

An Assessment of the Impacts of Covid-19 Lockdown in Summer 2020 on Transit Use in the Greater Toronto Area: Results from the Cycle-1 of SPETT Satellite Survey



**Sk. Md. Mashrur
Kaili Wang
Sanjana Hossain
Patrick Loa**

Professor Khandker Nurul Habib
khandker.nurulhabib@utoronto.ca

AUGUST 2020

Introduction

The outbreak of novel coronavirus disease, COVID-19, in December 2019 in Wuhan, China, continued to circulate globally in an unprecedented manner causing irretrievable casualty worldwide. In early March 2020, the World Health Organization declared COVID-19 a global pandemic for its severity and widespread (1). By July 15, 2020, the virus continued spreading around the world with a spiking death toll. There were over 13 million confirmed cases, with more than half a million reported death. As of response to the pandemic, countries worldwide closed international borders for non-essential travel, imposing travel restrictions and lockdown cities to enforce social distancing, all of which grinding their economy to a halt. Besides, elementary and high schools were shut down for an unknown period. Colleges and universities shifted to remote learning. Most of the employers adopted telecommuting policies and strictly maintained sector-specific safety guidelines in case of compulsory work-at-office.

Consequently, the daily mobility of bustling urban life has come to a halt. Social distancing strategies have abruptly altered the travel behaviors of urban residents. It affected the operation of urban transit systems and has the potential to shift people’s mode choice decisions, which is yet to be scrutinized.



Amongst all travel modes available for metropolitan residents, transit suffered the most. In the City of Toronto, Canada, where over 1.6 million transit trips were conducted before the pandemic, the transit ridership has dropped drastically within a noticeably short period upon the onset of the COVID-19 outbreak (2,3). With exceptionally low ridership, transit authorities are currently challenged in coping with unrecoverable expenses due to the radical fall in farebox revenue and developing effective recovery strategies to reinstate the demand and ensure health and safety for both its

employees and transit riders post-pandemic. Moreover, resuming regular operation of the transit system itself is a vital part of the economy reopen, as transit authorities are also one of the largest local employers. On the other hand, such dramatic events might affect habitual transit riders’ travel behavior and lead to a permanent travel mode switch. Hence, understanding the transformed mode choice behavior has become a pressing issue for both researchers and policymakers to outline the economy reopen plan and restructuring the existing urban transportation system during the post-COVID-19 era.

In Summer 2020, the **Travel Demand Modeling Group** at University of Toronto conducted an online questionnaire survey to examine the impact of the pandemic on **urban residents’ public transit usage behavior** in the GTA, Canada.

The survey aims to report firsthand representative status quo of urban residents’ transit usage and the degree of impact that the pandemic will have on their transit mode choices. Furthermore, the study inspected whether those who were still commuting during the pandemic considered transit or not and examined the pandemic factors that concerned them. Lastly, it reported the effectiveness of the transit policies in attracting commuters to use transit as it used to be before the pandemic.



Figure 1: Map of the Greater Toronto Area (GTA) (4)

The Survey

According to recent census data, almost 24.3% of the GTA residents use public transit as a primary mode of commuting trips (5). The municipalities and regions in the GTA operate 12 integrated local public transit system administered by corresponding regional governments. Amongst the local transit agencies, the Toronto Transit Commission (TTC) is the largest transit agency in Canada, handling the largest share of the transit ridership in the GTA (6). Besides, there is a regional transit system named GO transit, which operates both bus and train services that offer inter-regional connectivity. However, since the declaration of a state emergency in Ontario on Mar 17, 2020, the transit ridership plummeted drastically.

The survey, thus, primarily focused on capturing participants' attitudes towards transit and its usage before the pandemic and during the first wave of the pandemic when the daily new cases were at the declining phase, and the GTA was preparing for reopening gradually. It was designed using the survey platform surveygizmo.com. During the survey design stage, the

survey was piloted with transportation professionals from various local planning agencies, and the TTC, Metrolinx Feedback received, was carefully incorporated in the final questionnaires. The data were collected from July 10, 2020, to July 28, 2020, through an online panel. In total, 1001 completed data (after cleaning for incomplete information) out of 1320 responses were used for the empirical investigations.

The survey first collected participants' sociodemographic characteristics and their habitual mobility tools used for daily travel. The next segment of the survey focused on the respondents' concerns and subsequent measures that they practiced during the pandemic. Later, the survey accumulated information regarding their typical commuting and non-commuting trips, how frequently they used transit before and during the pandemic. Additional data were collected from the respondents who shifted from public transit to other modes during the pandemic for examining their reasons behind the modal shift.

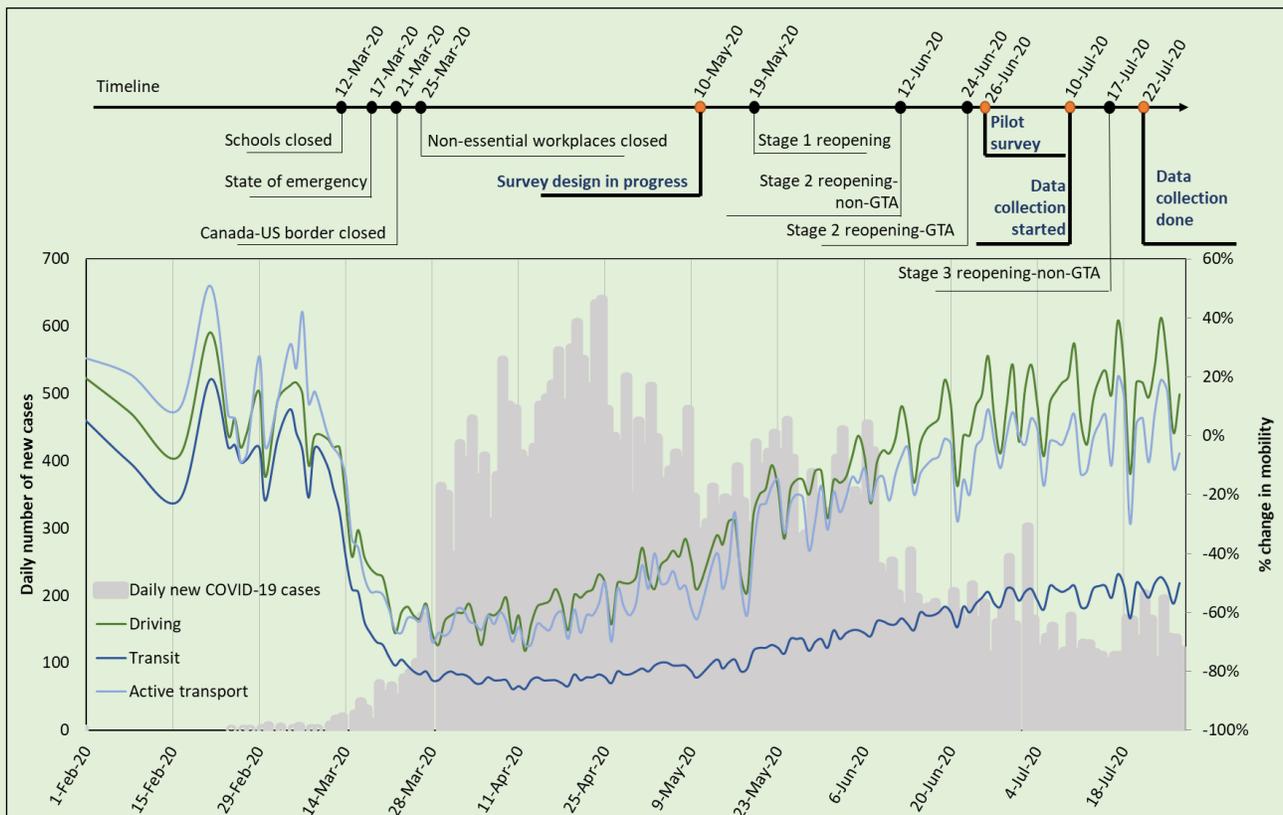


Figure 2. Daily number of new cases in the Ontario and the Apple Mobility trends in Toronto, Ontario

An attitudinal section was solely designed to account for the respondent's preference while choosing public transit, along with the transit policies that the Toronto Transit Commission (TTC) was planning to implement in response to the pandemic. Besides, they were inquired about when they would feel safe to retake trips on public transit and their expected travel behavior during the "new normal" when COVID-19 will no longer be a public threat.

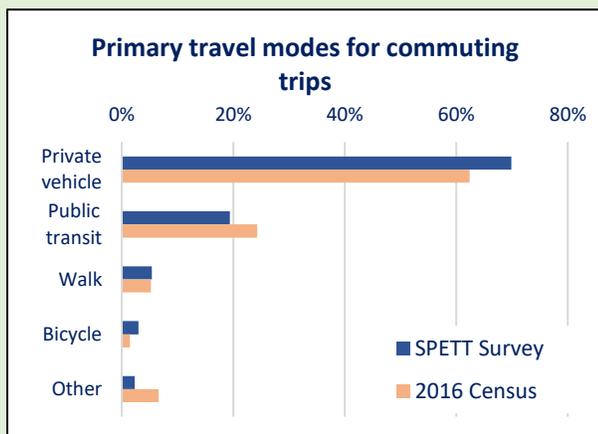
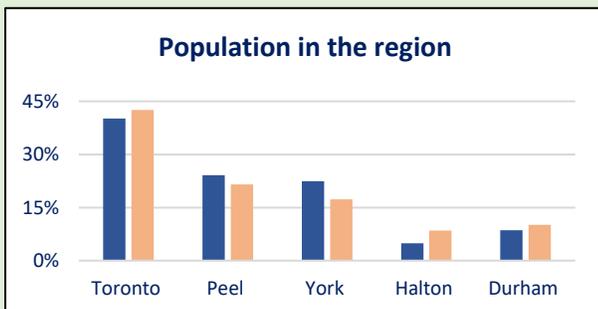
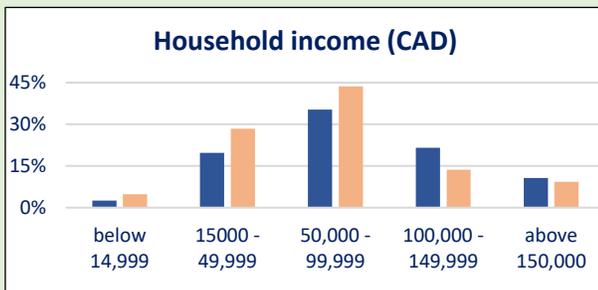
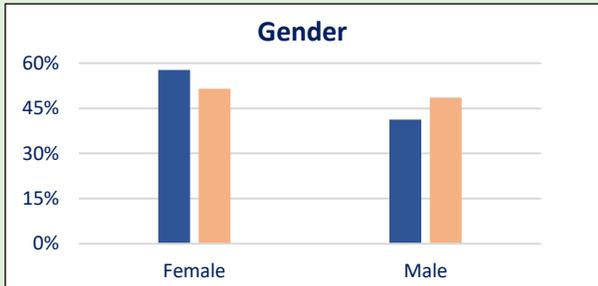


Figure 3. Distribution of the sample by socio-demographic factors

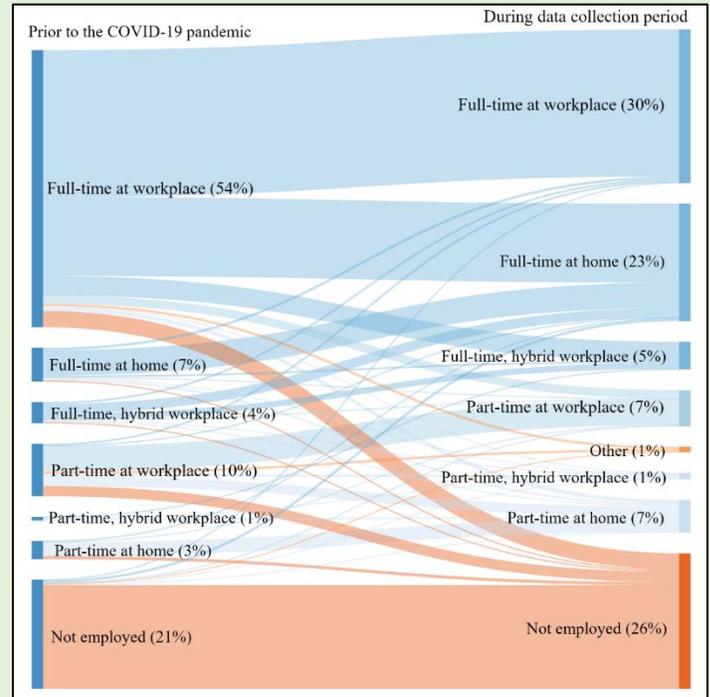


Figure 4. Change of employment status amongst the survey respondents due to the COVID.

Furthermore, twelve stated choice preference scenarios were presented to each respondent to explore the effects of novel factors regarding the pandemic and transit safety policies on mode choice for both inter- and intra-regional trips. The pandemic was characterized by the daily number of new cases in the last two weeks and treatment or vaccine available for the disease-causing the pandemic. WHO was continuously tracking these facts (7).

Mobility Tools



87.5%
participants have access to private vehicles



86.5%
respondents possess driving license



37%
participants have transit pass

Modal Shift by Trip Purposes

Modal shares are analyzed by two groups, which are distinguished by respondents' private vehicle availability. The group without vehicle access is still heavily dependent on transit for all travel purposes. For those who have private cars, around 19% commuted by public transits in typical conditions. However, this number dropped almost by 60% due to COVID-19, whereas the declination was only 20.5% in the case for respondents without vehicle access. 41.8% of them are still using transit despite COVID-19. People with private vehicle access rarely used transit for their shopping trips before COVID-19. For people without vehicle access, however, almost a quarter of them used transit for shopping transit. 20% still rely on transit to conduct shopping, especially grocery shopping, which maintains their necessities. Other purposes travel reveals a similar trend. It is evident that transit still provides vital services for people without vehicles during the pandemic. Indeed, people without private vehicles have limited alternatives when they try to avoid transit. The study also observed that most people with access to a private vehicle switched to a private vehicle. In contrast, people with no access switched to active transport (walking/ cycling), with some ride-hailing from public transport. The following illustration presents those transit users' statistics in no vehicle group who shifted to active transport and taxi/ on-demand transport alternatives.

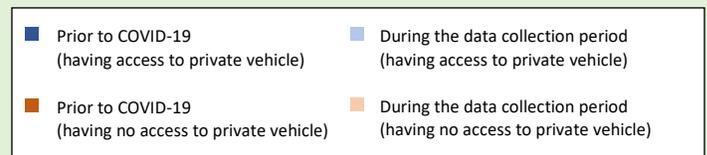
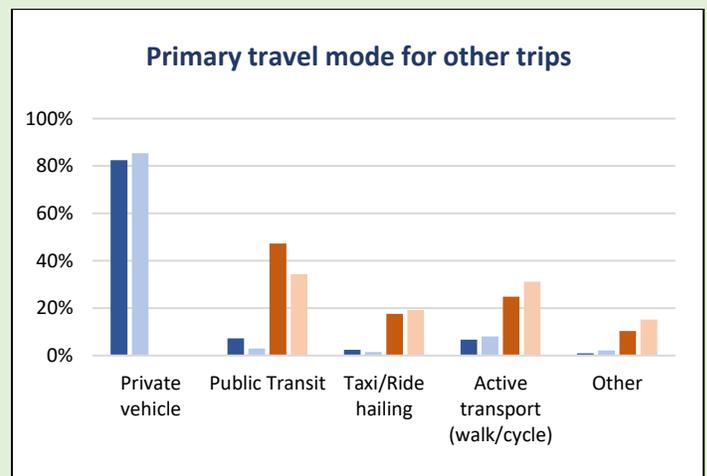
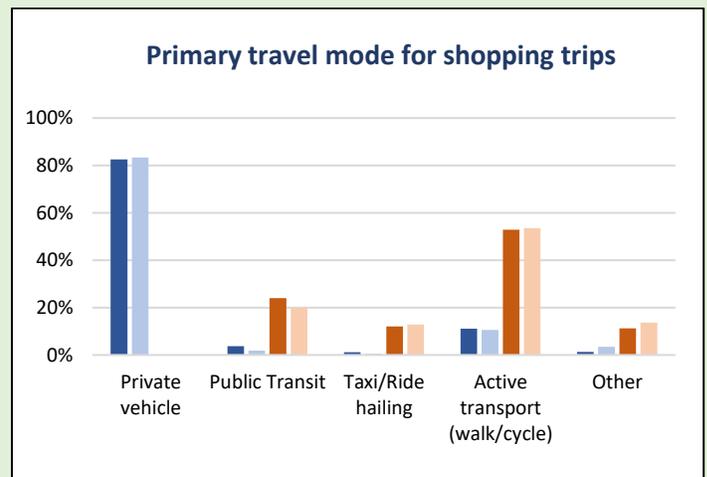
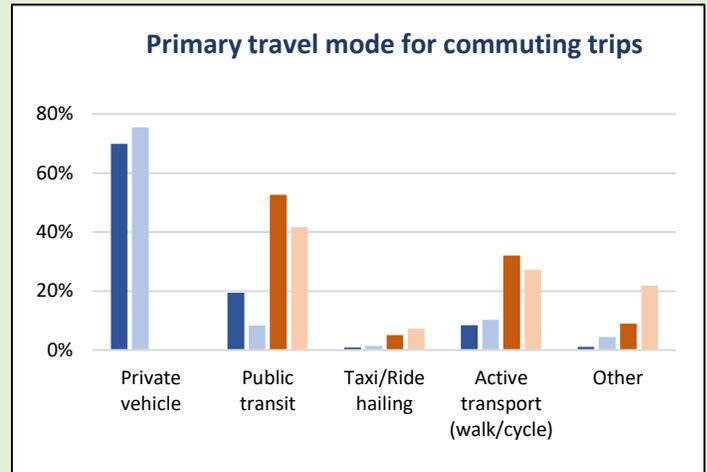
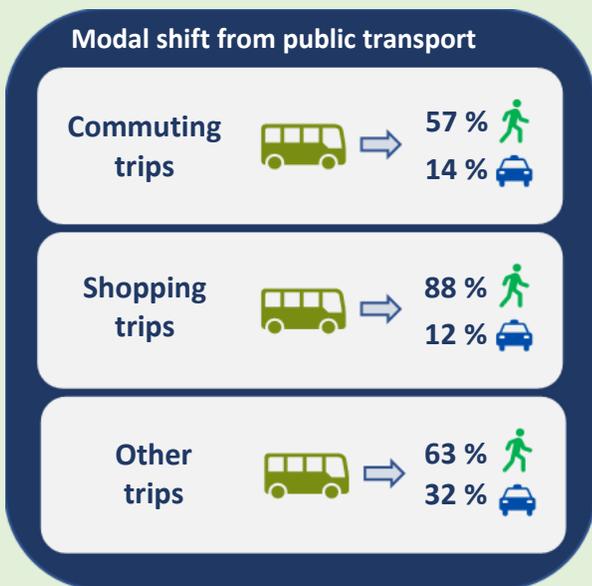


Figure 5. COVID impacts on primary travel modes by trip purposes

Ranking on Travel modes

Respondents' perceptions for each travel mode are also enquired. As expected, all private vehicular travel modes are perceived as the safest modes by 91.2% of the respondents. All transit alternatives are considered unsafe; subway is deemed the least safe by almost 38.2%. Interestingly, shared ride-hailing with other strangers is considered safer than transit vehicles. However, 29.9% of the respondents remarked it as the least safe option.

Transit usage

It was cleared that those with access to a car reduced their use of public transit, while those with no access to a car reduced their use of transit for other trips and used more active transport. Almost 33% of those who at least took a transit trip in a month before the pandemic did not make any trips using transit during the pandemic. It was also observed that as age, household income, and access to mobility tools like private vehicles increased, public transit usage decreased. The primary reasons for avoiding the transit trips and the resultant shift from public transport were traveling less overall, avoiding crowded public areas, and health concern; the least likely reason was that public transit had become unreliable.

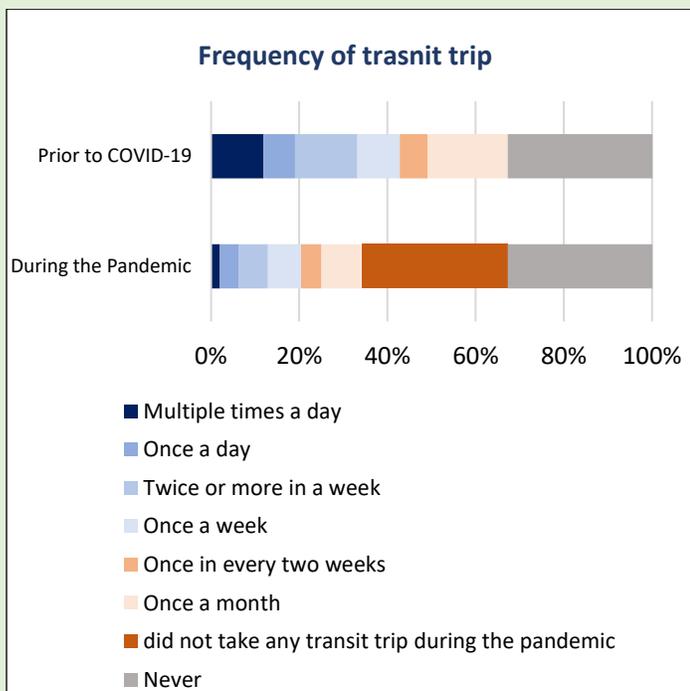


Figure 7. COVID impacts on transit usage frequency

	Private Vehicle	Taxi/ Ride Hailing	Shared Ride Hailing	Bus/ Streetcar	Subway	GO Train
1- most safe	91.2%	1.9%	1.6%	1.5%	2.1%	1.9%
2	3.6%	45.6%	6.0%	5.6%	5.4%	10.1%
3	1.9%	16.3%	33.0%	11.3%	11.8%	16.1%
4	1.7%	12.5%	15.3%	26.8%	16.8%	24.0%
5	0.6%	13.0%	14.8%	22.7%	25.8%	19.3%
6-least safe	1.0%	10.8%	29.4%	32.2%	38.2%	28.7%

Figure 6. Respondents' safety perception by travel modes.

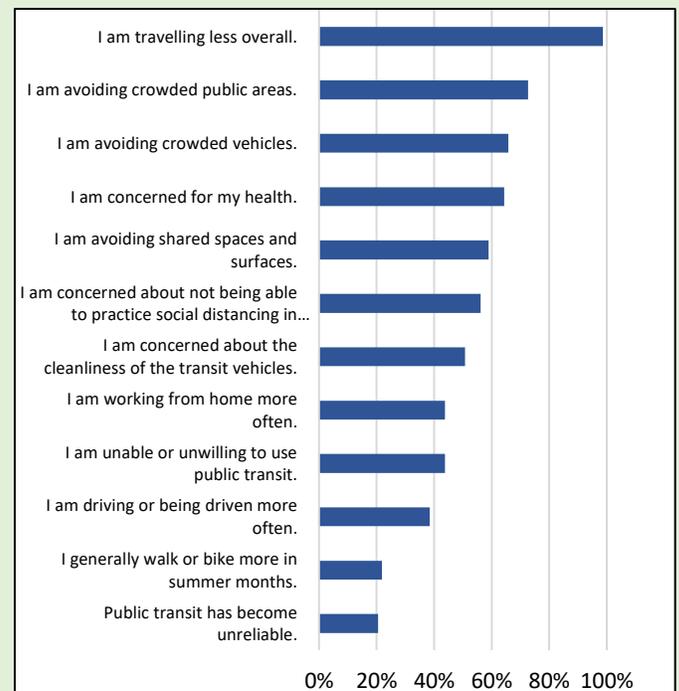
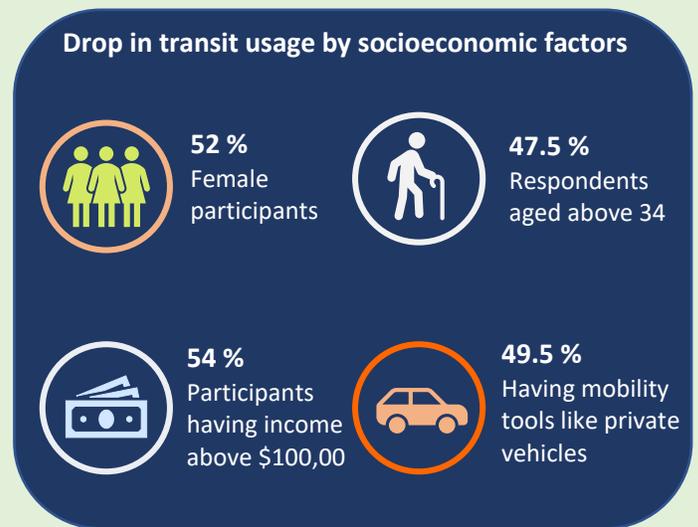


Figure 8. Reasons for avoiding the transit trips

Attitude towards transit health & safety policies

Respondents' opinions on implementations of various health and safety measures on transit is collected. Workable policies investigated in this study are selected with direct consultancy from TTC employees and their public reports (8). All policies are well received with approved rate (attitudes neutral or higher) 85% or higher. The only exception is offering a temperature scan before boarding transit vehicles. However, this policy still has 82% approval rate.

Timing of returning to ride public transit

Ontario governments planned to reopen the economy in three stages: all three stages having social distancing as a continued measure(9). Therefore, respondents' opinions on the timing of returning to their normal transit usage are collected. 80% of respondents believed that they would come back to transit at some point. The trend is clear that people will gradually return to transit as the threat of COVID-19 diminishing. More respondents agreed to use transit as a staged economy reopening progressed. Also, 77% of them agreed to return to transit as the number of new cases steadily dropped. Moreover, the successful discovery of vaccine will boost people's confidence in transit. Once the vaccine is discovered and distributed, 80% of respondents agreed to return to transit even without being vaccinated.

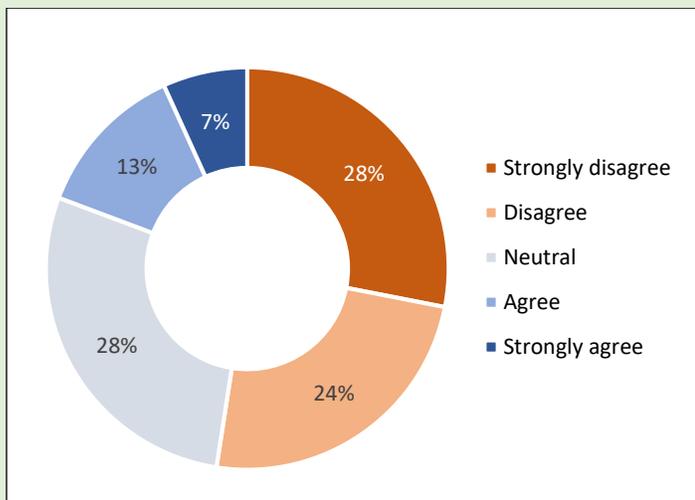


Figure 10. Respondents' attitude towards never using transit again due to the health threat posed by the COVID-19.

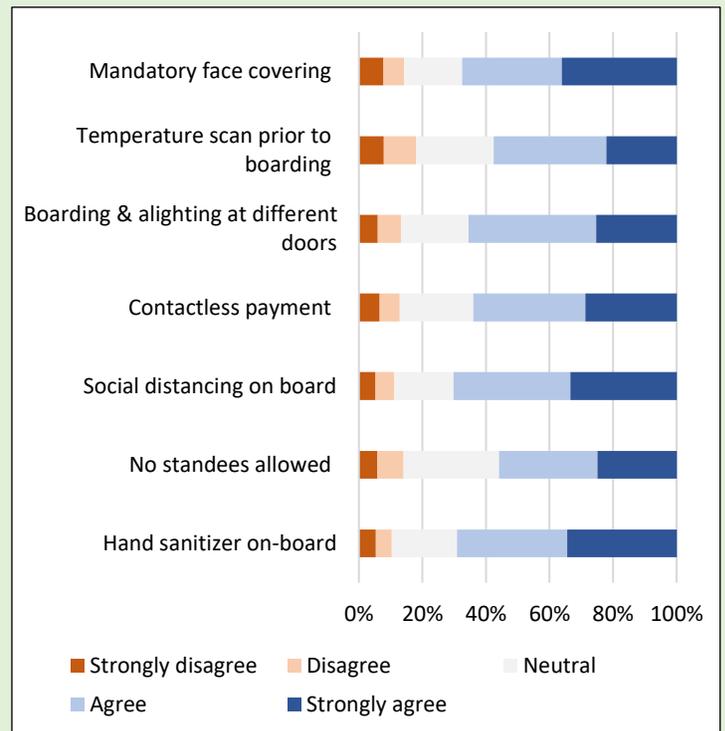


Figure 9. Preference for tentative transit health & safety policies.

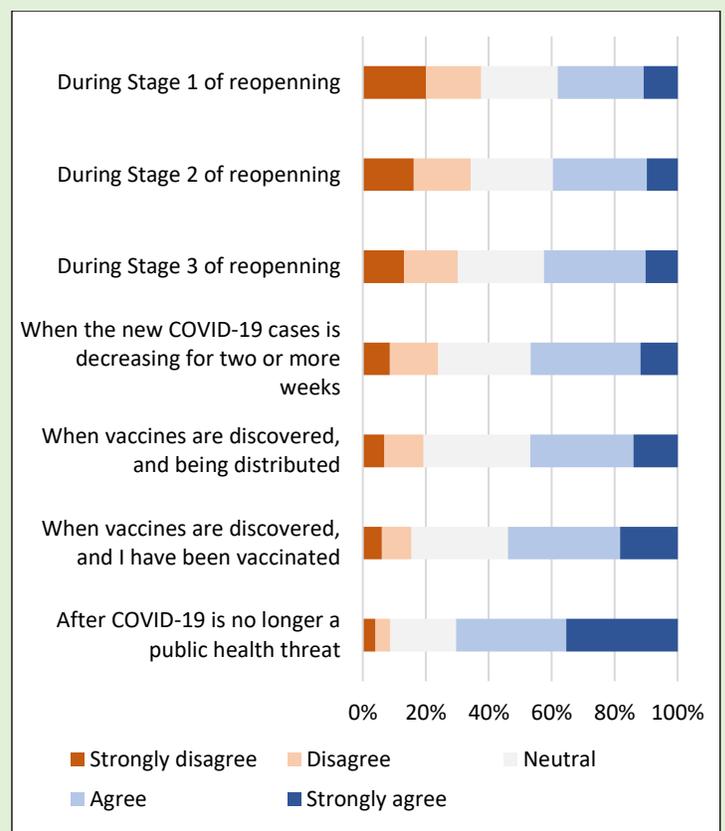


Figure 11. Stated time to feel safe to ride public transit.

Alternative to Public Transit

Those who had shown declination towards using transit again because of the COVID-19, they were further asked about their preferred mode of substitution. Most of those having access to car were obviously chosen to use their own vehicle for completing the trip, whereas participants having no access to almost 45% prefer to reach their destination by walking or cycling. Almost 18% of the respondents in this group are planning to acquire a personal vehicle due to the public safety concern posed by the COVID.

Stated Preference choice experiments

Contexts

Intra-regional trip

- Trips within regions using local transit
- TTC, MiWay, YRT/ Viva, DRT etc.
- Average trip length range: 10 - 12 km

Inter-regional trip

- Trips between regions with a focus on regional transit
- GO Transit
- Average trip length range: 33 - 35 km

Experiment Contexts

Intra-regional trip

Drive yourself	Local transit with park & ride
Driven by HH member (s)	Local transit with kiss & ride
Taxi/Ride-hailing (i.e. Uber, Lyft)	Local transit with taxi/ride-hailing access
Carpool	Local transit with carpool & ride
Local transit with walk access	Local transit with cycle access
Local transit with transfer	Cycle
Walk	

Inter-regional trip

Drive yourself	GO transit with park & ride
Driven by HH member (s)	GO transit with kiss & ride
Taxi/Ride-hailing (i.e. Uber, Lyft)	GO transit with taxi/ride-hailing access
Carpool	GO transit with carpool & ride
GO transit with local transit access	GO transit with walk access
Local transit with local transit access (i.e. from MiWay to TTC)	GO transit with cycle access

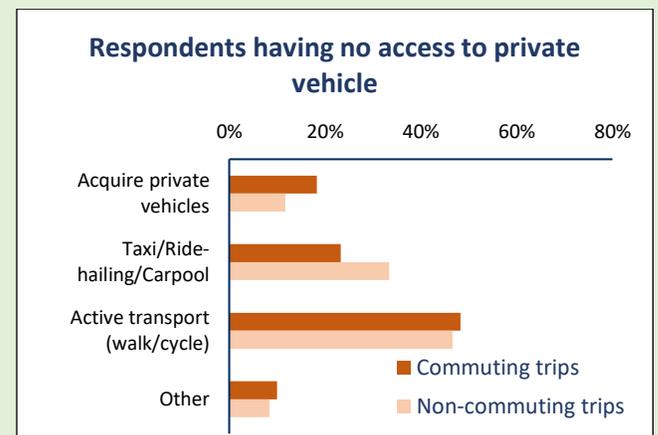
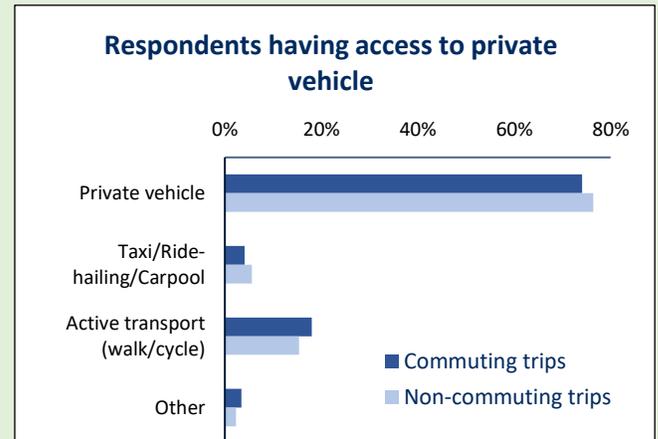


Figure 12. Substitutions for transit for COVID by trip purposes.

Attributes related to Pandemic and transit policies

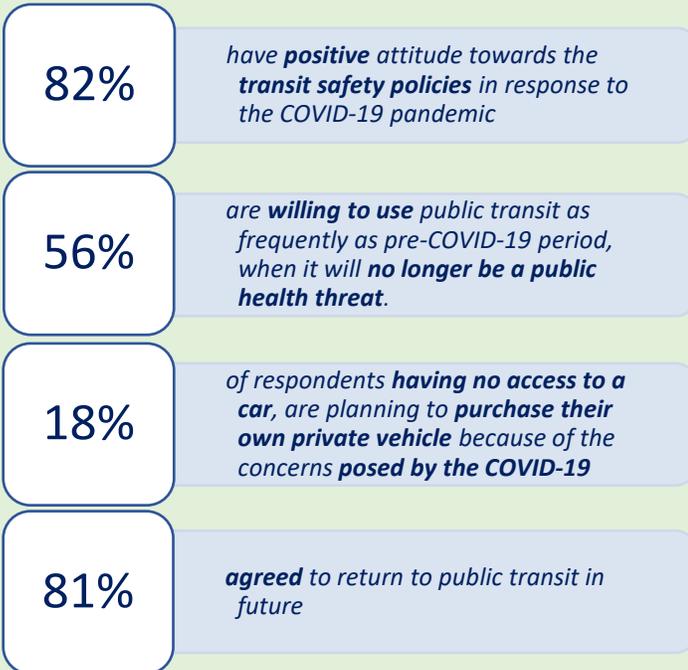
Pandemic specific

- ✓ Daily new cases for the past 14 days in Ontario
- ✓ Vaccine availability

Transit policies for public health and safety

- ✓ Mandatory face covering
- ✓ Contactless payment
- ✓ Boarding and alighting at different door
- ✓ Enforcing strict passenger limits on vehicles
- ✓ Installation of hand-sanitizers
- ✓ Temperature scan prior to boarding

Keys Statistics



Conclusion

This study exclusively focused on the transit rider's perception of transit in various dimensions, including but not limited to the transit safety policies in response to the pandemic. Furthermore, the study tried to provide insights on an urgent concern: transit riders still willing to use transit again or shift to other transportation modes, especially private vehicles. This study's fundamental interest is to identify factors that might influence individuals' modal preference during and post-pandemic.

The preliminary analysis suggested that individuals' accessibility to private vehicles is a crucial factor. The study noticed safety policies ensuing social distancing and health safety in transit trips to be the most preferred. Therefore, transit agencies should seek demonstrative safety policies that will meet the commuter's safety demand. However, further extensive study is required to have a comprehensive understanding of the commuter's perception and priority while choosing travel modes. Urban residents who are planning to shift away from transit are needed to be studied for comprehending the modal substitution pattern. Hence, policy maker and city planner can take effective long-term plan in mitigating the negative externalities that occurred due to the pandemic.

References

1. WHO Director-General's opening remarks at the media briefing on COVID-19 March 2020. Weblink: <https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020>; (Access in March 2020)
2. ES-1 Fast Cities: Executive Summary Fast Cities A comparison of rapid transit in major Canadian cities. Available in: <https://www.pembina.org/reports/fast-cities-summary.pdf> (Access in Aug 2020)
3. Coronavirus impact: Could Canadians end up using cars more, taking transit less? | CTV News [Internet]. Weblink: <https://bc.ctvnews.ca/coronavirus-impact-could-canadians-end-up-using-cars-more-taking-transit-less-1.4929258>; (Access in May 2020)
4. Greater Toronto Area and Toronto CMA Map [Internet]. City of Toronto; Weblink: <https://www.toronto.ca/wp-content/uploads/2017/10/90c1-EDC-Map-GTA-CMA.png>; (Access in Aug 2020)
5. Statistics Canada. Census in Brief: Commuters using sustainable transportation in census metropolitan areas [Internet]. Weblink: <https://www12.statcan.gc.ca/census-recensement/2016/as-sa/98-200-x/2016029/98-200-x2016029-eng.cfm>; (Access in Aug 2020)
6. City of Toronto. Toronto Transit Commission. Weblink: <https://www.toronto.ca/city-government/accountability-operations-customer-service/city-administration/city-managers-office/agencies-corporations/agencies/toronto-transit-commission/>; (Access in Aug 2020)
7. WHO Coronavirus Disease (COVID-19) Dashboard | WHO Coronavirus Disease (COVID-19) Dashboard. Weblink. Available from: <https://covid19.who.int/>; (Access in Aug 2020)
8. Toronto Transit Commission. COVID-19 – Transitioning from Response to Restart and Recovery. 2020; Weblink: http://www.ttc.ca/About_the_TTC/Commission_reports_and_information/Commission_meetings/2020/June_17/Reports/4_COVID_19_Transitioning_from_Response_to_Restart_and_Recovery.pdf; (Access in Aug 2020)
9. Ryan R. Coronavirus: Ontario releases gradual reopening plan, though no dates provided | Globalnews.ca [Internet]. Weblink: <https://globalnews.ca/news/6871656/ontario-reopening-framework-economy-coronavirus/>; (Access in Aug 2020)
10. COVID-19 - Mobility Trends Reports - Apple. Weblink: <https://www.apple.com/covid19/mobility>; (Access in Aug 2020)
11. Timeline: Emergency orders impacting Toronto and Ontario amid the COVID-19 pandemic | CTV News. Weblink: <https://toronto.ctvnews.ca/timeline-emergency-orders-impacting-toronto-and-ontario-amid-the-covid-19-pandemic-1.4881738>; (Access in Aug 2020)