Age Matters: Does Older Mean Lower Compliance in Building Standards?*

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This paper examines the relationship between building age and compliance with building standards in Toronto, focusing on whether older buildings are more likely to have lower evaluation scores. Using data from the open toronto, we analyzed over 3,000 buildings of varying property types, including Private, Social Housing, and TCHC properties. Our findings indicate that as buildings age, their compliance scores generally decline, particularly around the 50-year mark, which appears to be a critical period for maintenance and renovation needs. Social Housing properties demonstrate the highest average scores, suggesting better management and upkeep compared to other property types. Interestingly, very old buildings, those over 150 years, show a slight recovery in scores, likely due to restoration efforts for historically significant structures. These results highlight the importance of targeted interventions and resource allocation to maintain building standards as properties age, ensuring safe and livable conditions for residents.

1 Introduction

Toronto is a diverse city that offers a wide range of housing options for individuals and families. From historic Victorian homes to modern and contemporary condominiums, there is a housing type to suit each homeowner's unique needs and preferences. (Marin 2024)

Ensuring that these buildings meet contemporary property standards is essential for the safety and quality of life of residents. However, as buildings age, they may encounter increased maintenance issues, structural deterioration, and regulatory non-compliance. This situation is particularly concerning for older buildings, which may struggle to adhere to evolving safety and accessibility standards due to outdated infrastructure and design (Building Radar 2024).Understanding these dynamics is crucial for policymakers and property managers to allocate

*Code and data are available at: https://github.com/Changtong56/-Apartment-Building-Evaluations.git resources effectively and ensure that all residents, regardless of the age of their buildings, can live in safe and well maintained environments.

Our analysis covers RentSafeTO data and focuses on identifying patterns in compliance scores across building age groups.(City of Toronto) We use statistical methods to explore whether older buildings always score lower. Various packages were also used in the processing, cleaning, and presentation of this information such as tidyverse (Wickham et al. 2019), here (Müller 2020), knitr (Xie 2023a), tinytex (Xie 2023b), dplyr (Wickham et al. 2023), and janitor (Firke 2023).Section 2 describes the dataset and outlines the analysis methodology. Section 3 presents the results of the analysis, including a discussion of the key trends and patterns observed in the data. Section 4 presents the parts of this study that need improvement.

2 Data

The dataset used in this analysis is from the City of Toronto's Open Data Portal and is part of the RentSafeTO program established in 2017. The program requires owners and operators of apartment buildings with three or more floors or 10 or more units to comply with building maintenance standards. The program was introduced to ensure that rental housing in Toronto is safe and well-maintained for tenants.(City of Toronto)

The dataset includes assessment scores for buildings registered with RentSafeTO. The assessment of a building's compliance with property standards is calculated by adding the passive score (applicable orders or violation notices) to the active score (the most recent building assessment score). The score ranges from zero to 100. Higher scores indicate that the building is becoming more compliant.(City of Toronto) The dataset includes 3383 variables in 6 different catagr,

Table 1: Table 1: Summary of Building Evaluation Scores by Property Type

property_type	Total_Buildings	Avg_Total_Score	Min_Score	Max_Score
PRIVATE	2849	87.20358	17	100
SOCIAL HOUSING	223	88.83408	46	100
TCHC	311	86.59518	26	98

Table 1 summarizes the total number of buildings and their evaluation scores by property type in Toronto. Among the three property types, Private properties have the highest number of buildings with 2849, an average total score of 87.20, and a score range from 17 to 100. Social Housing properties have 223 buildings with an average score of 88.83, ranging from 46 to 100. TCHC properties include 311 buildings, with an average score of 86.60 and a range from 26 to 98.

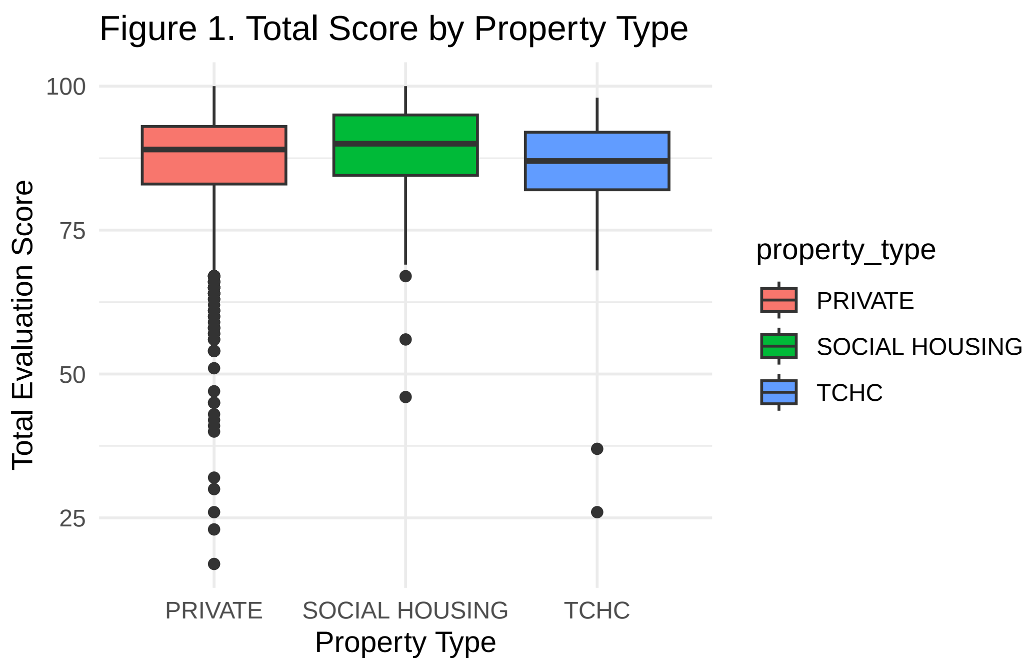

Figure 1 visualizes the total evaluation scores of different property types in Toronto, including Private, Social Housing, and Toronto Community Housing Corporation (TCHC).

Private Properties (Red): Scores are mostly concentrated between 85 and 100. There are some outliers below 50, indicating a few properties with significantly lower scores. Social Housing (Green): Scores are tightly clustered between 85 and 100, with a median around 95, which is the highest among the three property types. There are few outliers. TCHC (blue): Scores are between 75 and 100, and although slightly lower, the overall distribution is more concentrated, with fewer outliers, but the distribution is not very spread out.

Overall, Social Housing properties demonstrate the highest and most stable evaluation scores, while TCHC properties show a slightly broader distribution but remain generally concentrated around a high score range. Private properties exhibit a few more low-scoring, but the majority of scores remain high.

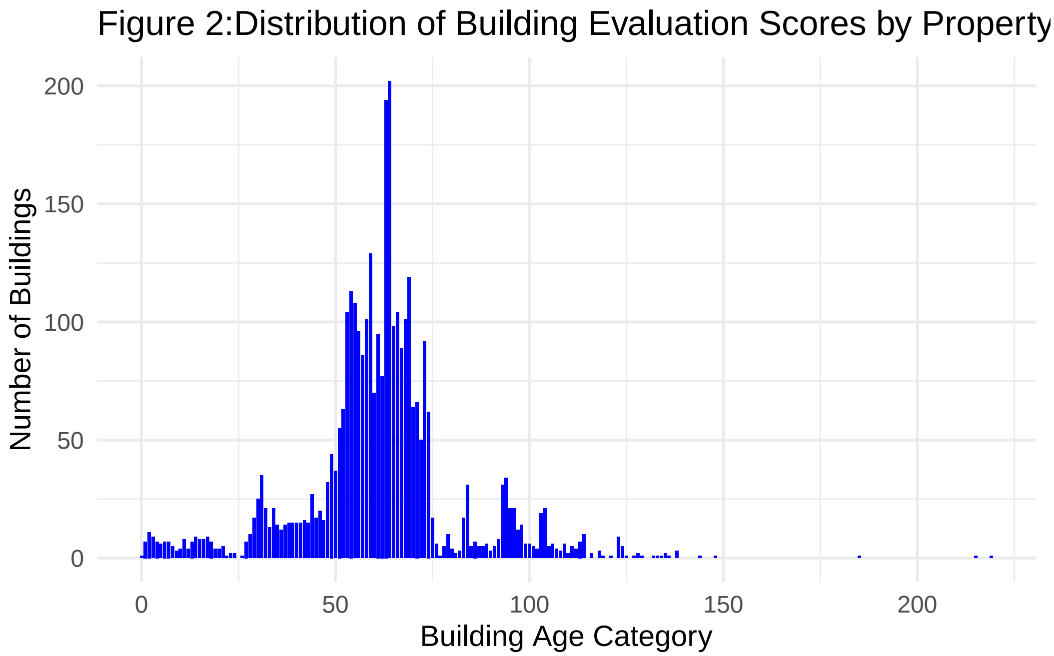

Figure 2 displays the distribution of building evaluation scores by property type, plotted against the building age category. The X-axis represents the "Building Age Category," while the Y-axis indicates the "Number of Buildings."

As the building age category increases beyond 75 years, the number of buildings sharply declines. Very few buildings fall into the 100 to 150 years range, and virtually no buildings are found in the 150+ years category. This may reflect fewer older buildings being part of the dataset or a lower survival rate of such buildings.

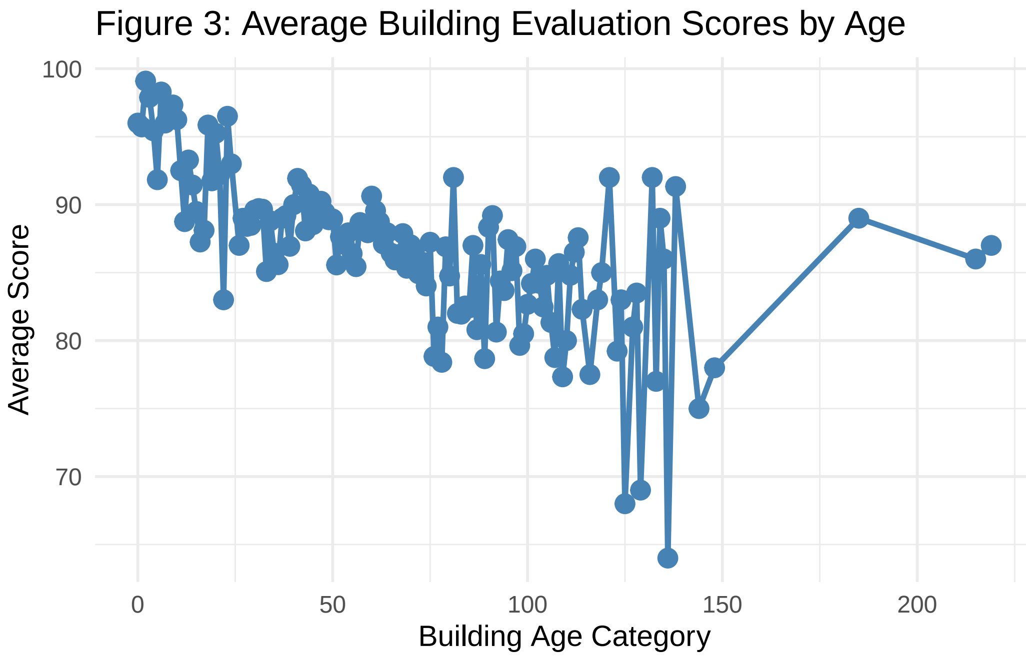

Figure 3 shows the average building evaluation scores plotted against the building age category. The X-axis represents the "Building Age Category," while the Y-axis indicates the "Average Score" for buildings within each category.

There is a noticeable downward trend in average evaluation scores as building age increases from 0 to around 100 years. Between the ages of 50 and 100 years, the average scores tend to stabilize around the 80 to 90 range. Despite some fluctuation, the overall trend shows less dramatic decreases in scores compared to earlier ages. A significant drop in scores occurs around the 100 to 150-year mark, where average scores dip below 80, and the variability increases dramatically. After this sharp decline, there is an upward recovery trend around the 150-year mark, where scores rise again.

3 Results

According to the figure 3, Newer Buildings (<50 years old): Generally maintain high average scores, often above 90. This is likely due to better construction standards, newer materials, and more effective maintenance practices. Middle-aged Buildings (50-100 years old): Scores stabilize, reflecting a balance between aging infrastructure and potential renovations or maintenance efforts. This age group represents a critical period where building upkeep is necessary to prevent further decline. Very Old Buildings (>100 years old): These buildings show highly variable scores, indicating a diverse range of conditions. Some may have been well-preserved due to historical significance, while others may have experienced substantial degradation.

4 Discussion

Based on my analysis, it is evident that the age of a building significantly impacts its evaluation scores. Figure 2 shows that the majority of buildings fall within the 30 to 60-year age range, with a sharp peak around the 50-year mark. This suggests that many buildings in Toronto were constructed during a particular period, and as these buildings age, they approach a critical point in their lifecycle, necessitating regular maintenance and evaluation to maintain compliance with standards.

Figure 3 delves deeper into the relationship between building age and evaluation scores, revealing a clear downward trend as buildings get older. Scores start high for newer buildings but begin to drop steadily after about 30 years. This decline indicates that older buildings face challenges such as aging infrastructure and potentially inadequate maintenance, which contribute to lower compliance with building standards. Interestingly, the graph also shows a slight recovery in scores after the 150-year mark, likely reflecting restoration and preservation efforts for historically significant buildings.

Overall, these findings emphasize that building age plays a crucial role in compliance with standards. Targeted interventions and resource allocation, particularly for mid-aged buildings around the 50-year mark, could help improve compliance and extend the lifespan of these structures.

5 Improvemrnt

To improve the analysis, several data-related enhancements could be considered. One significant improvement would be to compare evaluation scores across different property types separately, rather than aggregating them. This would help identify specific challenges and maintenance needs unique to each property type. For instance, comparing Private, Social Housing, and TCHC properties in terms of how their scores change with building age could reveal whether certain types of properties are more resilient to aging or require more frequent maintenance.

In summary, refining the analysis by comparing scores across property types, building characteristics, and evaluation frequency, along with incorporating a temporal dimension, would provide a more comprehensive understanding of how building age impacts compliance with standards.

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