

Assessing the Impact of the Toronto Transit Commission Transport Bus Initiative: Rising Demand and Shelter Capacity Challenges During Winter 2023-2024*

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This paper conducts an analysis on the daily usage of the TTC Transport Bus Initiative, launched to give transportation and temporary shelter for homeless individuals during winter in Toronto. We discovered that despite that demand for the service went up over time, many individuals were stationary because of shelter capacity limitations, with fewer clients being relocated to warming centers. These findings illustrate the challenges in logistics encountered by the initiative and stress the requirement for better shelter capacity and transportation public health interventions in the future. This analysis informs better planning for similar services in extreme weather conditions.

1 Introduction

The Toronto Transit Commission (TTC) Transport Bus Initiative was launched in response to the rising need to give shelter and transportation for homeless individuals during the winter in Toronto. Running from November 2023 to April 2024, the initiative deployed buses at Union and Spadina Stations to offer transportation to warming centers and shelters, and also intermission at Spadina Station when shelters were full. The main objective was to relieve the pressures of cold weather on vulnerable groups by providing safe and accessible options for warmth and transportation overnight.

There has been limited analysis of the program's usage patterns and overall effectiveness. The dataset gathered from this program provides an opportunity to investigate daily patterns in

*Code and data are available at: <https://github.com/JessLiang02/TTC-Transport-Bus-Initiative-TimeSeries-Analysis.git>

service usage, including the number of total clients who used the service, those transported to shelters, and those who remained stationary in one of the stations. Studying these patterns not only helps understand program utilization but also illustrates logistical difficulties, such as shelter capacity constraints, which might have affected the program’s effectiveness.

This study examines daily data from the TTC Transport Bus Initiative, with an angle on the distributions of and relationships between total clients, transported clients, and stationary clients. We examine variations in service demand and the impacts of shelter capacity limitations. The findings of this analysis reveal critical patterns in service usage and inform how the program adapted to changing needs throughout the winter. These findings are vital for informing implementations of provision of support to homeless individuals in similar conditions.

For this analysis, we use **R** for all numerical computations and data visualizations (R Core Team (2023)), along with the **tidyverse** suite of packages for data processing and graphing (Wickham et al. (2019)). The **opendatatoronto** package was used to retrieve open data provided by the City of Toronto pertinent to the Transport Bus Initiative (Gelfand (2022)). Furthermore, the **modelsummary** package was utilized for constructing and formatting tables and summary statistics (Arel-Bundock (2022)), and the **here** package facilitated reproducibility by handling file path management (Müller (2020)).

The remainder of this paper is structured as follows: in Section 2, we introduce the dataset and explain the variables used in the analysis. This is followed by a detailed examination of patterns and trends identified through data visualizations and tabular summaries of key characteristics. We conclude with a discussion of the findings in the context of broader challenges encountered by the program and provide recommendations for future policy decisions and service improvements.

2 Data

2.1 Data Source and Context

The dataset analyzed in this study came from the TTC Transport Bus Initiative that operated between November 15, 2023, and April 15, 2024. The program was launched to respond to the rising number of homeless individuals using Toronto’s transit system, the TTC, during the winter months. Throughout this period, buses were stationed at Union and Spadina Stations to transport individuals to shelters and warming centers. When these centers hit capacity, buses stayed at Spadina Station to provide temporary respite.

The dataset contains daily records on the number of “Total clients,” “Clients transported” to shelters, and those who were stationary. No personal data was recorded, guaranteeing anonymity of the clients. But this also limits the ability to track unique clients over multiple

days, as the same client may have used the service on numerous occasions. Nonetheless, the dataset provides information on the scale and details of the program.

2.2 Ethical and Analytical Considerations

The non-collection of personal information, which safeguards the privacy and dignity of individuals using the service, aligns with ethical standards.. This aligns with ethical standards concerning data collection from vulnerable populations. From an analytical perspective, the dataset contains aggregate daily counts, rendering it suitable for time-series analysis and trend assessment. But the lack of individual-level data is a limitation in evaluating the longitudinal service usage by the same clients across different periods.

The sections that ensue will give a detailed overview of the variables, their distributions, and the relationships among them, illustrated through visualizations and tabular representations.

2.3 Variable Definitions and Descriptions

The dataset contains three key variables: “Total clients,” representing the number of individuals using the service each day; “Clients transported,” denoting those taken to shelters or warming centers; and “Clients stationary,” referring to those who remained at Spadina Station because of limited shelter capacity. Each variable is a straightforward count. Also, the dataset has a “Date” variable that records the date of each service observation.

2.4 Visualization of the Data

Figure 1 illustrates the daily usage patterns of the TTC Transport Bus Initiative from November 2023 to April 2024, focusing on “Total clients,” “Clients transported,” and “Clients stationary.” The “Total clients” (purple) line shows a consistent rise throughout the winter, indicating growing demand as colder weather set in. This upward trend suggests that worsening outdoor conditions led more individuals to rely on the service.

The “Clients stationary” (yellow) line closely mirrors the “Total clients,” with significant overlap. This demonstrates that while more clients looked to use the service, many could not be transported and had to remain at Spadina Station. The close alignment between these two lines reflects shelter capacity limits, which forced many to stay on-site instead of being transported to warmer locations. On the contrary, the “Clients transported” (green) line stays relatively low and sporadic. While there are occasional spikes early in the program, the number of transported clients decreases over time. This implies that as the program progressed, fewer clients were transported elsewhere, likely due to shelters and warming centers being at capacity more often. The combination of a lower transport rate and an increasing number of stationary clients demonstrates that the program increasingly served as a temporary shelter at Spadina Station.

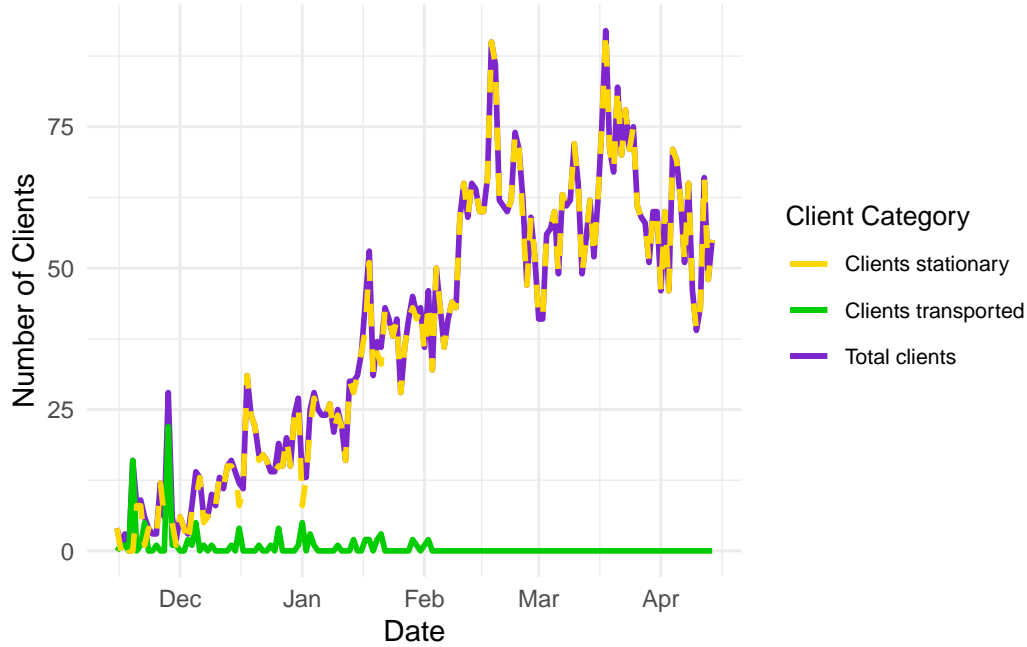


Figure 1: Time Series of Total clients, Clients transported, and Clients stationary, based on the Transport Bus Initiative Usage.

In summary, the plot illustrates the crucial role of the program during winter, demonstrating both the rising reliance on the service and the constraints due to shelter capacity. The program provided shelter for clients who had to remain stationary when transportation was not available.

Figure 2 provides a detailed overview of the daily usage patterns of the TTC Transport Bus Initiative.

In Figure 2a, we observe a wide range of client counts, with some days seeing fewer than 10 clients, while others exceeded 75. This variability suggests that demand fluctuated throughout the period, likely influenced by external factors such as weather conditions or the availability of shelter space. Peaks between 50 and 75 clients indicate particularly high demand on certain days.

Figure 2b, on the other hand, reveals that most days had very few individuals transported to warming centers or shelters, with the majority of days showing only 0–1 clients transported. This suggests that the transport services were underutilized, possibly due to limited shelter availability or logistical challenges. Days with higher numbers of transported clients were relatively rare, reinforcing the idea that capacity limitations affected the transport process.

Figure 2c shows that many individuals remained at Spadina Station, with stationary counts frequently ranging between 25 and 75 clients. This closely mirrors the trend seen in Total

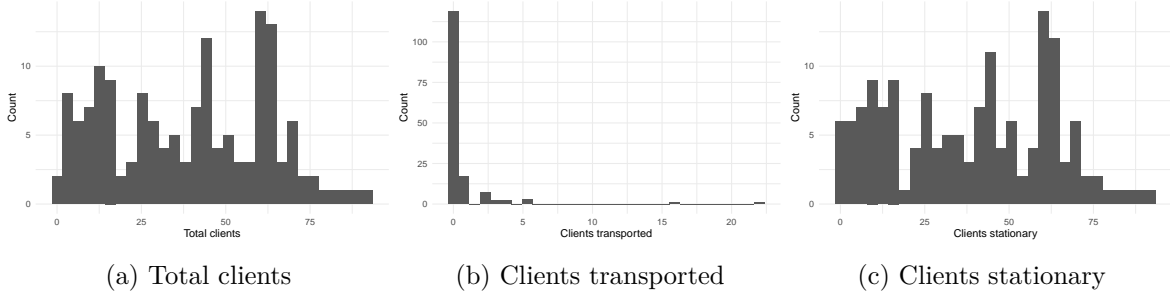


Figure 2: Distributions of Total clients, Clients transported, and Clients stationary, based on the Transport Bus Initiative Usage.

Table 1: Summary Statistics of key variables in the TTC Transport Bus Initiative Usage.

	Unique	Missing Pct.	Mean	SD	Min	Median	Max
Total clients	70	0	38.8	23.4	0.0	41.0	92.0
Clients transported	8	0	0.6	2.4	0.0	0.0	22.0
Clients stationary	67	0	38.1	24.0	0.0	41.0	92.0

clients, indicating that when demand was high, many clients had to stay at the station, likely due to shelters reaching full capacity.

In summary, Figure 2a, Figure 2b, and Figure 2c collectively highlight the fluctuating demand for the service and the significant number of clients who remained stationary. These figures underscore the challenges the initiative faced in accommodating all individuals, particularly when shelter capacity was limited.

Table 1 displays summary statistics for “Total clients,” “Clients transported,” and “Clients stationary.” Both “Total clients” and “Clients stationary” have similar distributions, with means around 38 and medians of 41, demonstrating that most people were stationary at Spadina Station. On the contrary, “Clients transported” has a much smaller mean of 0.6 and a median of 0, indicating minimal transportation to shelters, probably because of capacity limitations. The high variations in stationary individuals demonstrate the program’s role in providing temporary respite, which serves as temporary shelter, at the station.

In conclusion, the analysis showcases the growing reliance on the TTC Transport Bus Initiative during the winter months, with the majority of clients remaining stationary because of limited shelter capacity. The low transport rates lead to logistical issues in transporting people to warming centers. These findings stress the requirement for improved shelter capacity and transportation to better support vulnerable populations in future interventions.

References

- Arel-Bundock, Vincent. 2022. “modelssummary: Data and Model Summaries in R.” *Journal of Statistical Software* 103 (1): 1–23. <https://doi.org/10.18637/jss.v103.i01>.
- Gelfand, Sharla. 2022. *Opendatatoronto: Access the City of Toronto Open Data Portal*. <https://CRAN.R-project.org/package=opendatatoronto>.
- Müller, Kirill. 2020. *Here: A Simpler Way to Find Your Files*. <https://CRAN.R-project.org/package=here>.
- R Core Team. 2023. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. <https://www.R-project.org/>.
- Wickham, Hadley, Mara Averick, Jennifer Bryan, Winston Chang, Lucy D’Agostino McGowan, Romain François, Garrett Grolemond, et al. 2019. “Welcome to the tidyverse.” *Journal of Open Source Software* 4 (43): 1686. <https://doi.org/10.21105/joss.01686>.