TRANSPORTATION MOBILITY AND SAFETY IN RESPONSE TO COVID-19

FINAL PROJECT REPORT

by

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16. Abstract

In this project we collected data from residents of the Puget Sound region on their travel behavior changes during the pandemic and attitudes toward pandemic-related subjects. Data were collected through the Google Forms platform. This report summarizes our team's activities on data collection, data cleaning, and descriptive analysis of the data.

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Table of Contents

EXECUTIVE SUMMARY xii

CHAPTER 1. SURVEY DESIGN AND DATA COLLECTION 1

CHAPTER 2. CLEANING PROCESS 3

CHAPTER 3. SOCIOECONOMICS 5

CHAPTER 4. TRAVEL PATTERNS 9

CHAPTER 5. PERCEPTIONS AND ATTITUDES 27

CHAPTER 6: EXPECTED OUTCOMES 41

LIST OF TABLES

Table 2.1 Number of responses removed in each step 4
Table 2.2 Number of responses flagged in each step 4
Table 2.3 Work from home response check 4
Table 3.1 Gender distribution 5
Table 3.2 Age distribution 5
Table 3.3 Race distribution 6

LIST OF FIGURES

Figure 1.1 Snapshot of a Facebook ad promoting our survey 2
Figure 3.1 Age distribution 5
Figure 3.2 Income distribution 6
Figure 3.3 Employment status of the sample 7
Figure 3.4 Employment industry of essential workers 7
Figure 4.1 About 60 percent of individuals had never worked from home before. During the pandemic 30 percent of them had experienced working from home. After the pandemic, when COVID-19 is no longer a threat, 40 percent of the individuals said they expect to not work from home anymore 9
Figure 4.2: In-store grocery shopping had been reduced during the pandemic, but respondents expected to return to pre-pandemic patterns after COVID-19 is no longer a threat. 10
Figure 4.3: During the pandemic, more individuals had tried online grocery shopping, and they expected to use it after the pandemic as well. 10
Figure 4.4: In-store shopping, while reduced during the pandemic, was expected to return to normal. 11
Figure 4.5: Online shopping became more popular during the pandemic. Responses showed that individuals expected to do more online shopping after the pandemic than they did to before the pandemic. 11
Figure 4.6: Frequency of eating in a restaurants had dropped considerably during the pandemic, but respondents expected to return to before pandemic behavior in the future. 12
Figure 4.7: Ordering food had become more popular during the pandemic and was expected to remain more frequent in the future in comparison to before the outbreak. 12
Figure 4.8: Driving alone had dropped considerably during the pandemic. A majority of respondents expected to return to their pre-pandemic behavior after COVID-19 is no longer a threat. 13
Figure 4.9 During the pandemic fewer people carpooled. Respondents expected a small change toward more carpooling after the pandemic. 14
Figure 4.10: Public transit frequency of usage had dropped considerably, and almost 92 percent of individuals indicated they had not used transit during the pandemic. Interestingly, the

number of individuals who indicated they would never use transit after the pandemic was less than before the pandemic. 14
Figure 4.11 During the pandemic, about 90 percent of our sample had not used ferries or water taxies; however they expected to use them more often after the pandemic than before the pandemic. 15
Figure 4.12: Almost 95 percent of individuals had not used solo ridehailing and taxis during the pandemic but expected to return to their pre-pandemic behaviors after COVID-19 is no longer a threat. 15
Figure 4.13: Most respondents expected to return to their previous usage patterns of shared ridehailing. 16
Figure 4.14 About 75% percent of our sample had never used bikes and scooters before the outbreak. This number had increased slightlyduring the pandemic. However, more individuals expected to bike after the pandemic. About 40 percent of respondents expected to bike at least once a month, which was a larger group than before the pandemic. 16
Figure 4.15: Shared bikes and scooters had not been popular before the pandemic among our sample. Respondents did not expect to change their behavior after the pandemic..... 17
Figure 4.16: There was a small drop in those who had never walked, and a small increase in respondents who expected to walk every day post-pandemic. 17
Figure 4.17 Driving alone was the dominant mode of travel to work/school. During the pandemic 65 percent indicated that they had not traveled for work/school. 18
Figure 4.18 There was a very minimal change in the transportation mode for grocery shopping trips. 18
Figure 4.19 75 percent of respondents had driven alone for shopping before the pandemic. 60 percent of respondents had continuedto do so during the pandemic, while 25 percent had not traveled for other shopping. 19
Figure 4.20 For errands, driving alone remained the dominant mode. The figure shows a small shift from dirving alone to not traveling at all. Less than 10 percent of respondents who had ridden public transit for running errand before the pandemic stopped using transit during the pandemic for that purpose. 19

Figure 4.21 Interestingly, the figure shows see a slight increase in walking for socializing purposes during the pandemic. 25 percent of individuals had stopped traveling for this purpose. About 30 percent of individuals had to carpooled for such purpose before the pandemic, and that number had decreased to 15 percent%. 20
Figure 4.22: 32 percent of individuals had not made any changes to their working from home behavior, and about the same number had made changes because of their employers' policies. 21
Figure 4.23: 60 percent of individuals had not made any changes to their work hours. 21
Figure 4.24: 50 percent of respondents had not made changes in their mode of transportation for work trips. 17 percent of the sample had made changes voluntarily. 22
Figure 4.25: For online grocery shopping, half of the respondents had not made any changes, and a majority of the other half had done so voluntarily. 22
Figure 4.26 More than 65 percent of the respondents had made changes to their in-store grocery shopping behaviors voluntarily. About 10 percent indicated that theyhad made changes to their behavior because of government recommendations..... 23
Figure 4.27 A majority of respondents had changed their other shopping behaviors voluntarily. About 10 percent did so because of government recommendations..... 23
Figure 4.28 About half of the respondents had changed their non-work trips' mode voluntarily, while 40 percent had not made any changes at all..... 24
Figure 4.29 While a majority had continued their same behavior, 15 percent of individuals had started to work earlier than before, and 18 percent had started to work later than before the pandemic. 25
Figure 4.30 About 12 percent of repsondents had stopped working earlier than before, while 23 percent had stopped working later than before the pandemic..... 25
Figure 5.1 More than 50 percent of respondents strongly agreed that everyone should stay at home until the threat of COVID-19 subsided. Less than 5 percent of respondents stated some level of disagreement with the above statement..... 27
Figure 5.2 Less than 20 percent of the respondents agreed to some extent that media was exaggerating the spread of the COVID-19, while 45 percent strongly disagreed with this statement. 28

Figure 5.3 About 20percent of our sample, to some level, agreed that shutting down businesses was not worth the economic damage it caused, while 33 percent strongly agreed that it was worth the damage. 28
Figure 5.4 A majority of individuals indicated that their family and friends expected them to stay home until the pandemic subsided. About 22 percent indicated some level of disagreement with the statement. 29
Figure 5.5 Less than 5 percent of respondents disagreed that physical distancing was an inefficient approach for controlling the pandemic. 29
Figure 5.6 More than 60 percent of respondents indicated a strong agreement regarding their concerns for their family and friends' health. 30
Figure 5.7 More than 75 percent of participants indicated strong agreement with face-covering mandates. 30
Figure 5.8 About half of the participants thought that working from home made them less disiplined/self-controlled, while the other half felt the opposite. 31
Figure 5.9 A majority of individuals in our sample enjoyed social interactions with their colleagues. 31
Figure 5.10 About two-thirds of our sample indicated that they could efficiently replace their in-person work meetings with online meetings, while the other third thought otherwise. 32
Figure 5.11 More than 40 percent of our sample strongly disagreed with the statement, "I miss my commute." About one fourth of our sample missed their commute trip. 32
Figure 5.12 About 45 percent of the sample agreed with the statement that working from home increased family conflict to some extent. 33
Figure 5.13 When asked about the perceived impacts of in-person interactions with co-workers on performance, a majority of the sample indicated that they performed better when they interacted with their co-workers. 33
Figure 5.14 More than 60 percent of the sample indicated strongly that they were not okay with crowded buses. Only about 5 percent indicated some level of tolerance for crowded buses. 34
Figure 5.15 About 80 percent of participants indicated that they disagreed with being okay sharing rides to save money. About 20 percent said they would share rides with others to save money. 34

Figure 5.16 A majority of respondents were not comfortable with sharing a ride with a stranger. 35
Figure 5.17 About 90 percent of respondents had tried to avoid others when they used transportation options..... 35
Figure 5.18 Personal space while traveling was important to more than 90 percent of the respondents. 36
Figure 5.19 More than 85 percent of our sample thought traveling on public transit posed a health risk. 36
Figure 5.20 About 45 percent of survey participants indicated that they would travel on a bus or light rail if physical distancing were enforced. 37
Figure 5.21 About half of our pariticpants found in-store grocery shopping fun, while the other half did not. 38
Figure 5.22 About 90 percent of participants agreed that shopping online was convenient. 38
Figure 5.23 About 60 percent of individuals indicated that they did not enjoy going to stores and browsing, even if they ended up not buying anything 39
Figure 5.24 About 70 percent of our sample said they would rather buy groceries in the store than online..... 39
Figure 5.25 About 70 percent of our sample said that physically checking items before purchasing them was important. 40
Figure 5.26 More than 60 precent of respondents considered eating out in restaurants to be a fun leisure activity. 40

EXECUTIVE SUMMARY

This project aimed to understand how travel-related decisions of residents of the Puget Sound region in Washington state changed as a result of the COVID-19 pandemic. We collected data on travel behavior of respondents before and during the pandemic, their socioeconomic characteristics, attitudes, and behavior changes. Respondents were recruited through ads on Facebook, with 49,146 ad impressions yielding 1,389 completed surveys. Responses indicated sizable increases in working from home and online shopping, with reductions in commuting, transit ridership, and in-store shopping. In most cases, respondents expected to return to pre-pandemic activities and travel patterns once it is safe to do so. Two notable exceptions were working from home and online grocery shopping; respondents expected to do these more post-pandemic than they did pre-pandemic. Respondents indicated changing many of their behaviors voluntarily, with the exception of working from home, which many attributed to employers' policies.

CHAPTER 1. SURVEY DESIGN AND DATA COLLECTION

We designed a survey to study how travel-related decisions of residents of the Puget Sound region in Washington state changed as a result of the COVID-19 pandemic. In the survey, we asked respondents about their travel behaviors before and during the pandemic. We also asked them what they expected their future (after the pandemic) travel choices would look like. In addition to travel behavior questions, we asked respondents several socio-economic and psychometric questions. We used Google Forms as our data collection platform, and a word document of the questionnaire is at the end of this report. (Survey Text)

The survey was advertised through the Facebook page of the UW Civil and Environmental Engineering Department (figure 1.1), and was live for 14 days (June 26 through July 9, 2020). Ads were run on Facebook, Instagram, Messenger, and other social media platforms owned by Facebook, and were set to be shown only to residents of the Puget Sound region in Washington state (King, Snohomish, Kitsap, and Pierce counties). As an incentive to participate, respondents were entered in a drawing for their choice of an Apple iPad or a Microsoft Surface tablet.

The ads reached 49,146 people, of which 2,018 people (4.10 percent) clicked on the ad and opened the survey. Of the 2,018 people who clicked on the survey link, 1,389 individuals completed the survey (68.83 percent). The total survey cost was approximately $800, including $400 in ad expenses plus $400 for the incentive prize.

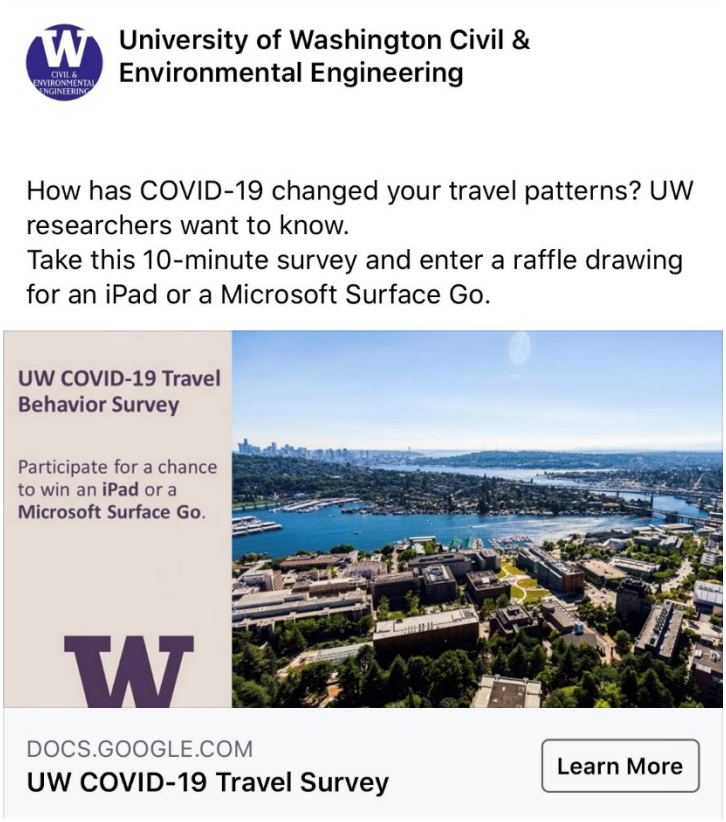


Figure 1.1 Snapshot of a Facebook ad promoting our survey

CHAPTER 2. CLEANING PROCESS

The data cleaning steps are described below:

1. Removed respondents who did not agree with terms and conditions
2. Removed individuals who chose the shared ridehailing option as their mode of travel (shared ridehailing wasn't available in the Puget Sound region at the time of the survey).
3. Removed anyone, among the first 30, who did not choose "Walk" or "N/A" at all. (Initially, for some questions, all the options were not visible on the page and required some scrolling. Therefore, we added a sentence to the instructions to remind respondents to scroll, and we checked the individuals who had already responded to make sure they had seen all the options.)
4. Removed data corresponding to the same email or phone number (people who submitted the survey multiple times).
5. Removed rows that were duplicated (people who submitted the survey several times but didn't enter email and phone number).
6. Flagged respondents who chose the same option for each question within a set.
7. Flagged respondents whose responses to work from home questions were contradictory (e.g., In a typical month BEFORE the outbreak (e.g., in January) how often did you.....work from home? "Never" and Did you use to work from home before the COVID 19 outbreak? "Yes, a few days a week"). (See table 3.3.)
8. Flagged respondents whose responses to mode of transportation were contradictory (e.g., In a typical month BEFORE the outbreak (e.g., in January) how often did you use the following modes of transportation? Drive alone, "Never" and In a typical month BEFORE the outbreak (e.g., in January) what mode of transportation did you generally use for the following purposes? Work/School, "Drive Alone").
9. Removed individuals who were flagged more than once (see table 2.2).

After data cleaning, we ended up with 1,310 valid responses. Table 2.1 shows number of removed responses after each of the above steps.

Table 2.1 Number of responses removed in each step

Step	Criteria	Removed responses
1	Respondents who did not agree with terms and conditions	7
2	Respondents who chose shared ridehailing option as their mode of travel during the pandemic (which wasn't an available option).	31
3	Respondents among the first 30, who did not choose "Walk" or "N/A" at all.	20
4, 5	Respondents who submitted answers more than once.	11
9	Respondents with more than one flag	9
	Total	78

Table 2.2 Number of responses flagged in each step

Step	Criteria	Flagged responses
6	Respondents who chose the same option for same option for each question within a set.	7
7	Respondents whose responses to work from home questions were contradictory	103
8	Respondents whose responses to mode of transportation were contradictory	26
9	Responses with more than one flag	9

Table 2.3 Work from home response check

N= 1310	In a typical month BEFORE the outbreak (e.g., in January), how often did you ...Work from home						
Did you use to work from home before the COVID-19 outbreak?		Never	Once a month or less	A few times a month	1-2 days a week	3-4 days a week	Everyday
	No response	255	22	23	18	12	22
	No	567	79	40	12	1	10
	Yes, a few days a week	4	3	13	91	27	3
	Yes, everyday	18	5	0	2	7	76

CHAPTER 3. SOCIOECONOMICS

The following tables and figures summarize the socioeconomic characteristics reported by the survey respondents.

Table 3.1 Gender distribution

Response	Count
Female	664
Male	636
Other (including non-binary, agender, FtM, transman)	8
Prefer not to say	1

Table 3.2 Age distribution

Minimum	1st Quantile	Median	Mean	3rd Quantile	Maximum
18	33	45	44.86	58	99

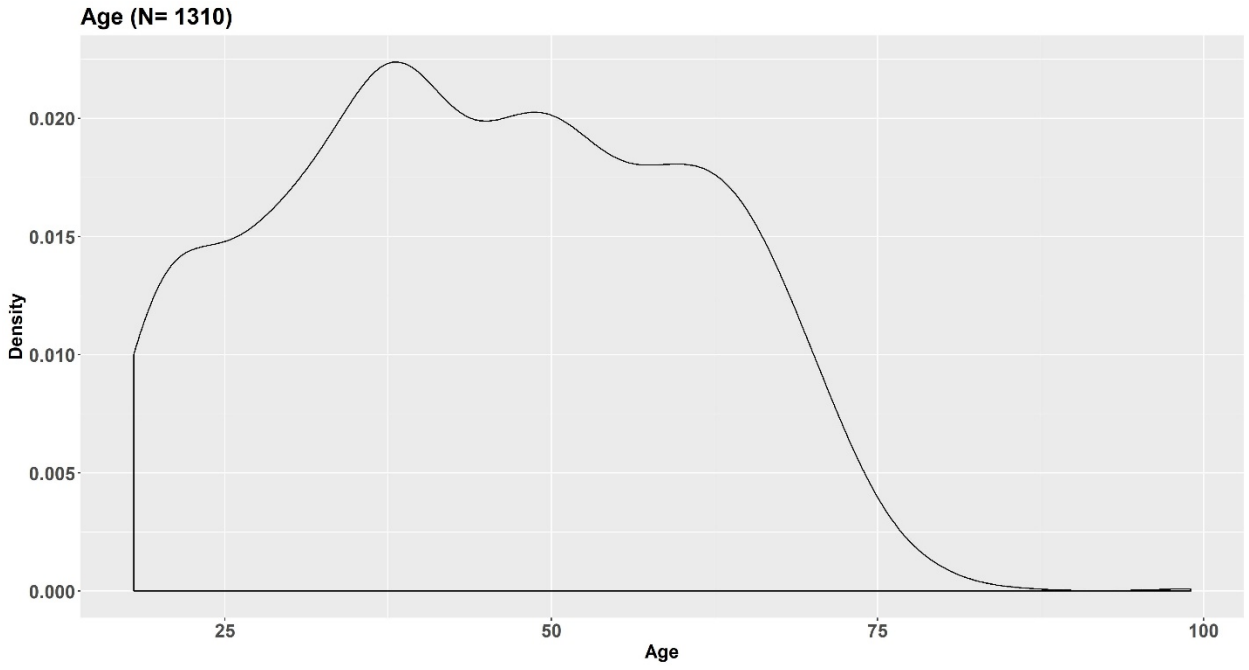


Figure 3.1 Age distribution

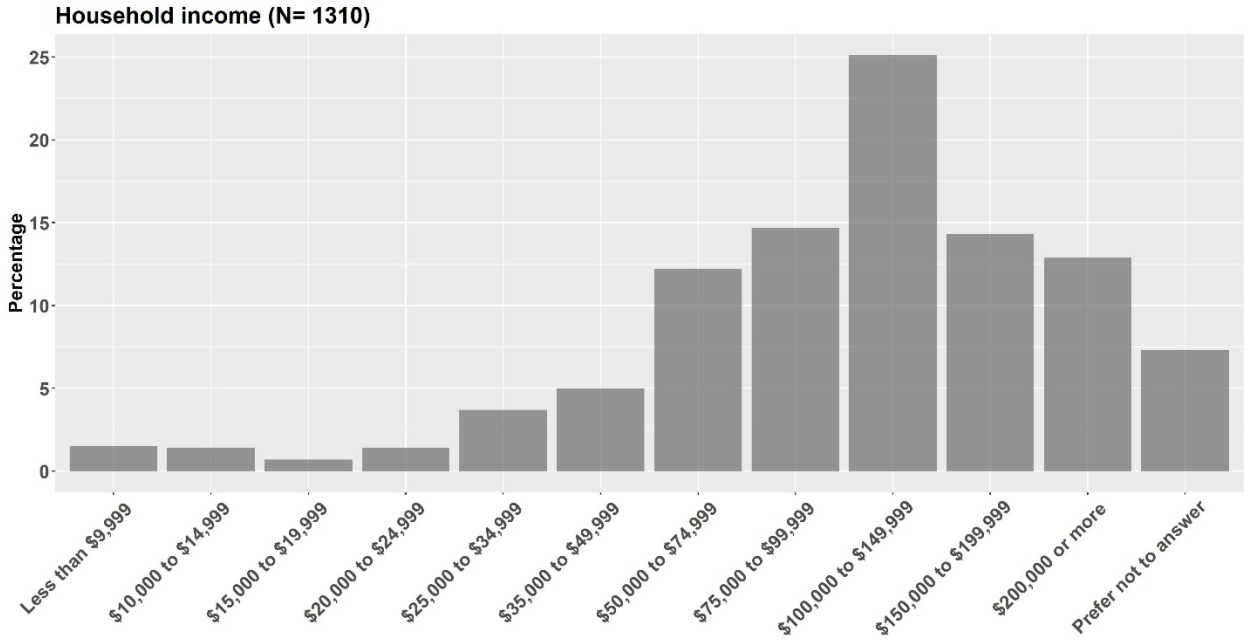


Figure 3.2 Income distribution

Table 3.3 Race distribution

Race	Count	Percentage
American Indian or Alaska Native	9	0.7%
Asian	159	12.1%
Black or African American	19	1.4%
Hispanic or Latino	49	3.7%
Mixed/Bi-racial	32	2.4%
Native Hawaiian or Other Pacific Islander	6	0.5%
White (Including: Italian, Italian American, Middle Eastern, Syrian, subcontinent of Asia-India/Punjab)	1028	78.5%
Prefer not to answer/Unknown	8	0.6%
Total	1310	100%

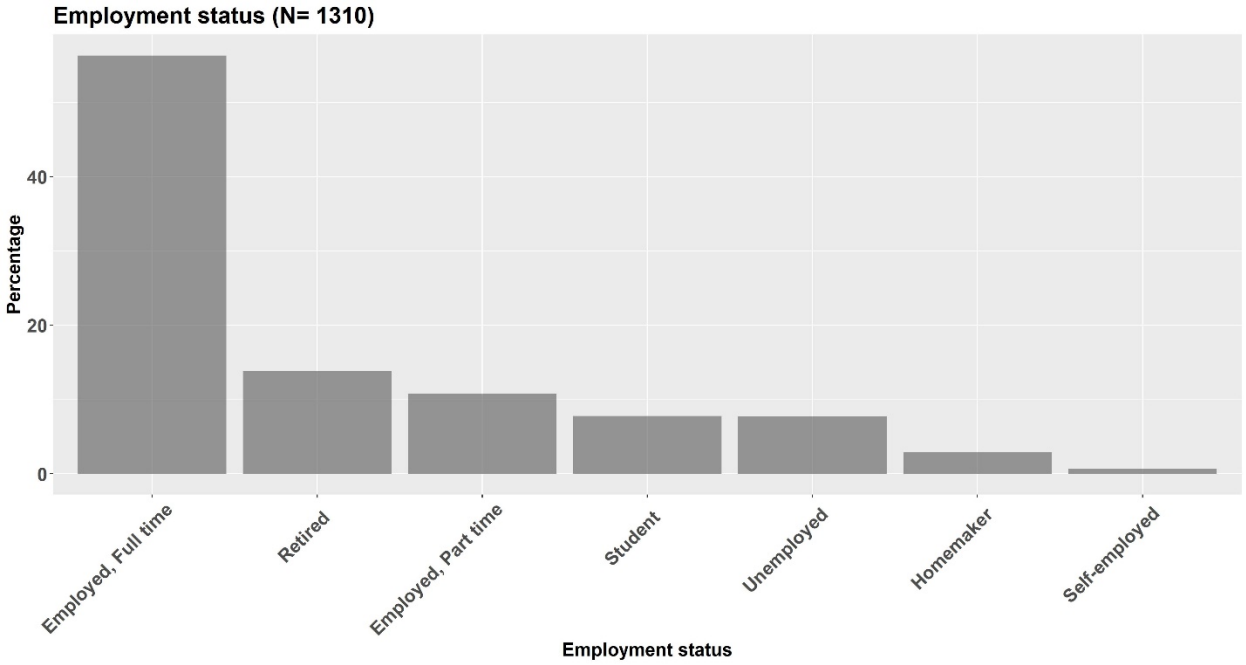


Figure 3.3 Employment status of the sample

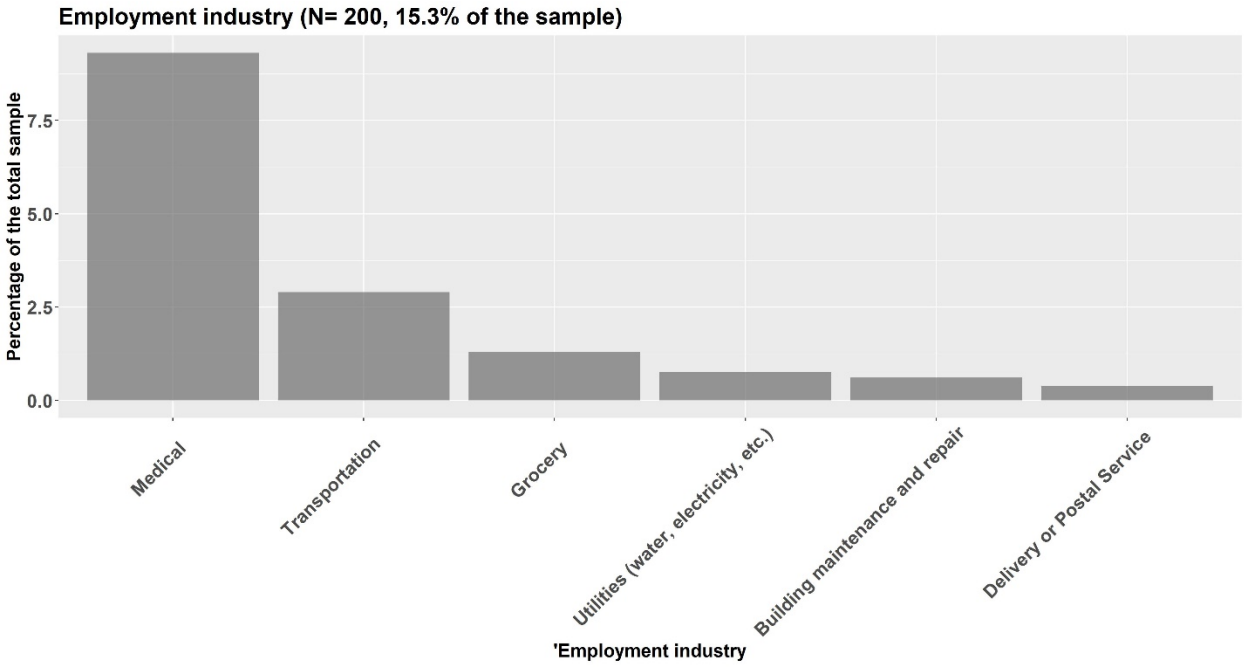
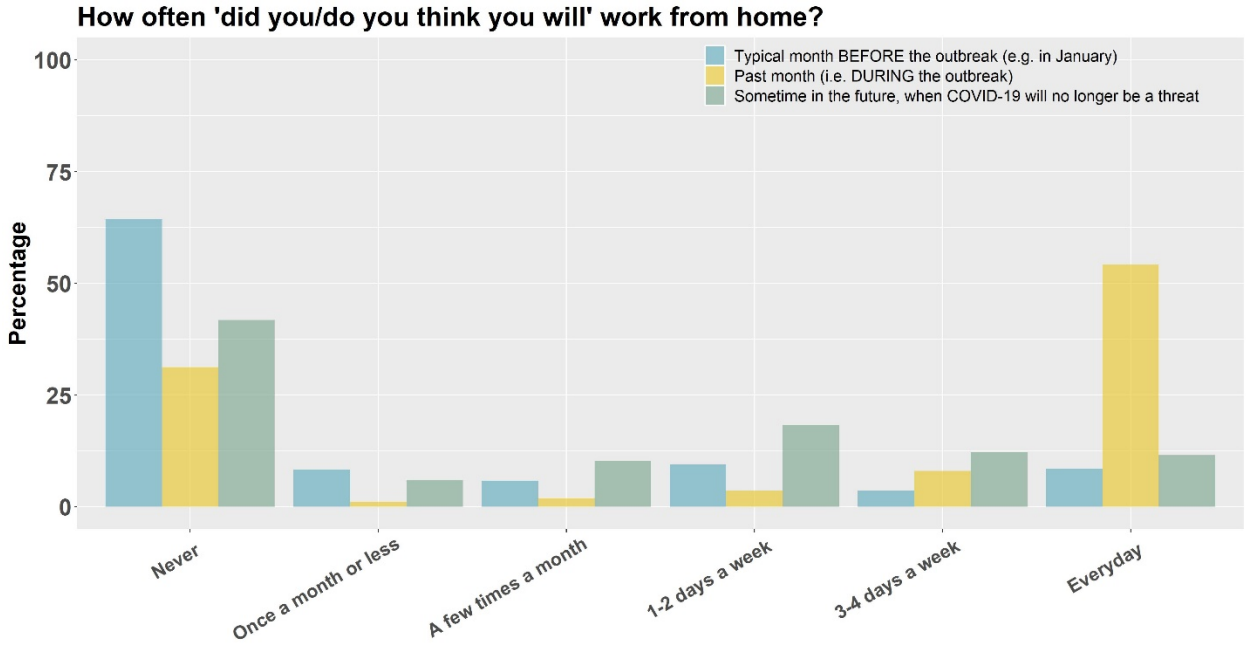


Figure 3.4 Employment industry of essential workers

CHAPTER 4. TRAVEL PATTERNS

Figures 4.1 through 4.7 report responses to questions regarding working from home, online and in-store grocery shopping, online and in-store shopping (other than grocery), eating in a restaurant, and ordering meals for pick-up or delivery. Responses for before, during, and after pandemic are shown side by side in each figure.



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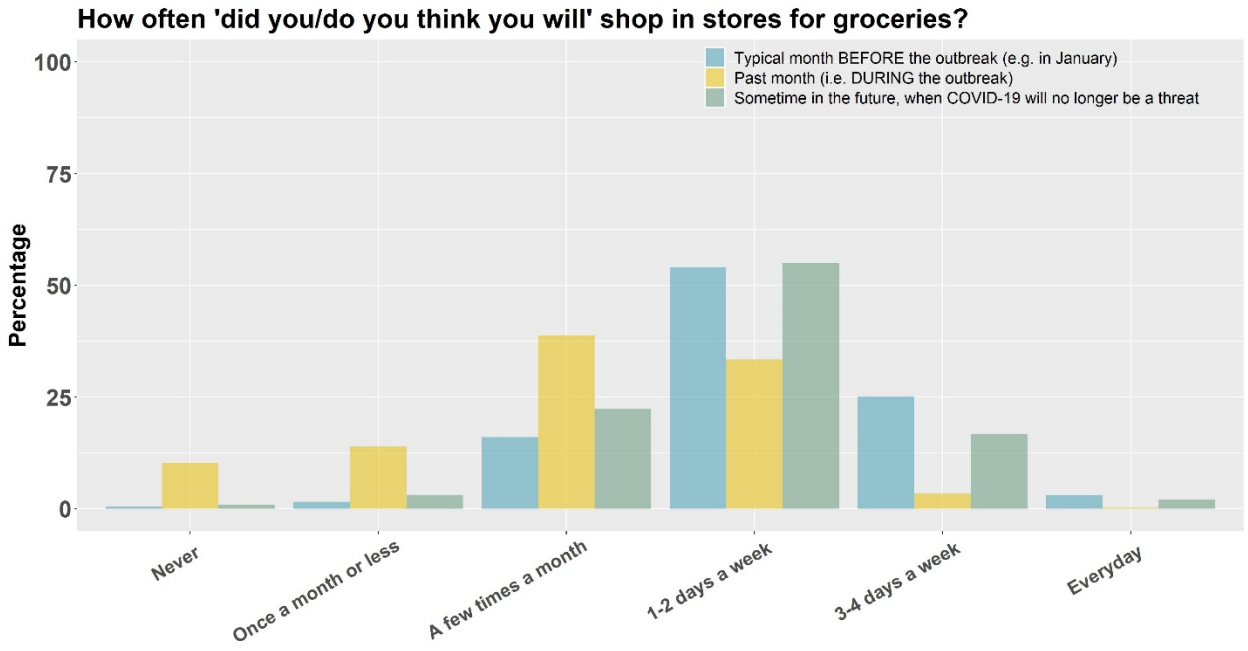


Figure 4.2: In-store grocery shopping had been reduced during the pandemic, but respondents expected to return to pre-pandemic patterns after COVID-19 is no longer a threat.

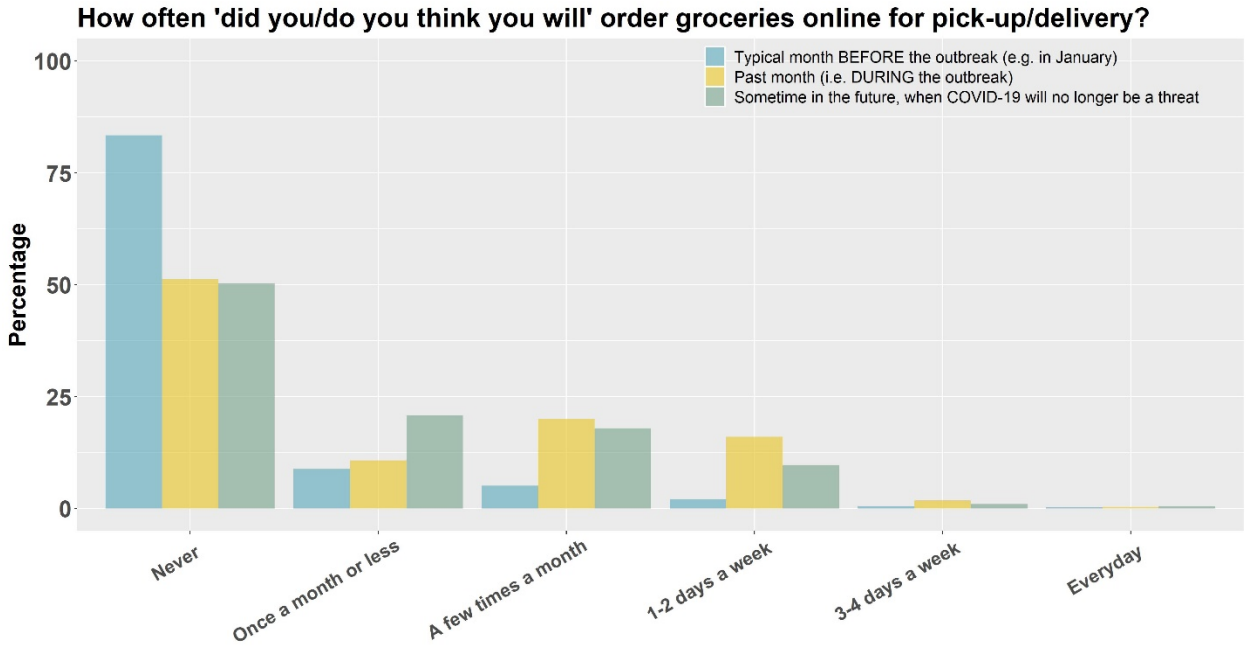
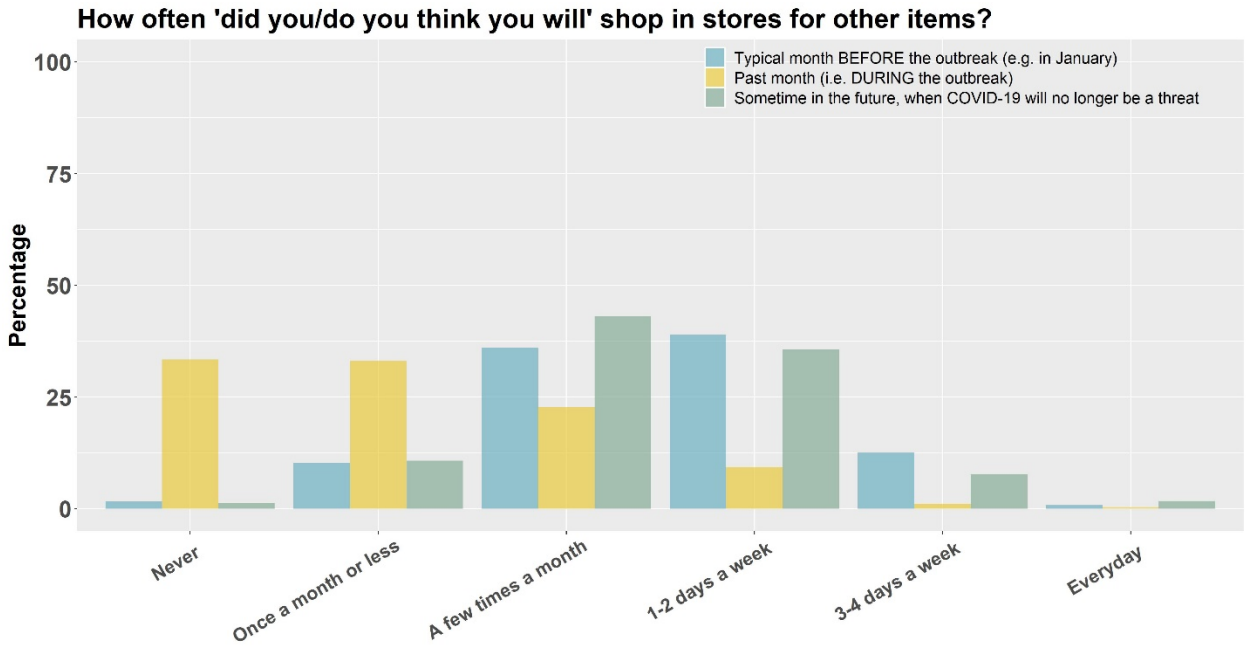


Figure 4.3: During the pandemic, more individuals had tried online grocery shopping, and they expected to use it after the pandemic as well.



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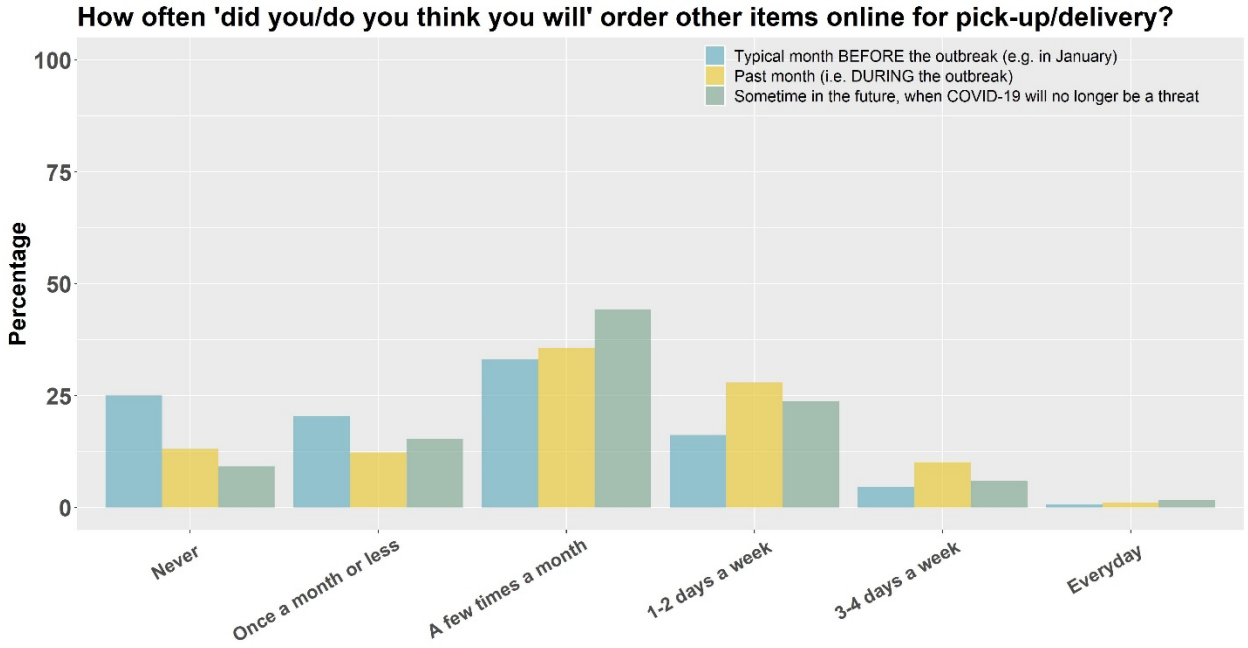

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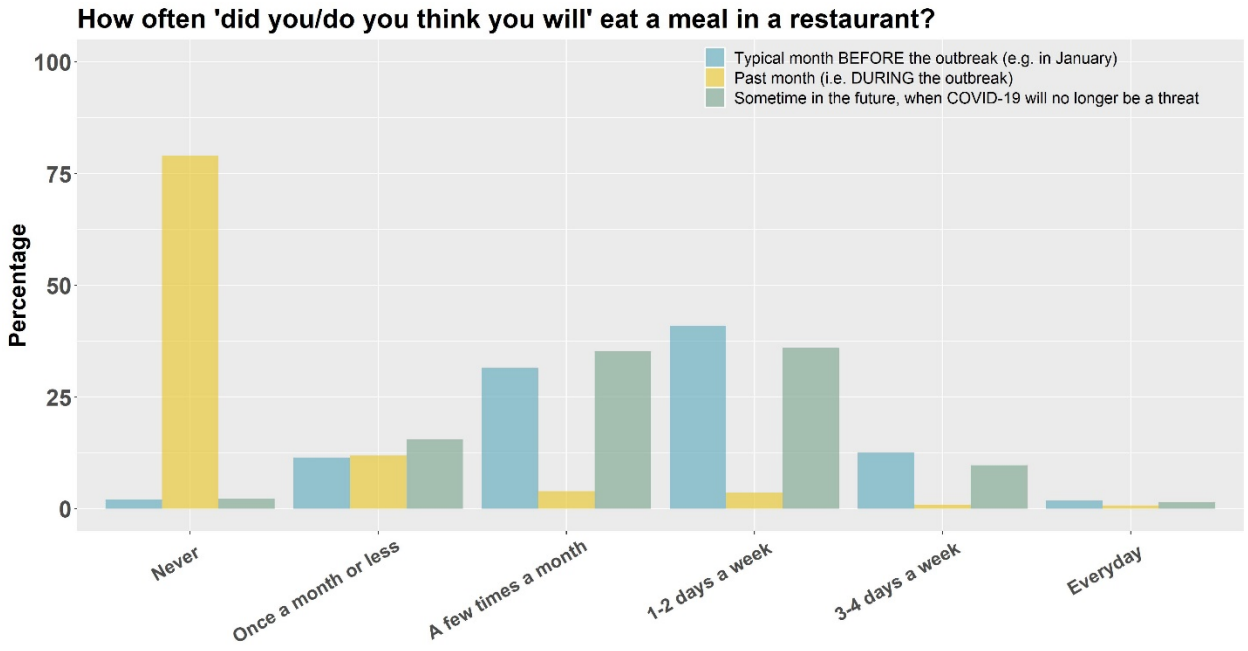

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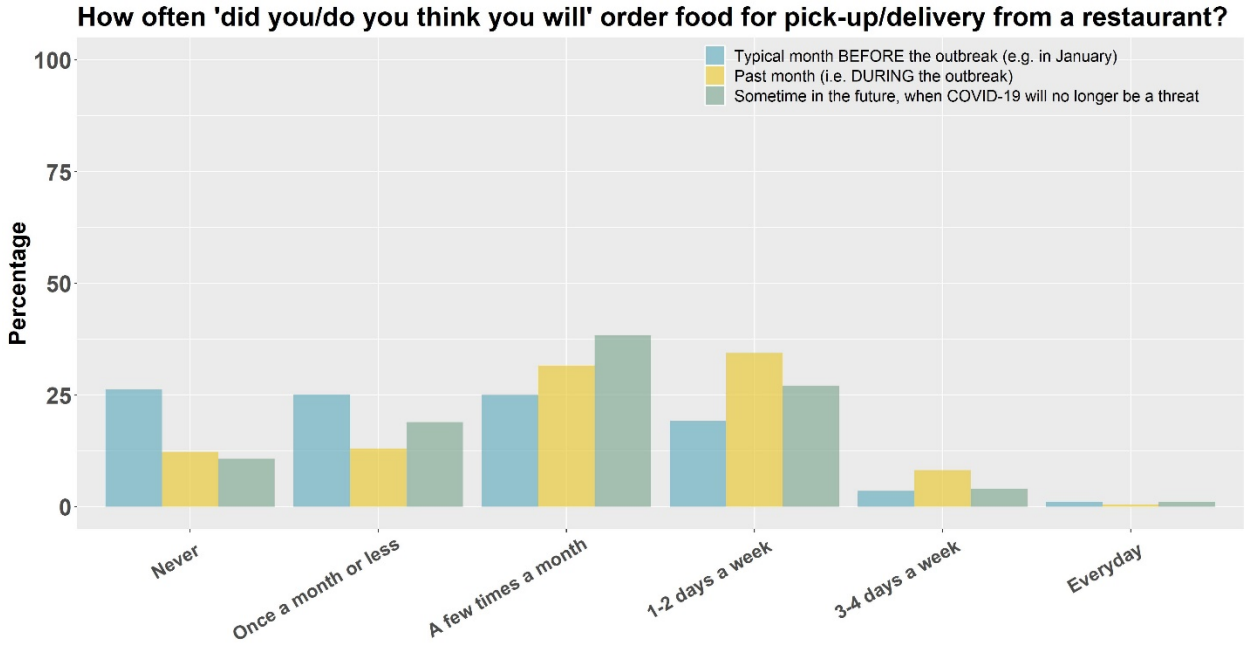
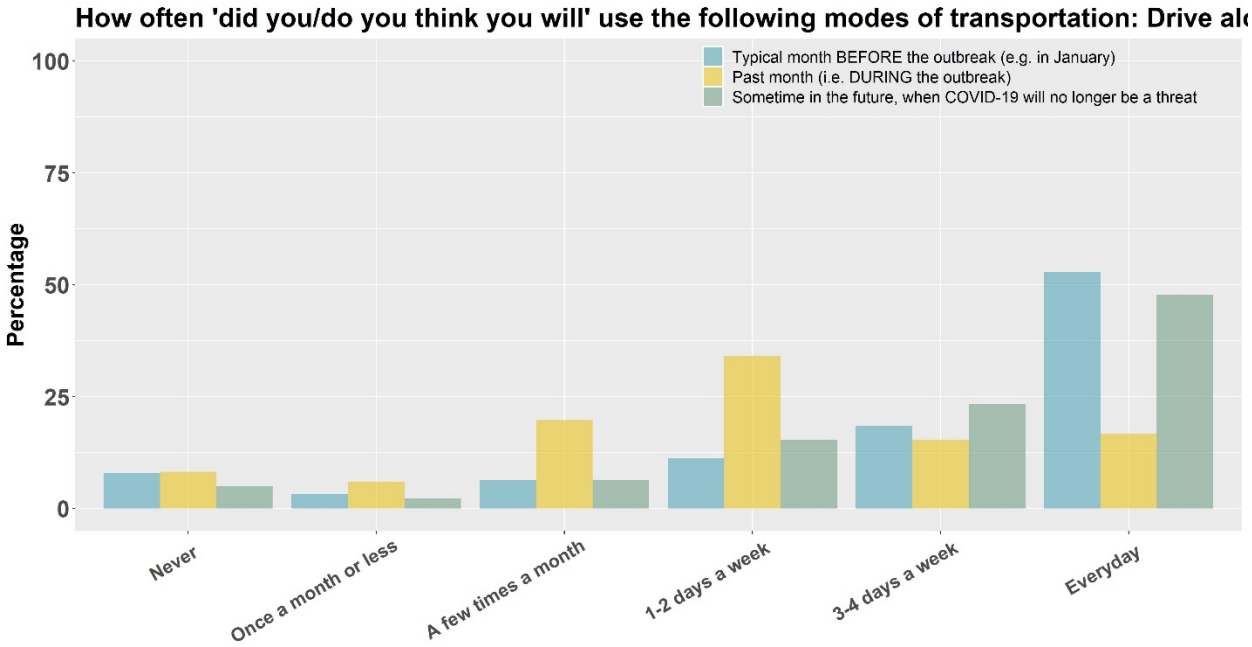


Figure 4.7: Ordering food had become more popular during the pandemic and was expected to remain more frequent in the future in comparison to before the outbreak.

Figures 4.8 through 4.16 demonstrate the frequency of use of each mode of transportation before, during, and after the pandemic.



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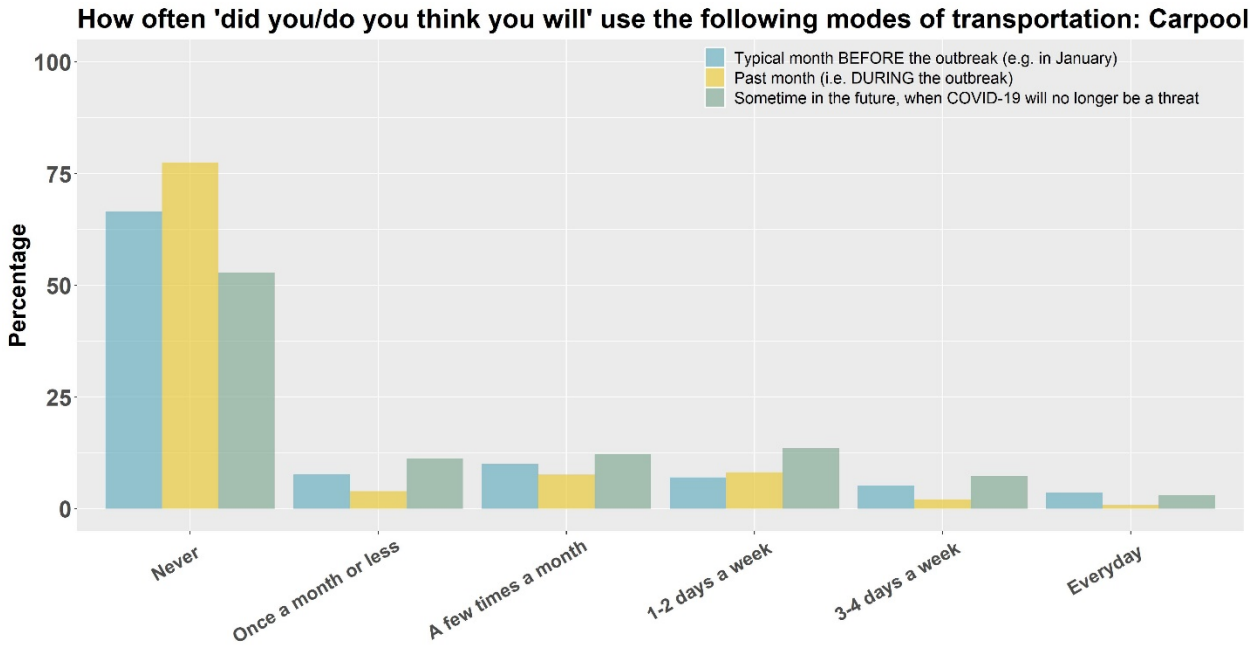

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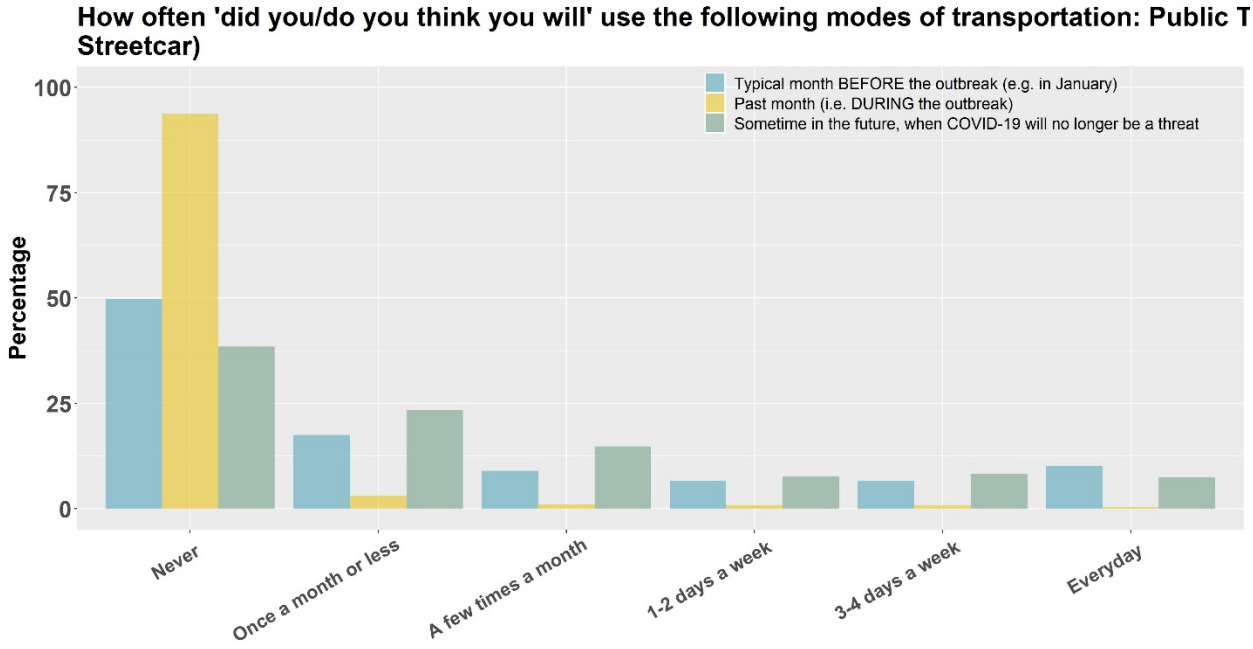

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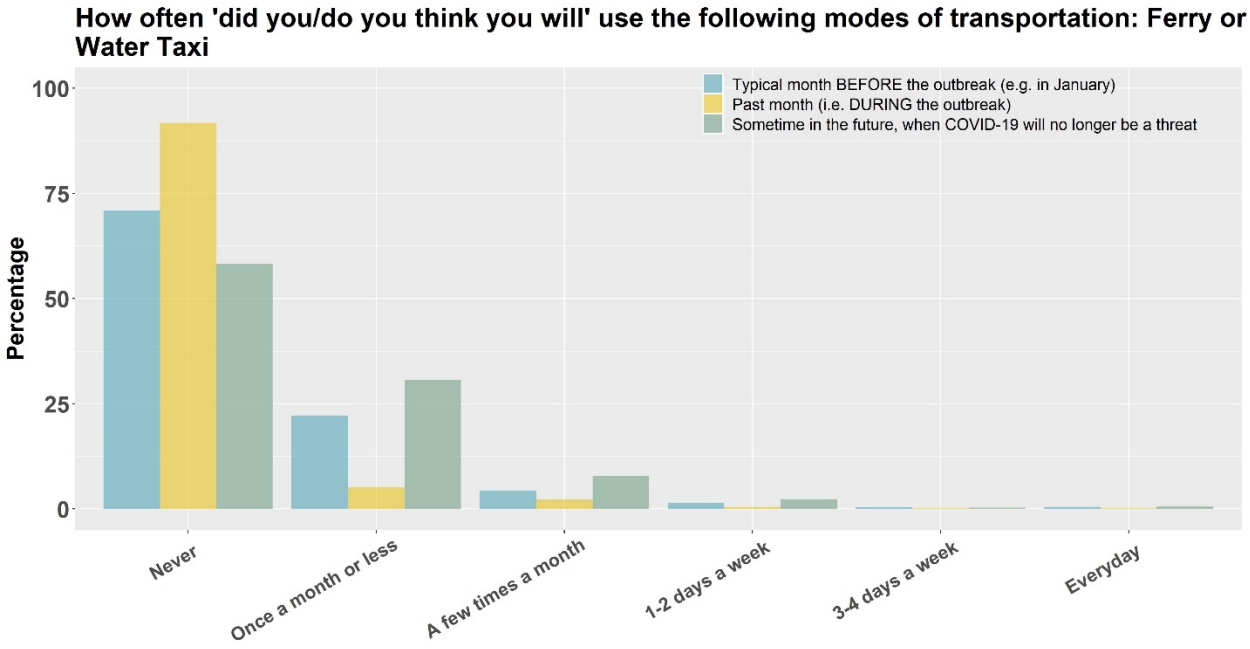

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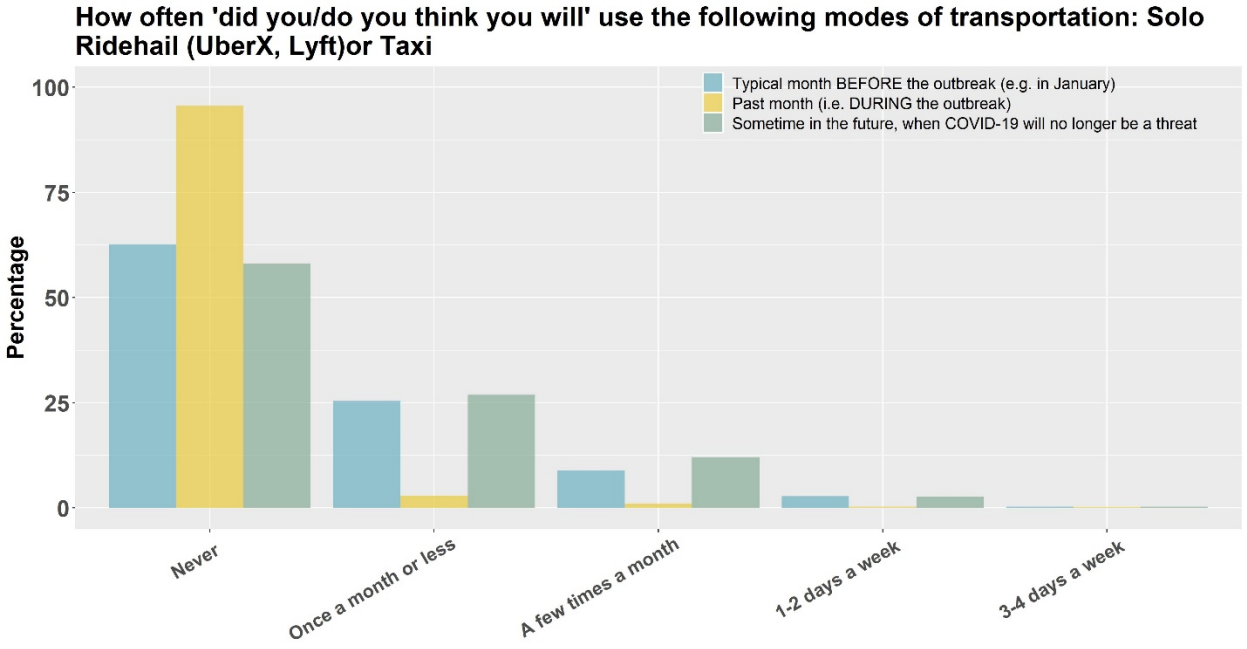

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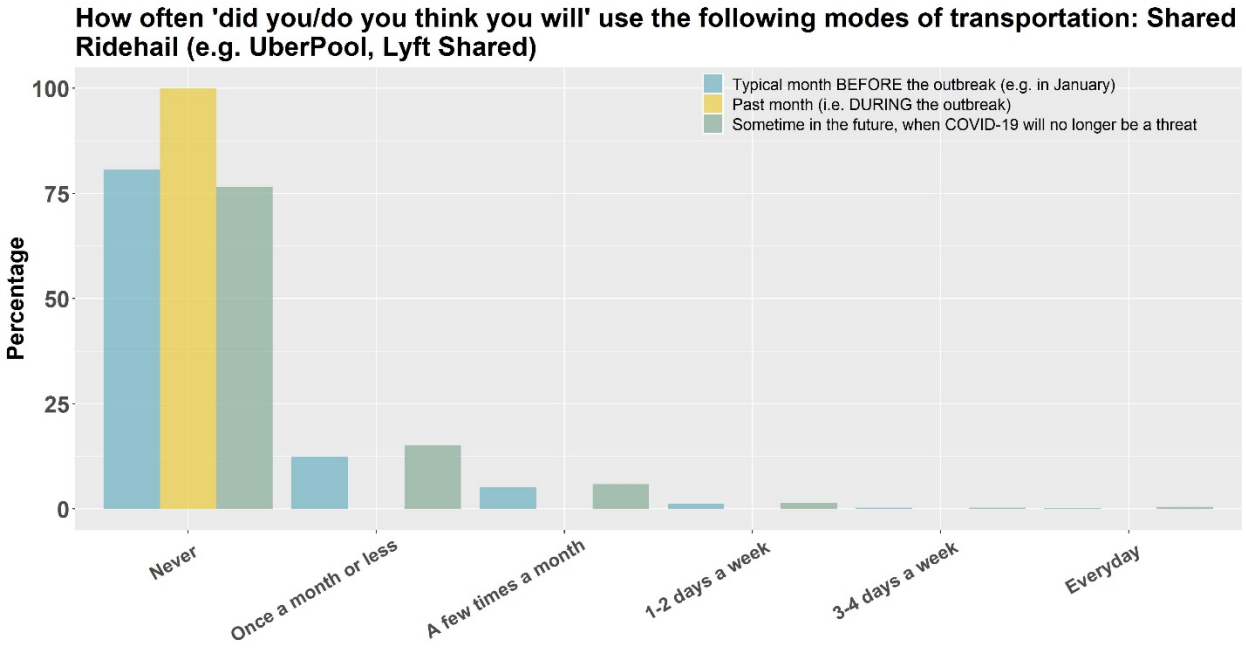

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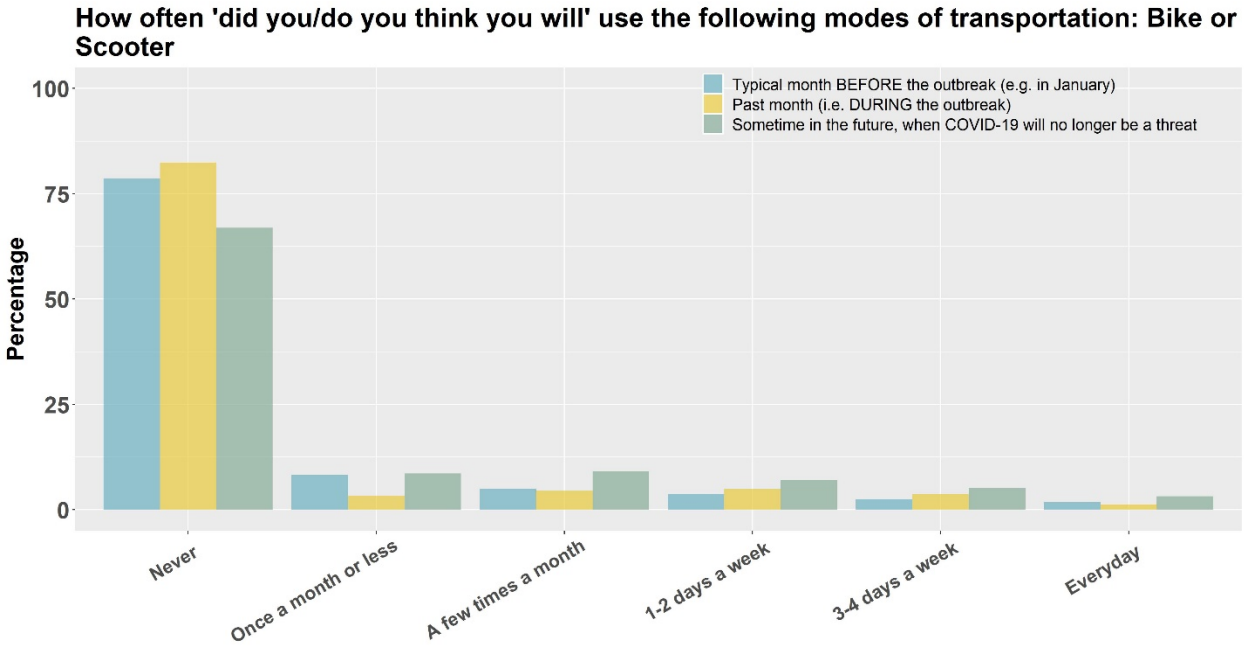

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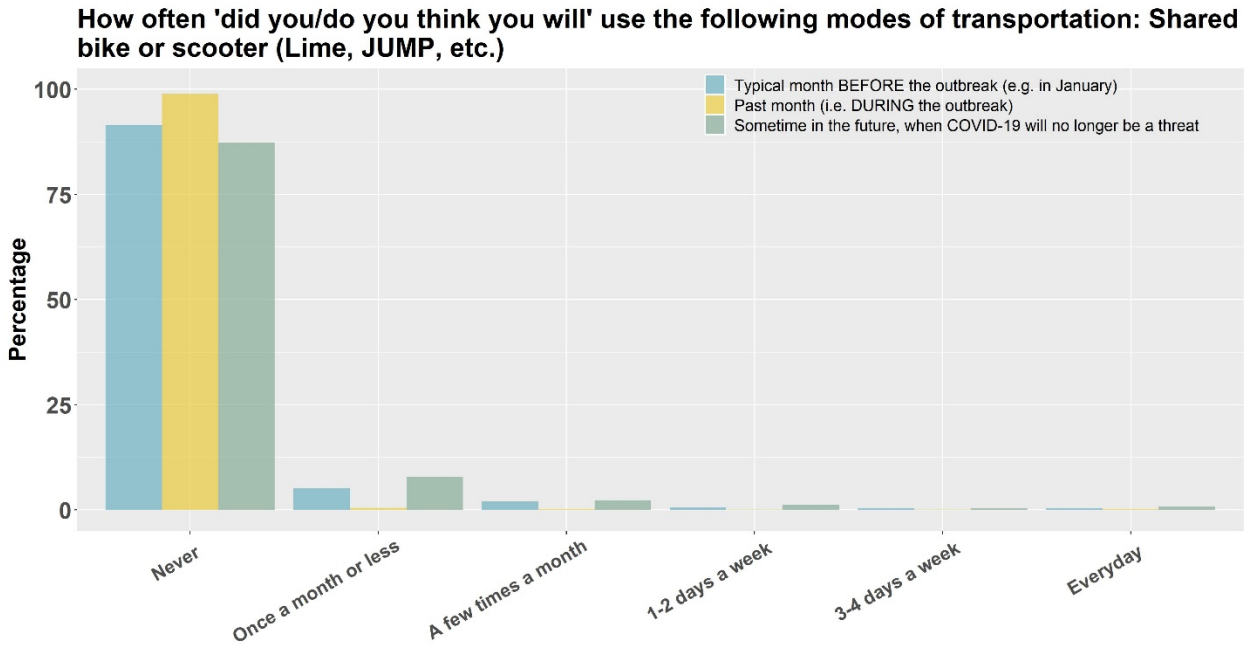

Figure 4.15: Shared bikes and scooters had not been popular before the pandemic among our sample. Respondents did not expect to change their behavior after the pandemic.

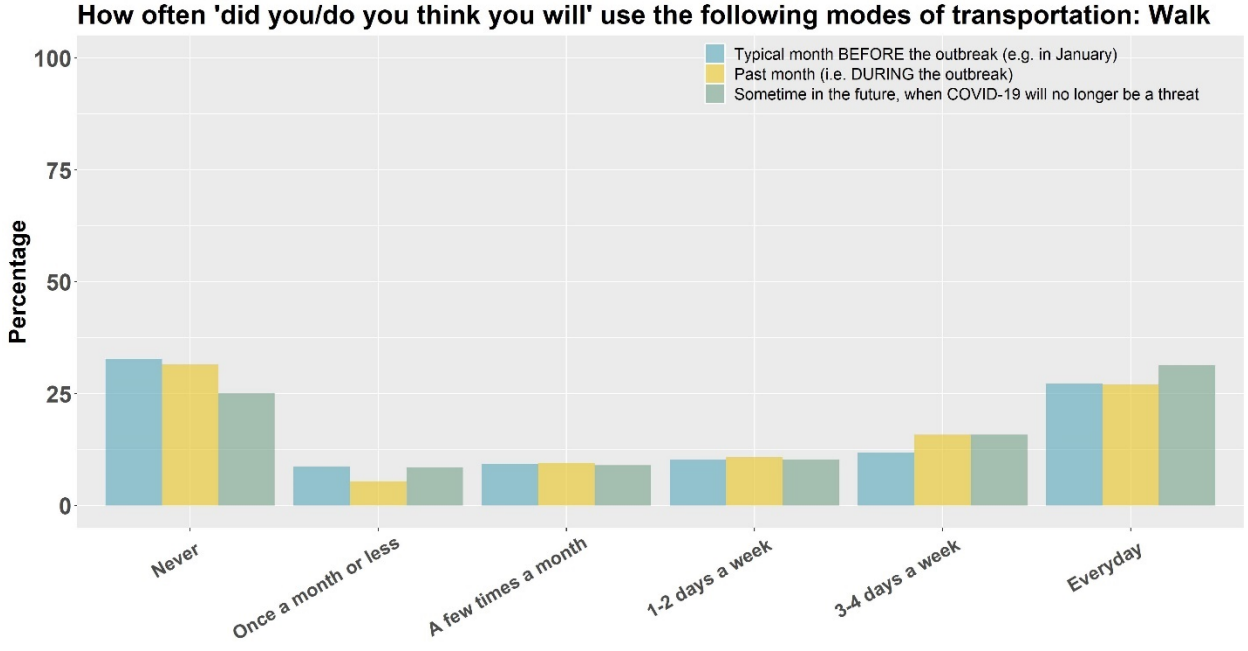

Figure 4.16: There was a small drop in those who had never walked, and a small increase in respondents who expected to walk every day post-pandemic.

Figures 4.17 through 4.21 show mode usage for each trip purpose. Driving alone was the most popular mode for all the purposes both before and during the pandemic.

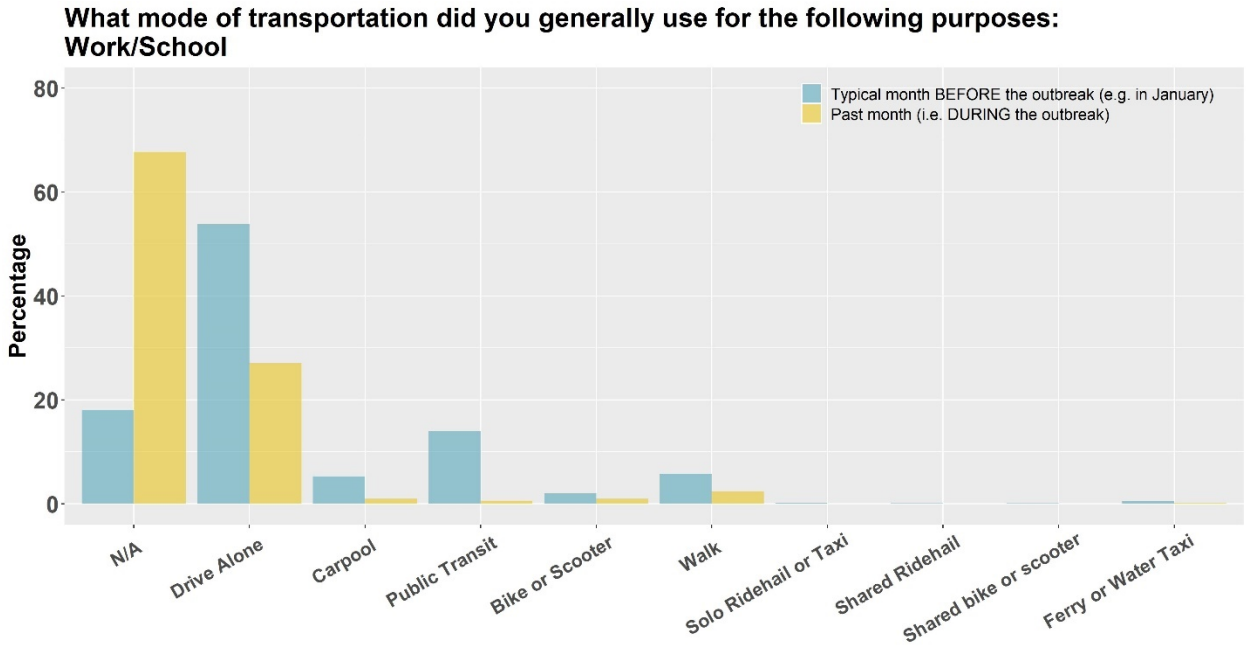

Figure 4.17 Driving alone was the dominant mode of travel to work/school. During the pandemic 65 percent indicated that they had not traveled for work/school.

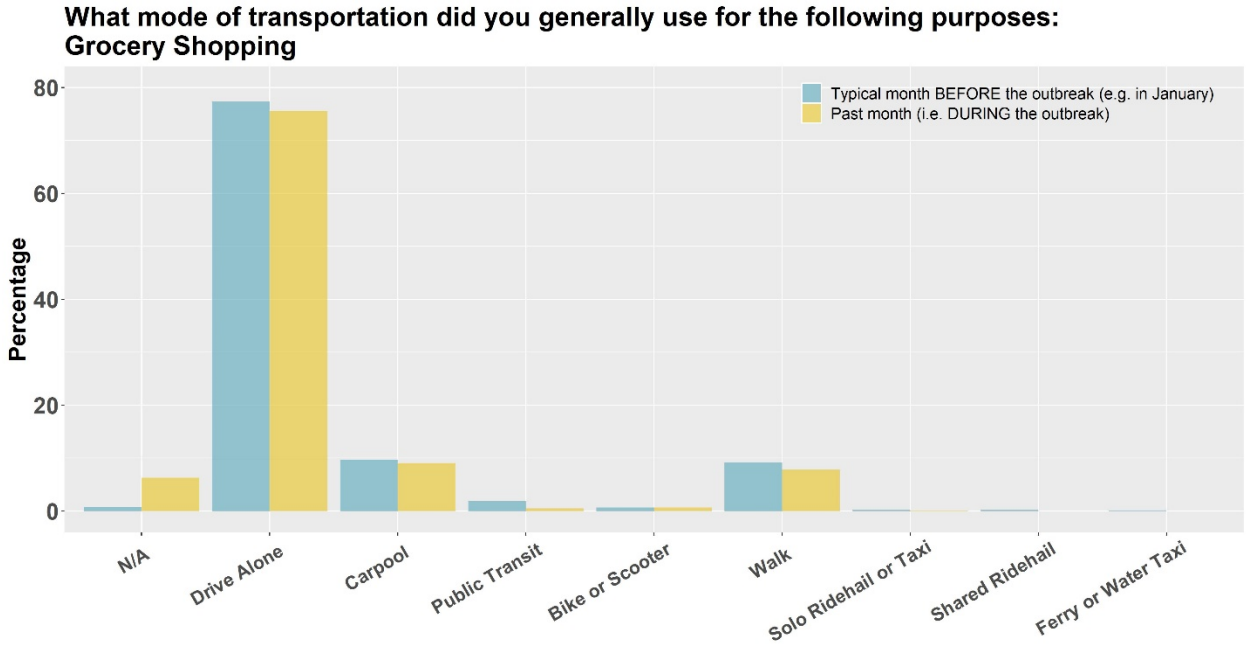

Figure 4.18 There was a very minimal change in the transportation mode for grocery shopping trips.

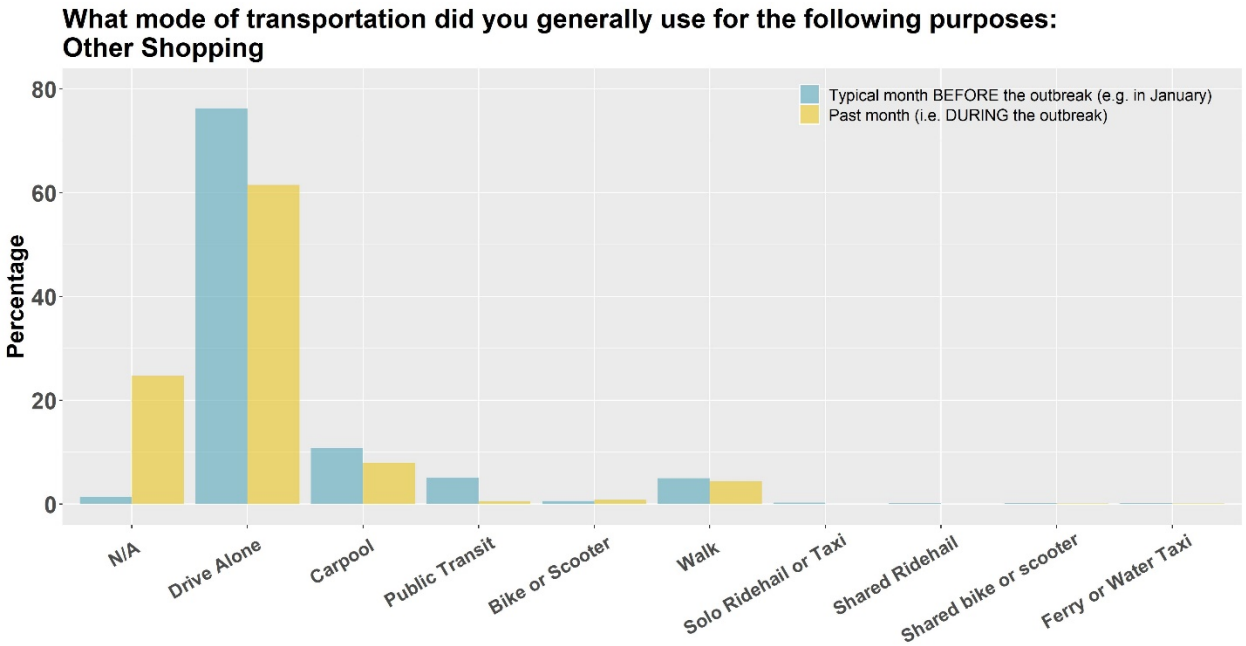

Figure 4.19 75 percent of respondents had driven alone for shopping before the pandemic. 60 percent of respondents had continuedto do so during the pandemic, while 25 percent had not traveled for other shopping.

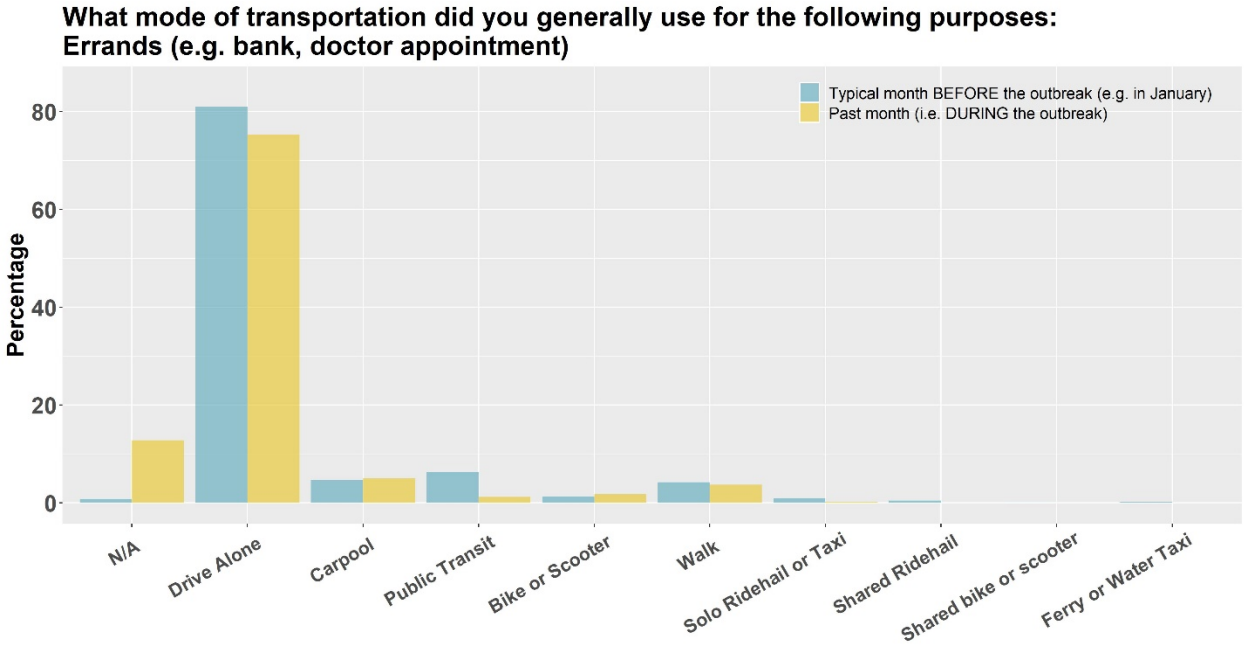

Figure 4.20 For errands, driving alone remained the dominant mode. The figure shows a small shift from dirving alone to not traveling at all. Less than 10 percent of respondents who had ridden public transit for running errand before the pandemic stopped using transit during the pandemic for that purpose.

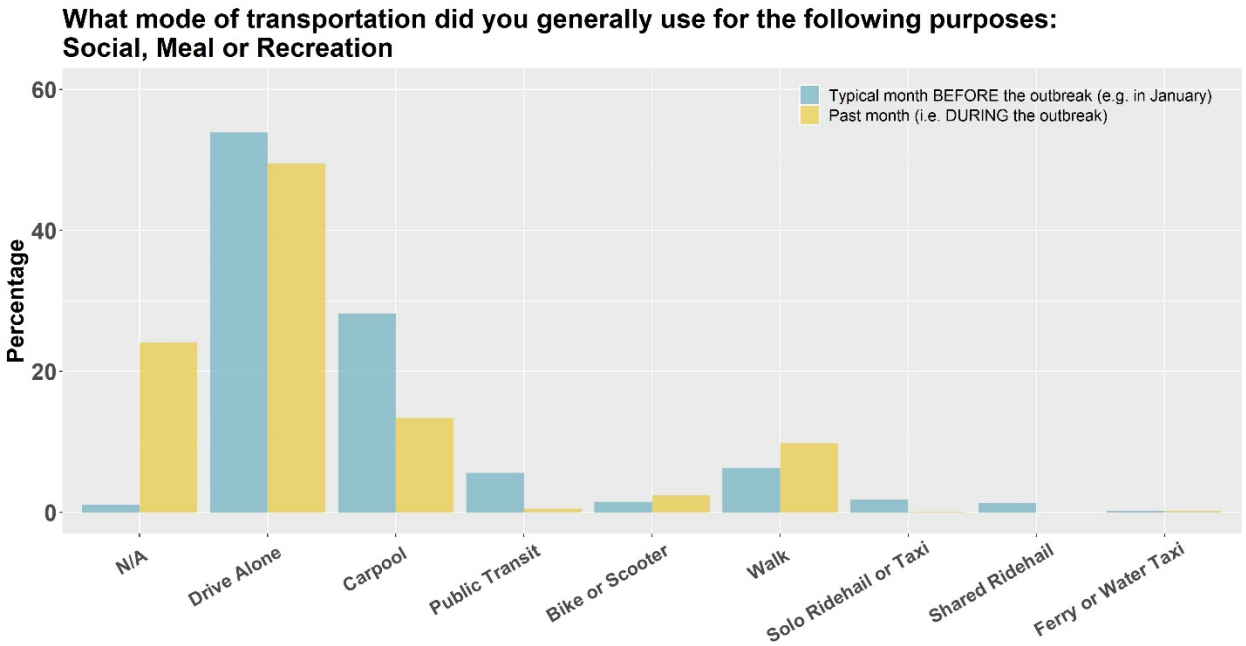

Figure 4.21 Interestingly, the figure shows see a slight increase in walking for socializing purposes during the pandemic. 25 percent of individuals had stopped traveling for this purpose. About 30 percent of individuals had to carpooled for such purpose before the pandemic, and that number had decreased to 15 percent%.

Figures 4.22 through 4.28 show respondents' reported reasons for changing behaviors.

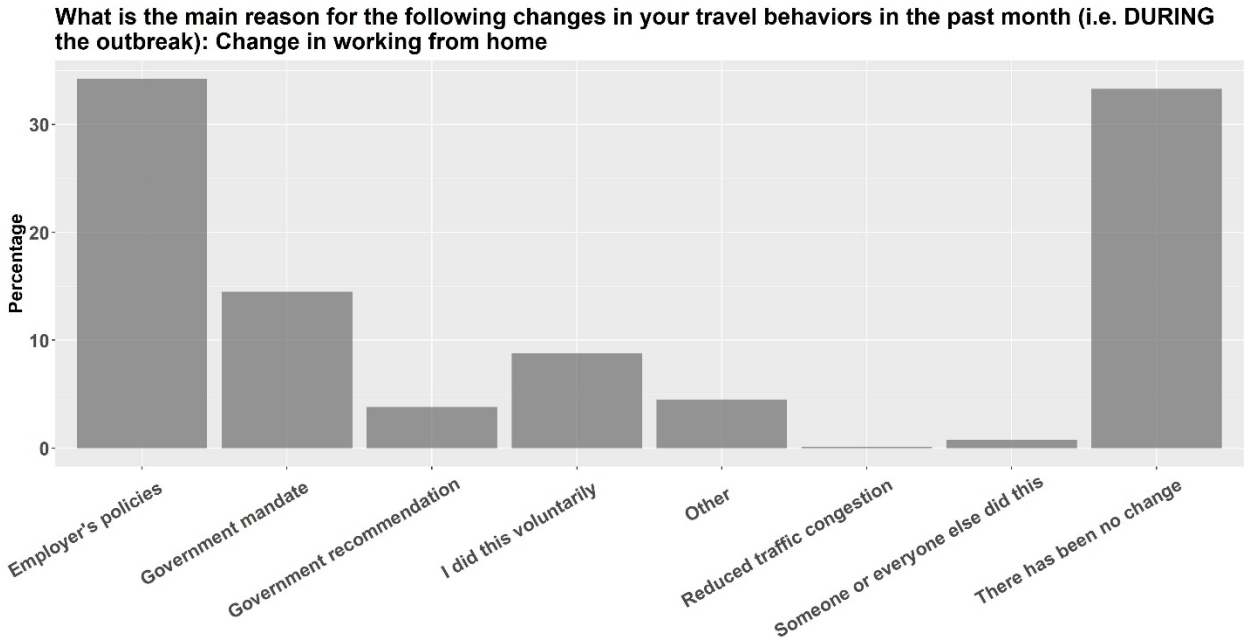

Figure 4.22: 32 percent of individuals had not made any changes to their working from home behavior, and about the same number had made changes because of their employers' policies.

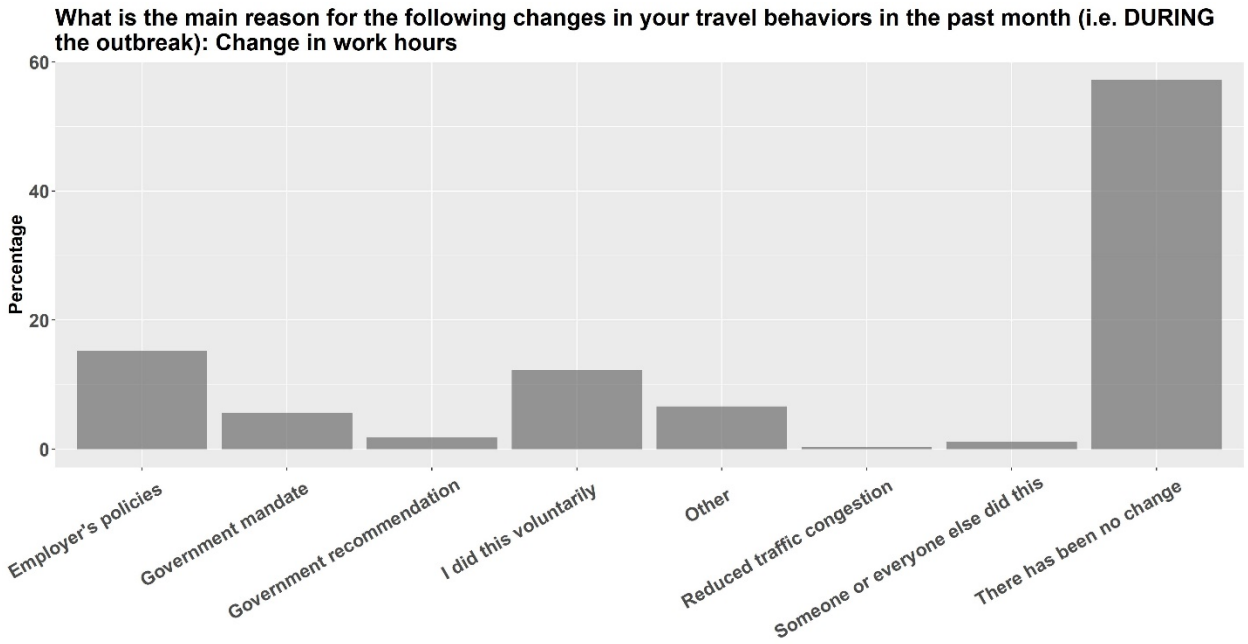

Figure 4.23: 60 percent of individuals had not made any changes to their work hours.

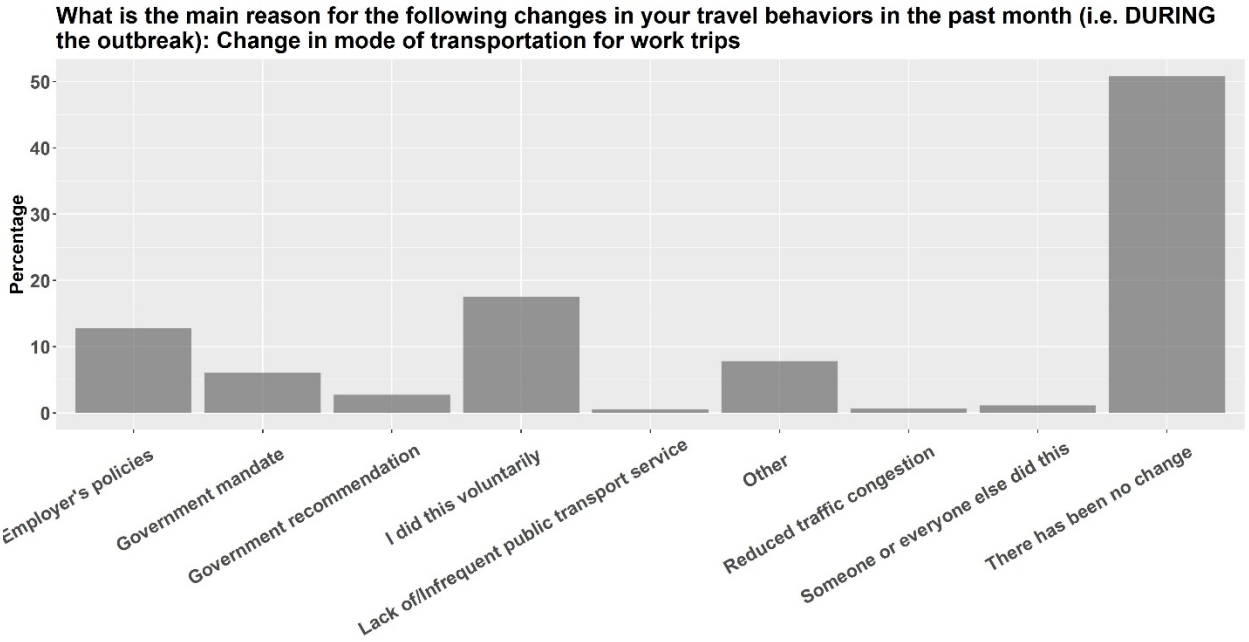

Figure 4.24: 50 percent of respondents had not made changes in their mode of transportation for work trips. 17 percent of the sample had made changes voluntarily.

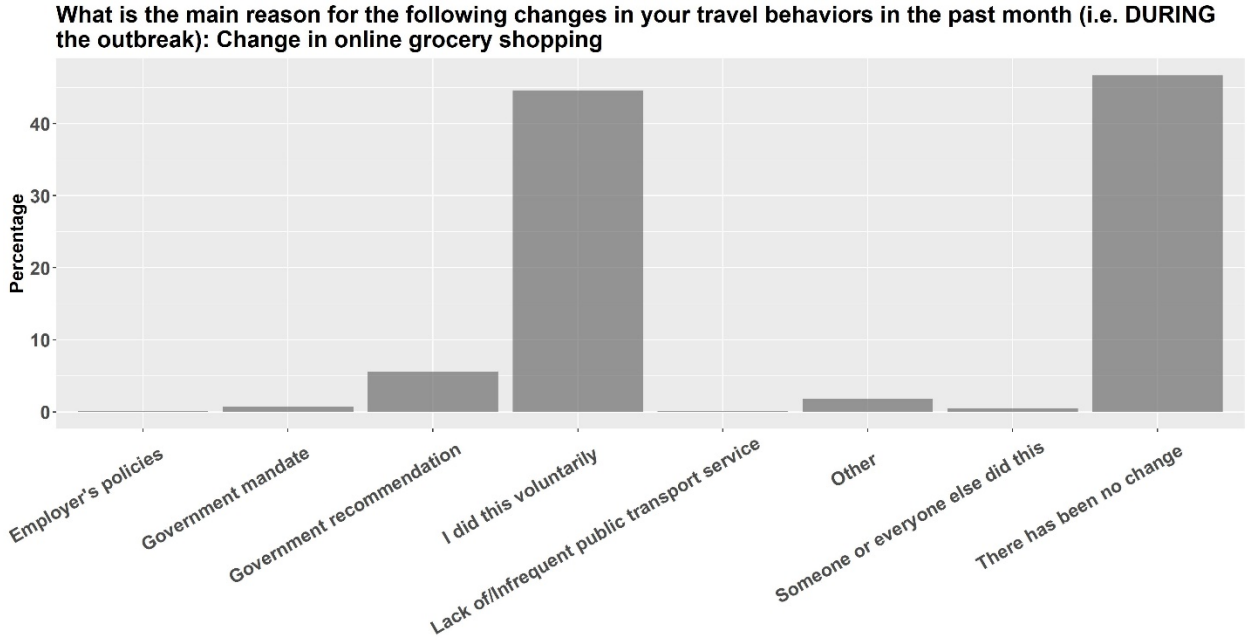

Figure 4.25: For online grocery shopping, half of the respondents had not made any changes, and a majority of the other half had done so voluntarily.

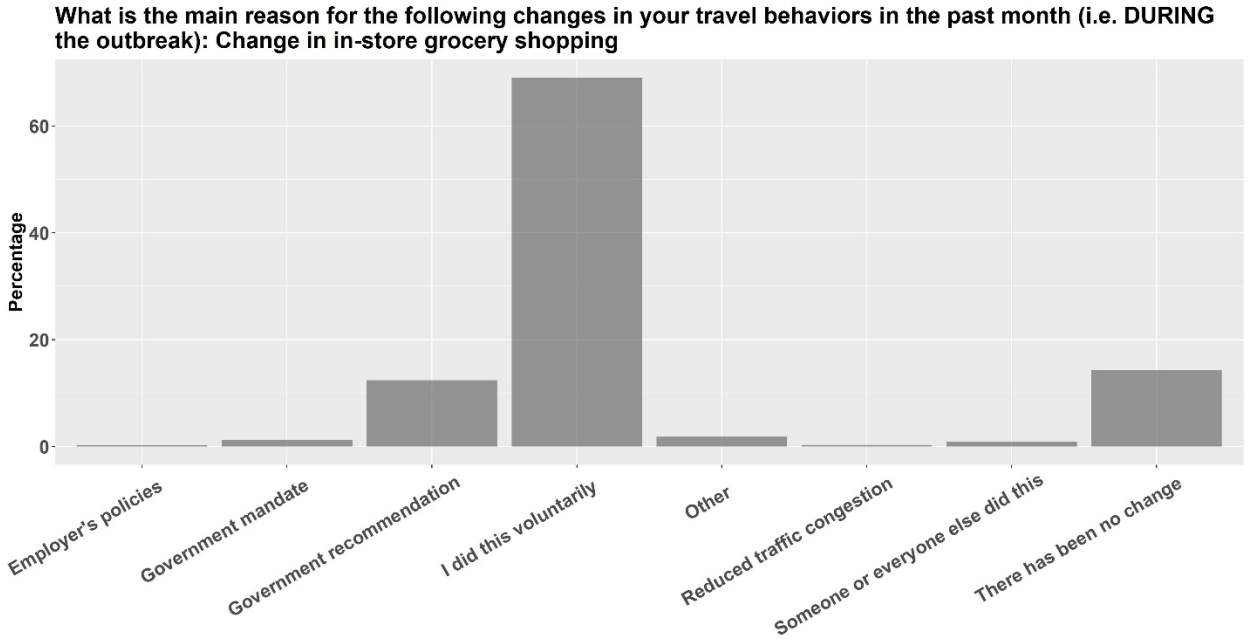

Figure 4.26 More than 65 percent of the respondents had made changes to their in-store grocery shopping behaviors voluntarily. About 10 percent indicated that theyhad made changes to their behavior because of government recommendations.

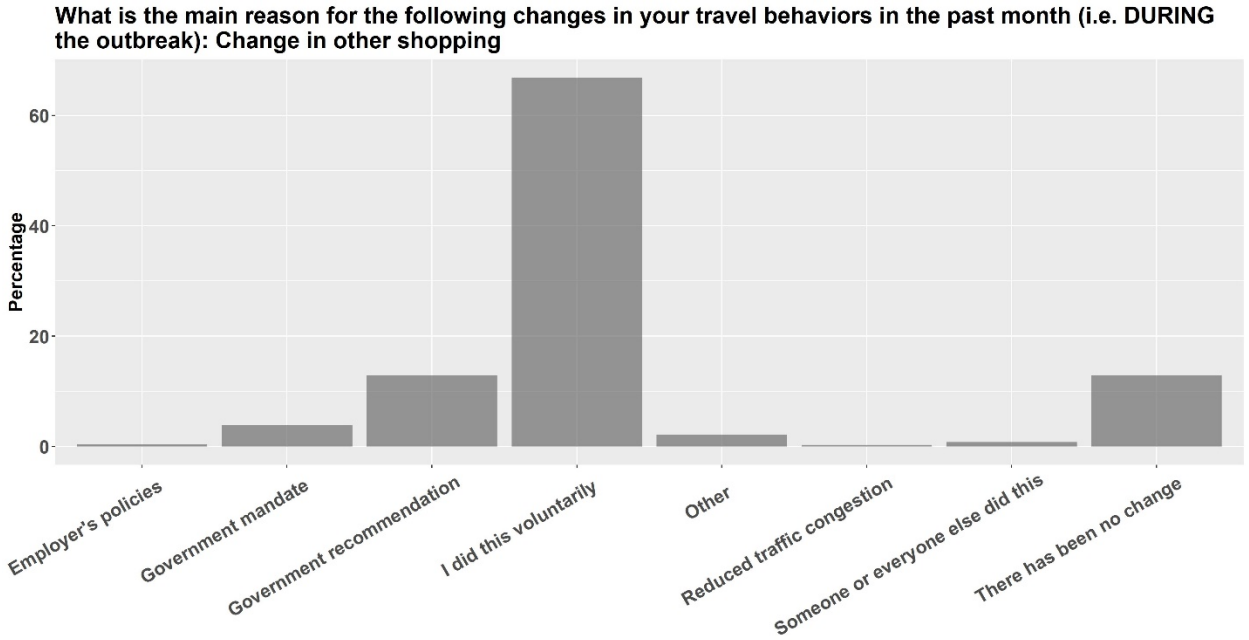

Figure 4.27 A majority of respondents had changed their other shopping behaviors voluntarily. About 10 percent did so because of government recommendations.

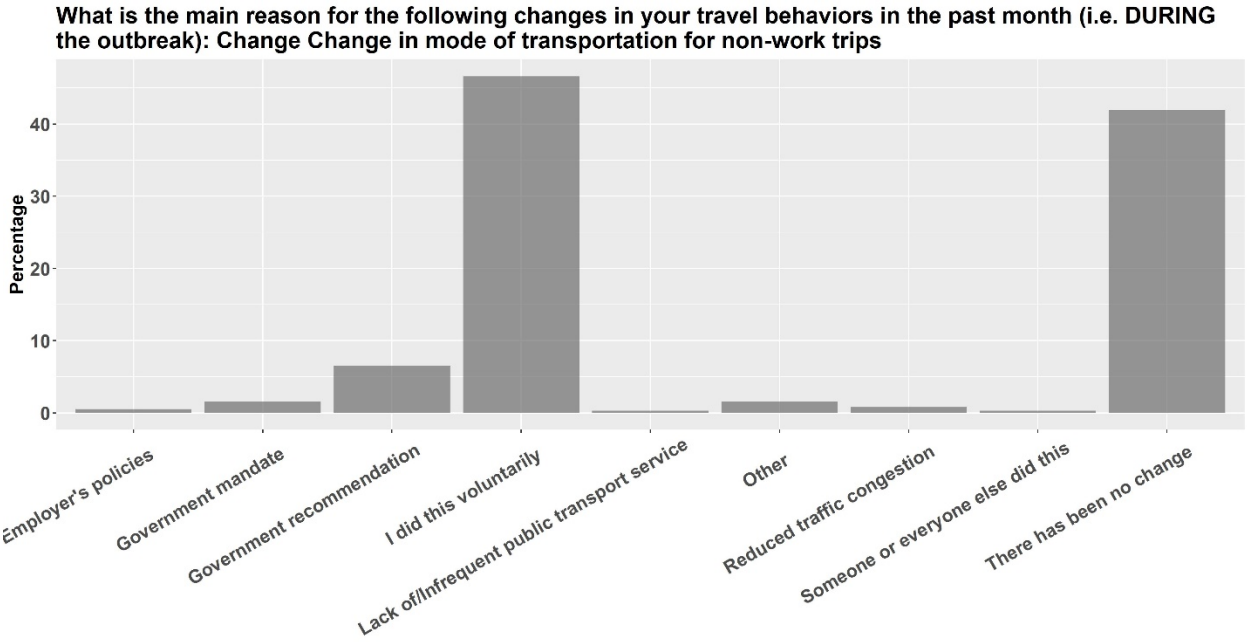

Figure 4.28 About half of the respondents had changed their non-work trips' mode voluntarily, while 40 percent had not made any changes at all.

Figures 4.29 and 4.30 show how individuals had changed their working start and stop times.

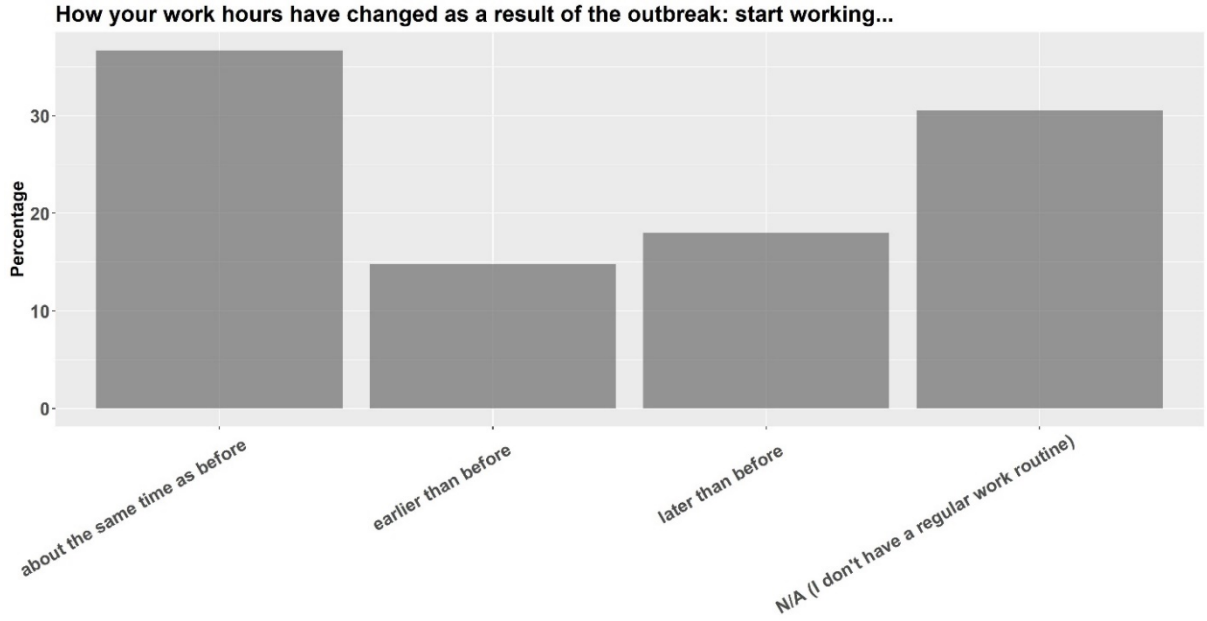

Figure 4.29 While a majority had continued their same behavior, 15 percent of individuals had started to work earlier than before, and 18 percent had started to work later than before the pandemic.

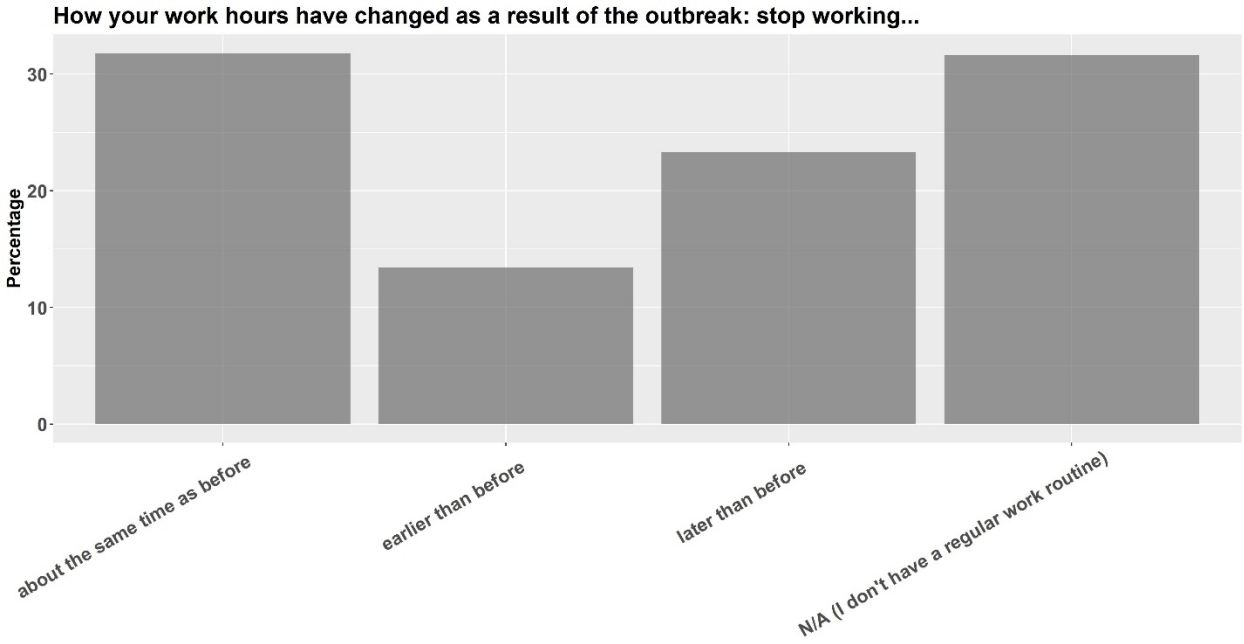

Figure 4.30 About 12 percent of repsondents had stopped working earlier than before, while 23 percent had stopped working later than before the pandemic.

CHAPTER 5. PERCEPTIONS AND ATTITUDES

Responses to attitudinal questions are shown in figures 5.1 through 5.26. In the first part of the attitudinal questions, we asked about respondents' general feelings about the pandemic and recommended actions to stay safe.

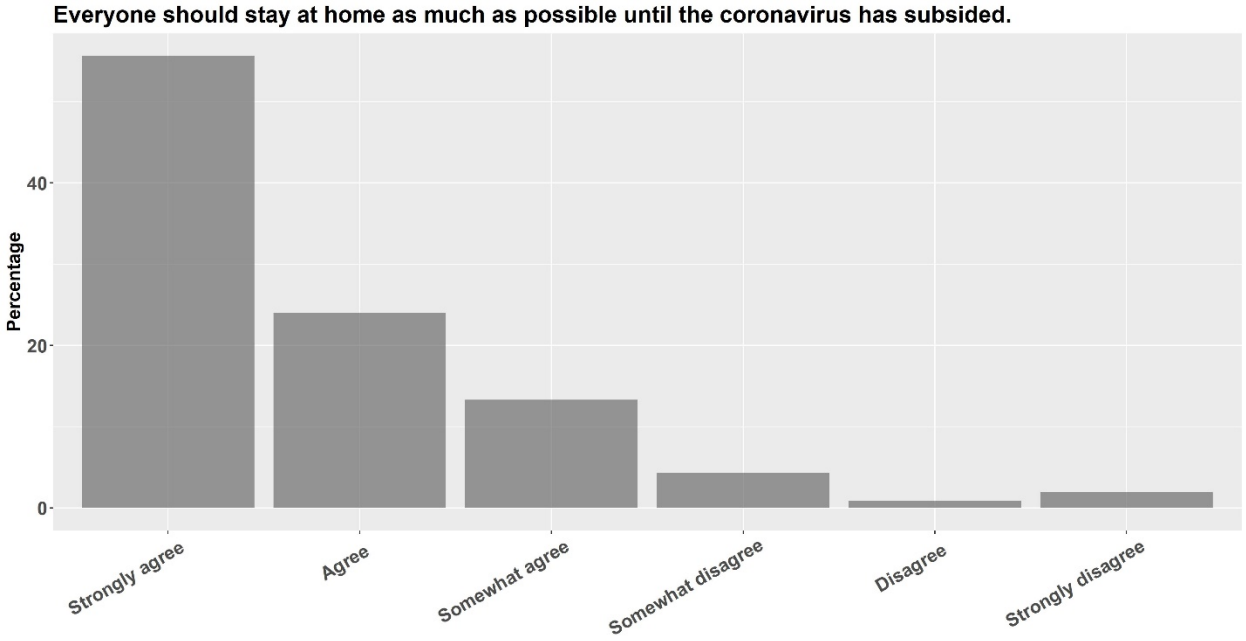

Figure 5.1 More than 50 percent of respondents strongly agreed that everyone should stay at home until the threat of COVID-19 subsided. Less than 5 percent of respondents stated some level of disagreement with the above statement.

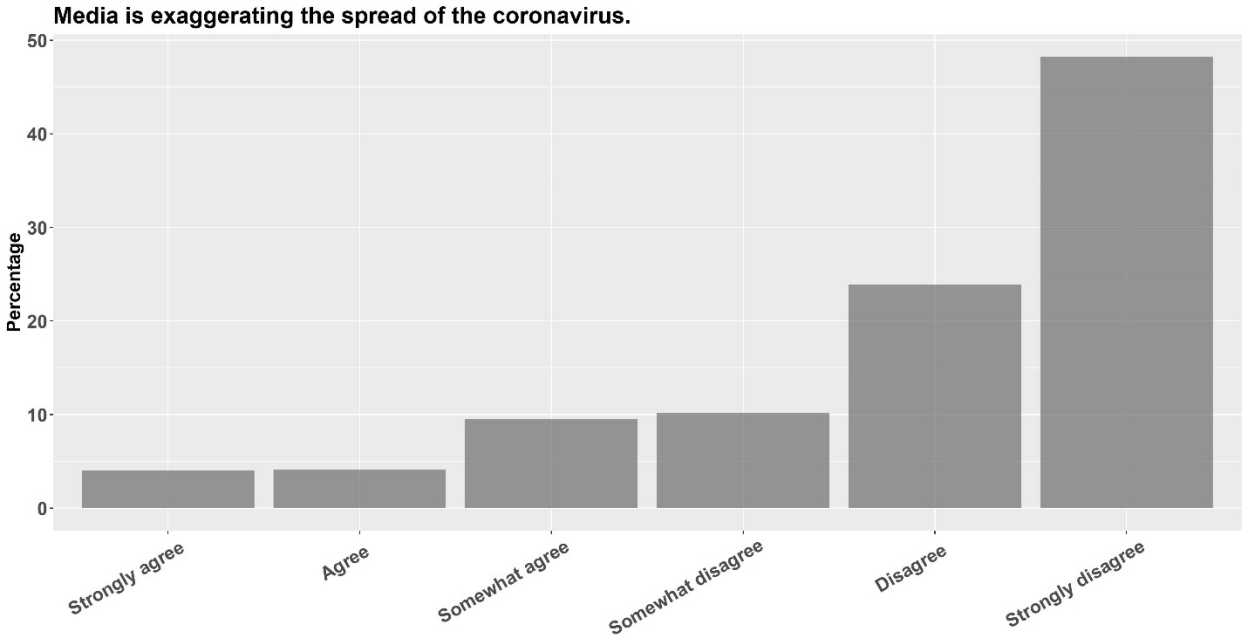

Figure 5.2 Less than 20 percent of the respondents agreed to some extent that media was exaggerating the spread of the COVID-19, while 45 percent strongly disagreed with this statement.

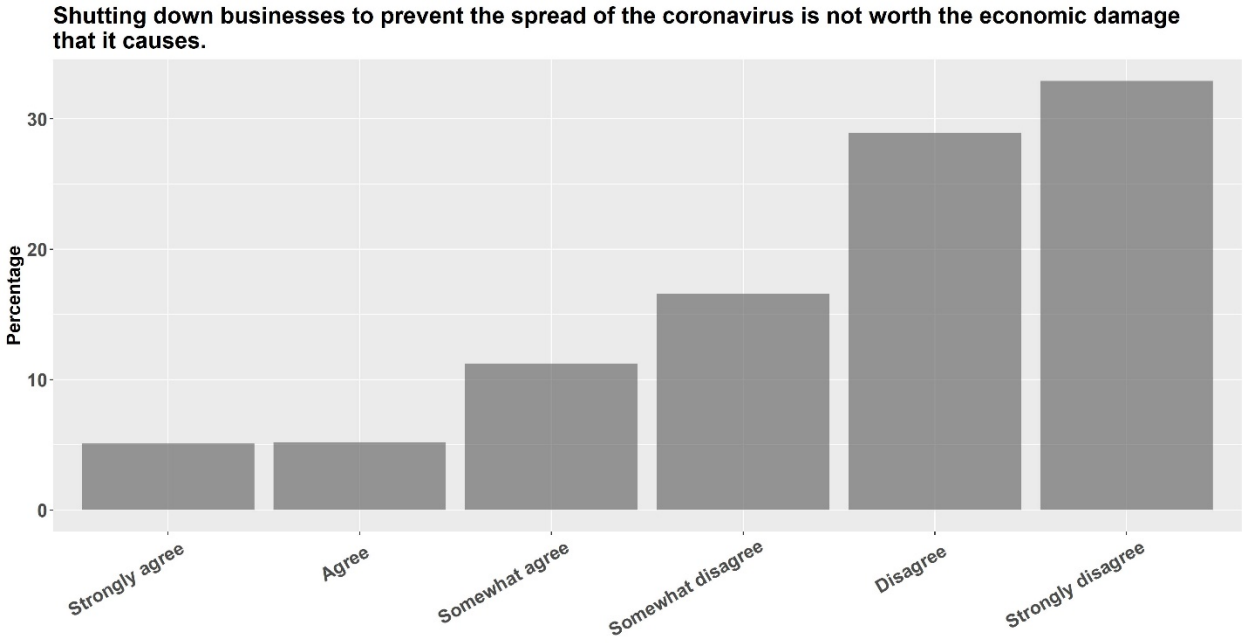

Figure 5.3 About 20percent of our sample, to some level, agreed that shutting down businesses was not worth the economic damage it caused, while 33 percent strongly agreed that it was worth the damage.

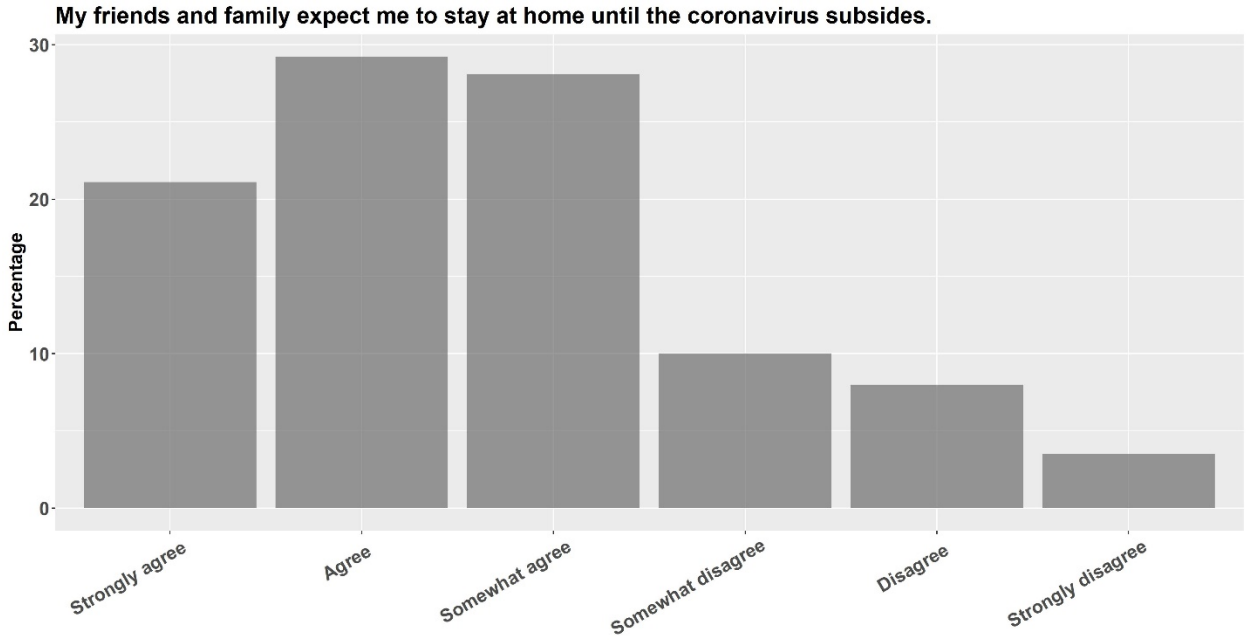

Figure 5.4 A majority of individuals indicated that their family and friends expected them to stay home until the pandemic subsided. About 22 percent indicated some level of disagreement with the statement.

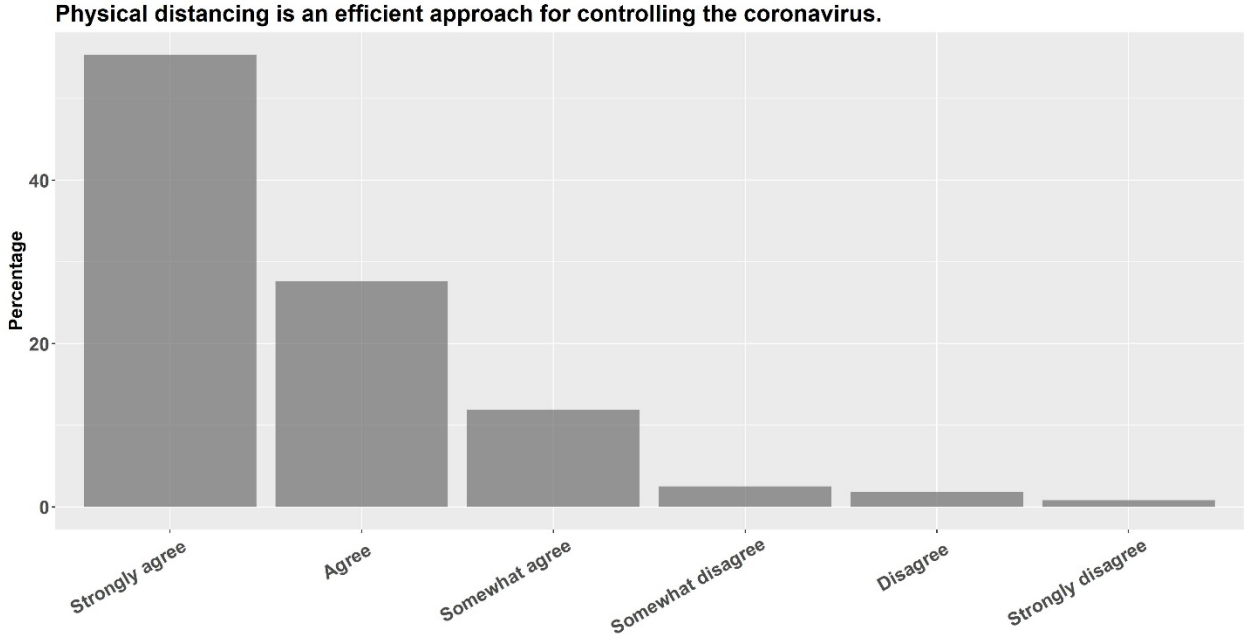

Figure 5.5 Less than 5 percent of respondents disagreed that physical distancing was an inefficient approach for controlling the pandemic.

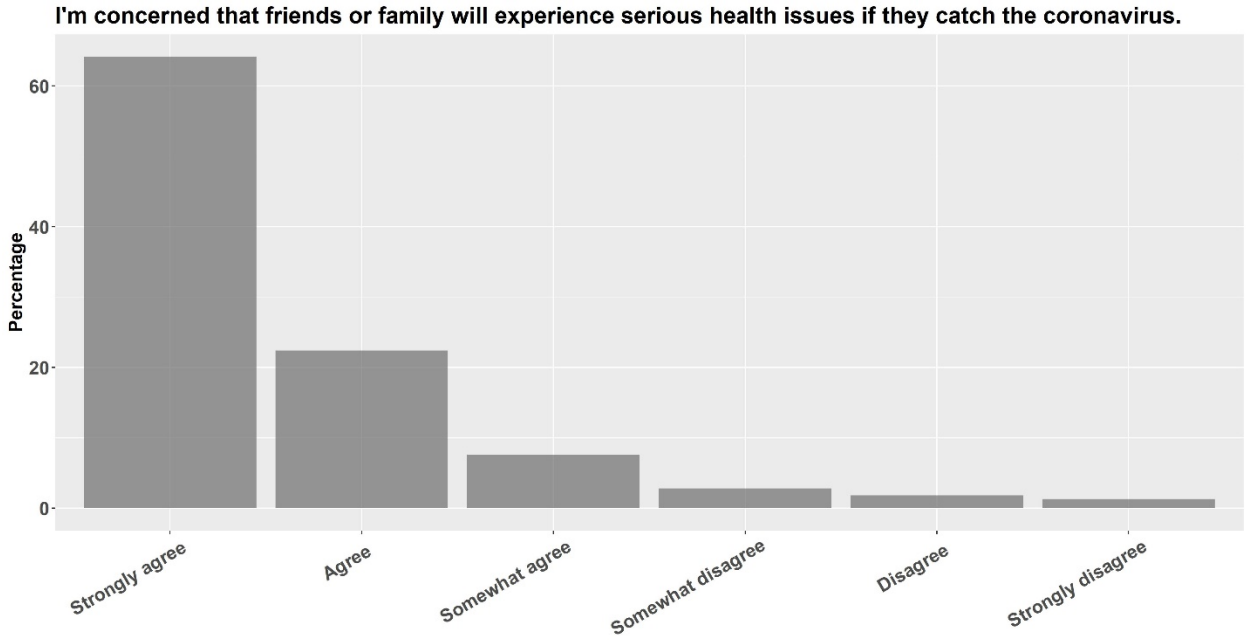

Figure 5.6 More than 60 percent of respondents indicated a strong agreement regarding their concerns for their family and friends' health.

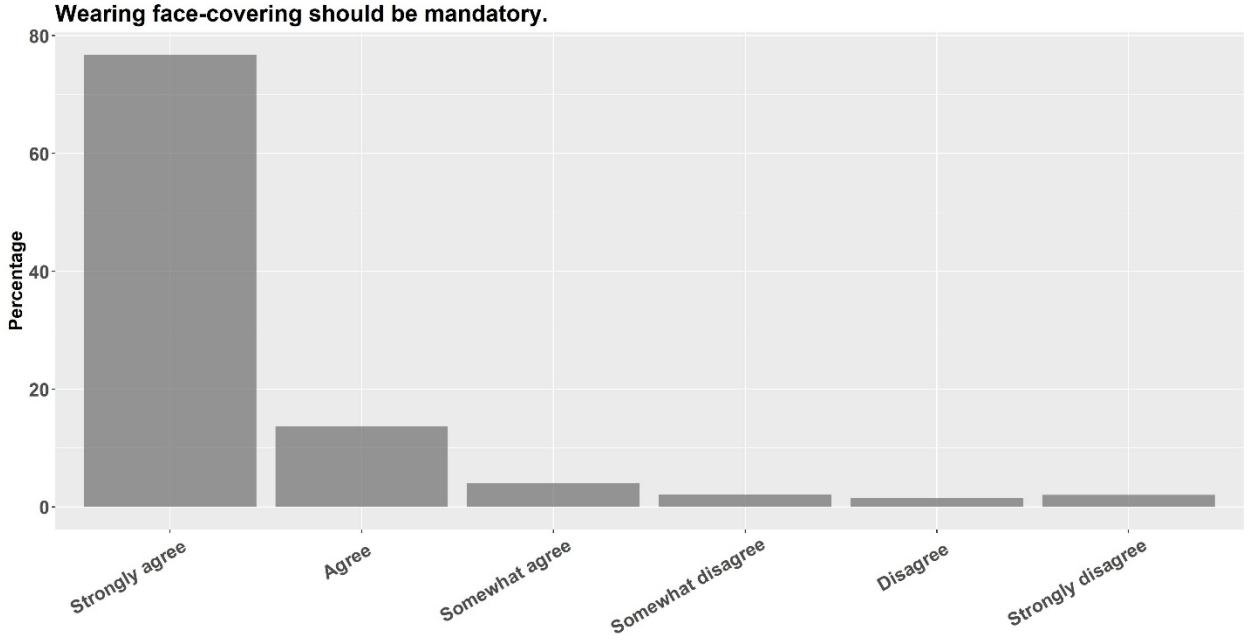

Figure 5.7 More than 75 percent of participants indicated strong agreement with face-covering mandates.

In the second part of the attitudinal questions we asked participants about their attitudes and behaviors toward changes in their work conditions.

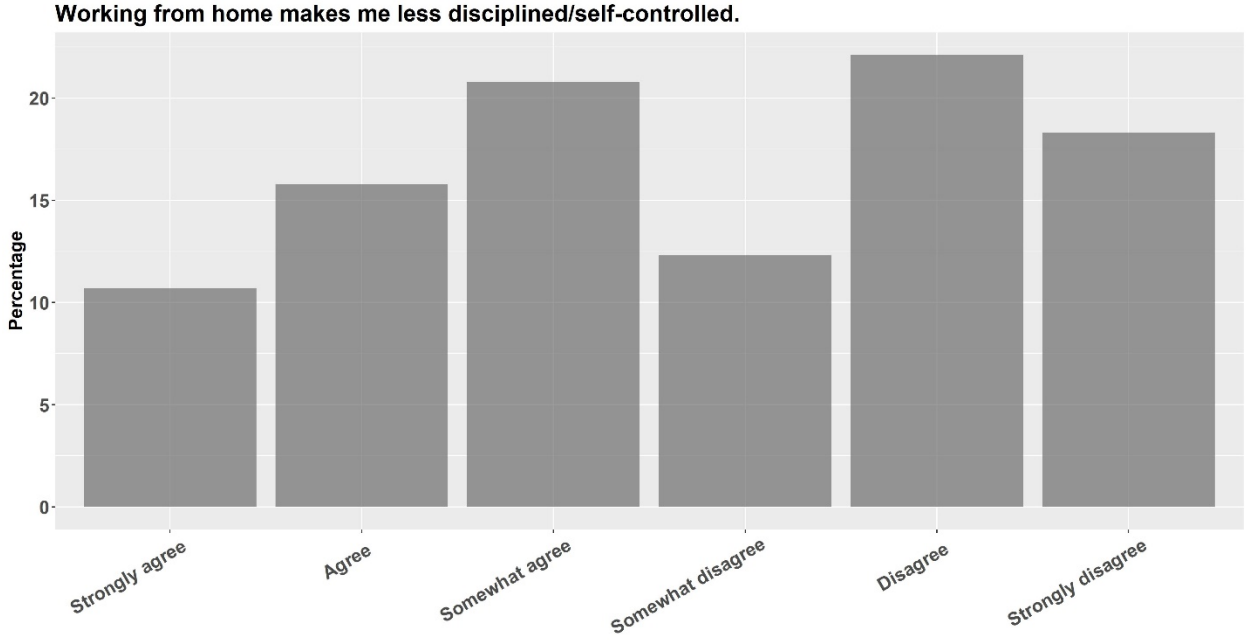

Figure 5.8 About half of the participants thought that working from home made them less disiplined/self-controlled, while the other half felt the opposite.

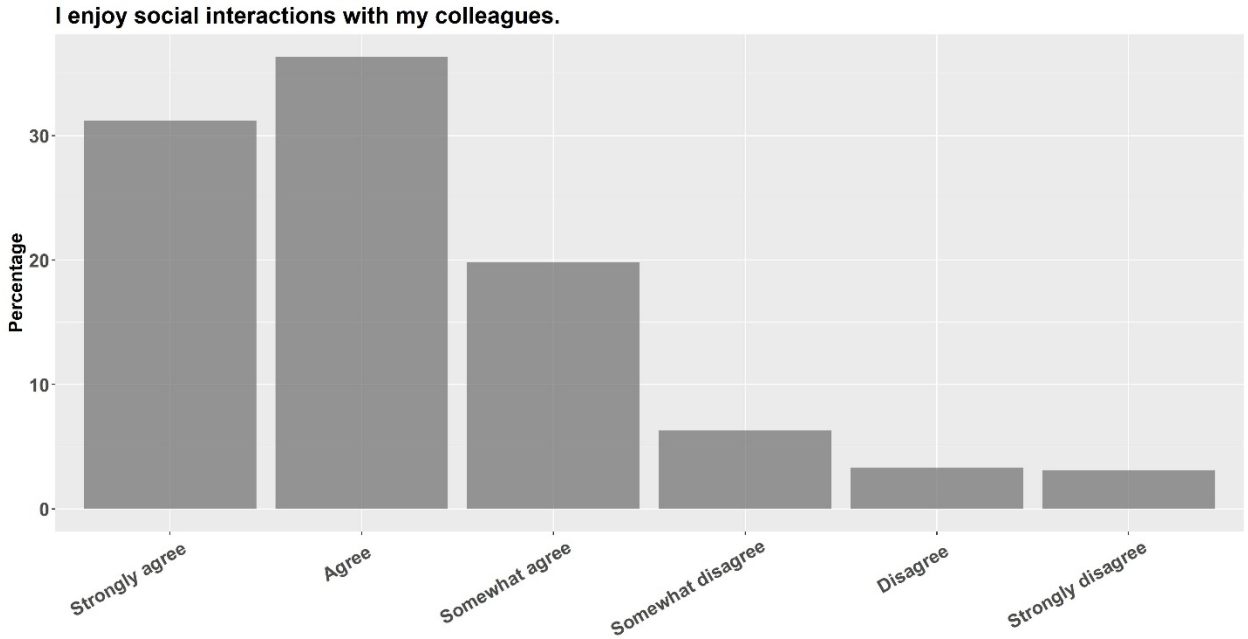

Figure 5.9 A majority of individuals in our sample enjoyed social interactions with their colleagues.

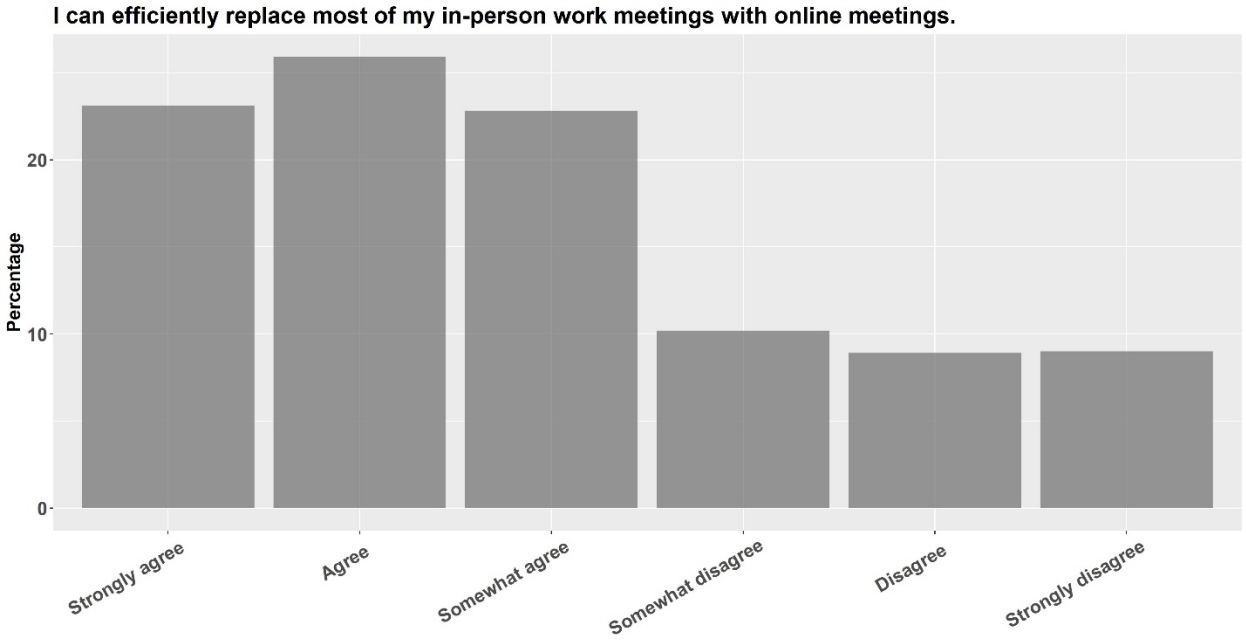

Figure 5.10 About two-thirds of our sample indicated that they could efficiently replace their in-person work meetings with online meetings, while the other third thought otherwise.

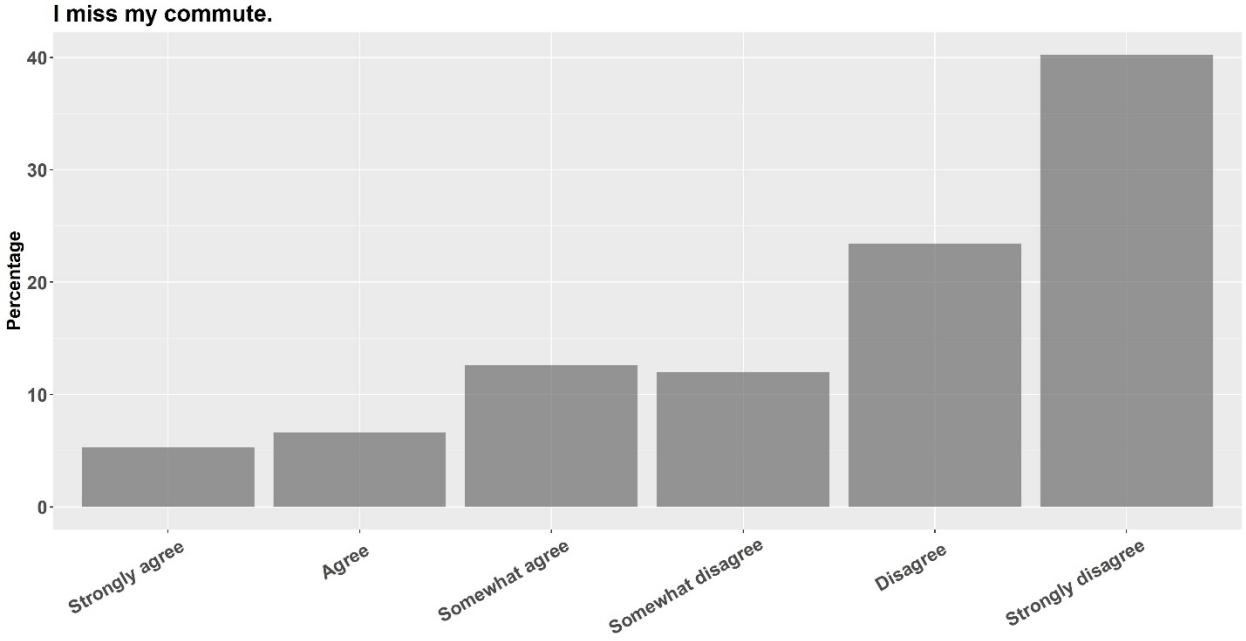

Figure 5.11 More than 40 percent of our sample strongly disagreed with the statement, "I miss my commute." About one fourth of our sample missed their commute trip.

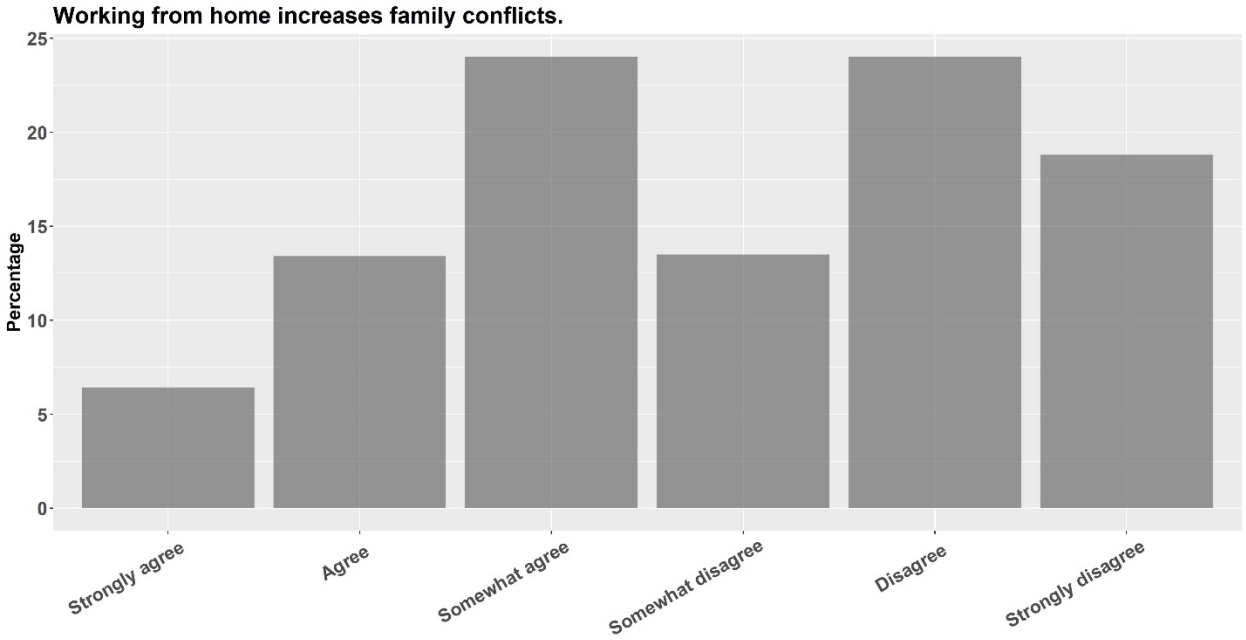

Figure 5.12 About 45 percent of the sample agreed with the statement that working from home increased family conflict to some extent.

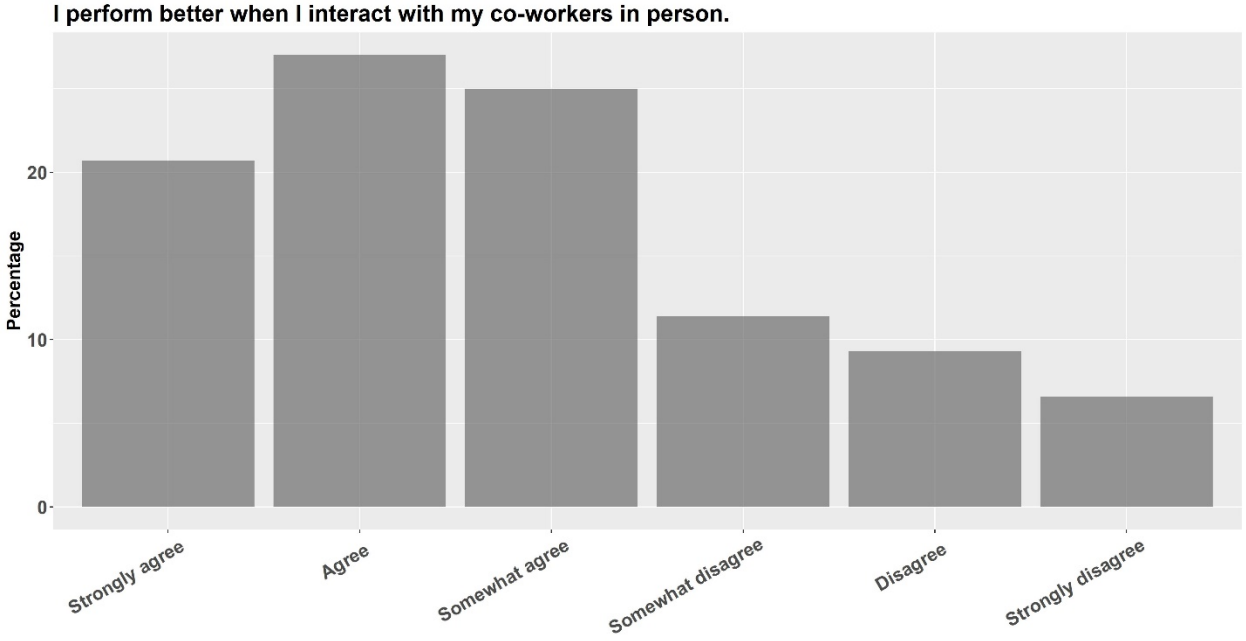

Figure 5.13 When asked about the perceived impacts of in-person interactions with co-workers on performance, a majority of the sample indicated that they performed better when they interacted with their co-workers.

In the third part of the attitudinal questions, we focused on ridesharing behavior during the pandemic.

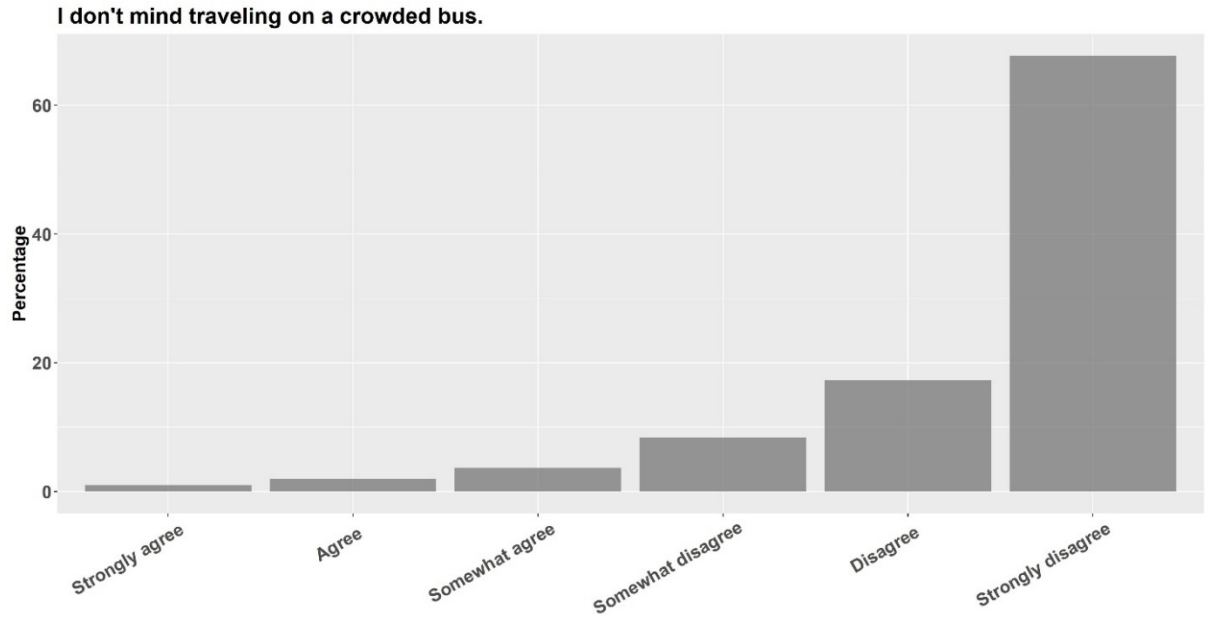

Figure 5.14 More than 60 percent of the sample indicated strongly that they were not okay with crowded buses. Only about 5 percent indicated some level of tolerance for crowded buses.

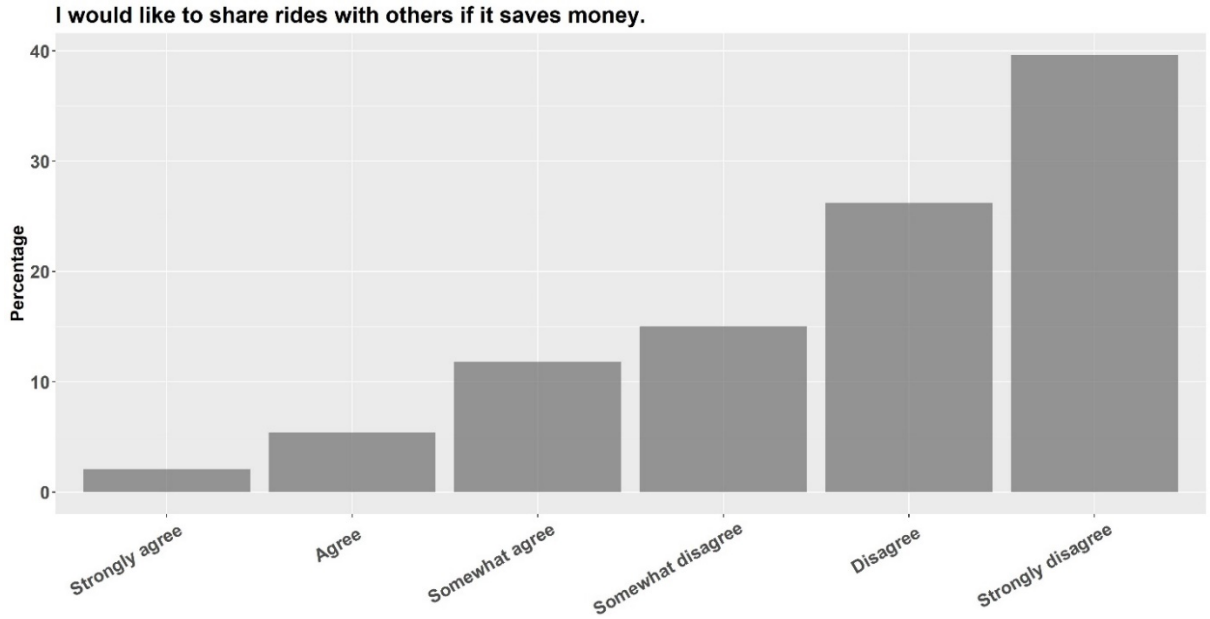

Figure 5.15 About 80 percent of participants indicated that they disagreed with being okay sharing rides to save money. About 20 percent said they would share rides with others to save money.

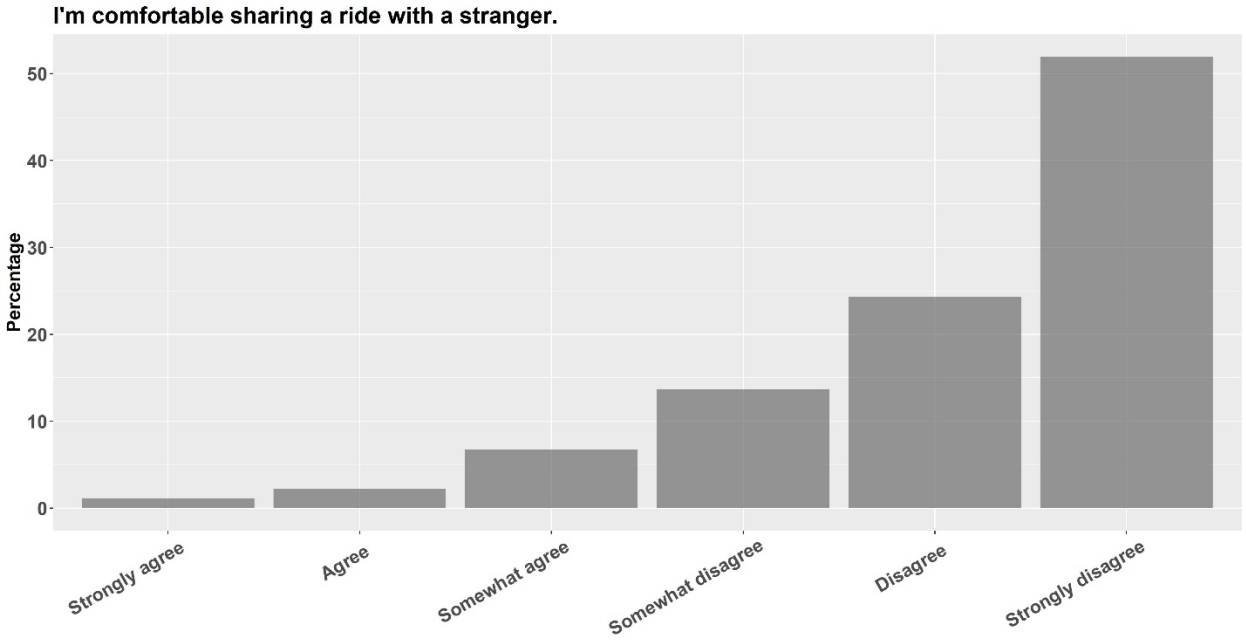

Figure 5.16 A majority of respondents were not comfortable with sharing a ride with a stranger.

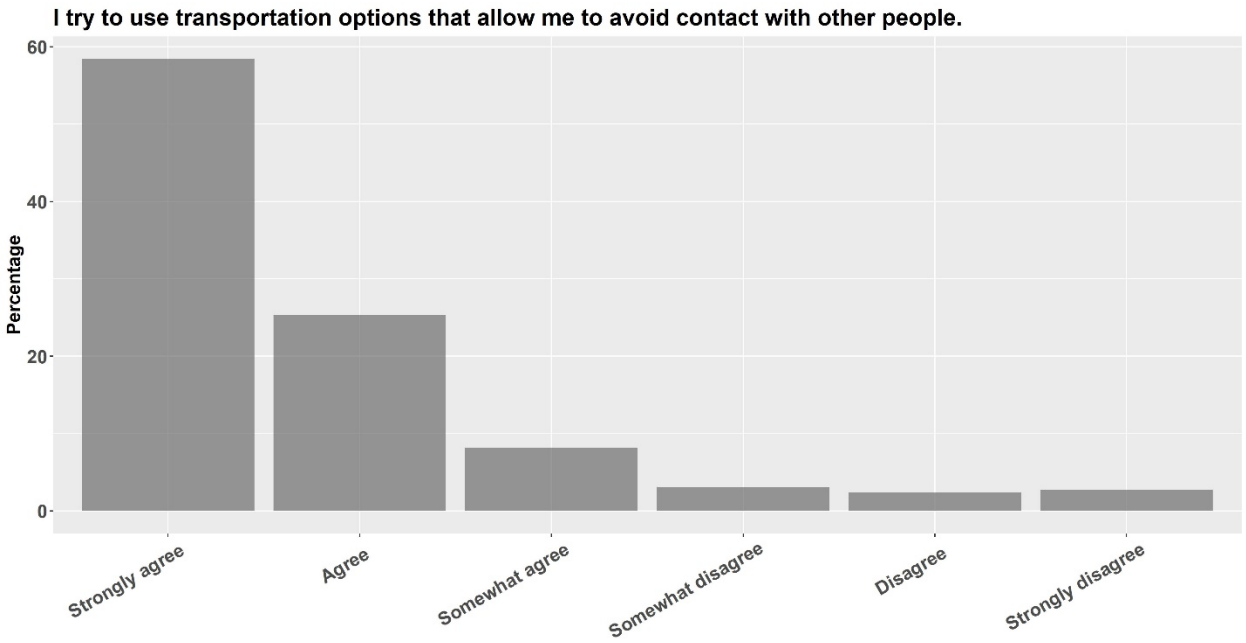

Figure 5.17 About 90 percent of respondents had tried to avoid others when they used transportation options.

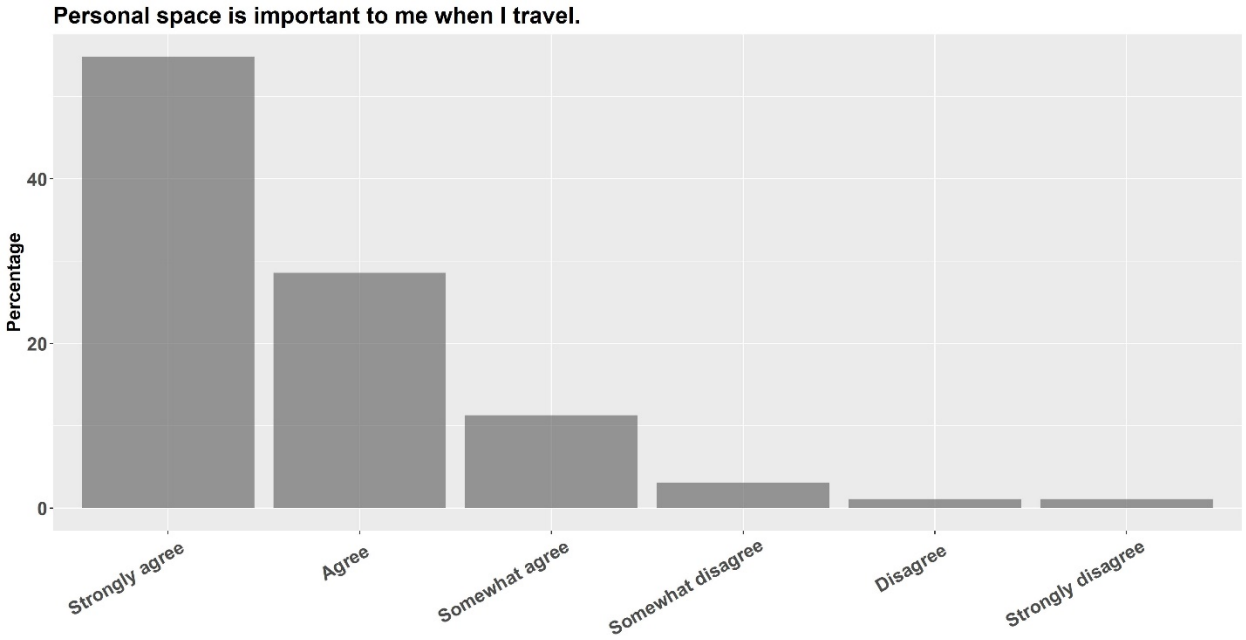

Figure 5.18 Personal space while traveling was important to more than 90 percent of the respondents.

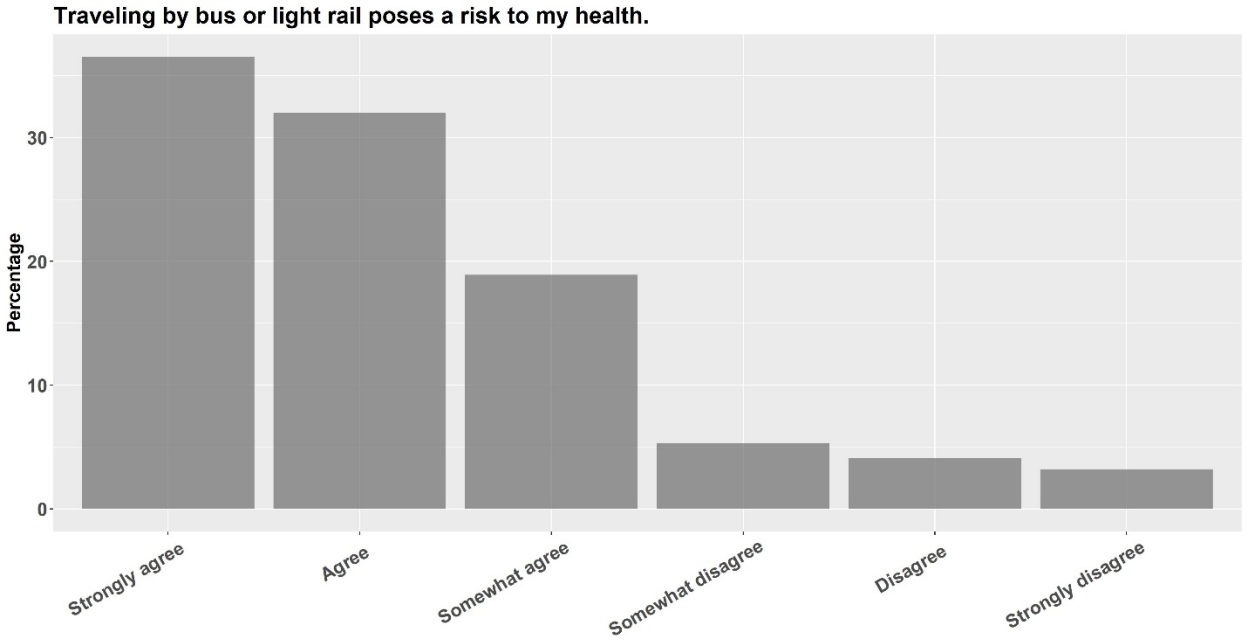

Figure 5.19 More than 85 percent of our sample thought traveling on public transit posed a health risk.

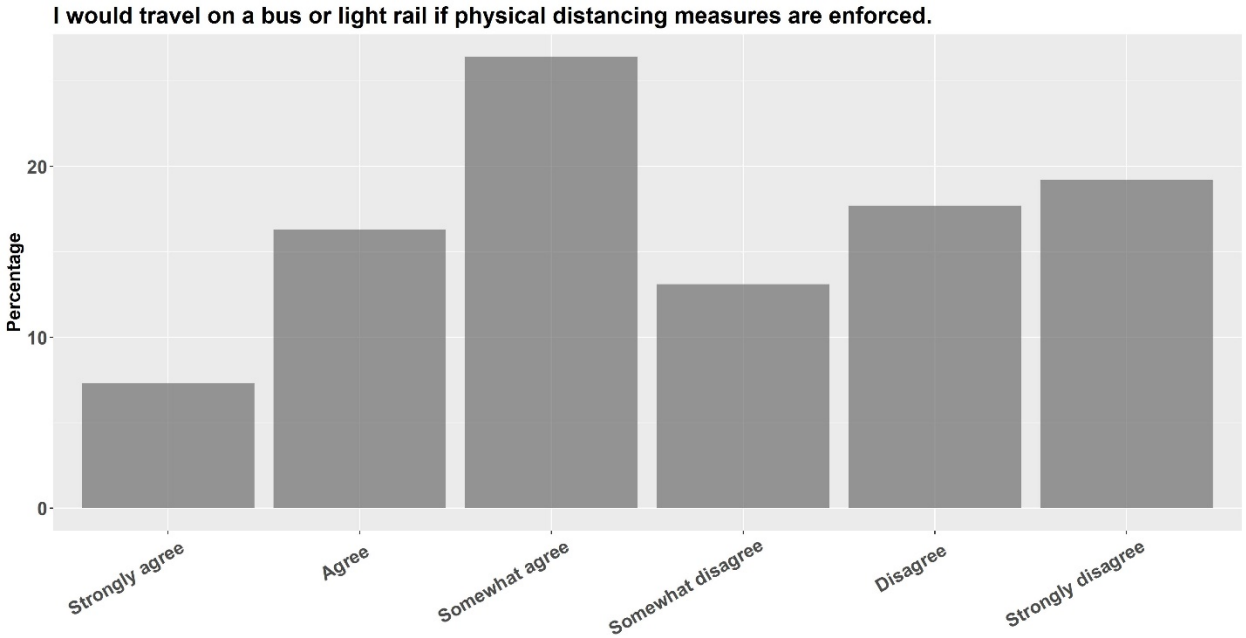

Figure 5.20 About 45 percent of survey participants indicated that they would travel on a bus or light rail if physical distancing were enforced.

In the fourth part of the attitudinal questions, we focused on shopping behavior during the pandemic.

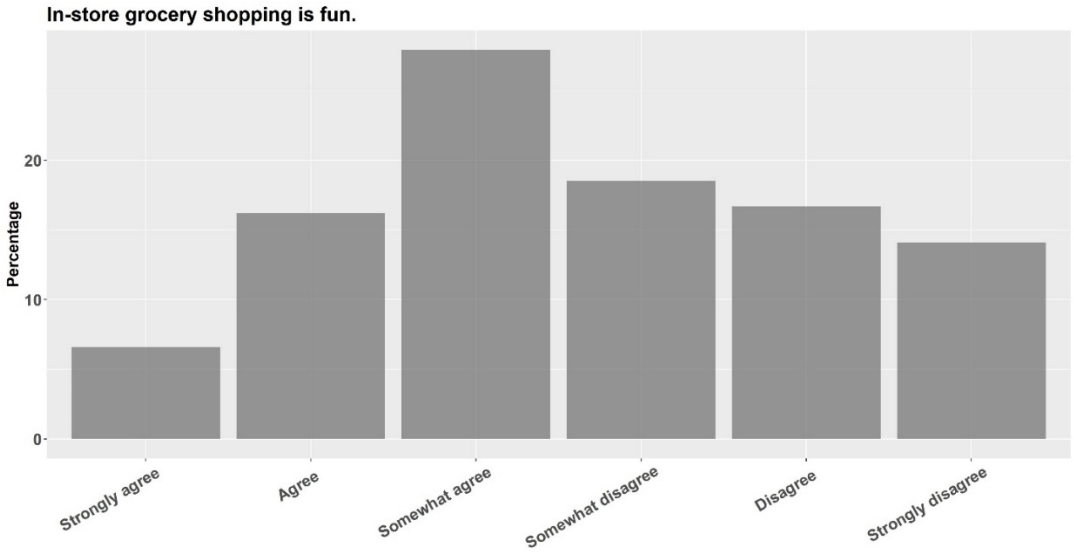

Figure 5.21 About half of our pariticpants found in-store grocery shopping fun, while the other half did not.

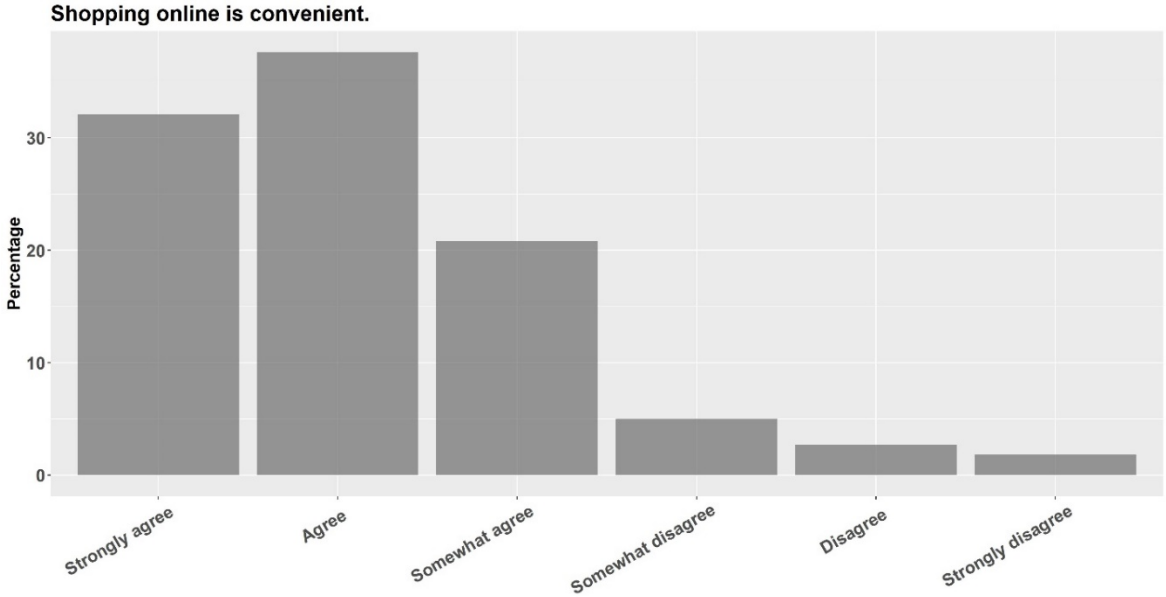

Figure 5.22 About 90 percent of participants agreed that shopping online was convenient.

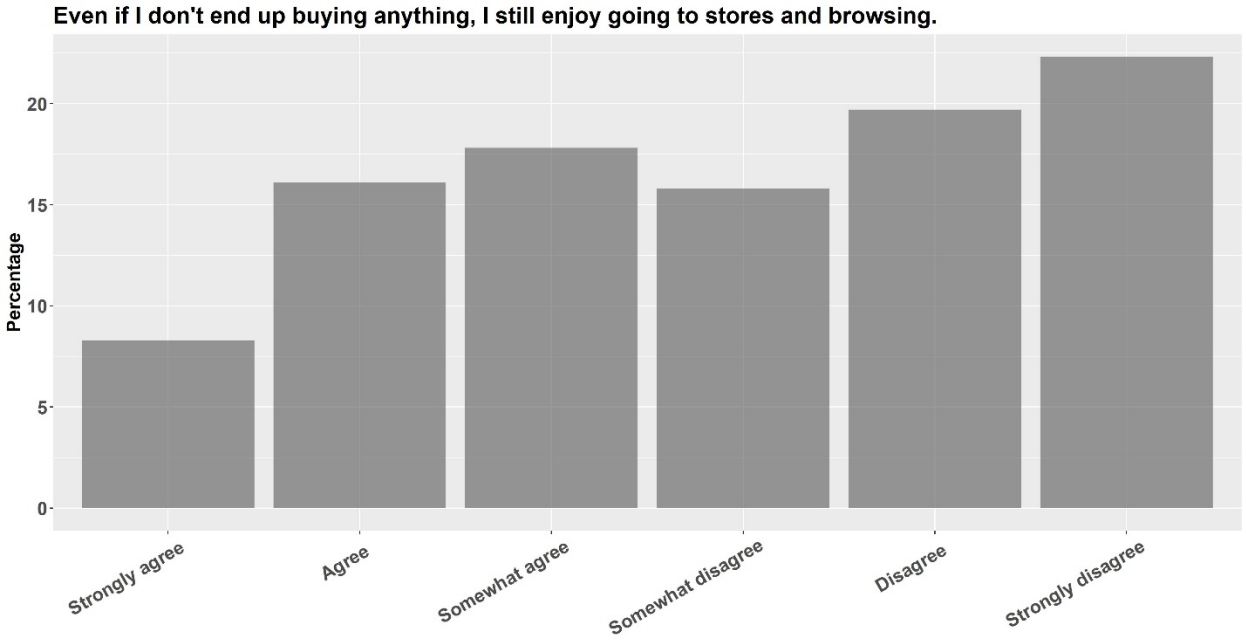

Figure 5.23 About 60 percent of individuals indicated that they did not enjoy going to stores and browsing, even if they ended up not buying anything

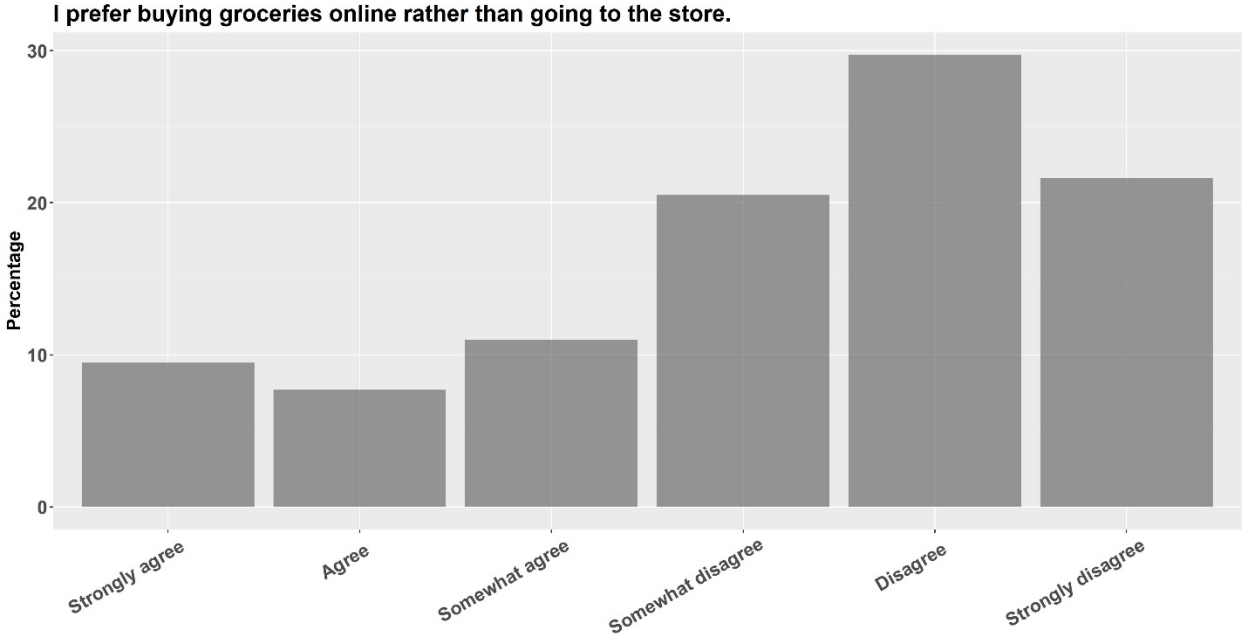

Figure 5.24 About 70 percent of our sample said they would rather buy groceries in the store than online.

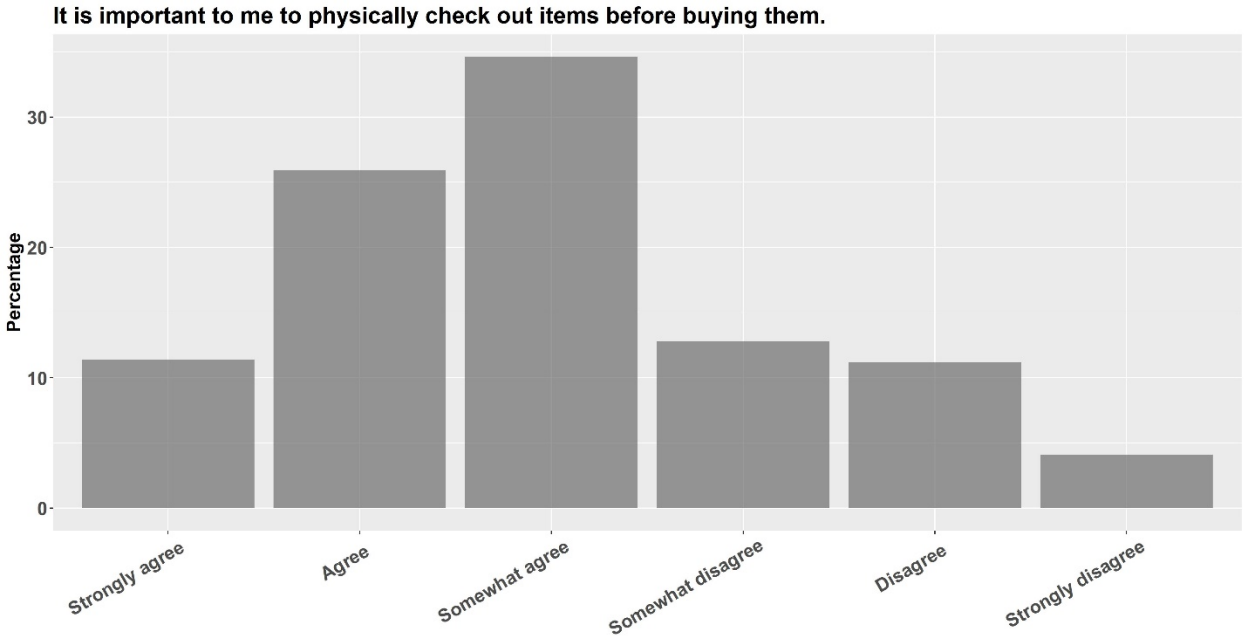

Figure 5.25 About 70 percent of our sample said that physically checking items before purchasing them was important.

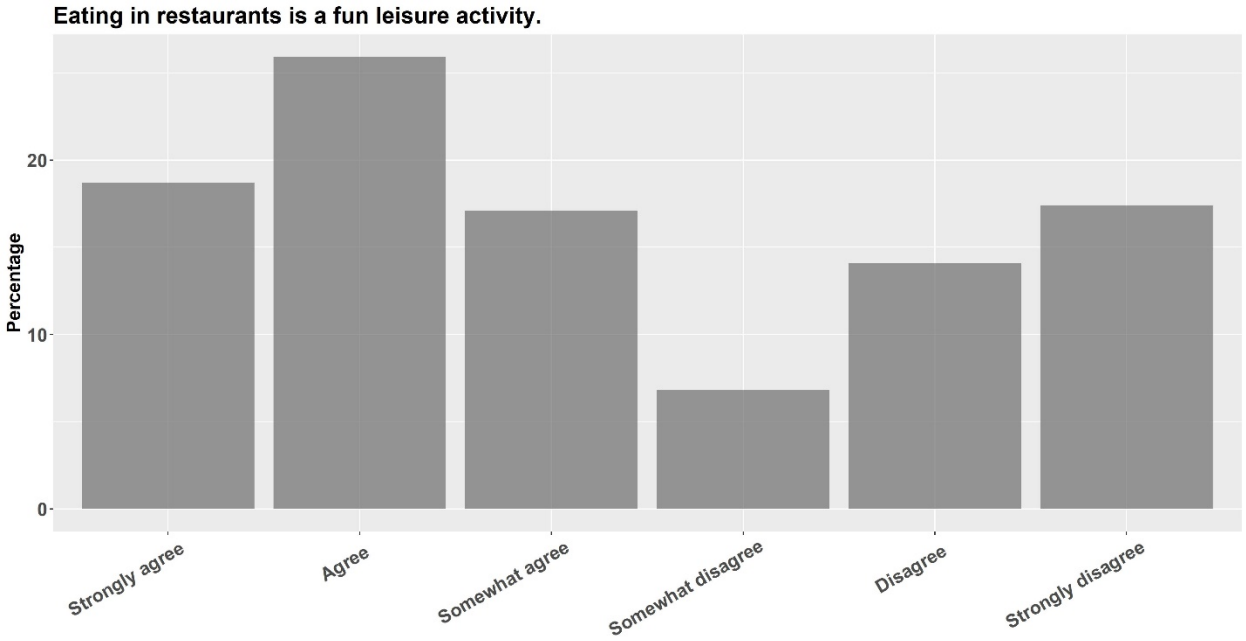

Figure 5.26 More than 60 precent of respondents considered eating out in restaurants to be a fun leisure activity.

CHAPTER 6: EXPECTED OUTCOMES

The expected outcomes of this work were an improved understanding of the initial and potential longer-term impacts of the COVID-19 pandemic on activity participation and travel behavior in the Puget Sound region. This will allow transportation professionals to better manage the response to the pandemic and the return to normal activity post-pandemic. The data collected in this project are freely available in the PacTrans Dataverse, which can be found at the following url: https://dataverse.harvard.edu/dataverse/pactrans