1	0	0	1
3	George Brown - Richmond Adelaide Childcare Centre	0	1	0	0	1
4	Woodland Nursery School	1	0	0	0	1

In [61]:

```
toronto_onehot.shape
```

Out[61]:

```
(1007, 6)
```

Clustering Neighborhoods

Run k-means to cluster the neighborhood into 5 clusters.

In [62]:

Out[62]:

```
array([1, 1, 1, 1, 3])
```
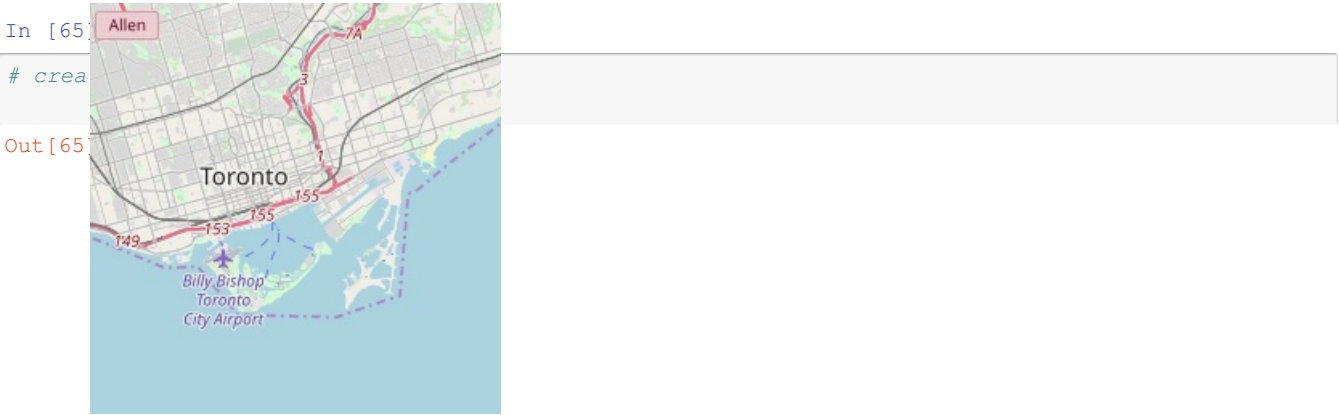
In [63]:

Out[63]:

	loc_id	name	type	str_no	street	postal_code	ward	phone	building.type	bldgname	Infant	Toddler	Preschooler
0	1013	Lakeshore Community Child Care Centre	Non-Profit	101	seventh st	M8V 3B5	6	416-394-7601	Public Elementary School	Seventh Street Public School	0	20	32
1	1014	Alternative Primary School Parent Group	Non-Profit	1100	spadina rd	M5N 2M6	16	416-322-5385	Public Elementary School	North Preparatory Public School	0	0	12
2	1015	Cardinal Leger Child Care Centre (Scarborough)	Non-Profit	600	morrish rd	M1C 4Y1	44	416-287-0578	Catholic Elementary School	Cardinal Leger Catholic School	0	10	16
3	1016	George Brown - Richmond Adelaide Childcare Centre	Non-Profit	130	adelaide st w	M5H 3P5	28	416-415-2453	Other	NaN	10	15	40
4	1017	Woodland Nursery School	Non-Profit	1	firvalley crt	M1L 1N8	35	416-694-1138x151	High Rise Apartment	NaN	0	10	0

In [64]:

```
toronto_merged.groupby('Cluster Labels').mean()
```

Out[64]:

Cluster Labels	loc_id	ward	Infant	Toddler	Preschooler	Kindergarten	Gradelevel	Total	gc_geoid	longitude	l
0	3634.436170	24.425532	6.585106	14.776596	30.457447	6.510638	16.787234	75.117021	6.113415e+06	-79.372614	43.
1	5619.293233	22.939850	3.240602	8.624060	19.552632	19.746241	30.009398	81.172932	5.761008e+06	-79.391281	43.
2	10873.601036	22.222798	3.720207	12.321244	29.419689	3.362694	4.150259	52.974093	6.456575e+06	-79.393549	43.
3	9816.553957	21.338129	0.503597	6.705036	23.482014	2.913669	8.618705	42.223022	6.400810e+06	-79.399636	43.
4	3204.660377	22.603774	6.754717	11.415094	18.264151	6.415094	7.377358	50.226415	7.565874e+06	-79.392709	43.

In [65]:

```
# crea
```

Out[65]:

In [75]:

```
# Lets just take portion of dataframe where Boroughs is having least number of care centers (197)
that is Scarborough.
```

(199, 28)

Out[75]:

	loc_id	name	type	str_no	street	postal_code	ward	phone	building.type	bldgname	Infant	Toddler	
0	1015	Cardinal Leger Child Care Centre (Scarborough)	Non-Profit	600	morrish rd	M1C 4Y1	44	416-287-0578	Catholic Elementary School	Cardinal Leger Catholic School	0	10	
1	1017	Woodland Nursery School	Non-Profit	1	firvalley crt	M1L 1N8	35	416-694-1138x151	High Rise Apartment	NaN	0	10	
		Centennial College			progress			416-289-	Community	Centennial College Of			

	loc_id	name	type	str_no	street	postal_code	ward	phone	building.type	bldgName	Infant	Toddler
2	1021	Progress Campus Child Care ...	Non-Profit	941	progress ave	M1G 3T8	38	416-289-5000x2110	Community College/University	Applied Arts & Technology	10	20
3	1031	Cedarbrae Day Nurseries (20 Greencrest)	Commercial	20	greencrest circt	M1G 1B8	43	416-431-2504	High Rise Apartment	Greencrest Property	0	0
4	1045	Children's Village #1 Day Care Centre	Commercial	1050	markham rd	M1H 2Y7	38	416-438-3355	High Rise Apartment	NaN	10	10

`In [76]:`

```
# Re-c...                        for scarborough Neighborhoods.
```

`Out[76`

Now, let's use foursquare api query url, search child care center on all boroughs

`In [77]:`

```
# The following function retrieves the care center given the names and coordinates and stores it into dataframe.
```

Retrieve all centers and nearby venues given the Addresses

`In [79]:`

```
# lets Check size of resulting dataframe
```

`(1777, 7)`

`Out[79]:`

	care_center	care_center Latitude	care_center Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Cardinal Leger Child Care Centre (Scarborough)	43.793104	-79.175711	Highland Creek	43.790281	-79.173703	Neighborhood
1	Cardinal Leger Child Care Centre	43.793104	-79.175711	Sunshine Variety &	43.794733	-79.174988	Convenience

	care_center	care_center Latitude	care_center Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
1	(Scarborough)	43.793104	-79.175711	Video	43.794723	-79.174988	Store
2	Cardinal Leger Child Care Centre (Scarborough)	43.793104	-79.175711	Kraftsman Kabinets Inc.	43.793929	-79.179604	Home Service
3	Cardinal Leger Child Care Centre (Scarborough)	43.793104	-79.175711	Morrish Pharmacy	43.790225	-79.174382	Pharmacy
4	Woodland Nursery School	43.702952	-79.281029	Starbucks	43.703634	-79.277661	Coffee Shop

In [80]:

```
#Count of venues were returned for each Borough
```

Out[80]:

care_center	care_center Latitude	care_center Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
A & A Child Care Centre	19	19	19	19	19	19
Abacus Day Care Centre (629735 Ontario Inc.)	32	32	32	32	32	32
Absorbent Minds	15	15	15	15	15	15
Absorbent Minds 2	12	12	12	12	12	12
After Four Children's Enrichment Program	4	4	4	4	4	4

In [81]:

```
#lets see how many venues were returned by Foursquare?
```

There are 162 uniques categories.

Analyze Each Center

In [82]:

```
# one hot encoding
```

Out[82]:

	care_center	African Restaurant	American Restaurant	Arts & Crafts Store	Asian Restaurant	Athletics & Sports	Auto Dealership	Auto Garage	Automotive Shop	BBQ Joint	Badminton Court	Bakery	Ba
0	Cardinal Leger Child Care Centre (Scarborough)	0	0	0	0	0	0	0	0	0	0	0	
1	Cardinal Leger Child Care Centre (Scarborough)	0	0	0	0	0	0	0	0	0	0	0	
2	Cardinal Leger Child Care Centre (Scarborough)	0	0	0	0	0	0	0	0	0	0	0	
3	Cardinal Leger Child Care Centre (Scarborough)	0	0	0	0	0	0	0	0	0	0	0	
4	Woodland Nursery School	0	0	0	0	0	0	0	0	0	0	0	

In [83]:

```
toronto_onehot.shape
```

Out[83]:

(1777, 163)

In [84]:

Out[84]:

	care_center	African Restaurant	American Restaurant	Arts & Crafts Store	Asian Restaurant	Athletics & Sports	Auto Dealership	Auto Garage	Automotive Shop	BBQ Joint	Badminton Court	Bakery
0	A & A Child Care Centre	0.0	0.00000	0.0	0.000000	0.0	0.0	0.0	0.000000	0.052632	0.0	0.052632
1	Abacus Day Care Centre (629735 Ontario Inc.)	0.0	0.03125	0.0	0.000000	0.0	0.0	0.0	0.000000	0.000000	0.0	0.031250
2	Absorbent Minds	0.0	0.00000	0.0	0.066667	0.0	0.0	0.0	0.066667	0.000000	0.0	0.000000
3	Absorbent Minds 2	0.0	0.00000	0.0	0.083333	0.0	0.0	0.0	0.083333	0.000000	0.0	0.000000
4	After Four Children's Enrichment Program	0.0	0.00000	0.0	0.000000	0.0	0.0	0.0	0.000000	0.000000	0.0	0.000000

In [85]:

```
# Check new size:
toronto_grouped.shape
```

Out[85]:

(193, 163)

Let's assume that you are staying at the 5600 Sheppard Ave E, Scarborough, Canada. So let's start by converting the address to its latitude and longitude coordinates.

In [87]:

```
address = '5600 Sheppard Ave E, Scarborough, Canada'
```

43.794924 -79.2364314148795

Now, let's assume that you are searching for Day care centers for you children around your address. So, let's define a query to search for Day care centers that is within 20000 metres from your address.

In [88]:

```
search_query = 'child care center'
radius = 2500
print(search_query + ' .... OK!')
```

child care center .... OK!

Define the corresponding URL

Send the GET Request and examine the results

Get relevant part of JSON and transform it into a *pandas* dataframe

In [92]:

```
# assign relevant part of JSON to venues
```

Out[92]:

	categories	hasPerk	id	location.address	location.cc	location.city	location.country	locatic
0	[{'id': '4f4532974b9074f6e4fb0104', 'name': 'D...	False	57c8d67bcd1043c5b04493dc	5600 Sheppard Ave E	CA	Scarborough	Canada	
1	[{'id': '4bf58dd8d48988d198941735', 'name': 'C...	False	4d937f857ac3a35d2958d825	NaN	CA	NaN	Canada	
2	[{'id': '4f4532974b9074f6e4fb0104', 'name': 'D...	False	5841b68aaf5c144c4edaffa9	96 Dunsfold Dr	CA	Scarborough	Canada	
3	[{'id': '4f4532974b9074f6e4fb0104', 'name': 'D...	False	5bc82090cf72a0002cb19198	61 Canmore Blvd	CA	Scarborough	Canada	
4	[{'id': '4f4532974b9074f6e4fb0104', 'name': 'D...	False	5bc71981d807ee002ce1ecc6	1965 Brimley Road	CA	Scarborough	Canada	

Define information of interest and filter dataframe

In [94]:

```
# keep only columns that include venue name, and anything that is associated with location
```

Out[94]:

	name	categories	address	cc	city	country	distance	formattedAddress	labeledLatLngs	lat	In
0	Sheppard Square Child Care	Daycare	5600 Sheppard Ave E	CA	Scarborough	Canada	62	[5600 Sheppard Ave E, Scarborough ON M1B 2L4, ...	[{'label': 'display', 'lat': 43.794412, 'lng':...	43.794412	79.23612
1	Centennial College Child Care Centre	College Academic Building	NaN	CA	NaN	Canada	1335	[Canada]	[{'label': 'display', 'lat': 43.786091, 'lng':...	43.786091	79.22518
2	Precious Gems Christian Home Child Care	Daycare	96 Dunsfold Dr	CA	Scarborough	Canada	2275	[96 Dunsfold Dr, Scarborough ON M1B 1T6, Canada]	[{'label': 'display', 'lat': 43.814607, 'lng':...	43.814607	79.22878
3	Scarborough Morrish YMCA Child Care Centre	Daycare	61 Canmore Blvd	CA	Scarborough	Canada	2145	[61 Canmore Blvd, Scarborough ON M1C 4B2, Canada]	[{'label': 'display', 'lat': 43.79792960255199...	43.797930	79.26281
4	Scarborough CD Farquharson YMCA Child Care Centre	Daycare	1965 Brimley Road	CA	Scarborough	Canada	2651	[1965 Brimley Road, Scarborough ON M1S 2B1, Ca...	[{'label': 'display', 'lat': 43.78459599857809...	43.784596	79.26616
5	Toronto Scarborough Town Centre Ct YMCA Child ...	Child Care Service	230 Town Center Court	CA	Scarborough	Canada	2665	[230 Town Center Court, Scarborough ON M1P 4Y7...	[{'label': 'display', 'lat': 43.77479523565078...	43.774795	79.25438

Let's visualize child care centers that are nearby
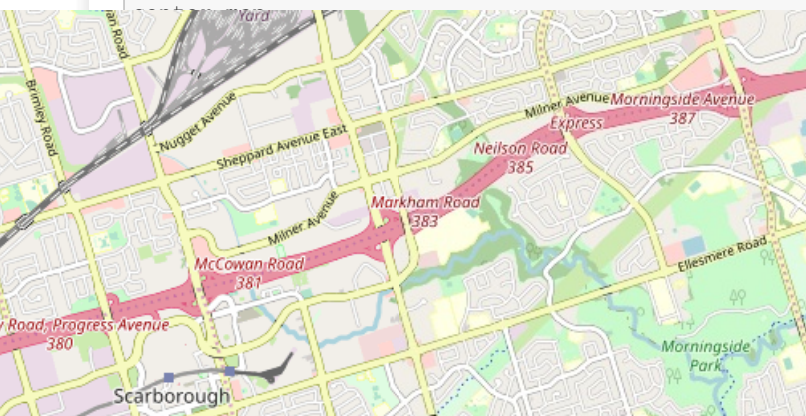
```
dataframe_filtered.name
```

```
0                      Sheppard Square Child Care
1               Centennial College Child Care Centre
2             Precious Gems Christian Home Child Care
3        Scarborough Morrish YMCA Child Care Centre
4    Scarborough CD Farquharson YMCA Child Care Centre
5    Toronto Scarborough Town Centre Ct YMCA Child ...
Name: name, dtype: object
```

```
# generate map centred around your location
# display map
```


Now you can explore each child center around your address.

```
dict_keys(['id', 'name', 'contact', 'location', 'canonicalUrl', 'categories', 'verified', 'stats',
'url', 'likes', 'dislike', 'ok', 'venueRatingBlacklisted', 'allowMenuUrlEdit', 'beenHere',
'specials', 'photos', 'reasons', 'description', 'hereNow', 'createdAt', 'tips', 'shortUrl',
'timeZone', 'listed', 'hours', 'pageUpdates', 'inbox', 'attributes', 'bestPhoto'])
```

```
{'id': '5841b68aaf5c144c4edaffa9',
 'name': 'Precious Gems Christian Home Child Care',
 'contact': {'phone': '4163350469', 'formattedPhone': '(416) 335-0469'},
 'location': {'address': '96 Dunsfold Dr',
  'lat': 43.814607,
  'lng': -79.228787,
  'labeledLatLngs': [{'label': 'display',
    'lat': 43.814607,
```

          'lng': -79.228787}],
   'postalCode': 'M1B 1T6',
   'cc': 'CA',
   'city': 'Scarborough',
   'state': 'ON',
   'country': 'Canada',
   'formattedAddress': ['96 Dunsfold Dr', 'Scarborough ON M1B 1T6', 'Canada']},
 'canonicalUrl': 'https://foursquare.com/v/precious-gems-christian-home-child-
care/5841b68aaf5c144c4edaffa9',
 'categories': [{'id': '4f4532974b9074f6e4fb0104',
   'name': 'Daycare',
   'pluralName': 'Daycares',
   'shortName': 'Daycare',
   'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/shops/daycare_',
    'suffix': '.png'},
   'primary': True}],
 'verified': False,
 'stats': {'tipCount': 0},
 'url': 'http://www.preciousgemschristiandaycare.com',
 'likes': {'count': 0, 'groups': []},
 'dislike': False,
 'ok': False,
 'venueRatingBlacklisted': True,
 'allowMenuUrlEdit': True,
 'beenHere': {'count': 0,
  'unconfirmedCount': 0,
  'marked': False,
  'lastCheckinExpiredAt': 0},
 'specials': {'count': 0, 'items': []},
 'photos': {'count': 20,
  'groups': [{'type': 'checkin',
    'name': "Friends' check-in photos",
    'count': 0,
    'items': []},
   {'type': 'venue',
    'name': 'Venue photos',
    'count': 20,
    'items': [{'id': '59b6ff73029a552f8558b07b',
      'createdAt': 1505165171,
      'source': {'name': 'Yext Yext', 'url': 'http://yext.com'},
      'prefix': 'https://fastly.4sqi.net/img/general/',
      'suffix': '/87388367_IPX4JZLB_T_nHMtWX3w6ZkqkSB9p4PCM2vcG592T7b0.jpg',
      'width': 800,
      'height': 589,
      'user': {'id': '87388367',
       'firstName': 'Yext',
       'lastName': 'Yext',
       'gender': 'none',
       'photo': {'prefix': 'https://fastly.4sqi.net/img/user/',
        'suffix': '/blank_boy.png',
        'default': True}},
      'visibility': 'public'},
     {'id': '59b6ff72ee71203bd8339ecd',
      'createdAt': 1505165170,
      'source': {'name': 'Yext Yext', 'url': 'http://yext.com'},
      'prefix': 'https://fastly.4sqi.net/img/general/',
      'suffix': '/87388367_Cpssd7_IkOBgW3FpVRaqGX-ObgRryEIWF8OkSiRUxpY.jpg',
      'width': 619,
      'height': 413,
      'user': {'id': '87388367',
       'firstName': 'Yext',
       'lastName': 'Yext',
       'gender': 'none',
       'photo': {'prefix': 'https://fastly.4sqi.net/img/user/',
        'suffix': '/blank_boy.png',
        'default': True}},
      'visibility': 'public'}]}],
  'summary': '0 photos'},
 'reasons': {'count': 0, 'items': []},
 'description': 'Precious Gems Christian Home Daycare is a fun filled learning and Godly
environment! We offer programs for children ages 10 months to 7 years at our facility in
Scarborough.',
 'hereNow': {'count': 0, 'summary': 'Nobody here', 'groups': []},
 'createdAt': 1480701578,
 'tips': {'count': 0,
  'groups': [{'type': 'others', 'name': 'All tips', 'count': 0, 'items': []}]},
 'shortUrl': 'http://4sq.com/2gVrDau',

```
'timeZone': 'America/Toronto',
'listed': {'count': 0,
 'groups': [{'type': 'others',
   'name': 'Lists from other people',
   'count': 0,
   'items': []}]},
'hours': {'status': 'Closed until 7:30 AM tomorrow',
 'richStatus': {'entities': [], 'text': 'Closed until 7:30 AM tomorrow'},
 'isOpen': False,
 'isLocalHoliday': False,
 'dayData': [],
 'timeframes': [{'days': 'Mon-Fri',
   'open': [{'renderedTime': '7:30 AM-6:00 PM'}],
   'segments': []}]},
'pageUpdates': {'count': 0, 'items': []},
'inbox': {'count': 0, 'items': []},
'attributes': {'groups': []},
'bestPhoto': {'id': '59b6ff73029a552f8558b07b',
 'createdAt': 1505165171,
 'source': {'name': 'Yext Yext', 'url': 'http://yext.com'},
 'prefix': 'https://fastly.4sqi.net/img/general/',
 'suffix': '/87388367_IPX4JZLB_T_nHMtWX3w6ZkqkSB9p4PCM2vcG592T7b0.jpg',
 'width': 800,
 'height': 589,
 'visibility': 'public'}}
```

In [99]:

This venue has not been rated yet.

6. Results and Discussion

This section provides some insights on how the effectiveness of the fee subsidy program is related to the number of child care centres across districts and centre types. First, I aim to visualize the aspects of child care centres for the City of Toronto. I use bar charts to visualize the data.

From the bar chart, we see that the dataset can be briefly analyzed as the following:

- This report analyzes 1007 child care centres in Toronto as follows:
    - Based on center type we have the following;
        - 668 centers are Non-Profit. **(530 have Fee-Subsidy)**
        - 286 centers are Commercial. **(Only 94 have Fee-Subsidy)**
        - 53 centers are city operated. **(All have Fee-Subsidy)**
    - Based on Fee-Subsidy program we have:
        - 677 centers are accepting Fee-subsidy.
        - 330 centers are not having Fee-subsidy program.
    - Based on center Location:
        - 318 centers are located in Toronto East York.
        - 266 centers are located in North York.
        - 226 centers are located in Etobicoke York.
        - 197 cenetrs are located in Scarborough.
    - Total number of enrolled children in this report is = 68763 ranged from Infant-Toddler-Preschooler-Kindergarten-Gradelevel
    - Childern are distributed based on the type of the care centers as follows:
        - 48871 **(71% from total children)** are enrolled in *Non-Profit* centers.
        - 17230 **(25% from total children)** are enrolled in *Commercial* centers.
        - 2662 **(4% from total children)** are enrolled in *city-operated* centers.

clustering was applied to the data set based on the above categories. 5 clusters labels were in the range [0,1,2,3,4] as follows:

- **0: color = Red, commercial centers with fee-subsidy.**
- **1: color = Purple, Non-Profit centers with fee-subsidy.**
- **2: color = Blue, commercial centers with no fee-subsidy.**
- **3: color = Green, Non-Profit centers with no fee-subsidy.**
- **4: color = Yellow, City operated centers with fee-subsidy.**

7. Conclusion

Investigating the effectiveness of fee subsidy program is multidimensional. It is related to the data on the details of fee subsidy applications in the City of Toronto as well as the fee subsidy policy of child care centres and how many spaces are reserved for children with fee subsidy in these centres. Furthermore, Census 2016 can be used to uncover some demographic features in each district and their wards. This may help us to see which wards need more child care centres with fee subsidy contract.