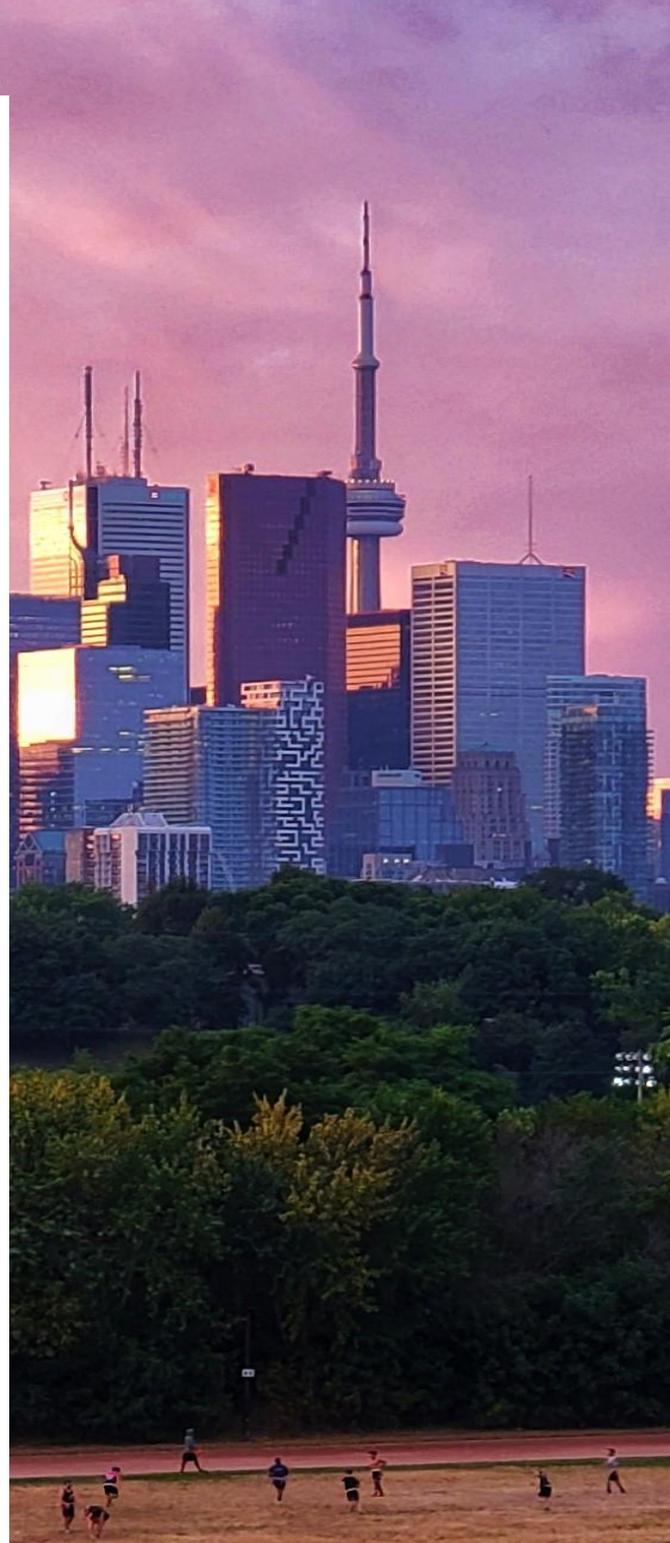


COVID-19 Impact on Residential Relocation Choice in the Greater Toronto Area: Result from a Specialized Survey, Cycle II Summer 2021

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Introduction

The world is experiencing its second year of the COVID-19 global pandemic. The promising results of vaccination programs worldwide in controlling the COVID-19 fatality rate are once again giving hope that it is possible to move back to the restriction-free normal daily activities. However, a question remains: given the opportunity to move back to normal daily lives, to what extent will people keep their current pandemic habits. One of the challenges of the field of transportation in the coming years is assessing the post-pandemic travel behaviour. The key in this assessment is investigating long-term mobility choices as they contribute to future mid-term and short-term mobility in the study area. For a more reliable future travel demand analysis, it is essential to explore whether the pandemic experience has caused residential dissonance among households. It will impose direct and indirect long-term effects on travel behaviour. Capturing these long-term effects is the motivation behind conducting the “GTA-ResMobility” survey. The first cycle was collected in July 2020 to identify the initial impact of the pandemic. The second cycle was collected a year after the first cycle to capture any possible alterations after the first year of the pandemic.



The first and second cycle of “GTA-ResMobility” survey has been conducted in July 2020 & 2021 respectively to assess the impact of COVID-19 on households’ residential relocation behavior.

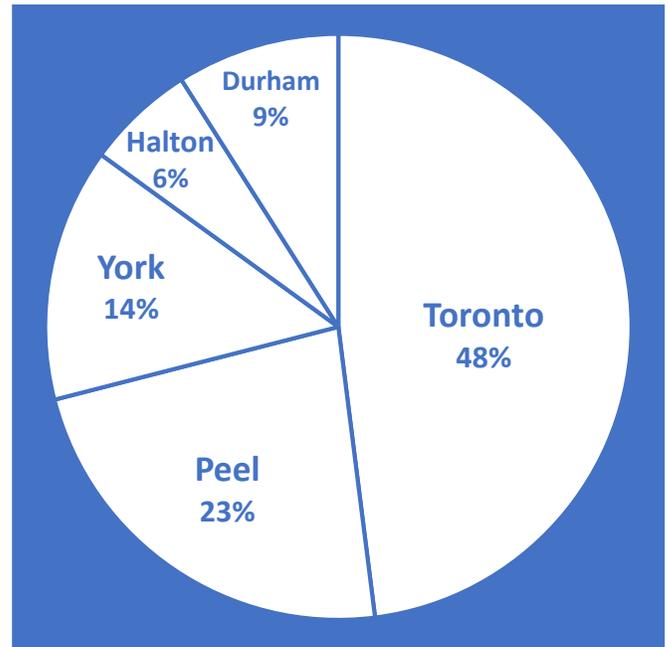


Figure 1- Sample Population Distribution

Sociodemographic Characteristics



42% Male
58% Female



25% Living alone



27% Couple with no child



40% Family with children

Survey Method

In July 2021, a total of 1,377 invitations were sent randomly to individuals who live in the study area, out of which 1,010 completed the survey. In the data cleaning process, we eliminated inattentive responses based on the time spent on specific sections of the survey and choice experiments, and 859 responses remained for data analysis. Then, the collected sample is weighted by using the iterative proportional fitting (IPF) method to match 2016’s census distributions in age, household size, and regions population.

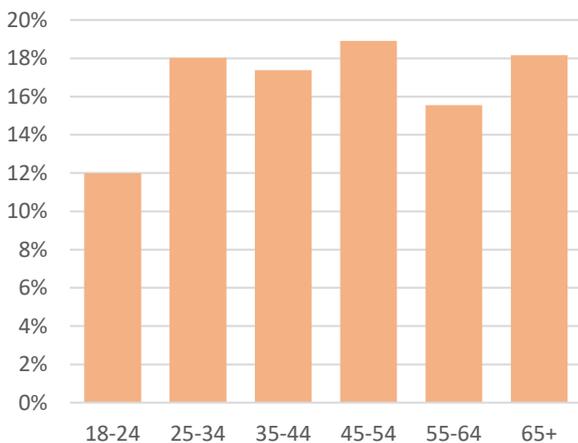
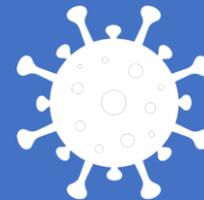


Figure 2- Sample age distribution

Like the first cycle, each individual faced nine hypothetical choice experiments and answered them under three different pandemic-related conditions. The conditions for the second cycle were updated to align with Ontario’s vaccination plans. The combination of choice experiment attributes had some changes compared to the first cycle. Based on the findings of the first cycle, tenure type, parking availability, and access to local schools were replaced with biking paths in the neighbourhood and shopping accessibility.

Choice experiment attributes
Three COVID-19 Conditions
Telecommuting levels
Dwelling Type
Regions
Price
Area
Neighbourhood quality
Access to public transit
Access to the highway network
Biking paths in the neighbourhood
Walk access to shops

The study area has been divided into 19 different regions, as presented in Figure 3. The definition of the regions has been made on a large scale to meet our interest, which is to test whether the COVID-19 pandemic can cause suburbanization in the Greater Toronto Area.



Respondents made their relocation decisions under three hypothetical COVID-19 conditions:

- 1) Going back to normal status after the majority of population is vaccinated
- 2) Adapting to the new normal with mandatory social distancing due to population’s partial immunity
- 3) Experiencing a new strict lockdown in case a new COVID variant escapes the vaccine protection

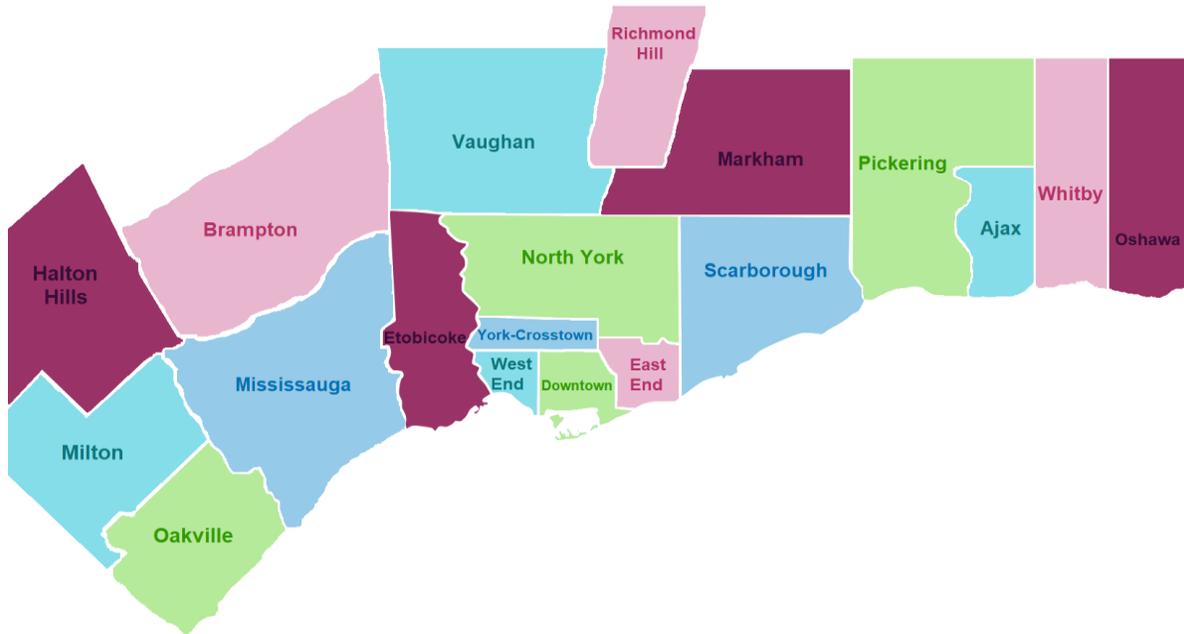


Figure 3- Map of defined regions in choice experiments

As an improvement to the first cycle, the second cycle uses an innovative adaptive choice experiment design where the survey learns respondents' preferences as they respond to survey questions. The new design method helps to provide accurate and personalized choice experiment designs which are more competent in capturing household relocation preferences and produce higher quality data.

Preliminary Findings

Like the previous cycle, homeowners demonstrated less residential mobility compared to renters. The most flexible age group in terms of relocation behaviour were people aged between 25 to 34 years old. Compared to the previous year, there is an 11.3 % less chance for condo residences to switch to detached dwelling type. Still, condo residents are showing more interest in switching to detached dwelling types. In the first cycle, in 39.8% of the scenarios, household chose to relocate their residence. This number drops to 19.7% in the second cycle



41% of households have chosen to move to detached houses in case where a new COVID variant emerges that escapes the vaccine protection.



89% of households who lived in condo/apartments during the pandemic chose to continue their stay in condos regardless of the future status of the pandemic.

showing significant alteration in households' residential relocation behaviour in the last year.

In terms of pandemic behaviour, the first cycle shows households who are stricter in following protective health measures and more pessimistic about the future of the pandemic. While in the second cycle, respondents are more optimistic

	Alternative#1	Alternative#2	Alternative#3	Alternative#4
Dwelling Type:	Semi-detached House	Townhouse	Semi-detached House	Detached House
Region:	Pickering	York-Crosstown	Pickering	Brampton
Overall rent compared to your current dwelling	2,100 CAD/Month	2,700 CAD/Month	3,300 CAD/Month	3,000 CAD/Month
Overall dwelling area compared to your current dwelling	720 sqft	810 sqft	810 sqft	1,170 sqft
Neighborhood quality	Close to the main road with high traffic and noise level	Green and quiet area	Close to the main road with high traffic and noise level	Located at an area with moderate traffic and noise level
Access to public transit	Easy access to all modes of transit	Access to moderately crowded transit	Access to moderately crowded transit	No or limited access
Access to the highway network	Access to a highway with low or medium traffic volume	Access to a highway with high traffic volume	Access to a highway with high traffic volume	No immediate access
Biking paths in the neighbourhood	Painted on-street designated biking lanes	Shared on-street biking lanes	Protected biking lanes	Protected biking lanes
Walk access to favorite shops	No	Yes	Yes	No
Telecommuting option:	Telecommuting is not allowed			

Figure 4- sample of the statement of preference choice experiments presented to respondents.

about the future of the pandemic and the possibility of going back to normal routine life.

On an aggregate level, our analysis show there is less chance of relocation for respondents who believe that the next outbreak like COVID-19 will happen more than 30 years from now.

Our experience from the first cycle results indicated that the harsher the COVID-19 condition becomes, the higher chance of residential mobility. Results of the second cycle also suggest the same pattern as the chance of residential mobility under the third condition is 16.3% and 47.1% higher than the second and first conditions, respectively.

The reduction in the residential mobility is perhaps due to the higher certainty of future during the second cycle data collection. This reduction also indicates that relocation patterns observed during the pandemic are most likely do not have lasting effects and dissipate over time.

92% of households consider their current residence to be accessible to public transit out of which 56% considered proximity to public transit in choosing their current residence. 13% of these households stated they would not consider proximity to transit as a factor in choosing their next residence after the pandemic experience.

No observable patterns are detected for the effect of telecommuting on households' residential relocation as aggregate statistics on scenarios with available telecommuting show no higher residential mobility. This finding does not rule out the possibility of heterogenous taste towards telecommuting attributes. Further disaggregated modelling on survey data is required to capture such an effect.

Our descriptive analysis on the second cycle data indicates that the attitude of households has improved regarding the accessibility to gyms, restaurants, entertainment centers. However, attitude towards public transit accessibility is still similar to the attitude at the beginning of the pandemic. Across both cycles, around 17.5% of respondents no longer consider proximity to public transit a bonus for their residence. If this notion remains in the GTA, there will be a reduction in transit mode share in the future.



On average, in every five households there is a member who is over 60 years old and at higher risk for severe illness from COVID-19. 67% of the sample were fully vaccinated and 10% of the sample stated they have no plans to take the COVID-19 vaccine.

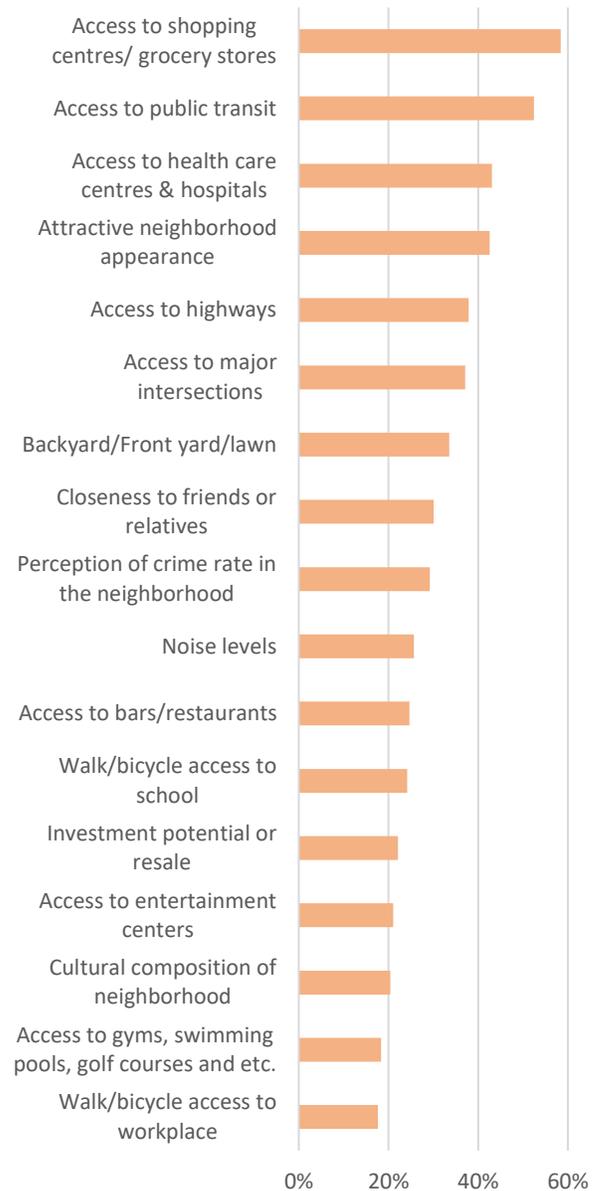


Figure 5- Ranking of factors Households considered in their current residential location choice.

Figure 5 shows the percentage of households considered certain factors in choosing their current residential location. This question came with a follow-up question in which we asked if the respondent lost interest in any of them when choosing their next residential location, due to their pandemic experience. Figure 6 ranks the

affected factors by COVID-19 based on the number of times households chose them. For example, 52.5% of respondents reported considering the proximity to public transit in choosing their current residence (Figure 5). After they experienced the lockdown, 13.2% of them were no longer interested in being close to public transit (Figure 6). 13.2% compares to 24.6% from the first cycle results and suggest less negative attitude toward public transit after the pandemic experience.

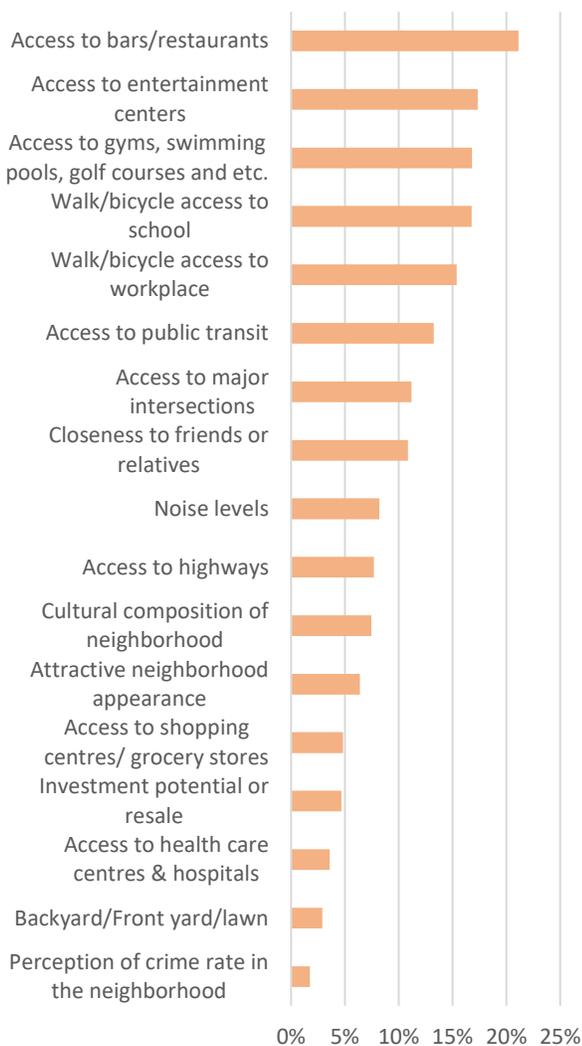


Figure 6- Ranking of factors Households no longer considered in relocating their residential location

Conclusions

Results from the first cycle showed us that the lifestyles of households had been changed through the pandemic. Many households experienced ICT choices for the first time, and their experience lasted for several months. The second cycle findings show households' residential relocation attitudes and behaviour are changing through time. The dominant trends on both cycles were different. During the first cycle, which was conducted at a time when the future of the pandemic was more uncertain, households demonstrated more extreme but distinctive relocation behaviour. In the first cycle, a group of households has chosen not to relocate under any circumstances and rather wait to receive more information on the future of the pandemic. On the other hand, another group of households demonstrated zero tolerance for residential dissonance caused by the COVID-19 pandemic and wanted to change their residence in case they find a new favourable residence.

The second cycle shows households extreme attitudes have been alleviated after the first year of the pandemic suggesting that the residential dissonance has been reduced after the first year of the pandemic. Although in some cases this dissonance is eliminated due to the household's relocation, the majority of cases depict change in attitudes of households after more certainty is gained about the future of the pandemic.

“It was an enjoyable study and I found myself considering the options of changing