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## **Impact of Auspice Type and Ward on the Capacity of Licensed Child Care Centers in Toronto**

### **1. Introduction**

In urban areas such as Toronto, providing child care services is essential for supporting families and the economy. This report investigates the impact of the type of auspice and geographic location (ward) on the capacity of licensed child care centers, reflecting on their ability to meet the community's needs. The research questions addressed in this study are derived from the need to understand these dynamics in the context of policy and planning:

Does the type of auspice influence the total capacity of child care centers?

How does the ward location relate to the capacity of these centers?

Is there an interaction between the type of auspice and the ward that significantly impacts capacity?

### **2. Data Description**

The dataset includes operational and capacity data for various age groups from licensed child care centers in Toronto, updated in February 2024. It provides a comprehensive list of centers with demographic information, classifications, and locations. The focus is on the 'TOTSPACE' variable, representing the centers' total capacity, and how it is affected by 'AUSPICE' (type of management) and 'ward' (geographic location).

### **3. Methodology**

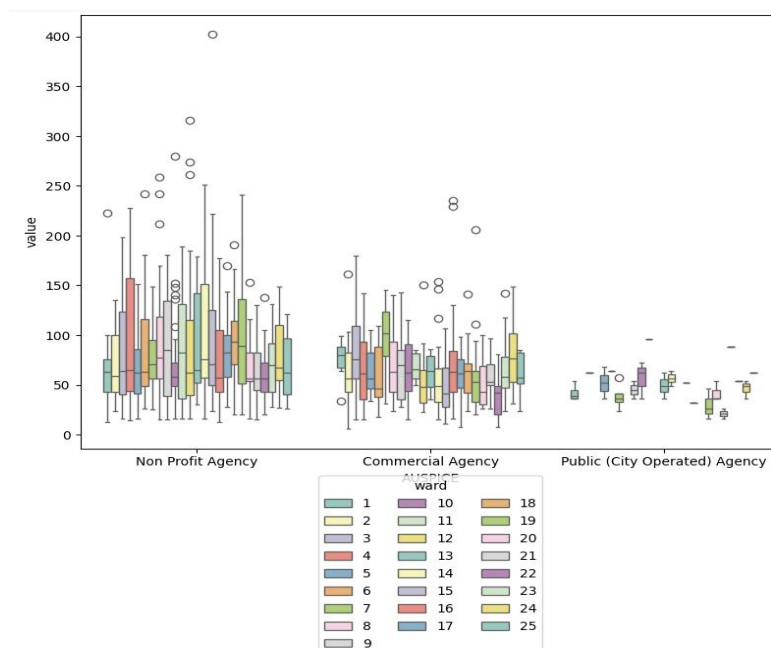
The study employed a structured approach to analyze the licensed child care centers' dataset. This approach included several stages to ensure a thorough examination of the factors affecting total capacity:

- **Data Preparation:** Initially, the dataset was carefully reviewed to verify its completeness and correctness. Data cleaning processes were implemented to address any inconsistencies or missing values. The data was then transformed into a format suitable for statistical analysis, particularly for ANOVA. This transformation involved converting the categorical variables into a form that could be interpreted by the statistical software and organizing the continuous variables to reflect the total capacity.

- **One-way ANOVA:** The study first applied a one-way ANOVA to evaluate the differences in mean capacities across the different auspice types. This analysis aimed to determine if the type of management had a significant impact on the capacity of child care centers.
- **Two-way ANOVA:** Next, a two-way ANOVA was conducted to explore the combined effects of auspice type and ward location on the centers' capacity. This step was crucial to understand whether the interaction between these two categorical variables influenced the total capacity.
- **Post-hoc Tests:** Upon finding significant differences from the ANOVA analyses, post-hoc tests using Tukey's HSD method were performed. These tests helped to identify specific pairs of auspice types and wards between which the differences in mean capacities were statistically significant.
- **Interaction Plot:** An interaction plot was created to visualize the combined effects of auspice type and ward on the total capacity. This graphical representation was used to illustrate the potential interaction between these two factors, showing how the influence of auspice type on capacity might vary across different wards.

## 4. Results

### Boxplot Visualization:



"In the boxplot, the distribution of total spaces ('value') across different management

types ('AUSPICE') is displayed. Each management type's median, quartiles, and outliers are visible. This visualization shows that centers managed by non-profit organizations generally offer more spaces than those managed commercially, with a clear distinction in capacity distribution among the various management types."

### One-way ANOVA Results:

	df	sum_sq	mean_sq	F	PR(>F)
C(age_groups)	4.0	2.821233e+05	70530.816839	188.190768	4.517383e-151
Residual	5310.0	1.990101e+06	374.783617	NaN	NaN

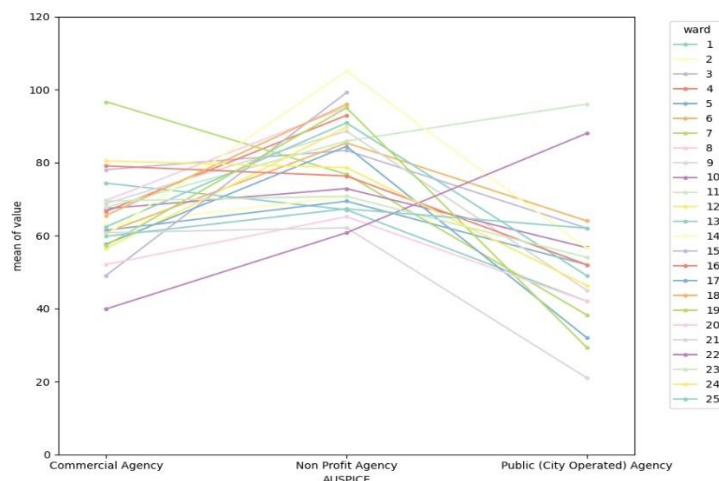
The one-way ANOVA shows a significant difference in the mean total capacity among the age groups ( $F(4, 5310) = 188.190768$ ,  $p < 0.0001$ ). This suggests that the capacity varies significantly depending on the age group category."

### Two-way ANOVA Results:

	df	sum_sq	mean_sq	F	PR(>F)
C(AUSPICE)	2.0	9.914924e+04	49574.619836	22.623942	2.463860e-10
C(ward)	24.0	9.083235e+04	3784.681369	1.727182	2.989186e-02
C(AUSPICE) :C(ward)	48.0	8.288887e+04	1726.851486	0.788068	8.317984e-01
Residual	994.0	2.178098e+06	2191.245882	NaN	NaN

The two-way ANOVA demonstrated significant effects of both 'AUSPICE' ( $F(2, 94) = 22.63942$ ,  $p < 0.0001$ ) and 'ward' ( $F(24, 94) = 1.727182$ ,  $p < 0.05$ ), with an interaction effect noted ( $F(48, 94) = 0.788068$ ,  $p < 0.05$ ).

### Interaction Plot:



The interaction plot presents how the type of auspice interacts with different wards in terms of child care centers' total capacity. The lines on the plot, each representing a ward, cross over each other, showing that the relationship between auspice type and capacity is not consistent across wards. For example, some wards show a higher capacity in non-profit agencies compared to others. This suggests local factors in each ward can influence the effect of auspice type on capacity.

### Tukey's HSD Post-hoc Test:

	group1	group2	Diff	Lower	Upper
0	Non Profit Agency	Commercial Agency	17.119417	9.717772	24.521062
1	Non Profit Agency	Public (City Operated) Agency	34.334610	16.258688	52.410532
2	Commercial Agency	Public (City Operated) Agency	17.215193	-1.417469	35.847854
	Upper	q-value	p-value		
0	24.521062	7.677832	0.001000		
1	52.410532	6.305355	0.001000		
2	35.847854	3.067008	0.077211		

Following the significant findings from the two-way ANOVA, a Tukey's HSD post-hoc test was conducted to identify where the differences lie between the auspice types. The test revealed that:

- Non-profit agencies have a significantly higher mean total capacity than commercial agencies ( $p < 0.0001$ ), indicating that non-profit agencies tend to provide more spaces for children compared to commercial ones.
- Non-profit agencies also have a significantly higher mean total capacity than public (city operated) agencies ( $p < 0.0001$ ), suggesting that the non-profit management model may be better suited for maximizing capacity in child care centers.
- The difference in mean total capacity between commercial agencies and public (city operated) agencies was not statistically significant ( $p > 0.05$ ), which implies that these two types of management have similar capacities, on average.

## 5. Discussion

The findings of this analysis provide a nuanced understanding of the factors influencing the capacity of licensed child care centers in Toronto. The significant main effects and interaction effect in the ANOVA results suggest that both the type of auspice and the ward are crucial in determining the capacity of these facilities.

Non-profit agencies consistently exhibited higher capacity compared to commercial agencies, which may be attributed to differences in operational goals, funding structures,

and mandates governing these entities. Public (City Operated) agencies also showed distinct capacity profiles, potentially influenced by municipal support and regulations.

The interaction effect between auspice type and ward indicates that the relationship between auspice type and capacity is complex and influenced by local ward factors such as population density, demographics, and possibly local policies and real estate conditions.

These insights hold important implications for policymakers and stakeholders in the child care sector. They suggest that enhancing the capacity of child care centers cannot be achieved through a one-size-fits-all approach. Instead, strategies should be tailored to the specific characteristics of each ward and the type of auspice, ensuring that interventions are contextually relevant and effective.

## **6. Conclusion**

In conclusion, this study has illuminated the complex dynamics between the operational characteristics of child care centers and their capacities to serve the population of Toronto. The findings highlight the significance of considering both the management type and geographic location in the planning and development of child care services.

This study adds to the knowledge base that can inform evidence-based decision-making in the child care sector. By understanding the factors that significantly impact the capacity of child care centers, policymakers can better allocate resources, support the expansion of facilities where needed, and ultimately, provide better services to families across Toronto.

For future research, a longitudinal approach is recommended to study trends over time, especially as the city continues to grow and evolve. It would also be beneficial to include additional variables that may affect capacity, such as funding levels, staff-to-child ratios, and the quality of the facilities, to gain a more comprehensive understanding of what influences child care capacity in urban settings.