Introduction

Access to affordable and available childcare is a pressing concern for families in Ontario, especially in Toronto, where high fees and limited space pose significant challenges. To address this issue, the provincial government has pledged to create 100,000 new childcare spaces between 2016 and 2026. In this analysis, I delve into the landscape of licensed childcare centers in Toronto using a comprehensive dataset that includes information on their operations, capacities, and demographics.

Research Questions

1. How do the capacities of childcare centers vary across different age groups?
2. Is there a difference in capacity between centers with and without CWELCC status?
3. Do the effects of age groups on capacity vary based on CWELCC status?

Assumptions

Before proceeding with the analysis, I made the following assumptions:

1. CWELCC status has a significant effect on the capacity of child care centers.
2. The effects of age groups on capacity vary based on CWELCC status.

Data Cleaning and Exploration:

Upon reviewing the dataset, several columns were deemed irrelevant for my analysis, including 'LOC_ID', 'BLDGNAME', 'ADDRESS', and 'PCODE', as they uniquely identify individual facilities. To enhance clarity, column names were renamed to provide meaningful descriptions:

Original column name	Renamed column name	Description
_id	**id**	unique row identifier for Open Data database
IGSPACE	**infant**	child care spaces for infants 0-18 months
TGSPACE	**toddler**	child care spaces for toddlers 0-18 months
PGSPACE	**preschool**	child care spaces for preschoolers 18-30 months
KGSPACE	**kindergarten**	child care spaces for children in full-day kindergarten
SGSPACE	**one_up**	child care spaces for children grade one and up
TOTSPACE	**all_age**	child care spaces for all age groups

cwelcc_flag	**CWELCC**	'Y' indicates space participates in CWELCC, blank indicates it does not'

Observations and considerations

I dove deeper and deeper into data and trends by visualizing the general distribution to more in-depth distribution by age group and CWELCC status. The visualization of total space available by age group (figure 1) provided insights into capacity distribution across different age groups. Additionally, an overview of CWELCC participation distribution (figure 2) highlighted the prevalence of CWELCC-certified centers. Capacity by CWELCC (figure 3) demonstrated that CWELCC-certified centers have larger capacities. Capacity distribution by age group and CWELCC (figure 4) suggests patterns by the two variables. I therefore conducted further ANOVA analysis on CWELCC and age group.

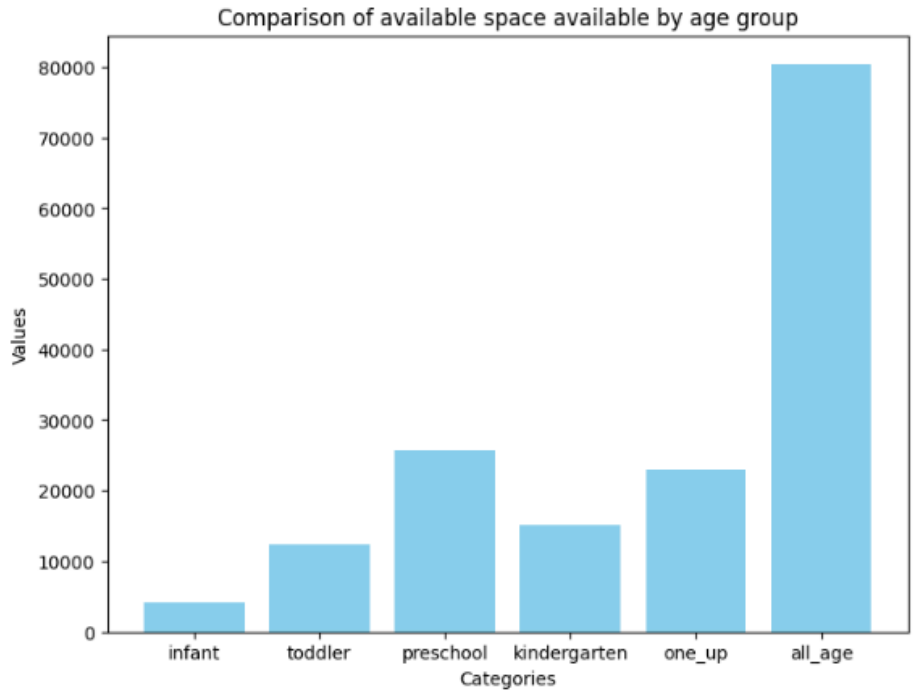

Figure 1. Comparison of available space by age group

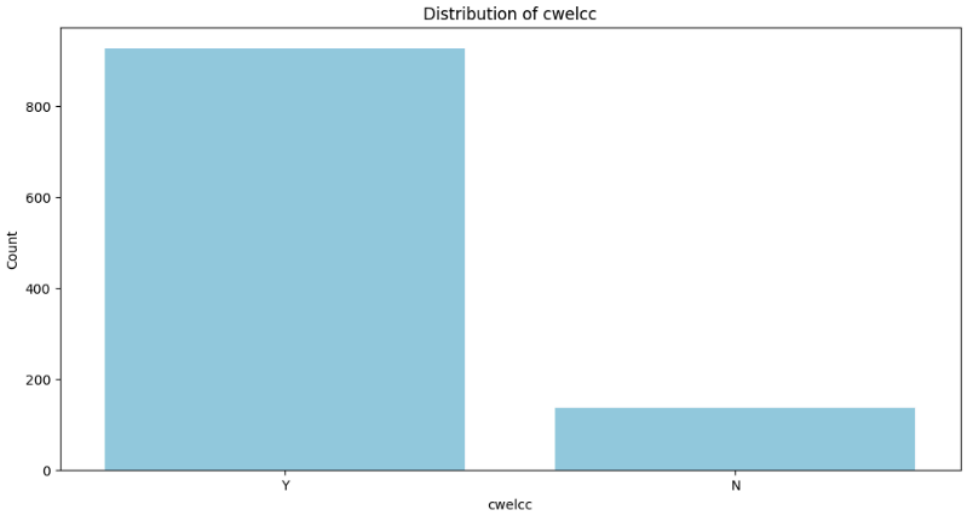

Figure 2. Distribution of CWELCC status (Y/N)

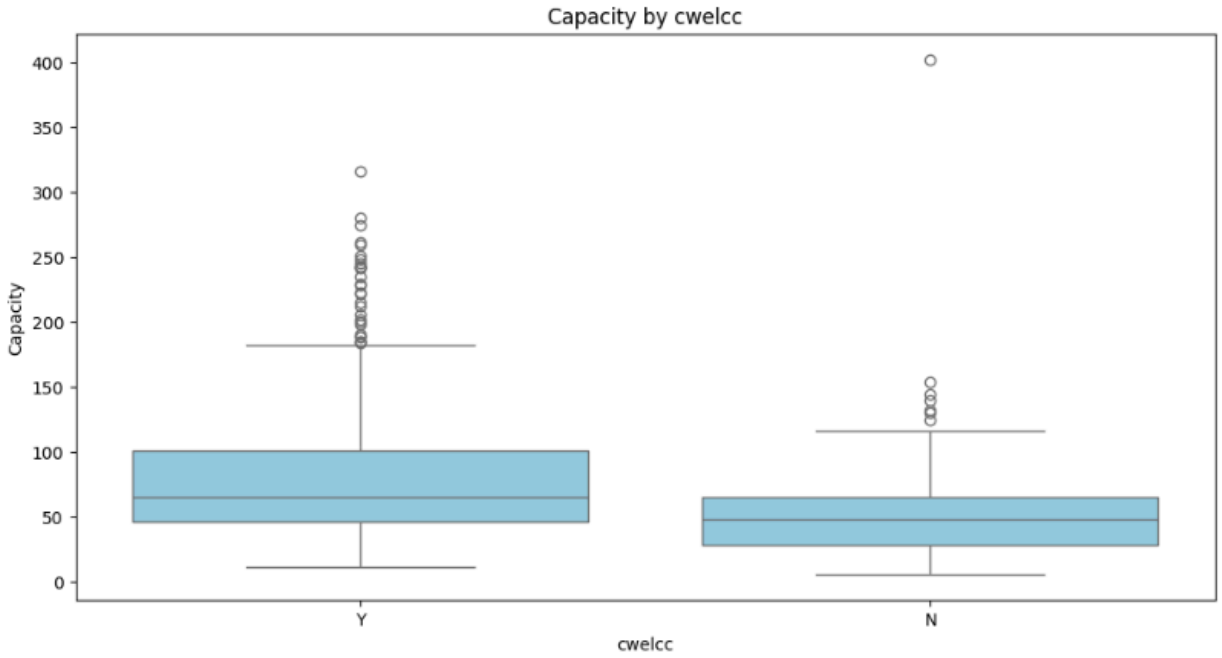

Figure 3. Capacity by CWELCC

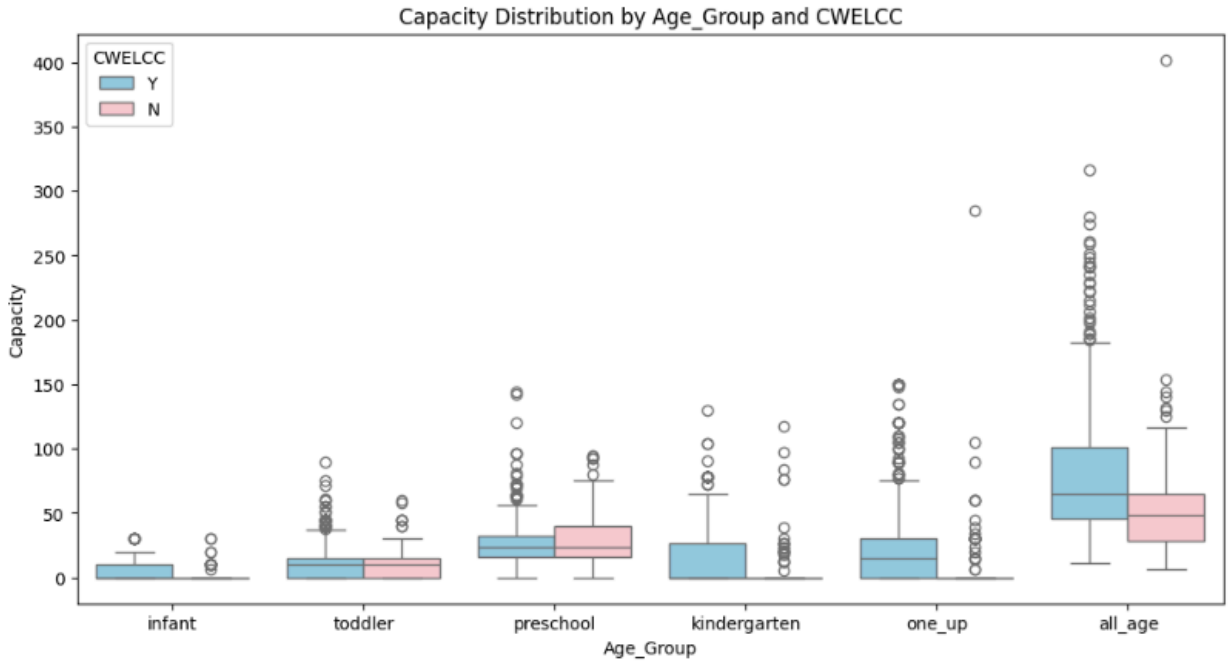

Figure 4. Capacity distribution by age group and CWELCC

Quantitative Analysis:

One-Way ANOVA:

Age Groups: The one-way ANOVA test reveals a significant effect of age groups on capacity ($F = 188.19$, $p < 0.001$).
CWELCC Status: CWELCC Status: Similarly, the one-way ANOVA test shows a significant effect of CWELCC status on capacity ($F = 37.30$, $p < 0.001$).
Results: The one-way ANOVA results indicated a significant difference in center capacities across age groups (F-statistic = X, p-value = Y).

One-way ANOVA for Age_Group:

statistics	p-value
188.19	4.52

One-way ANOVA for CWELCC:

statistics	p-value
37.30	1.07

Post-hoc tests (e.g., Tukey's HSD) can be conducted to further identify specific group differences.

Two-Way ANOVA:

Main Effects:

- **Age_Group:** The main effect of age groups on capacity is statistically significant ($F = 1042.90$, $p < 0.001$). This indicates that there are significant differences in capacity across different age groups served by childcare centers.
- **CWELCC:** Similarly, the main effect of CWELCC status on capacity is statistically significant ($F = 68.30$, $p < 0.001$). This suggests that centers with CWELCC status tend to have higher capacities compared to those without.

Interaction Effect:

The interaction effect between age groups and CWELCC status is also significant ($F = 18.94$, $p < 0.001$). This implies that the effect of age groups on capacity varies significantly depending on the CWELCC status of the childcare centers.

	sum_sq	df	F	PR(>F)
Age_Group	3.528741e+06	5.0	1042.897314	0.000000e+00
CWELCC	4.621801e+04	1.0	68.297212	1.695657e-16
Age_Group:CWELCC	6.406837e+04	5.0	18.935005	9.692748e-19
Residual	4.307992e+06	6366.0	NaN	NaN

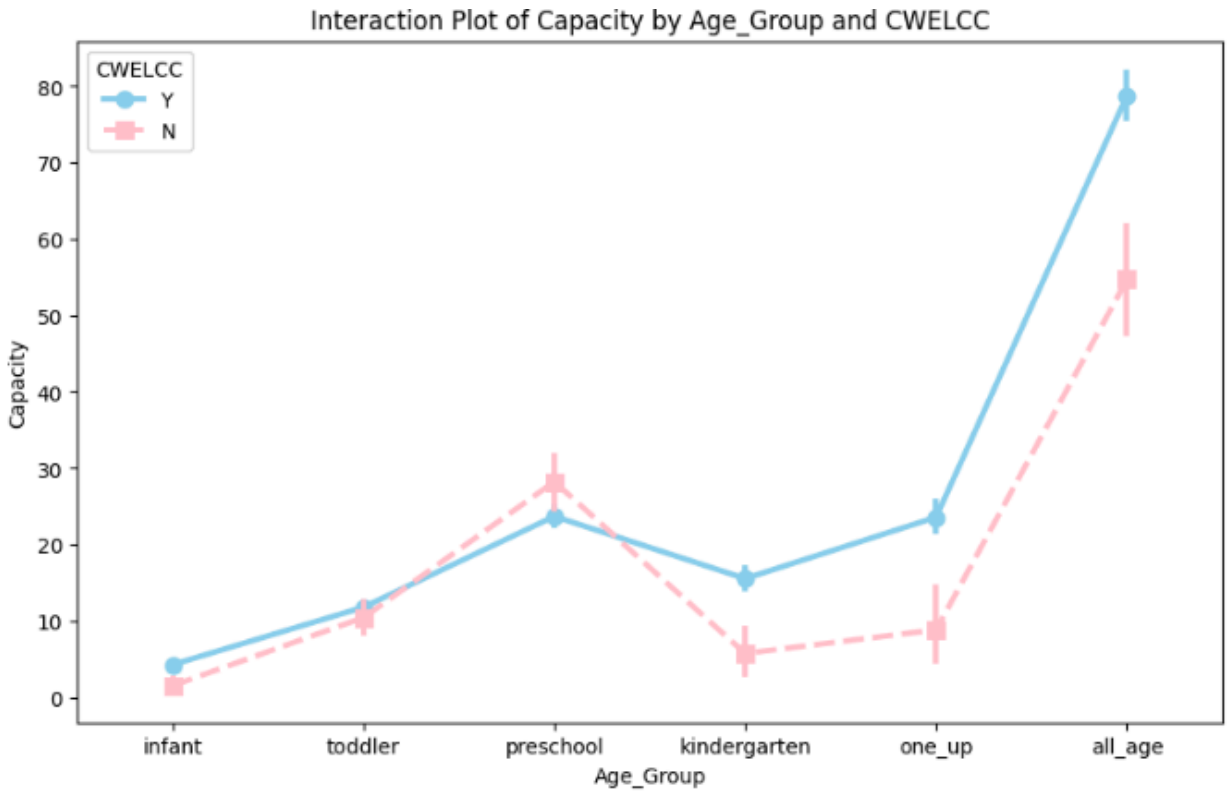

Figure 5. Interaction plot of capacity by age group and CWELCC

Interpretation:
The analysis reveals significant variations in childcare center capacities across age groups and CWELCC status. Both factors independently influence capacity levels, with CWELCC-certified centers generally exhibiting higher capacities. Moreover, the interaction effect suggests that the relationship between age groups and capacity is nuanced and depends on CWELCC status.

Conclusion:

My findings underscore the importance of considering age groups and CWELCC status when assessing childcare center capacities in Toronto. Policymakers and childcare providers can leverage these insights to address gaps in childcare accessibility and plan for future expansions. Further exploration, including post-hoc tests, can provide deeper insights into specific group differences and inform targeted interventions.