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An Assessment of the Impacts of Covid-19 Lockdown in Summer 2021 on Activity-Travel Behaviour in the Greater Toronto Area: Results from Cycle-2 of CASAS Satellite Survey

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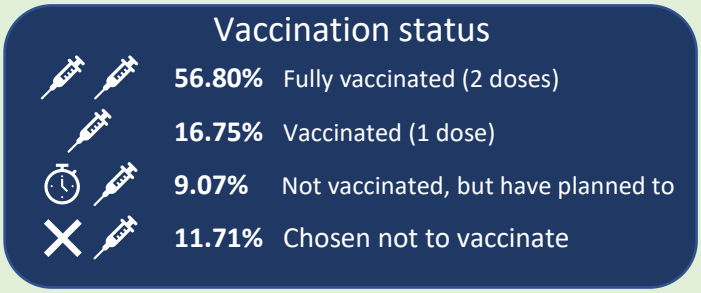
Introduction

After less than a month from the first confirmed case of infection to the COVID-19 in China on the last day of 2019, Canada reported its first case on Jan. 25th, 2020 (1). Later, on March 11th, 2020, the number of cases in Canada exceeded 100 persons, and from March 17th, 2020, provinces declared a state of emergency (1).

At the time this article wrote, it had been more than 18 months since the state of emergency was declared in Ontario, Canada, to control the spread of the novel Coronavirus (COVID-19) pandemic (2). Various rules were introduced to limit mandatory and leisure outdoor activities and respective travels from early days. Although these restrictions were relaxed for a while during this time, they have not been completely lifted, and our life has not returned to normal. Despite this, we accustomed ourselves to this new situation, or better to say, New Normal (3).

This new normal offered new alternatives to perform everyday activities. For instance, individuals have practiced telecommuting and online meetings, online grocery and non-grocery shopping, and socializing with family and friends using video calls. In addition, companies and businesses have employed methods based on Internet and Communication Technologies (ICT) to present their services to the customers on the one hand, and on the other hand to provide a working platform to their employers.

At this stage of dealing with disruptions, most of the residents of Canada have been vaccinated (at least one dose), and activity destinations are reopening (4). We are gradually getting back to our pre-pandemic life, but we have gained a precious experience of performing activities from a distance. The important question for researchers is the level of interest society has to continue



Using tele-activities after the situation ultimately returned back to normal. In terms of the stability of these new routines, they need to be perceived entirely and reflected by all of its aspects in the next generation of activity-travel scheduling models.

Although it was not the first time a natural disruption led to activity-travel alterations, this one is distinctly different (5). We believe the long temporal and wide spatial distribution of this interruption can have a deeper impact on individuals' habits. At least we can expect that in comparison to previous disruptions, a greater proportion of society tends to substitute new routines or retain new routines for a longer duration afterward. This is a hypothesis that would be tested in this study for some frequent activities, especially for work activities.

After one year from the first cycle, in summer 2021, the second cycle of web-based COVID-19 impact on Activity Schedule Alteration Survey (CASAS 2021) (5) was conducted by the Travel Demand Modeling Group of the University of Toronto. This survey explored the impact of the COVID-19 lockdown on the daily activity-travel behaviour of the Greater Toronto Area residents (**Fig. 1**).

Figure 1 Map of the Greater Toronto Area (GTA) (6)

The purpose of this survey was to collect evidences on the impact of the COVID-19 lockdown on the way individual performing their activities such as working, shopping, eating, and visiting to enable the anticipation about the probable continuity of these activities in future. The report presents the summaries of preliminary analyses and take-away lessons.

The Survey

This survey is the second cycle of the two-cycle panel CASAS data collection. For this cycle, a representative sample of 1000 adult residents of the GTA was selected to participate in a web-based survey. The participants are from 5 subdivisions of GTA: 1. Toronto, 2. Halton, 3. Durham, 4. Peel, and 5. York (**Fig. 1**). The data collection started on July 11, 2021, synchronized with the third stage of reopening in Ontario (4). The population distribution of the sample among subdivisions were fixed to match with relative populations from Census 2016 (7). The distribution of other aspects of the sample was checked by Census 2016 regarding conformity validation of the sample (**Table 1**).

The questionnaire of this study includes questions about sociodemographic attributes in individual and household levels, pandemic-related topics, frequency of performing activities using various in-person and remote methods, stated preference for work, and attitudinal questions towards workplace choice and online grocery shopping. **Figure 2** presents the change in time expenditure on everyday activities, comparing during and before the lockdown. Some other activities are discussed in more detail later in this report. Scenarios for stated preference questions were generated using an efficient design method by NGENE software (8).

Table 1 Conformity of CASAS sample to the real population of GTA in different sociodemographic factors

	STATS Canada	CASAS sample
Gender		
female	52.2%	59.6%
male	48.8%	40.4%
Age		
18-29	20.7%	23.3%
30-39	17.3%	27.3%
40-49	18.0%	17.6%
50-64	25.6%	20.9%
65<	18.4%	10.8%
Marital Status		
single	30.8%	36.6%
couple (married/partner)	56.0%	54.9%
separated	8.2%	5.7%
widowed	5.0%	2.8%
Level of Education		
below high-school	5.24%	2.5%
high-school	12.26%	16.7%
diploma/trade/certificate	60.31%	34.6%
bachelors	14.52%	32.4%
advanced degree (master/PhD/MD)	7.67%	13.7%

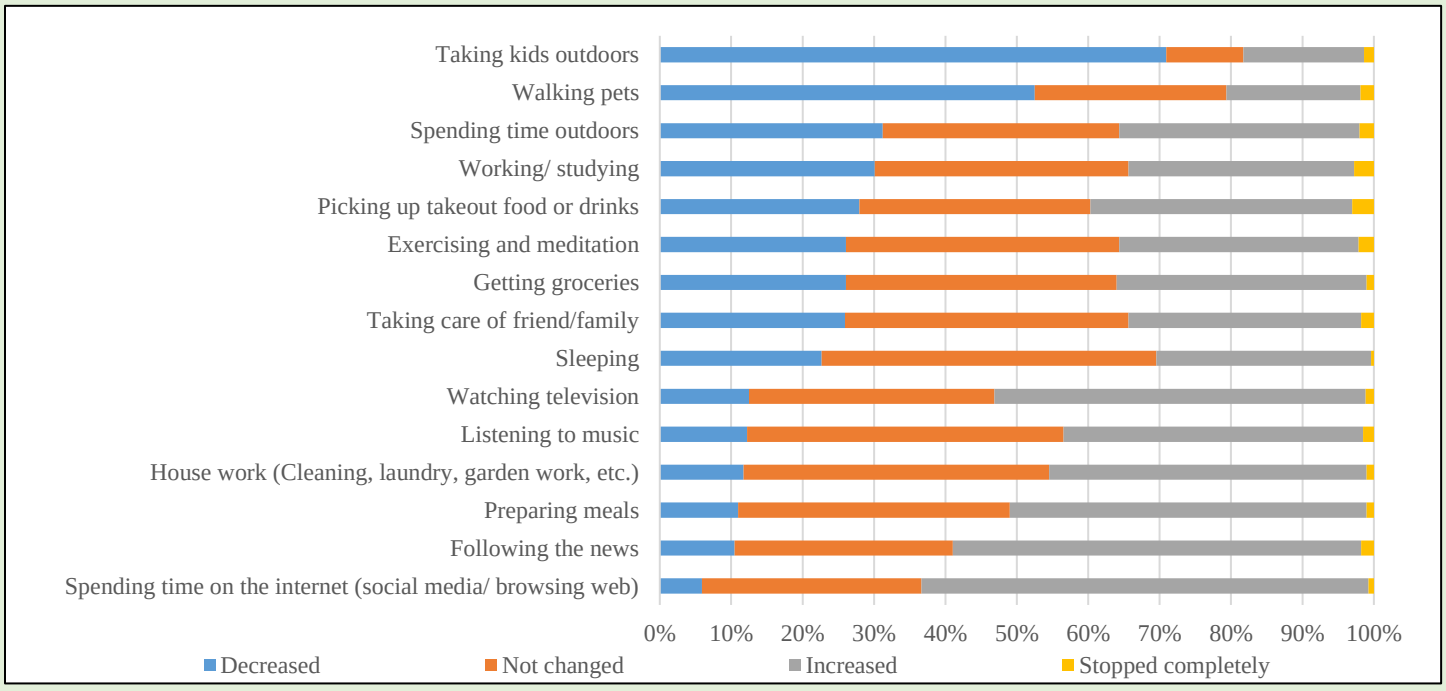


Figure 2 The difference in time expenditure on different activities, comparison of before and during lockdown

Frequency of Visiting Methods

With lockdown restrictions, it is not surprising to observe a drastic drop in indoor gatherings since the pandemic (**Fig. 3 (a)**). Although most of this drop is said to have recovered after the pandemic, the overall frequency would remain lower than pre-pandemic conditions. Similarly, meetings in public spaces and hospitality venues would be less frequent in post-pandemic times. The latter ones are predicted to experience a greater decrease (**Fig. 3 (c) and (d)**). In contrast, 54% of respondents seem to utilize online meetings more than once a week during the pandemic. This suggests a 14% increase than before. Also, the share of less frequent users (1 to 3 times a month) increased significantly during this time, implying that meeting online is one of those habits that stabilized during this lockdown and would be practiced more frequently in the future (**Fig. 3 (b)**). Finally, using phone calls to contact family members and friends showed close to minor change since and after the pandemic (**Fig. 3 (e)**).

In the previous cycle, phone calls were more frequent during the lockdown than before the pandemic, although the higher use of phones was not predicted to continue. Also, a higher proportion of respondents stated they would continue using online meetings in the future. After a year, online meetings to visit family and friends seem to be not as frequent as it was anticipated hypothesis of a new behavioural routine practiced during the lockdown that will continue.

Participants' Access to Facilities at Home

- **90.5%** Internet connection
- **92.9%** Laptop or PC
- **34.4%** Secondary monitor
- **69.4%** Printer
- **65.7%** Work desk
- **34.0%** Office room

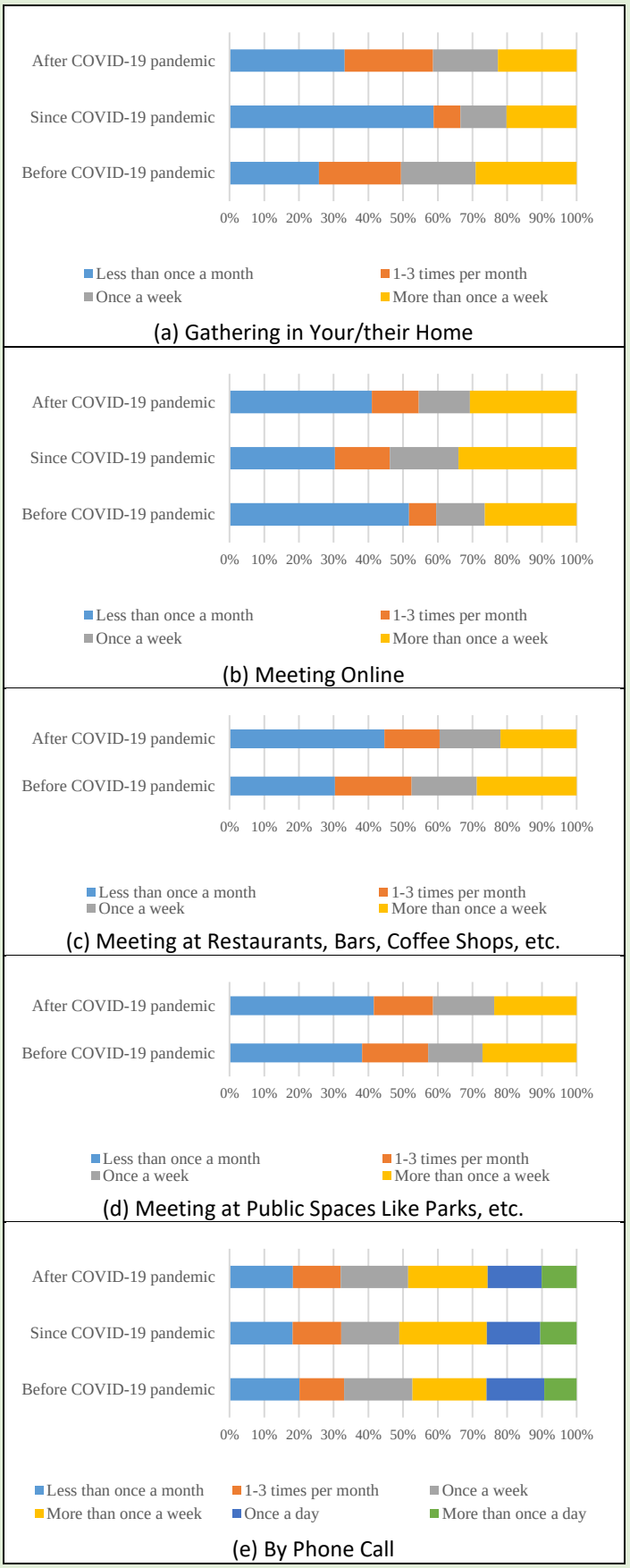


Figure 3 Visiting family or friends - Different method frequencies before during, and after the pandemic

Meal Preparation/Eating Methods

It is found that eating habits have altered due to COVID-19, like restaurants and other foods and drink venues were forced to be closed during the lockdown. They could only serve customers by delivery or pickup. Restaurants predicted to lose in-person customers after the pandemic as people stated they would less frequently eat at restaurants (**Fig. 4 (a)**). The frequency of preparing food at home increased mainly for those who cook 2 to 4 times a week but not to an extent for those who are cooking less frequently. The frequency of in-home cooking would get back to its regular routine after the lockdown (**Fig. 4 (b)**). Overall, the frequency of ordering food with delivery or pickup increased slightly during the pandemic. However, this activity would return to its previous routine, yet a small proportion of those who were in extremes would become moderate (**Fig. 4 (c) and (d)**).

In the previous cycle, cooking meals at home was found to be more frequent during the pandemic. However, the frequency of eating at restaurants seems to become less attractive for respondents. It shows some newly adopted routines are gradually returning to normal after the pandemic while others are still kept.

Grocery Shopping Methods

During the lockdown, grocery shops were open for an in-store shopping experience within limited capacity and guidelines. In addition, home delivery and in-person pickup options were available during the pandemic. The summary of how respondents used different grocery shopping methods in three-time slots is presented in (**Fig. 5**). The frequency of in-store shopping dropped since the pandemic, but respondents stated they would return to their previous manner as COVID-19 disappears (**Fig. 5 (a) and (b)**). Since the pandemic lockdown, 10% of respondents who had never used online shopping beforehand (both with home delivery and in-person pickup), attempted such options at least once a month (**Fig. 5 (c) and (d)**). Although the frequency distribution of online grocery shopping has not changed significantly, 5% stated that it would be more utilized in the future compared to before the pandemic.

Compared to the previous cycle, the respondents showed a decrease in online grocery shopping for less than once a month during the lockdown. This means the use of online grocery shopping increased from the previous year.

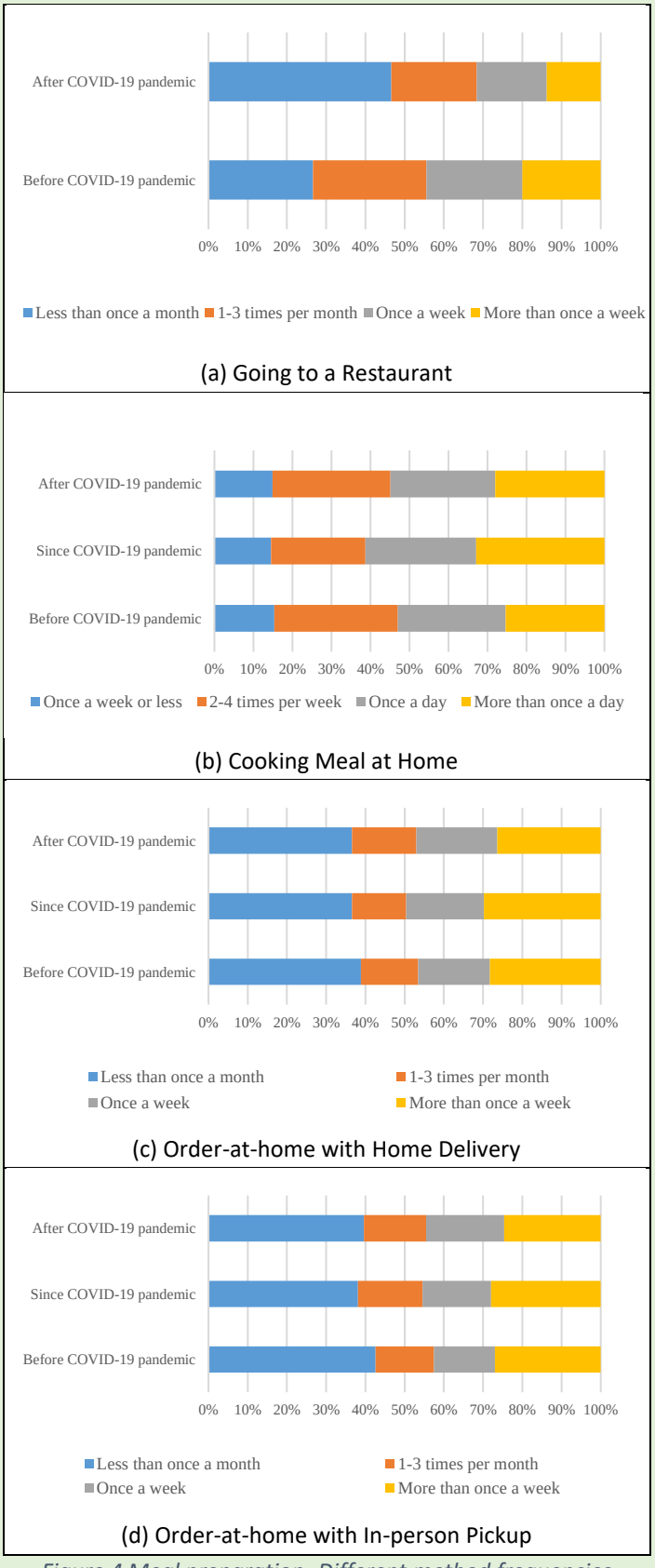


Figure 4 Meal preparation- Different method frequencies before, during, and after the pandemic

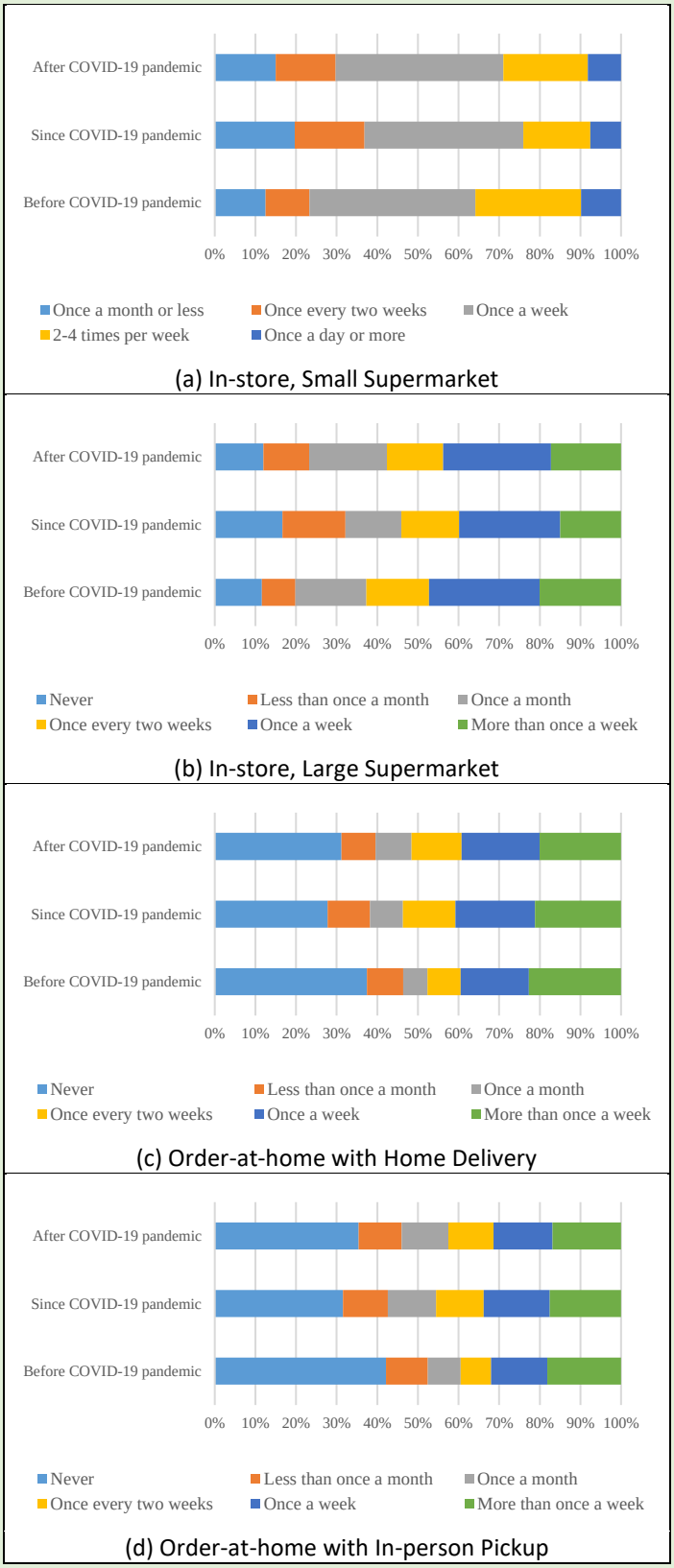


Figure 5 Grocery shopping - Different method frequencies before, during, and after the pandemic

Working from home

During the pandemic lockdown, some occupations such as health care employees and other key workers were required to work on-site. In our sample, 54.2% of the employed respondents were needed to physically attend their workplace. The flow between employment status before (on the left side tagged with B) and during the pandemic (on the right side) is displayed in (**Fig. 6**). In comparison with results from the previous cycle, the ratio of off-site full-time workers during the pandemic dropped from 24% to 19%, which correlates to about 20% reduction.

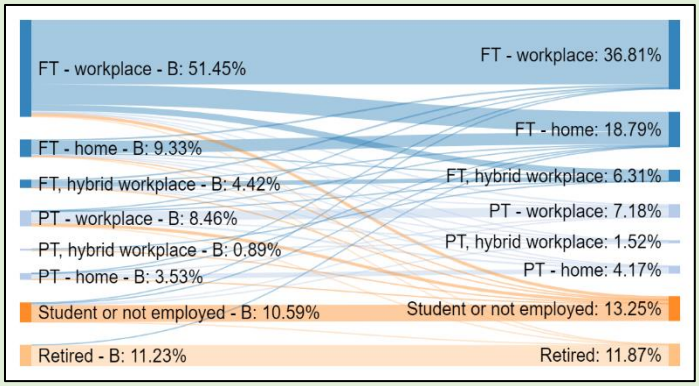


Figure 6 Employment status before and during the pandemic

43% of the sample who were employed had the experience of telecommuting at least once a month before the pandemic. This number increased to 56% since the pandemic. As well as this, the distribution of telecommuting frequency changed since the pandemic (**Fig. 7**). The number of individuals who performed telecommuting 5 days a week was multiplied by 1.67. This is the new share for individuals working from home since the other frequency levels are more or less similar to before pandemic levels.

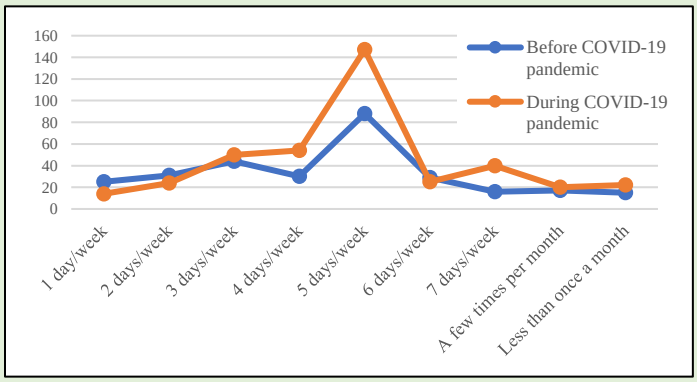


Figure 7 Frequency of telecommuting before and during the lockdown

Working from home might have different types and different definitions (9). From the list of possible options, we picked four types of distance working. The distribution of types before and during the pandemic is presented in **Fig. 8**. We used frequency to show the great addition for "working as an employee", the most distinct change since the pandemic.

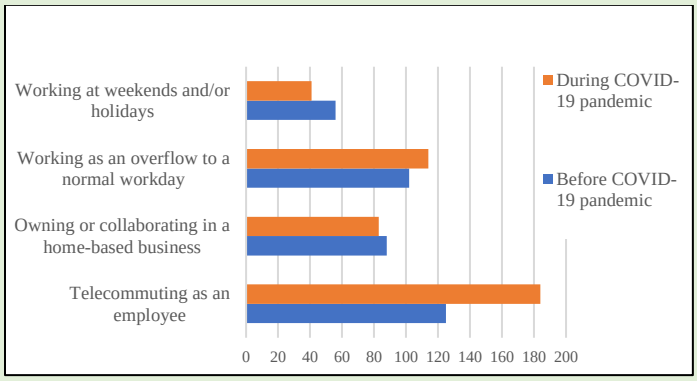


Figure 8 Distribution of telecommuting types before and during the lockdown

Work productivity changes and reason

Productivity or work performance is an important measure that will affect the preference of telecommuters to continue working from home. We asked telecommuters if their productivity changed compared to before pandemic levels (**Fig. 9**) and what are the parameters affecting the productivity (**Fig. 10**). From the parameters that caused telecommuting to increase, elimination of commuting time, more demanding jobs, and comfortable workspace were stated to have the highest impact. For work productivity reductions, distractions at home and communication and technical difficulties that arise with technology had the most negative impacts while sharing the workplace with others and being sick had the least effect. An important observation is the impact of "concerns" and "distractions" on the productivity drop. When we get back to normal and places reopen, specifically childcare and schools, the main origins that cause such distractions would fade if not disappear. Also, concerns from COVID-19 related topics will no longer be viable too. Thus, when time eliminates these issues, telecommuting would be more desirable.

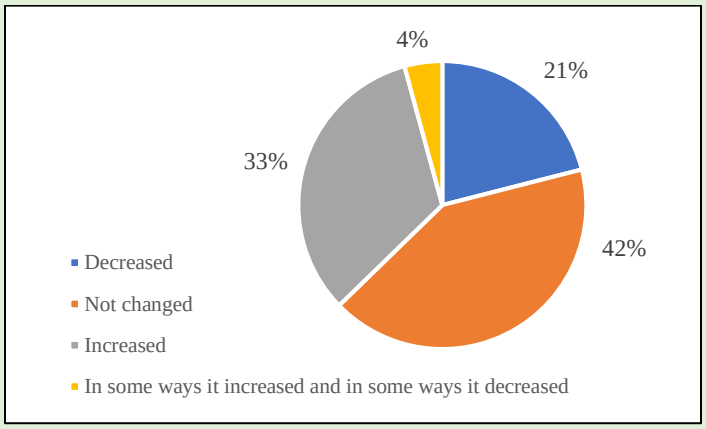


Figure 9 Productivity changed during compared to before the lockdown

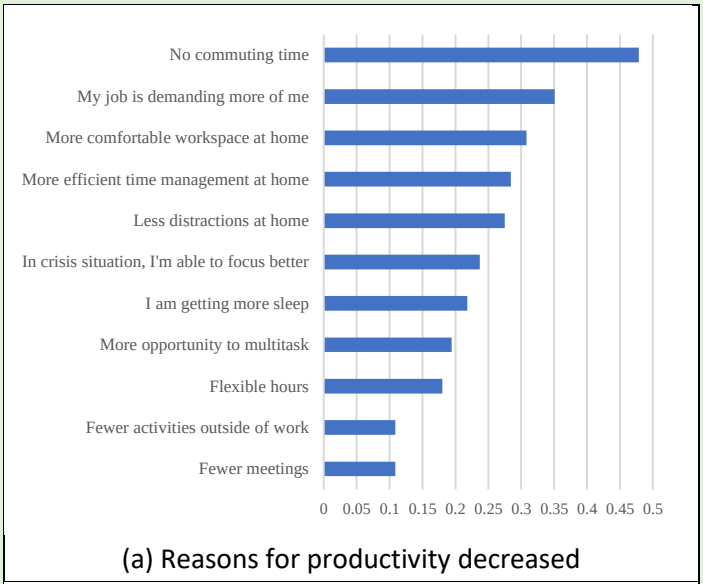


Figure 10 Parameters affecting the telecommuting productivity

Stated Preference choice experiments

To complete our analyses on workplace choice, we designed a set of stated preference (SP) scenarios to picture a real choice case in the future for respondents. To understand the impact of influential variables in the decision of respondents, we estimated a binary mixed logit with repeated choices from the respondents model using a combination of sociodemographic variables and attributes of SP scenarios. We used this model to capture the heterogeneity in the set of choices made by every participant. An example of a displayed SP-table is presented in **Fig. 11**.

Model results show a negative impact of greater travel time on the utility of the on-site workplace. The negative value is greater for larger travel time, which is expected. Travel time between 10 to 30 minutes was found to have no significant impact on choice. Having an exclusive workplace positively supports the probability of an on-site workplace but has no significant effect on an off-site workplace. Also, both utilities increase when flexible work hours is permitted, but this option seems more desirable for off-site work. Age between 30 to 40 years old has a positive correlation with off-site working since youngers are more open to adopting technology-based alternatives and elders have more resistance toward it.
For the off-site alternative, access to better communication tools and a dedicated workplace positively affect the probability. Time spent on child-caring tasks during work hours has a significant negative impact on remote working. The attractiveness of on-site working increases when the condition completely returns to normal or when the respondent should provide riding service to another family member.

Keys Statistics

56% *agree/strongly agree that telecommuting has more advantages than disadvantages*

61% *of respondents think telecommuting should be more common*

71% *of respondents who practiced teleworking during the pandemics wants to perform that at least once a week in future*

65% *of the respondents concern of emerge of new variant of COVID-19*

74% *of respondents believe the social distancing is essential to control the spread of the virus*

50% *of respondents are hesitant about the efficacy of the vaccine*

Providing ride to other family members	***No***
COVID-19 status	***Everything completely back to normal***

Attributes	Work from home	Work in workplace
Furniture at home (Comfort level of the workplace)	No fixed/dedicated desk or place	-
Hours spent on childcare task (during work hours)	Less than 1 hour	-
Available communication tools	No communication tools	-
Flexible working hour (Shifting/Splitting)	permitted	not permitted
Workplace sharing (distraction/ concentration)	Sharing workplace with another worker/student family member	Sharing workplace with another colleague
One-way travel time to workplace	-	More than 60 min
Commuting vehicle	-	Ride hailing (private/shared)

Figure 11 An example of displayed SP scenario for workplace choice

Conclusion

This study sought to investigate how respondents perform frequent everyday activities (work, grocery shop, meal preparation/eat, visit family/friends) using different in-person and ICT-based methods and the possibility of these methods being utilized in the post-pandemic era. We used a sample of 800 residents of the Greater Toronto Area (GTA). They attended a web-based survey collected in July 2021 about the impact of COVID-19 on activity-travel schedule alterations. Analyses were presented to understand the change in utilization of in-person and ICT-based methods of doing activities during the pandemic in comparison to before the pandemic and the possibility of their continuity afterward.

Respondents stated they are still concerned about the new variant of COVID-19 and other possible future mutations and variants. Although more than 73% of the sample received at least one dose of the vaccine, they were hesitant about the vaccine efficacy. During the pandemic, some activities like in-person grocery shopping and contacting family and friends using phone calls seem not to be affected, yet, for some other activities like non-grocery shopping and visiting, ICT based methods was utilized as a valid substitute for in-person alternatives for a substantial proportion of the sample during the pandemic.

As well as this, the stability of the new routines and their prominence in the future was the critical question we tried to investigate in this study. We found some ICT-based alternatives that stated it would be practiced after the pandemic with a greater frequency than before the pandemic, such as online grocery and non-grocery shopping and online meetings. These activities are the candidates of being continued in the future, at least by a noticeable proportion of society.

Work activity, our main focus in this study, seems to be practiced by half of the employed respondents during the pandemic, and about 70% of respondents stated that telecommuting for at least a few days per week is desirable for them. The employed respondents mentioned that a comfortable workspace and no commuting time are the reasons their productivity increased during their time telecommuting. Also, the communication issue and distractions are two parameters that negatively affect the productivity of telecommuters. The employees should be noticed that permitting to have a hybrid workplace can improve the satisfaction of their staff. They also can improve productivity in the workplace by providing more comfortable space. Employees also can consider multiple carrier hubs distributed around the city instead of one central place to omit commuting time.

Finally, this study tried to be comprehensive and include many activity types. More focused studies on each of the above activities might shed light on the hidden part of the individual's activity behaviour. Repeating this survey when everything got back to normal gives more comparative data for behaviour alteration. Also, using panel data from two cycles of CASAS, dynamic models can be estimated for future studies.

References

1. From first cases to first vaccines: A timeline of COVID-19 in Canada - National | Globalnews.ca. [cited 2021 Sep 30]. Available from: https://globalnews.ca/news/7597228/covid-canada-timeline/
2. A timeline of COVID-19 in Ontario | Globalnews.ca. [cited 2021 Jul 21]. Available from: https://globalnews.ca/news/6859636/ontario-coronavirus-timeline/
3. Kamplimath H, Shivam S, Goenka S. A user opinion survey on the probable impact of COVID-19 on long-distance travel in India. Transportation Letters [Internet]. 2021 [cited 2021 Jul 30];13(5–6):388–94. Available from: https://www.tandfonline.com/doi/abs/10.1080/19427867.2021.1897938
4. Reopening Ontario | Ontario.ca [Internet]. [cited 2021 Jul 20]. Available from: https://www.ontario.ca/page/reopening-ontario
5. Dianat A, Hawkins J, Habib K. Assessing the Impacts of COVID-19 on Activity-Travel Scheduling: A Survey in the Greater Toronto Area. 2021 [cited 2021 Jul 20]; Available from: https://trid.trb.org/view/1759537
6. List of municipalities in the Greater Toronto Area - Wikipedia [Internet]. [cited 2020 Nov 26]. Available from: https://en.wikipedia.org/wiki/List_of_municipalitie

s_in_the_Greater_Toronto_Area#/media/File:Greater_toronto_area_map.svg

7. Statistics Canada. Data tables, 2016 Census. 2016 Census of Population. 2018 [cited 2021 Jul 30]. Available from: https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/dt-td/Index-eng.cfm?TABID=2&LANG=E&A=R&APATH=7&DETAIL=0&DIM=0&FL=A&FREE=0&GC=0&GL=-1&GID=0&GK=0&GRP=1&O=D&PID=0&PRID=10&PTYPE=109445&S=0&SHOWALL=0&SUB=0&Temporal=2016&THEME=0&VID=0&VNAMEE=&VNAMEF=&
8. ChoiceMetrics (2012) Ngene 1.1.1 User Manual & Reference Guide, Australia.
9. Patricia Mokhtarian by L, Salomon Leon IJ, Ell Professor AK, Choo S, Salomon I. MEASURING THE MEASURABLE: WHY CAN'T WE AGREE ON THE NUMBER OF TELECOMMUTERS IN THE U. S.? Quality and Quantity. 2005;35:423–52.