

Brief Summary: Assessing and Measuring the Factors Affecting Mobility, Transportation Accessibility, and Social Need: Barriers to Travel among those with Low Income and Other Vulnerable Groups

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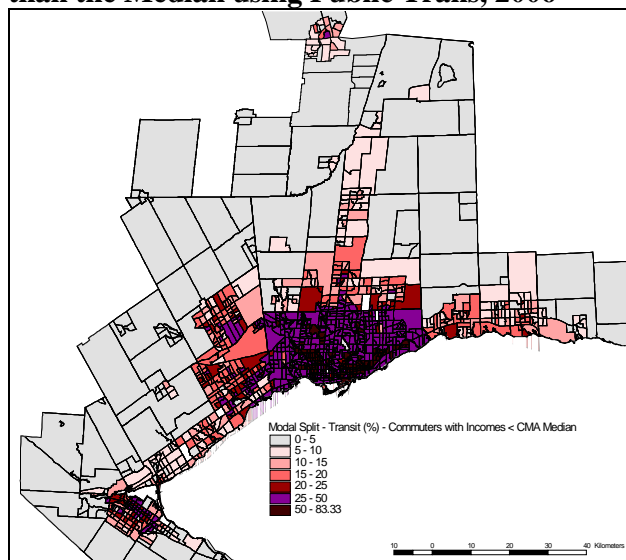
This report sheds light on the relationship between mobility and transportation accessibility, and social need, in the greater Toronto-Hamilton-Barrie-Oshawa area (GTHBOA), with a particular focus on the mobility and accessibility needs of low-income residents and other vulnerable social groups, such as women, lone-parent households, immigrants, children, and seniors (those aged 65+). Mobility and accessibility are related, but distinct concepts, with the former defined as actualized travel, and the latter defined as the ability to access, via the transportation system, employment and other opportunities within the urban region. Transportation accessibility can be measured in terms of access *by* the transport network, access *to* the transport network, and in terms of the number or density of opportunities reachable within a given distance or time period from a given locale (otherwise known as cumulative opportunity measures). The study reported on herein draws on variants of all three of these measures of accessibility.

The barriers to mobility and accessibility facing those with low income and/or these vulnerable groups were examined using two different approaches and data sets. First of all, custom data from the 2006 census was analyzed in order to determine how forms and levels of mobility and accessibility, and social needs related to mobility and accessibility, are distributed both socially and spatially within the GTHBOA. The distances travelled via different transit modes by different social groups were calculated and mapped, and regression analysis was used to identify how social variables aggregated at the neighbourhood (census tract) level, as well as the physical accessibility characteristics of places (density, distance to transportation stops/stations, and local transit stop density), related to public transit mode share (the proportion of those of working-age who commuted using public transit). This analysis was also used to identify five study areas with disproportionately lower levels of public transit use among lower-income residents than would be expected given prevailing mobility and accessibility patterns in the GTHBOA. Second, an in-depth survey of residents in these five study areas was conducted in the summer of 2014. The survey over-sampled low-income respondents and public transit users, and identified the issues and barriers to mobility and accessibility facing these groups and other vulnerable social groups in the GTHBOA.

Findings I: Analysis of the 2006 Census

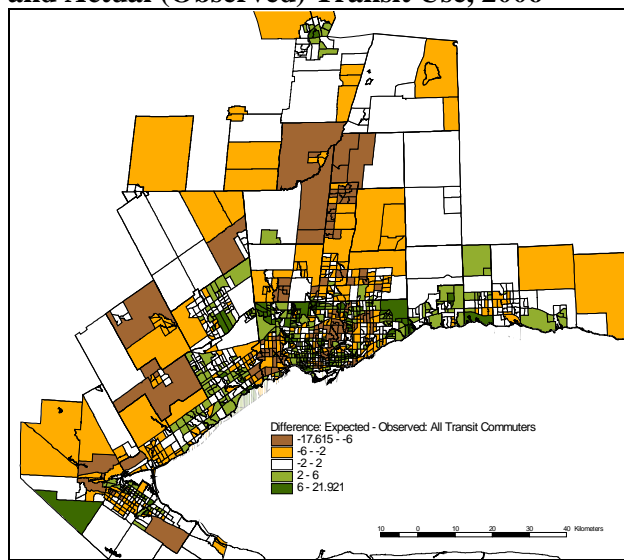
Low-income commuters, as well as heads of lone-parent families, and immigrants, were more likely (than those without these characteristics) to use public transit, to commute as a passenger in other vehicles or using non-motorized forms of travel, and to commute shorter distances overall. However, mobility patterns depended on where they lived within the GTHBOA. Low-income commuters in particular were disproportionately more likely than others to travel via public transit within much of the City of Toronto, particularly in the old inner city built up before 1945, followed by the old part of Hamilton (below the Mountain) and some small pockets of the 905 suburbs (Map 1 below). Much of the rest of the region, including much of the 905 suburbs, revealed lower use of public transit by all commuters, and even in some cases lower-public transit use on behalf of low-income households. A large proportion of the variation in public transit use between neighbourhoods (76 percent out of the 86 percent of variation that can be explained) can be accounted for just by the urban form and physical characteristics of neighbourhoods, including distance to bus, subway and GO train stations/stops, bus stop density, and overall population/dwelling density (Table I below). In addition to the effects of urban form and distance to transit, higher proportions of renters, lone-parent families, and immigrants (and among low-income commuters, manufacturing workers), are associated with higher public transit use. Overall, a number of neighbourhoods, including some within the City of Toronto, revealed disproportionately lower public transit use than expected given their physical and social characteristics (Map 2 below).

Map 1: % of Commuters with Incomes less than the Median using Public Trans, 2006



Source: Figure 4.2 in the full report, created by the author from custom data derived from the 2006 Census of Canada

Map 2: Difference between Expected (Predicted) and Actual (Observed) Transit Use, 2006



Source: Figure 4.3 in the full report. Values are the residuals resulting from the first combined model in Table I below

Table I: OLS Regressions Models – Predicting Transit Mode Share (%) in the GTHBOA

Variable	All Commuters			With Incomes < Median \$		
	Block A	Block B	Both A+B	Block A	Block B	Both A+B
Block A: Transit Accessibility Measures						
Toronto Subway – Gravity Index ¹	2.067***		1.855***	2.552***		2.329***
York Region BRT – Gravity Index ¹	0.770***		0.470***	0.969***		0.641***
GO Train – Gravity Index ¹	1.147***		0.695***	1.333***		0.831***
GO Bus – Gravity Index ¹	-0.634***		-0.596***	-0.665***		-0.659***
Transit Stop Density Index (stops per sq. km)	0.033**		0.015***	0.045***		0.021***
Population Density per square hectare	0.086***		0.040***	0.082***		0.019***
Block B: Socio-Demographic/ Housing (%)						
Housing Tenure - Rented		0.270***	0.132***		0.340***	0.170***
Housing - Single-Detached Housing		-0.128***	-0.029***		-0.180***	-0.062***
Housing - Apartments greater than 5 stories		-0.113***	-0.050**		-0.145***	-0.065***
Education – Less than Grade 9		0.214***	-		-	-
Education – High School Diploma		-0.507***	-0.116***		-0.657***	-0.127*
Family Status – All w/ Kids at Home		0.302*	-		-	-
Family Status – Lone-Parent Families		0.317**	0.436***		0.443	0.476***
Age – Seniors (Age 65+)		0.184**	-		0.276***	-
Occupation – Employed in Manufacturing		-0.752***	-		-0.708***	0.226**
Immigration Status – Foreign Born		0.197***	0.170***		0.220**	0.190***
Minority Status – Visible Minority		0.101***	-		0.134***	-
Income – Average Household Income (by \$10k)		-	-0.183***		-	-0.184**
Income - % Low Income (< LICO) ²		0.104*	0.018		2	2
Constant	5.797***	18.223***	5.690***	7.186***	25.066***	7.474***
R Square	0.766	0.684	0.861	0.704	0.661	0.823

Source: Table 4.4 in the full report. Calculated by the author from custom data ordered from the 2006 census of Canada.

Notes: Units of analysis are census tracts. Coefficients are the result of OLS forward regression. Variables that do not get added to the model due to this forward method are indicated by “-“. Census tracts are the units of analysis. Coefficients represent the percent change in each variable associated with a one percent increase in transit mode. ⁽¹⁾ The gravity indices used in these models assumes no “pull” effects beyond 10 km, but reducing to zero the gravity indices for census tracts more than 10km away from public transit access nodes. This assumption is necessary for dealing with the fact some services (BRT, TTC Subway) end at the borders of particular municipalities, and so should not have effects beyond those borders. ⁽²⁾ The variable for low income was only included in the models predicting transit use among all commuters, and was left out of the models predicting transit use among those with incomes less than the median income. Significance *p<0.05 **p<0.01 ***p<0.001

Findings II: Analysis of the 2014 Survey

Through the survey, low-income respondents identified a number of barriers to their ability to use the public transit system (Table II below). The most common barrier concerned the length of time it takes to travel via public transit compared to driving, and the timing of transit services. Problems include the time spent waiting between transfers, lack of scheduling on weekends, nights and early mornings (which affects low-income commuters more than others, as they are more likely to work shifts), lack of frequency on existing routes, and time limits on transfers. Related to this is the problem of reliability, including delays, and routes that would leave their stops/perch early, making it difficult for those needing to catch a connecting route to get to work or school on time. Another common barrier concerned the lack of connectivity, including the lack of routes going to where travellers need to go, routes that only meet up at very distant transfer points, and long distances to local stops/stations from places of employment and residence. Public transit users also said that problems of comfort, safety and security (mainly, an inability to get a seat) reduced the desirability of using transit. However, the most common barrier expressed by low-income travellers (over two thirds), and even more commonly by low-income public-transit users (73.4 percent), was the cost of travel. The latter issue was particularly acute for those who need to use regional services (GO transit and the Viva service), as well as those who transfer between different transit services. The fact that one has to pay twice just to cross a municipal boundary, or to transfer between systems, poses a significant barrier to the ability of lower-income people to access the transport network. When combined, these different factors present serious obstacles to transit use among lower-income travellers in the GTHBOA.

In addition, members of other vulnerable groups were statistically-significantly more likely to mention certain barriers to travel. Women were more likely to discuss the cost of multiple tickets when travelling with children on public transit, and the difficulties of bringing strollers onto buses (and sometimes being refused). Those with children under 18 at home were more likely to complain about the time required for transferring between different transit systems, as well as travelling with strollers, while lone-parents and immigrants were more likely to criticize the cost of having to pay multiple fares when transferring between systems. Seniors were not statistically more likely to mention any particular issue.

Table II: Factors acting as Barriers to Travel, All 5 Study Areas

Weighted Average	ALL MODES (%)				PUBLIC TRANSIT USERS (%)				OTHER MODES (%)			
	Total	Low Income	Not Low Income	Unreprt'd	Total	Low Income	Not Low Income	Unreprt'd	Total	Low Income	Not Low Income	Unreprt'd
All 5 Study Areas												
Trip Duration/ Timing, incl.:	63.2	62.0	64.2	61.1	66.0	66.2	66.8	64.4	62.2	57.5	63.4	60.5
Takes too long	40.3	40.3	40.8	35.1	39.0	38.2	41.7	32.3	41.7	43.9	41.4	36.8
Frequency of service	37.0	36.2	39.0	33.4	41.9	39.4	44.2	39.2	34.6	34.5	36.3	31.7
Time spent transferring	14.2	18.1	13.9	9.1	16.7	18.5	16.9	11.7	12.6	17.4	12.6	7.8
Scheduling: weekends/nights	11.0	11.1	11.9	6.7	11.0	12.6	10.8	3.5	10.9	8.9	12.5	7.6
Time limits on transfers* **	3.8	6.2	3.3	1.7	5.8	10.0	3.8	0.0	1.9	2.5	1.9	1.1
Accessibility via/to Transit, incl.:	42.7	36.9	45.6	41.5	37.6	39.8	36.0	34.2	44.8	31.9	49.1	42.5
Lack of connectivity	26.5	21.9	28.7	25.8	23.0	24.6	21.7	22.0	28.2	18.0	31.0	26.8
Lack of routes	13.3	12.1	13.6	12.6	9.7	10.6	9.7	6.8	15.2	13.4	15.2	15.0
Distance to local stops	7.6	6.5	7.6	9.2	8.2	9.5	5.2	8.6	7.4	2.8	8.6	9.6
Direction of routes **	4.2	3.1	6.0	0.9	2.2	2.3	2.6	0.0	5.2	3.8	7.2	1.2
Cost * **	28.4	66.7	15.6	11.0	43.2	73.4	19.8	23.3	20.7	59.8	13.3	6.1
Cost of Transfers **	9.2	11.1	8.4	7.9	14.4	15.2	14.4	13.5	6.1	6.5	5.8	5.2
Reliability * **	18.5	25.0	16.9	16.3	22.2	23.5	24.1	17.0	16.8	26.2	14.7	15.6
Cost of Vehicle, Gas, Insurance	11.8	12.0	12.2	12.3	7.3	4.5	9.9	10.1	13.7	19.0	13.1	12.8
Safety, Crowding, Comfort	10.2	12.4	9.1	11.7	13.6	15.9	10.2	18.6	8.7	8.8	8.9	9.1
Difficult re Families, Strollers	3.6	4.5	3.8	1.9	5.4	7.7	4.8	0.0	2.9	1.6	3.6	2.4
Parking: lack of, cost	3.1	3.0	3.0	2.6	2.3	0.0	3.7	5.0	3.3	6.3	2.6	1.9
External Infrast. (shelters, etc)	1.7	2.0	0.9	2.2	2.1	2.5	0.0	3.5	1.4	1.3	1.2	1.6
Rudeness/Unhelpfulness *	0.9	2.8	0.4	0.0	1.9	2.5	2.0	0.0	0.5	2.9	0.0	0.0

Notes: This is Table 5.11 in the full report. These results show the percentage (%) of respondents in each category who listed each of these issues as representing a barrier to travel in the GTHBOA in the respondent survey. (*) Statistically-significant difference in the proportions of low income versus non-low income respondents listing this issue. (**) Statistically-significant difference in the proportions of public transit users versus users of other modes listing this issue.

Recommendations

1: Provide discounted monthly/ daily passes, and allow children accompany parents for free

For all low-income travellers, monthly and daily passes should be offered at the same discount rate paid by seniors. Family day passes should be offered on weekdays as well as weekends, and single parents should be given a special discount on these. For single rides, children up to a certain age should be allowed to accompany parents for free, at all times.

2: Routes should never leave their perch/stop early, and should always stop for those waiting

Routes should not be allowed to 'run short', and should never, for any reason, leave their perch or stop early. Connecting routes should wait for the providing route to arrive. If a passenger is running late and is within view, drivers should always wait to pick them up. If a passenger is waiting at a stop, the driver should always stop, even if the bus is full and they must tell the passenger they cannot accommodate them. If a passenger knocks on the door or window of a bus that is not moving and they wish to board, the driver should always open the door to let them board, even if this occurs after the scheduled departure time.

3: GO and VIVA rates should be reduced, or discounted for low-income riders

4: Free or minimal cost transfers between different systems, with extended time limits on transfers

Once a rider boards one system, they should be able to transfer to adjoining systems for either no additional cost, or for a very minimal additional cost, and to use the same fare-transfer system for this purpose. Time limits on transfers, both for journeys made on the same system and for transfers to adjoining systems, should be extended to take into account the lack of reliability of arriving on schedule for connecting routes.

5: Implement a single integrated fare-payment system across *all* local and regional transit systems, and allow cards to be 'reloaded' at multiple everyday locations

Allow the same payment system to be used for payment on all local and regional systems. Apply the same rules regarding discounts when transferring to adjoining systems. Allow payment cards to be 'reloaded' at schools, community centres, city halls and other public buildings, and common variety stores.

6: Restructure local Municipal public transit routes along the lines of grid-based networks

Restructure transit routing in local municipal transit systems so that a majority of routes ply the main arterials in a grid-like network form, meeting up with cross routes and adjoining municipal transit systems at major intersections. Any looping routes that are kept should be used to deliver local residents onto the main arterial routes, and should allow for significant multiple transfer points to other routes.

7: Extend transit service on weekends and after hours

Smaller transit vehicles, or alternate vehicles (use of buses instead of trains, small buses instead of larger one) will help meet this demand. Ideally, all major routes should run on regular schedules 7 days/ week.

8: Provide fast cross-connecting lines between suburban areas, without going through Toronto

New high-speed train, or BRT, lines should be built between and across suburban areas, connecting different local municipal transit systems and regional (GO) transit systems at key nodes.

9: Provide fully weather-protected shelters on all regular routes, in cases where they do not yet exist

10: Provide space for strollers, and work towards improving stroller and wheelchair accessibility

Design space for strollers into all buses and trains, and always allow strollers on all transit vehicles. Provide elevators where possible for access to train stations or bus hubs that are not at grade. Provide 'stooping' buses on routes where they do not yet exist, so that strollers, seniors, and wheelchairs can enter easily.