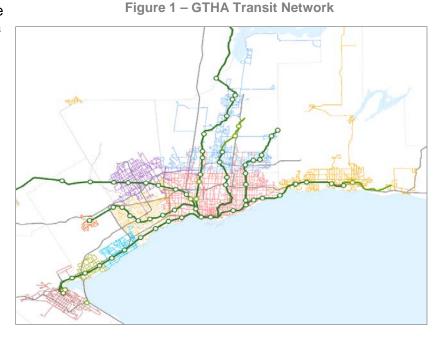# GTHA Fare Integration: Income and Transit Use

In reviewing potential modifications to the transit fare system across the Greater Toronto and Hamilton Area (GTHA), the social equity implications of transit fare policy must be considered. Lower-income households rely more on transit for their mobility, are more sensitive to the fare they pay for their transit trips than higher-income households, and, as a result, fare policy choices may impact them more.

To better understand the transit travel requirements of lower income households as background for assessing the impacts of alternative fare integration approaches, we analyzed the current transit trip patterns in the

Figure 1 – GTHA Transit Network

GTHA by household income. The following paper focuses on trips taken by *transit modes alone* under the *current fare environment*; it is important to note potential fare policy changes may potentially prompt current trips on other modes to shift to transit, as well as incent new trips.

Summary

Residents of lower-income areas make more transit trips overall and rely more on bus networks than residents of higher-income areas. These bus trips include both trips within their neighbourhoods and to access the subway network. They rely on transit for a mix of trip purposes—work, school, and other trips—but in different proportions than residents of higher-income areas. With the current transit fare barriers, they cross municipal boundaries on transit as much as others, but are less likely to have their destination be downtown Toronto.

Given these travel patterns, certain types of fare changes have a greater potential to impact transit-reliant lower-income households than others, with both adverse and beneficial outcomes possible.

Identifying lower-income travellers

The Census and Transportation Tomorrow Survey (TTS) do not provide information about incomes and travel patterns on an individual by individual basis; rather, they report the aggregated income and travel characteristics of all residents within specific units of geography. As such, the travel experiences of *lower-income individuals* cannot be directly examined, but closely approximated by examining the travel experiences of *residents of lower-income areas*.

To achieve the greatest possible precision in aligning these populations, analysis was conducted at the Dissemination Area (DA) level. DAs are the smallest standard geographic area for which all census data are disseminated; they have populations of 400 to 700 persons and typically exhibit greater homogeneity in the household incomes of their residents than larger geographic units.

To examine social equity impacts that may be associated with any changes to the GTHA fare structure, we analyzed trips made by each equivalent-income[1] decile. Each decile consists of ten percent of the GTHA population (approximately 650,000 persons) grouped by the income levels of the DAs they live in. As shown in Table 1, the first decile (Q1) contains residents of the lowest income areas and the last one (Q10) contains residents of the highest income areas.

Table 1: Equivalent income ranges by decile

Q1	Below $24,444		Q6	$43,769 - $47,937
Q2	$24,444 - $30,228		Q7	$47,938 - $52,688
Q3	$30,229 - $35,403		Q8	$52,689 - $58,251
Q4	$35,404 - $40,060		Q9	$58,252 - $68,069
Q5	$40,061 - $43,768		Q10	$68,070 and above

Distribution of DAs by income in the GTHA are illustrated in Figure 2. Lower-income households live mostly in the inner suburbs of the City of Toronto, especially the northeast and northwest, as well as in some areas of Brampton, Oshawa, and Hamilton.

We identified the equivalent-income decile of each DA based on the DemoStats[2] package and analyzed the trips made by the residents of each DA using the 2011 TTS. This included analysis of different travel patterns by trip mode, length, location and purpose. We used the median equivalent income of each DA as a proxy for the equivalent income of each household within that DA.[3]

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[1] Equivalent income is calculated by dividing the household income by the square root of the number of persons in the household to take into account the benefits of shared consumption units. It is the OECD's current preferred approach for analyzing income inequality and poverty, and produces results between per capita income and household income.

[2] Environics DemoStats

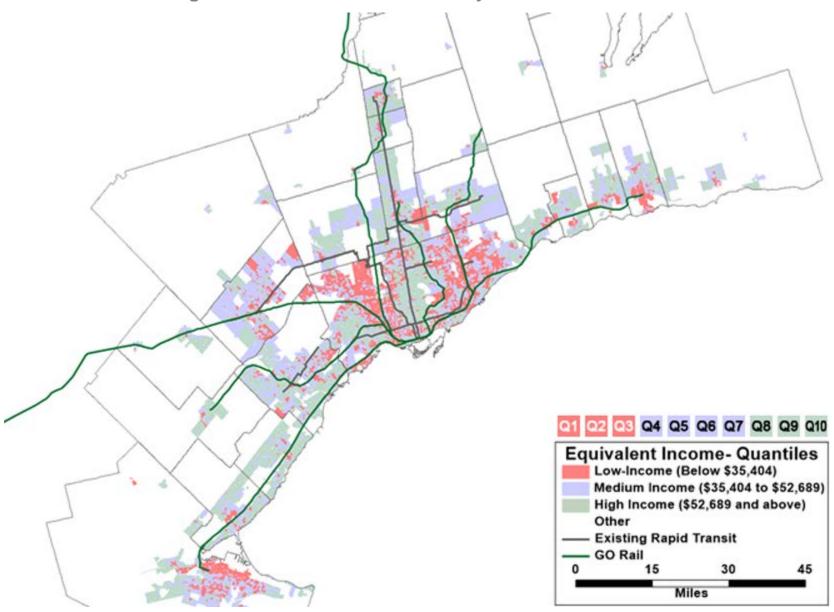[3] Each household member is assumed to have the same equivalent income.

Figure 2 - Distribution of Income by Dissemination Area

Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10

Equivalent Income- Quantiles
- Low-Income (Below $35,404)
- Medium Income ($35,404 to $52,689)
- High Income ($52,689 and above)
- Other
- Existing Rapid Transit
- GO Rail

0   15   30   45
Miles

* Lightly-populated dissemination areas (fewer than 500 persons per square kilometre) not illustrated

Findings

These findings are intended to better understand the current trip patterns of households from lower-income areas in the region and can provide a useful basis for understanding how fare integration approaches may affect lower-income travellers. However, they do not predict the changes in these trip patterns that will result from fare integration.

In general, our travel pattern analysis reflected a clear relationship between income deciles and travel behavior. The DAs in the highest income decile exhibit slightly different behavior due to their geographical location and their proximity to higher order transit.

As illustrated in Figure 3, transit ridership was found to be closely correlated to income levels. Even though approximately 14% of all trips in the GTHA are via transit, the bulk of transit trips—close to 40%—are made by residents of lower-income areas. In general, those living in the lowest income areas take twice as many transit trips as those living in the higher income areas.
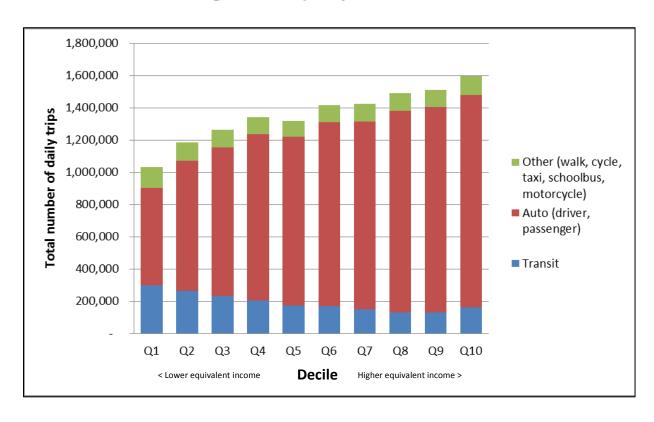
Figure 3 -Trips by mode

About half of transit trips associated with lower-income areas are via bus and streetcar (see trip patterns analysis in Figure 4), a much higher rate than that of higher income areas. In the City of Toronto and nearby areas, these travelers rely heavily on bus to access the subway for their other travel needs, as most do not live within walking distance of subway stations.

Residents of higher income areas were found to be significantly more likely to ride GO Transit. The highest income decile shows the highest incidence of "subway only" transit usage.
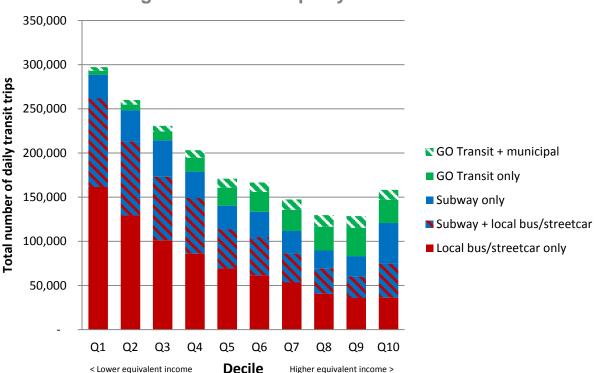
Figure 4 - Transit trips by transit mode

As illustrated in Figure 5, transit trips made by residents of lower-income areas are, on average, approximately 25% shorter than the average for all transit travellers [4]. Average trip length climbs consistently by income, peaking in the ninth decile. The tenth decile is an exception to this pattern, with comparatively short average transit travel distances.

The average distance travelled for each service type remains broadly consistent regardless of income: for example, lower-income deciles make trips of similar length on the subway as higher-income deciles.[5] Differences in average trip length across incomes are largely due to the different mode shares noted in Figure 4, with lower-income deciles more commonly using transit modes associated with short distance travel (such local bus) and less commonly using those modes associated with long distance travel (such as GO Transit) than higher-income deciles.

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[4] To estimate the difference in distances travelled on transit across income deciles, the grid distance (Manhattan distance) using origins and destinations of trips are calculated.

[5] Trip lengths including subway are calculated in Manhattan distance
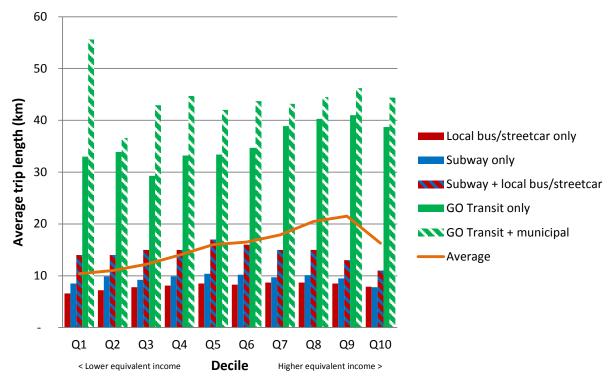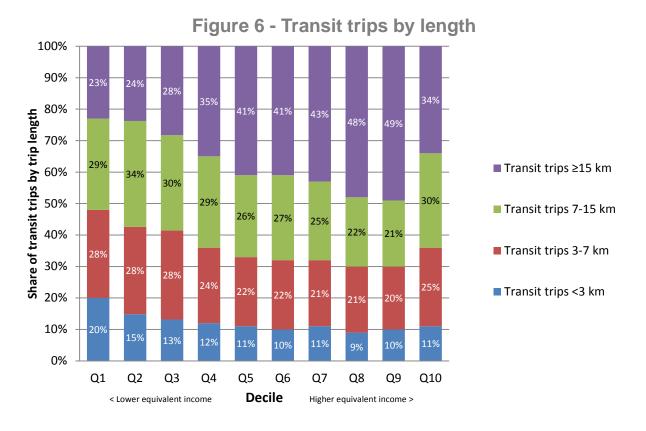
Figure 5 - Distance travelled by transit mode

As shown in Figure 6, the share of short trips (less than three kilometers) is twice as high in lower-income deciles compared to higher-income deciles (20% vs. 10%).

Figure 6 - Transit trips by length

While the majority of trips made by all income deciles have at least one trip end in Toronto, many more of the trips made by lower-income deciles take place outside the Toronto downtown core (Planning District 1; PD1). As seen in Figure 7, as income increases, a greater portion of trips have at least one of their ends in downtown Toronto.
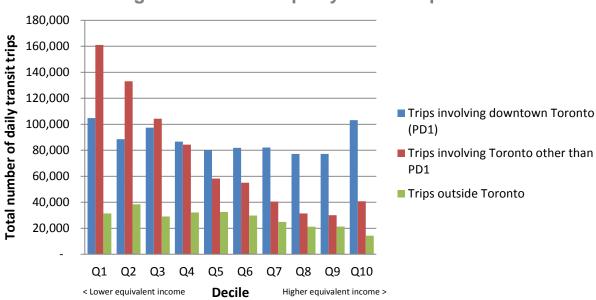
Figure 7 - Transit trips by start/end point

A review of the double fare municipal transit trips crossing Toronto-905 boundaries reveals that the majority of these trips involving PD1 are by residents of higher-income areas, while those involving the rest of Toronto are made by residents of lower-income areas (see Figure 8).
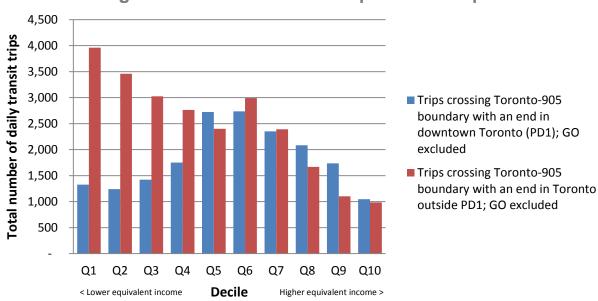
Figure 8 - Double fare municipal transit trips

As Figure 9 shows, a significant portion of transit trips for all deciles is designated for work or school purposes. However, residents of lower-income areas are more likely to rely on transit for non-work/school purposes than residents of higher-income areas. This helps explain why residents of lower-income areas appear to make a significantly higher portion of their trips during off-peak periods than do residents of higher-income areas (Figure 10).
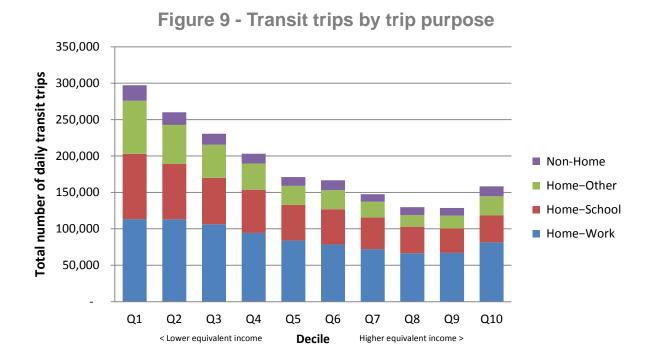
Figure 9 - Transit trips by trip purpose

Figure 10 - Transit trips by time of day