Exploring Child care in Ontario in Toronto

1.   Introduction

In the past years, it can be difficult to find licensed or unlicensed child care for children in Ontario due to high fees and low availability of spaces for children. Toronto Children's Services found that 75% of families cannot afford child care, to which the provincial government pledged 100,000 new child care spaces from 2016 to 2026

1. **Research Question 1:** Is there significant differences between center with a fee subsidy contract and center with no subsidy?
2. **Research Question 2:** Is there significant differences between center is hosted by non-profit agency and other agency?

2.   Exploratory Data Analysis (EDA)

We proceeded with a comprehensive EDA to leverage insight that could potentially lead to interesting research questions. We started by describing our quantitative data as shown in *Figure 1* below. Additionally, we employed boxplots seen in *Figure 2* to visually represent the distribution of these features, after removing outliers. This descriptive analysis offered a clearer understanding of the general trends within each feature

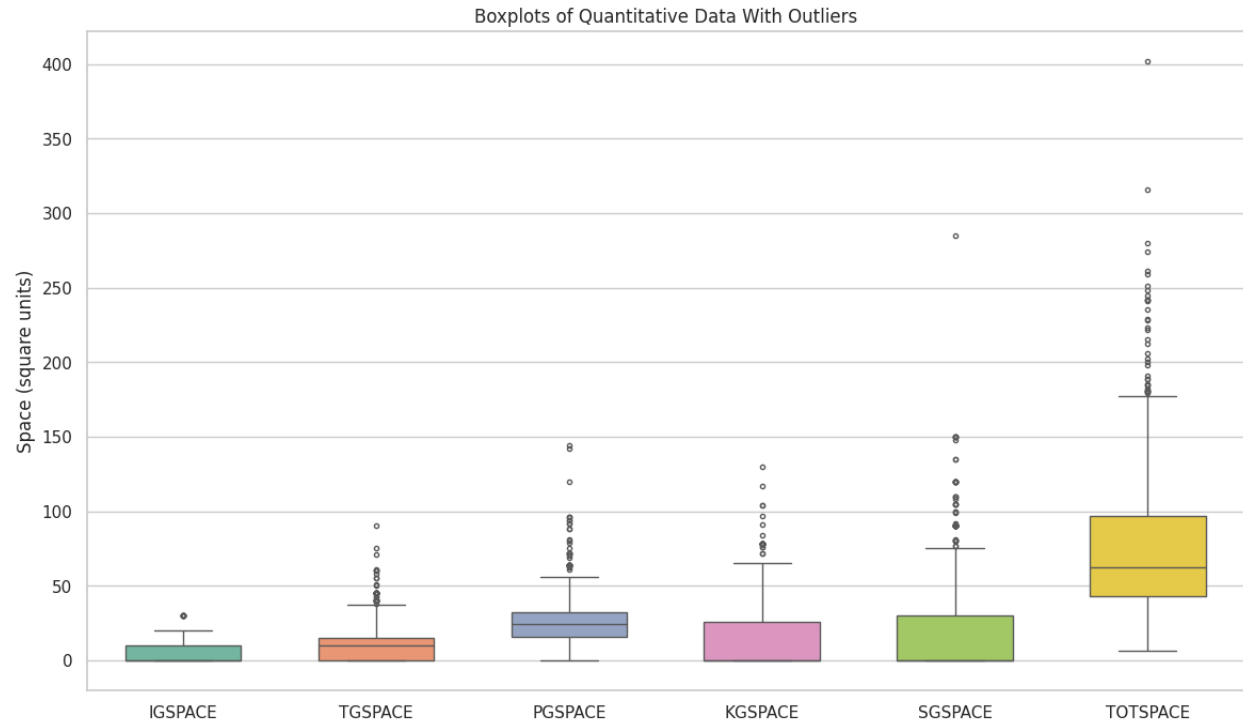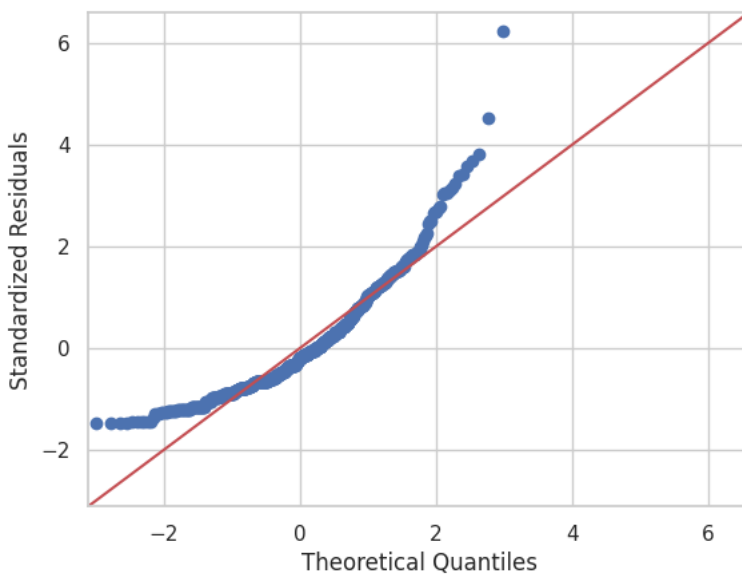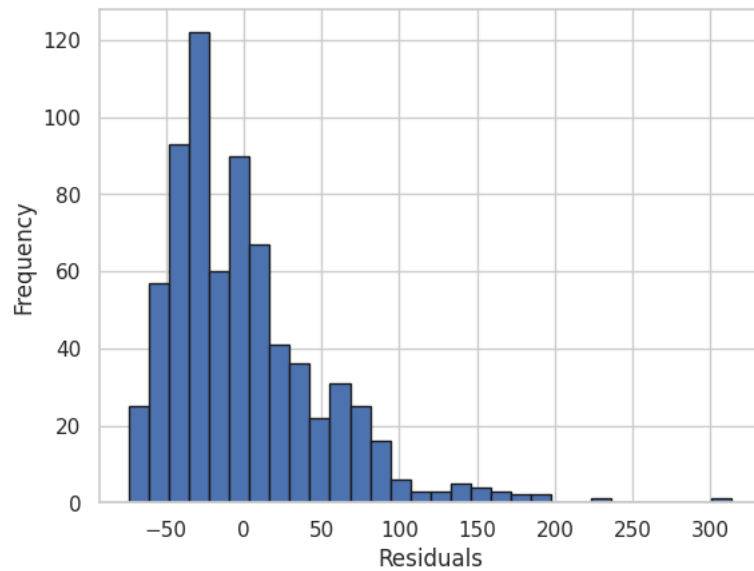|	_id	LOC_ID	ward	IGSPACE	TGSPACE	PGSPACE	KGSPACE	SGSPACE	TOTSPACE
count	1063.000000	1063.000000	1063.000000	1063.000000	1063.000000	1063.000000	1063.000000	1063.000000	1063.000000
mean	532.000000	8087.888053	12.511759	3.896519	11.600188	24.258702	14.257761	21.661336	75.674506
std	307.005972	5151.252693	7.032050	6.091782	12.088152	18.577416	20.493290	30.423503	47.816518
min	1.000000	1013.000000	1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	6.000000
25%	266.500000	1862.000000	6.000000	0.000000	0.000000	16.000000	0.000000	0.000000	43.000000
50%	532.000000	8826.000000	12.000000	0.000000	10.000000	24.000000	0.000000	0.000000	62.000000
75%	797.500000	13245.000000	19.000000	10.000000	15.000000	32.000000	26.000000	30.000000	97.000000
max	1063.000000	14504.000000	25.000000	30.000000	90.000000	144.000000	130.000000	285.000000	402.000000

Figure1

Figure2

Based on the boxplot above, we can see except the IGSPACE, other Spaces have lots of outliers, let try to figure it out in further analyze.
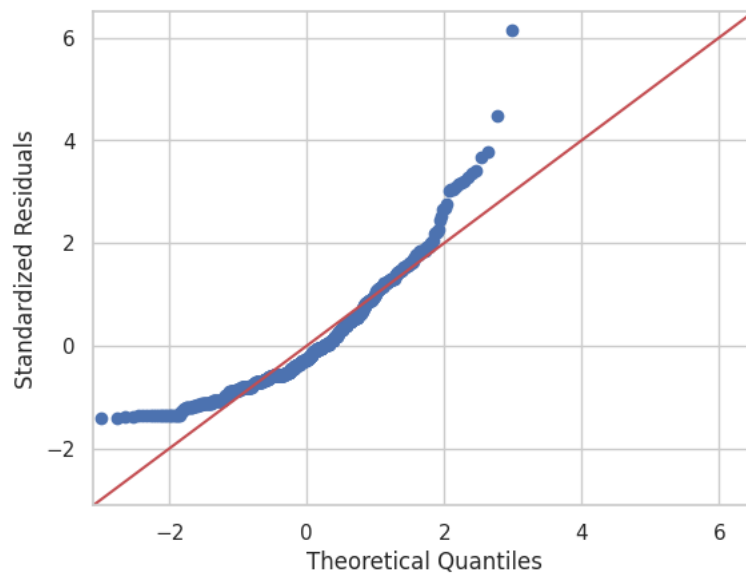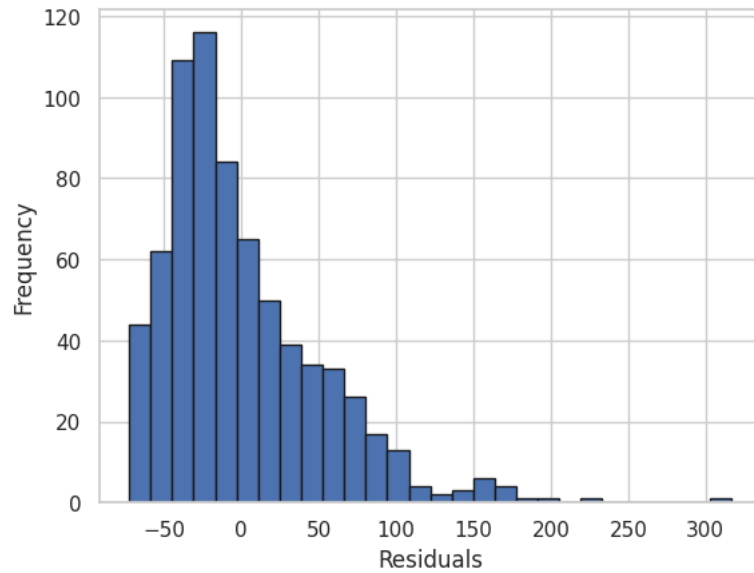
3.   Anova for subsidy

	group1	group2	Diff	Lower	Upper	q-value	p-value
0	Y	N	34.121178	24.784715	43.457641	10.147115	0.001

The p-value is revealed a significant difference (with $a = 0.05$), which means that if the child care agency has subsidy, more likely the more available space they are offer. We can understand that more money makes more space.
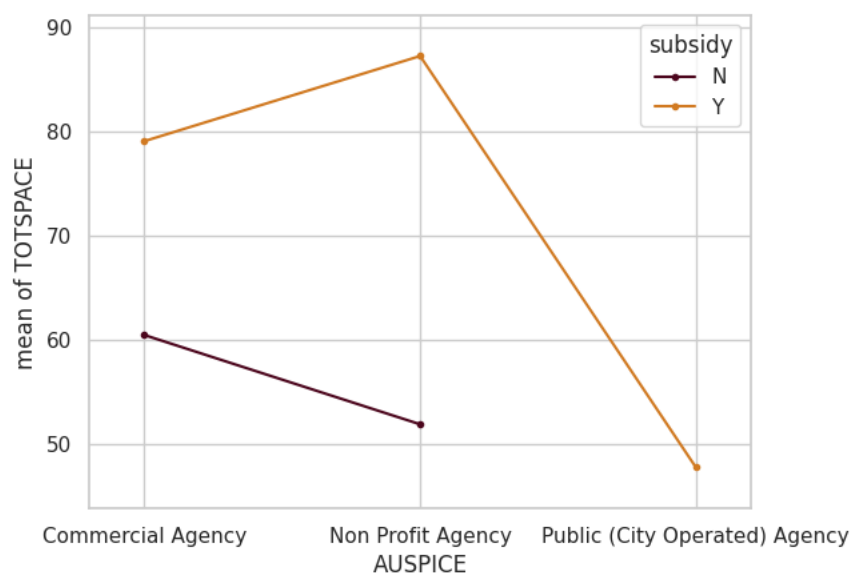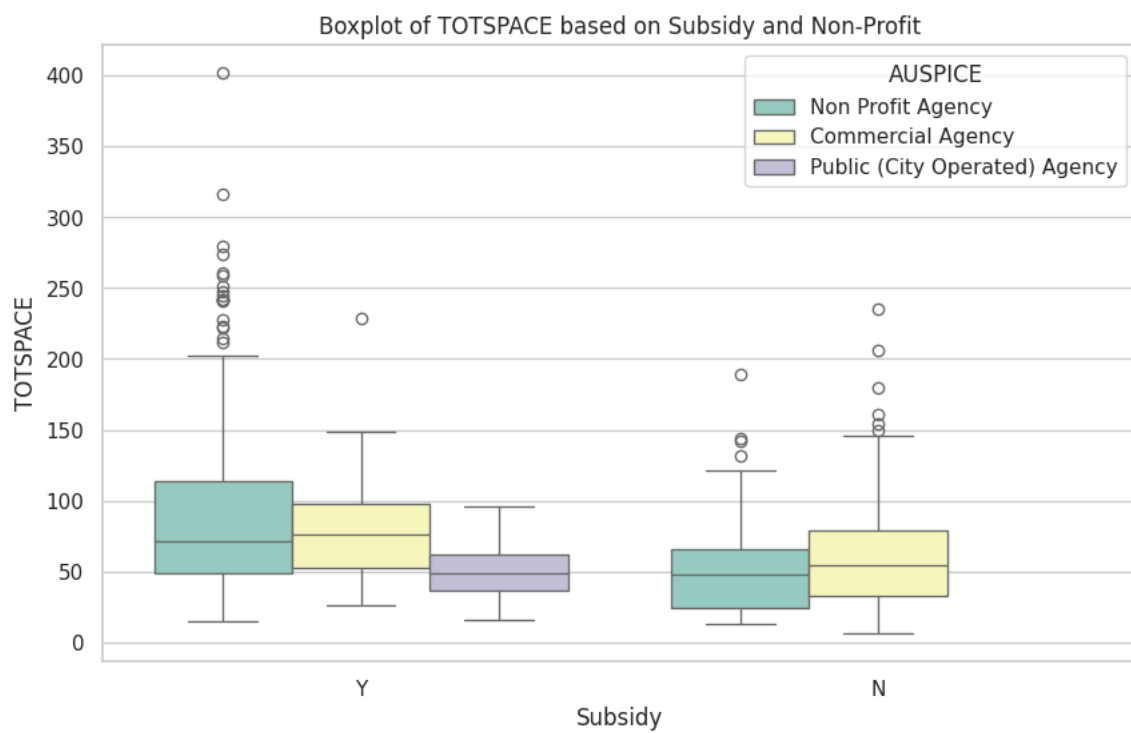
4.   Anova for subsidy

	group1	group2	Diff	Lower	Upper	q-value	p-value
0	True	False	19.905966	9.939864	29.872068	5.545732	0.001

Similarly, The p-value is revealed a significant difference (with $a = 0.05$), which means that if the child care agency are non-profit, more likely the more available space they are offer. We can understand that non-profit agency doesn't need to care about the money so they are more likely to build more space and let more family get benefits from them.

5. Two way Anova

Boxplot of TOTSPACE based on Subsidy and Non-Profit

	group1	group2	Diff	Lower	Upper	q-value	p-value
0	(Non Profit Agency, Y)	(Non Profit Agency, N)	44.986164	25.584897	64.387430	9.370204	0.001000

	group1	group2	Diff	Lower	Upper	q-value	p-value
1	(Non Profit Agency, Y)	(Commercial Agency, Y)	0.145138	-28.465689	28.755965	0.020500	0.900000
2	(Non Profit Agency, Y)	(Commercial Agency, N)	28.370552	11.192465	45.548638	6.674107	0.001000
3	(Non Profit Agency, Y)	(Public (City Operated) Agency, Y)	40.752830	8.307960	73.197700	5.075887	0.004757
4	(Non Profit Agency, Y)	(Public (City Operated) Agency, N)	0.000000	-inf	inf	0.000000	0.900000

Based on the Tukey HSD test results for the 'TOTSPACE' variable, we can make the following conclusions:

Significant Difference between Non-Profit Agencies with and without Fee Subsidy:

There is a significant difference in the mean 'TOTSPACE' between Non-Profit Agencies that have a fee subsidy ('Y') and those that do not ('N'). The mean 'TOTSPACE' for agencies with a subsidy is significantly higher (44.99 units) than for those without.

No Significant Difference between Non-Profit Agencies with Fee Subsidy and Commercial Agencies:

There is no significant difference in the mean 'TOTSPACE' between Non-Profit Agencies with a subsidy and Commercial Agencies, as the confidence interval for the difference includes zero.

Significant Difference between Non-Profit Agencies with Fee Subsidy and Commercial Agencies without Fee Subsidy:

There is a significant difference in the mean 'TOTSPACE' between Non-Profit Agencies with a subsidy and Commercial Agencies without a subsidy. The mean 'TOTSPACE' for agencies with a subsidy is significantly higher (28.37 units) than for Commercial Agencies without a subsidy.

Significant Difference between Non-Profit Agencies with Fee Subsidy and Public (City

Operated) Agencies with Fee Subsidy:

There is a significant difference in the mean 'TOTSPACE' between Non-Profit Agencies with a subsidy and Public (City Operated) Agencies with a subsidy. The mean 'TOTSPACE' for Non Profit Agencies with a subsidy is significantly higher (40.75 units) than for Public (City Operated) Agencies with a subsidy.

No Significant Difference between Non-Profit Agencies with Fee Subsidy and Public (City Operated) Agencies without Fee Subsidy:

There is no significant difference in the mean 'TOTSPACE' between Non-Profit Agencies with a subsidy and Public (City Operated) Agencies without a subsidy, as the confidence interval for the difference includes zero.

In summary, the presence of a fee subsidy appears to be a significant factor in determining the mean 'TOTSPACE,' particularly when comparing Non-Profit Agencies with a subsidy to those without, as well as to Commercial and Public (City Operated) Agencies with a subsidy.

6. Conclusion

Through quantitative analysis and visual exploration, we gained valuable insights about child Care in Toronto. Our findings suggest that subsidy and agency type have a significant impact on total space.