DEPARTMENT OF TRANSPORTATION

Understanding post-COVID safety concerns toward the use of transit and shared mobility in Greater Minnesota

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FINAL REPORT

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EXECUTIVE SUMMARY

The COVID-19 pandemic and widespread social distancing measures have dramatically reduced the use of public and shared transportation services, leaving transit and shared mobility providers with massive revenue shortfalls. This research study investigates the perceived safety risks and barriers that might prevent transit and shared mobility services from attracting post-COVID riders in Greater Minnesota. It includes an online survey of Greater Minnesota residents to understand their COVID-related safety concerns and their preferences and perceptions toward existing and potential safety protocols.

The survey results show that during the post-COVID era, driving alone continues to dominate but desires to use transit and shared mobility modes remain strong. Lack of access, lack of interest, and lack of available better alternatives jointly affect transit-use behavior. Women, people with COVID concerns, urban residents, online shoppers, and transit users are associated with stronger preferences toward COVID safety measures. People with COVID concerns, online shoppers, and transit users are also associated with a preference toward general transit service improvements. We also find that elderly people, hesitant tech users, and transit-dependent users are unlikely to be positively affected by trip-planning tools and contactless payment technology. Furthermore, income and car ownership predict future transit use. Younger age is associated with more interest in carpooling.

The study results help to inform transit, shared mobility providers, government agencies, and transportation demand management (TDM) organizations regarding what safety and communications strategies will be most effective in bringing back users. It is worth noting that about 40 percent of our survey respondents choose more frequent and faster services above all other service improvements. A few COVID-19 safety measures and occupancy info are ranked higher on the preference scale because of overall respondent interest and interest from key demographics. As COVID-19 or other infectious epidemics become less of a concern among potential transit riders, frequent and fast service will be an important strategy in attracting riders.

CHAPTER 1: INTRODUCTION

The COVID-19 pandemic and widespread social distancing measures have dramatically reduced use of public and shared transportation services, leaving transit and shared mobility providers with massive revenue shortfalls. This research project aims to investigate the perceived safety risks and barriers that might prevent transit and shared mobility services from attracting post-COVID riders in Greater Minnesota. Various data sources illustrate significant reductions in public transit use around the world in response to the COVID-19 pandemic. It is no different in Minnesota.

The larger, urban 5307 agencies saw a 55 percent reduction in revenue and a 40 percent reduction in trips while maintaining a similar level of expenses in 2020, compared to 2019 (Figure 1.1). Smaller, rural 5311 agencies saw an 80 percent reduction in revenue and a 40 percent reduction in trips but were also able to reduce expenses by a commiserate amount. Both agencies saw similar reductions in the number of service hours and miles, perhaps explaining expense levels among 5307 agencies while creating a contradiction among 5311 agencies. The impacts to revenue illustrated the importance of regaining ridership to sustain service expenses. The overall moderate reduction in trips also illustrated the necessity of public transit services even during an epidemic.

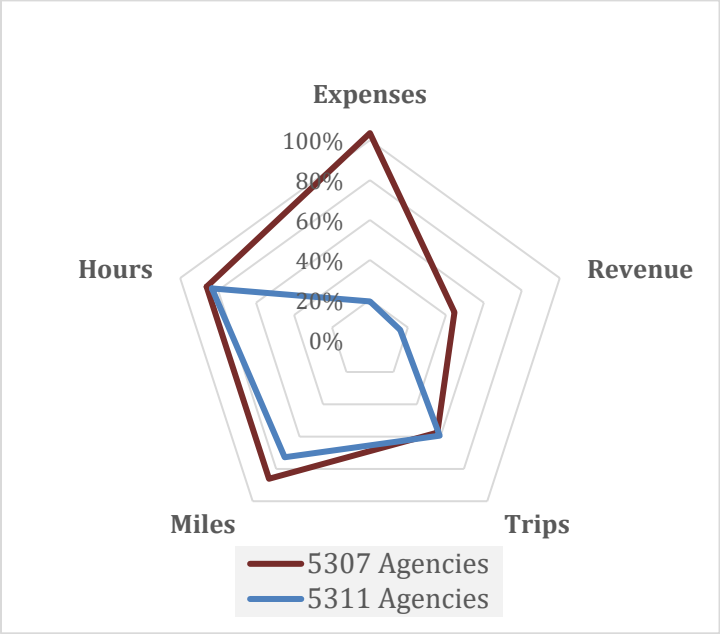


Figure 1.1 Overall Comparison between 2020 and 2019 Performance among Greater Minnesota public transit agencies. Statistic represents 2020 total as a percent of the 2019 total. (Source: MnDOT—OTAT)

Figures 1.2 and 1.3 show the average percentage of trips in 2020 compared to 2019 between service types (i.e., fixed route, demand response, route deviation, ADA) and among all agencies. The figures are delineated by agencies that reported every month throughout 2020 and by agencies that reported every four months or less throughout 2020. When looking at trips in 2020, the steep reduction in ridership in response to pandemic lockdowns is immediately evident. As various parts of the state began to shut down in March and April 2020, public transit took steps to restrict trips and reduce service levels. After

the temporary shutdown, public transit ridership began to steadily climb despite a worsening of the epidemic in the state. The dip evident in Figure 2 in November and December could be influenced by the worsening epidemic in Minnesota, the holiday season, or missing ridership statistics for December.

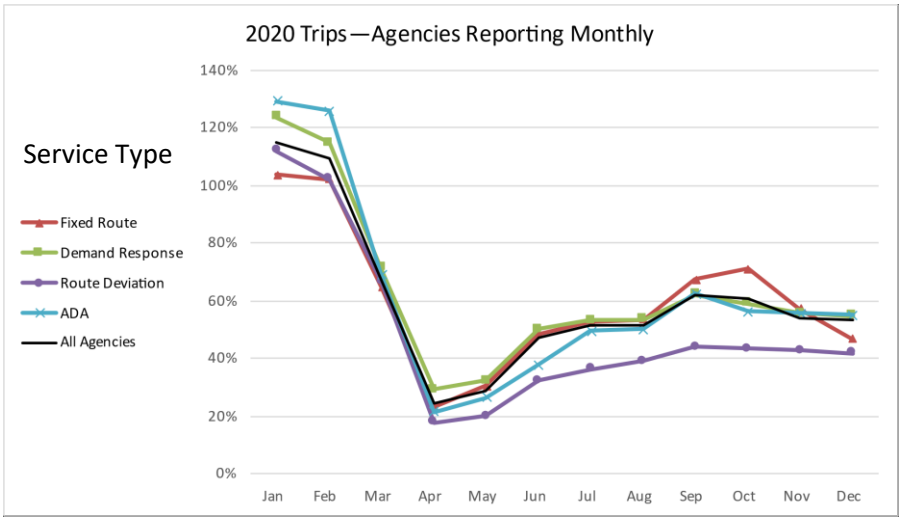


Figure 1.2 Trips Comparison between 2020 and 2019 among agencies reporting monthly. (Source: MnDOT—OTAT)

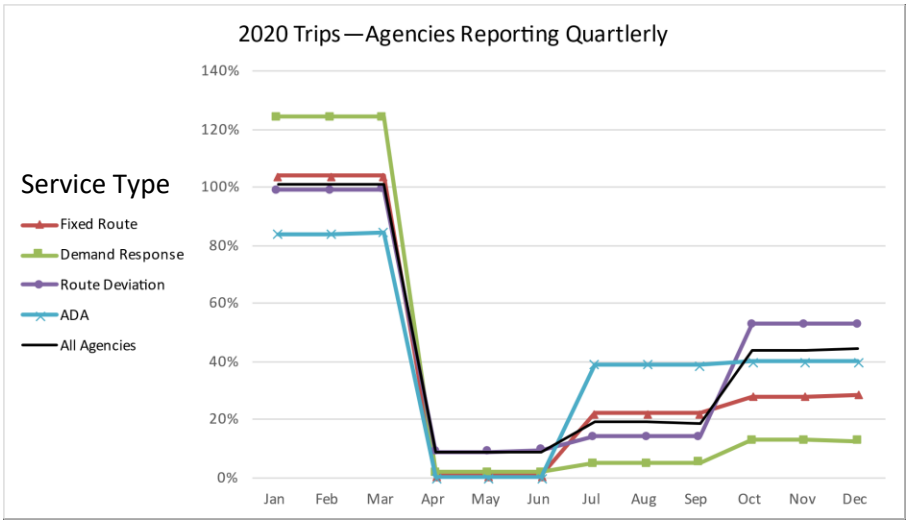


Figure 1.3 Trips Comparison between 2020 and 2019 among agencies reporting quarterly. (Source: MnDOT—OTAT)

There is also some variation in ridership throughout 2020 based on service type. Among agencies reporting monthly, all of the service types approximately follow the all agencies' average except route deviation service, which experiences a slower rebound in ridership after the spring shutdown. Agencies reporting quarterly see a greater variation among service types with route deviation and ADA services

rebounding more by the end of the year than the demand response and fixed route service. It is not clear whether these variations are caused by user demand or service restrictions. By the end of 2020, many of the quarterly reporting agencies were still not operating their fixed route and demand response service.

CHAPTER 2: LITERATURE REVIEW

The perception of risk of infectious diseases spreading on public transit is under researched (Doug et al., 2021). Early research highlights the important of vehicle ventilation, vehicle cleaning, and safe physical distancing (Gkiotsalitis & Cats, 2020; Moovit, 2020). Raunak et al. (2020) find that the primary perceived risks on public transit are the overall fear of transmission compounded with the perceived difficultly of maintaining a safe physical distance. However, results indicate that public transit use would not significantly change for those without reasonable transportation alternatives (Raunak et al., 2020).

Bove and Benoit (2020) present safety signals that service providers can implement to better welcome back customers. Safety signals deliberately communicate to customers that the risk of infection is low while using a particular service. These signals allow customers to make safety assessments on what would otherwise be an imperceivable risk of infection, especially in instances of potential asymptomatic spread. The recommendations were developed from a search of trade publications and other relevant secondary data. There are default-independent signals which require upfront costs to the provider; the upfront costs are separated by whether the cost is incurred regardless of service consumption (sale independent) or the cost is incurred upon service consumption (sale contingent). Second, there are default-contingent signals which do not require upfront costs; the delayed costs are separated by whether the signals prevent service consumption (revenue risking) or the signal incurs a cost after the fact (cost risking).

Table 2.1 on the following page details the signals identified by Bove and Benoit's (2020) research that apply to public transit. Bove and Benoit (2020) cite that voluntary signals with "high up-front costs and are easy-to-verify are more likely to be perceived as credible evidence of an otherwise hidden quality."

Pryzbylowski et al. (2021) investigate the impact of the COVID-19 pandemic on public transit use in Gdansk, Poland. Their survey asked about certain factors that could affect the respondents feeling of comfort using public transit before and during the pandemic. The "number of passengers" and the "behavior of other passengers" were the highest ranked among six to nine other factors both before and during the pandemic. "Fear of other passengers not following the hygienic regime" was the third highest ranked factor for during the pandemic. Lastly, there was a slight increase in the number of respondents finding "tidiness of the vehicle" important during the pandemic than before (Pryzbylowski et al., 2021).

Another study found that provision of sanitizer, face mask requirements, frequent cleaning, web ticketing, and increased frequency were the top five preferred safety measures among eleven choices (Raunak et al., 2020). Transit (2021) conducted a survey in April of 2021 of public transit riders that use their app (for navigating transit) about COVID-19 safety concerns and travel behavior. They surveyed about which measures app users would like to see implemented in order to return to using public transit. Over 50 percent indicated they would ride more if the cleaning of vehicles was improved and agencies distributed masks; although, a greater majority of respondents selected other general service improvements that would entice them to use public transit more: more accurate trip information (80%), more frequent service (86%), faster service (77%), and more convenient routes (75%) (Transit, 2021).

Table 2.1 Categorization of COVID-19 Safety Signals Applicable to Public Transit. (Adapted from Bove & Benoit, 2020)

		Access to Servicescape	Servicescape Physical Environments	Tangibles	Staff	Other Customers	Communication about Servicescape
COVID safety measures requiring upfront costs	**Sale Independent**	(1) Monitoring temperature, heart and respiratory rate (2) Booking platforms (3) Curtailed service hours to allow extra cleaning	(1) Social distancing floor stickers (2) Increased level of cleaning (3) Provision of accessible handwashing facilities and/or hand sanitizer (4) Design to minimize contact with surfaces, e.g., hands-free door	(1) Virus repellent fabrics (2) Increased cleaning of items customers touch (3) Rollout of contactless payment	(1) Protective shields around high-contact staff (2) Regular testing, temperature and traceability checks (3) Provision of protective equipment for staff, e.g. gloves and masks (4) Introduction of virus detection dogs (5) Introduction of "germzapping" robots (6) Staff hygiene auditing	(1) Monitoring temperature, heart and respiratory rate (2) Provision of protective equipment for customers, e.g., gloves	(1) Use of language signaling safety
	Sale Contingent	(1) Introduction of revised cleaning protocols (2) Contactless boarding				(1) Protective shields for customers (2) Provision of health and safety kits	
COVID safety measures not requiring upfront costs	**Revenue Risking**	(1) Restriction on the number of customers (2) Designated hours for key workers and vulnerable customers (3) Commencing or reducing service portfolio to delivery (4) Restrict customers access depending on protection level	(1) Removal of all furniture to avoid congregations	(1) Advice to customers to wash and self-handle bags (2) Customer advice to self-swipe card on payment	(1) Removal of nonessential, courtesy staff (2) Online only, no-counter ordering	(1) Change in communal sharing practices	(1) Provider announcements for social distancing (2) Best time to come indication
	Cost Risking	(1) Changing the way customers access the service, e.g., middle door of busses (2) Delivery fee waiver for vulnerable customers (3) Extending opening hours		(1) Suspension customer items entering the servicescape (2) Removal of items used in the service process, e.g. baskets or trays	(1) Staff increased hand washing routines (2) Compensation to staff including peer service providers with positive diagnosis		

A handful of studies examine how the COVID-19 pandemic will affect shared mobility use. Ivaldi and Palikot (2020) investigate the impact of the pandemic on BlaBlaCar's, a ridesharing system, operation in France. The authors observed that the number of trips per day increased rapidly and steadily as France lifted travel restriction over the course of a one-month observation period, with larger inflections around the days when restrictions were lifted. The authors also observed that the severity of the pandemic in each region had a large effect on the number of trips departing from that region. In addition, the severity of the pandemic as perceived by the driver increases the price per kilometer of the ride. The authors are unable to definitively isolated these effects but the results highlight the importance of these factors (Ivaldi and Palikot, 2020).

Nikiforiadis et al. (2020) study the impact of the COVID-19 pandemic on the perceptions of bike-sharing in Thessaloniki, Greece. Their survey of 223 respondents finds that bike-sharing use could potentially increase after the pandemic, now perceived as a more preferred option, especially among people commuting in a private vehicle as a passenger or those already subscribed to the service (Nikiforiadis et al., 2020). Shamshiripour et al. (2020) implement a stated preference-revealed preference survey in the Chicago metropolitan area, investigating the patterns of activity-travel patterns during and after the pandemic. Respondents perceived public transit, solo ride hailing, and pooled ride hailing as the three most risky travel modes; even participants that lacked regular access to a personal vehicle viewed public transit as risky (Shamshiripour et al., 2020).

Teixeira and Lopes (2020) examine the impact of the COVID-19 pandemic on subway and bike share systems in New York city. They found that while both systems saw ridership declines, bike sharing saw a smaller reduction and saw a slight increase in the average distance per trip. These findings illustrated potential modal shifting of subway users to bike share users as the pandemic worsened.

CHAPTER 3: DATA COLLECTION AND SAMPLE DEMOGRAPHICS

3.1 DATA COLLECTION

The research team conducted an online survey of Greater Minnesota residents. The 15-minute survey instrument was developed by the research team with input of the project Technical Advisory Panel and hosted on Qualtrics. The survey collected information about mode use, COVID-19, public transit, shared mobility, autonomous vehicles, and socio-demographics. The full list of survey questions is included as Appendix A of this report. The survey targeted Greater Minnesota residents, defined as living outside the 7-county Twin Cities Metro Area, who are age 18 or older.

Survey respondents were identified through a Qualtrics panel service and by distributing an email through Greater Minnesota transit providers. Qualtrics independently recruited potential participants that matched the eligibility criteria then compensate participants who successfully completed the survey. Sampling through Qualtrics cost about $7.50 per respondent. The research team also advertised the survey through Greater Minnesota transit providers using email listservs and posters on transit vehicles. The research team compensated participants that successfully completed the survey and verified their identity with $10 prepaid debit cards.[1] The survey responses were collected during the fall of 2021 between September 22 and November 5, 2021. We collected 758 total responses, 711 through Qualtrics and 47 through the email distribution.

Figure 3.1, on the next page, illustrates the distribution of survey respondents across Minnesota by their home zip code. The map shows the boundaries of regional transit providers and the location of municipal transit providers for reference. We received about 223 (30 percent) responses from urban areas in Greater Minnesota, categorized as respondents living in the approximate service area of large municipal transit providers.

[1] The research team initially planned to compensate respondents recruited through Greater Minnesota transit providers with a $10 electronic amazon gift card; however, the online survey was well targeted by fraudulent respondents taking the survey multiple times with fake identities. Although several security measures were implemented through the Qualtrics platform, we still received over 1,000 fake responses. We then implemented a physical prepaid debit card that would be mailed to respondents; this adjustment required us to recontact survey respondents and collect additional identifiable information. After this change, we were able to verify 47 legitimate responses from 1,375 recorded surveys. It is likely that the delay and change in compensation turned away other legitimate responses that did not submit the additional info for compensation (full name, address, date of birth). The survey was previously anonymous (beside email address).

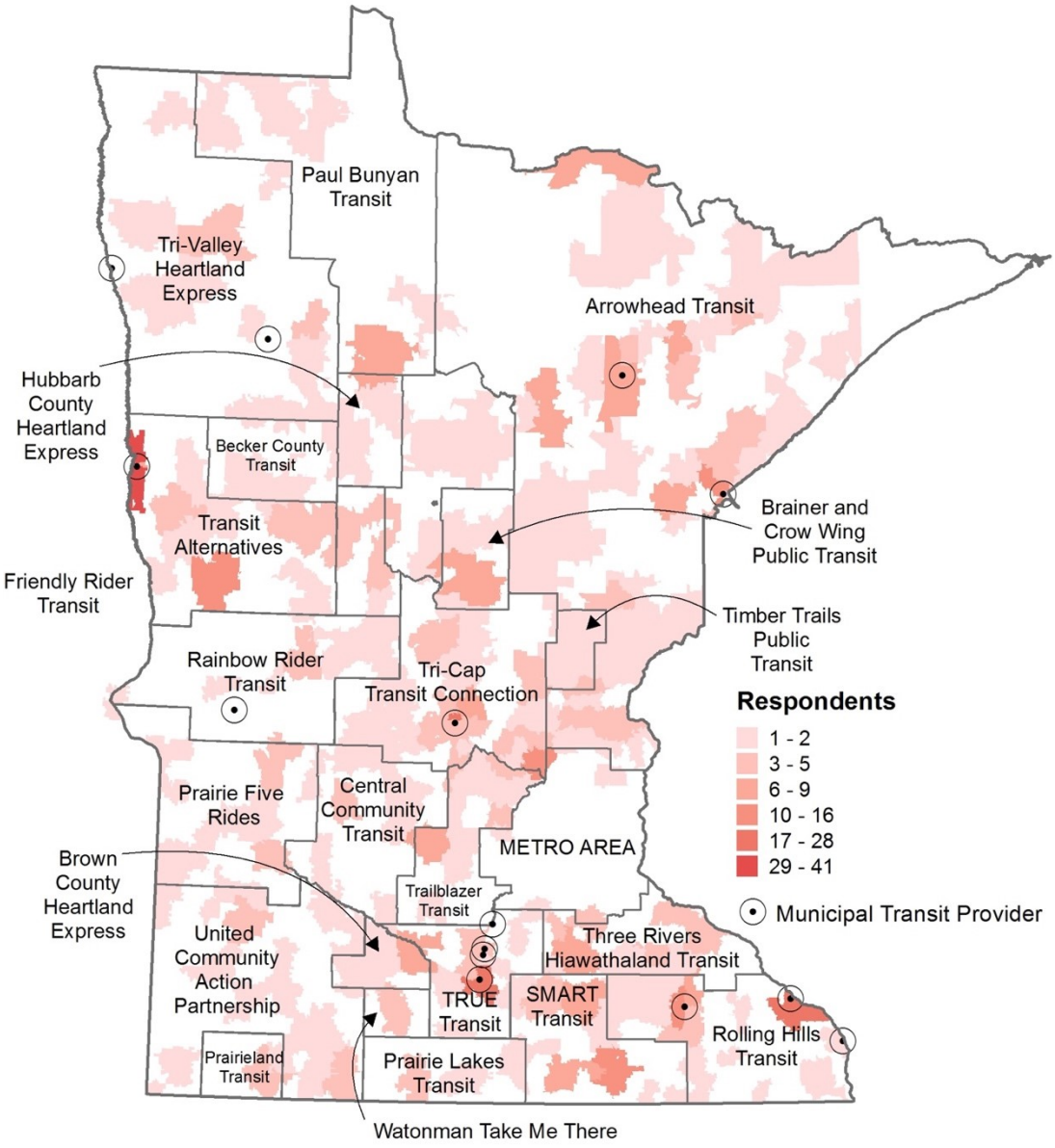


Figure 3.1 Distribution of survey respondents by zip code, including the boundaries of regional transit providers and locations municipal transit providers in Greater Minnesota.

3.2 SOCIODEMOGRAPHIC CHARACTERISTICS

Table 3.1, on the next page, contains key socio-demographics of the study sample that are used as explanatory variables in logistic and ordered logistic regression in **Chapter 4 and Chapter 5** of this report. Greater Minnesota is about 95 percent white. The research aimed to oversample people of color to conduct more specific analysis by race; however, just 13 percent of the final sample is non-white. We investigate preferences and perceptions of the white alone respondents compared with non-white respondents.

Greater Minnesota is about 50 percent men and 50 percent women according to the 2015–2019 5-Year American Community Survey (the ACS did not recognize non-binary residents). Our survey population is 72 percent female. We investigate preferences and perceptions of women compared to non-women, includes both men and a few non-binary respondents. Sixty-two percent of the respondents identified themselves as white women.

Table 3.1 Descriptive statistics of key socio-demographics in the study sample and the explanatory variables investigated through logistic and ordered logistic regression in this report.

Explanatory Variable	Count (Percent)
White alone	654 (86%)
Woman	548 (72%)
30 years old and younger	225 (30%)
65 years old and older	122 (16%)
Born outside U.S.	40 (5%)
Increased health risk of COVID-19 in Household	357 (47%)
Not Vaccinated	244 (32%)
Employed	425 (56%)
Renter	292 (39%)
Income less than 25k	206 (27%)
Income 100k or greater	101 (13%)
Less than 1 Vehicle Per Driver in Household	183 (24%)
Takes Trips of Less than 30 Minutes per Day	311 (41%)
Hesitant to Use New Technology	239 (32%)
Deliveries from Online Shopping—Less than 1 day per week	472 (62%)
Deliveries from Online Shopping—1–2 days per week	207 (27%)
Deliveries from Online Shopping—3–4 days per week	65 (9%)
Deliveries from Online Shopping—5 or more days per week	14 (2%)
Used Public Transit during or before Pandemic	216 (28%)
Knows local Public Transit agency	550 (73%)
Interest in Future Transit Use, no previous use	106 (14%)
Other Shared Mobility User	400 (53%)
Interest in Future Shared Mobility Use, no previous use	88 (12%)
Lives in large urban area.	223 (29%)
Total	758 (100%)

Increased risk of COVID-19 in household measures whether the respondent or someone in their household has an underlying health condition that makes them more vulnerable to COVID-19. Employed includes respondents that are employed full-time, part-time, or self-employed. Less than 1 vehicle per driver in household is a ratio of the number of cars owned by a household and the number of licensed drivers. Takes trips of less than 30 minutes per day measures if respondents are taking trips less than 30 minutes total per day, approximating a measure of fewer or shorter trips.

Hesitant to use new technology is a measure of whether respondents are skeptical of new technologies or are usually one of the last people they know to use a new technology. Deliveries from online shopping is broken down by four weekly frequencies and used as an ordinal variable. Knows local public transit agency measures whether a respondent has heard of a regional or municipal transit provider that serves their zip code. Lives in urban area indicates that a respondent lives in the approximate service area of a large municipal transit agency.

CHAPTER 4: MODE USE ANALYSIS

We asked respondents about their use of eight different modes at three different time points: before the COVID-19 pandemic, during the COVID-19 pandemic before vaccines were widely available, and in an ideal future assuming that each mode is widely available and convenient to use.

- Drive Alone: you drive your own vehicle
- Carpool: you drive or ride with a family member, friend, or co-worker
- Carshare: you rent a vehicle for your personal use
- Transit: you use services provided by public transit companies
- Ride Hail: you use on-demand ride services provided by private companies
- Shared Bike you use a shared bike for personal use
- Shared Scooter: you use a shared scooter for personal use
- Personal Bike/Scooter: you use your own bike or scooter

Table 4.1 shows the number of respondents that used each mode weekly at each of the three specified time points. About 80 percent of respondents were driving alone weekly before the pandemic and there was only slight variation in weekly use in the other two time periods. Carpooling and transit were the 2nd and 3rd most frequently used modes before the pandemic, about 25 percent and 16 percent of respondents. These modes saw modest decreases in use during the pandemic but also have the greatest increases in interest for weekly use in the ideal future.

Table 4.1 Weekly mode use at three different time points before March 2020 (the start of the pandemic in Minnesota), during the pandemic before vaccines were widely available (i.e., April 2021), and in a future where each mode is widely available and easy to use.

Mode	Before	During	Ideal Future
Drive Alone	601 (79%)	577 (- 4%)	618 (+ 3%)
Carpool	185 (24%)	141 (- 24%)	285 (+ 54%)
Transit	119 (16%)	81 (- 32%)	182 (+ 53%)
Ride Hail	24 (3%)	11 (- 54%)	36 (+ 50%)
Carshare	47 (6%)	27 (- 43%)	73 (+ 55%)
Shared Bike	13 (2%)	7 (- 46%)	28 (+ 115%)
Shared Scooter	7 (1%)	3 (- 57%)	29 (+ 314%)
Personal Bike or Scooter	100 (13%)	91 (- 9%)	163 (+ 63%)

In terms of frequency of driving alone, about 20 percent of respondents want to use a car more in the future than they were during the pandemic while 11 percent want to use a car less. The remaining 70 percent indicated no change in use from during the pandemic than in the future.

Table 4.2, on the next page, shows how respondents answered questions about why they did not use a certain mode during the pandemic. The Total column shows the overall number of respondents that did not use a particular mode during this time period. Respondents were given 5 choices: “I did not have access”, “I was not interested in using it”, “I had access to a better alternative”, “Other (with text

entry)", and "None of the above". Respondents were able to select more than one choice expect if they picked "none of the above." For most modes except Drive Alone, respondents are split between lack of access and lack of interest. Only a quarter of respondents indicate they had a better option for all modes except Transit, where more respondents had a better option, and Drive Alone, where much fewer respondents had a better option.

Table 4.2 Selected reasons for why respondents did not use a given mode during the pandemic.

Mode	Did not have access	Was not interested	Had better alternative	Total
Drive Alone	68%	9%	6%	113 (15%)
Carpool	33%	46%	24%	510 (67%)
Transit	36%	42%	31%	623 (82%)
Ride Hail	40%	43%	26%	720 (95%)
Carshare	39%	41%	26%	703 (93%)
Shared Bike	46%	38%	26%	748 (99%)
Shared Scooter	49%	38%	24%	750 (99%)

Table 4.3 details the results from the first set of logistic regression analysis. The columns, Transit, Carpool, Drive Alone, and Other Shared Mobility are separate regressions with an ordinal scale outcome variable. The colors in the figure correspond to the percent change in odds given a particular significant explanatory variable, laid out in a key to the right of the figure. Blank cells represent results that were not statistically significant.

We can observe patterns in significant variables across the regressions to highlight potentially important factors for determining interest in mode use. The young and old age categories, vaccination status, employment, vehicles per household, trip duration, and transit use variables are significant in at least two of the regressions. Note that coefficients are not applicable to the opposite categories of significant variables. For example, a respondent 30 years and younger almost 3 times more likely to be interested in using carpool in the future than not at all; this does not mean that a respondent older than 30 is almost 3 times less likely, we are not able to interpret a pattern for categories not explicitly included in the regression. A summary of the odds ratios for each regression is below:

Interest in Future Transit Use

- 30 years and younger 35% less likely
- 65 years and older 46% less likely
- Not Vaccinated 33% less likely
- Renter 53% more likely
- Few Vehicles 69% more likely
- Trips less than 30 minutes per day 44% less likely
- Hesitant to use new tech 43% less likely
- Transit User almost 16 times more likely

Interest in Future Carpool Use

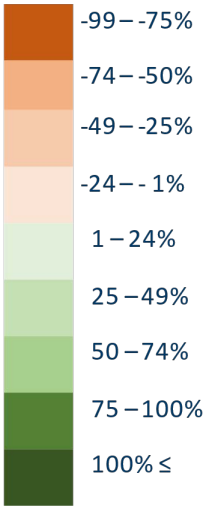
- Women 33% more likely
- 30 years and younger almost 3 times as likely
- 65 years and older 44% less likely
- Employed 35% more likely
- Trips less than 30 minutes per day 33% less likely
- Transit User 40% more likely

Interest in Future Drive Alone Use

- Not Vaccinated 40% more likely
- Employed over twice as likely
- Income less than 25k 33% less likely
- Few Vehicles 61% less likely
- Trips less than 30 minutes per day 39% less likely
- Transit user 70% less likely

Table 4.3 Ordered logistic regression of interest in future mode use, in an ideal scenario, for public transit, carpooling, and driving alone. Color coding corresponds to percent change in odds given a particular explanatory variable. Statistical significance is denoted with asterisks: *p<0.10; **p<0.05; ***p<0.01.

Explanatory Variable	Transit	Carpool	Drive Alone	Other Shared Mobility
White alone				***
Woman		*		
30 and younger	**	***		
65 and older	**	**		**
Foreign born				
Increased risk in household				
Not vaccinated	**		**	**
Employed		*	***	*
Renter	**			
Income < 25k	*		**	*
Income ≥ 100k				
Urban resident				
Hesitant tech user	***			
Online shopping deliveries				***
Few vehicles per household	***		***	
Short daily trip duration	***	***	***	*
Transit user	***	**	***	***
Knows transit agency				



CHAPTER 5: PUBLIC TRANSIT PERCEPTIONS AND PREFERENCES

Figures 5.1 and 5.2 provide a glimpse of the perception of risk on public transit among respondents in the fall of 2021. While over two-thirds of the sample saw large gatherings as a greater risk of contracting COVID-19, 18 percent of the sample considered public transit the riskiest setting of those provided (Figure 5.1). We compare the findings from this survey with the findings from a nationwide study conducted by Transit in 2021, sampling transit riders in large U.S. metro areas. The national and Minnesota samples show similar patterns. Further, twenty-eight percent of our sample had no concern at all about COVID-19 infection when using public transit (Figure 5.2). Twelve percent of respondents were very concerned with the risk of COVID-19 infection when using public transit.

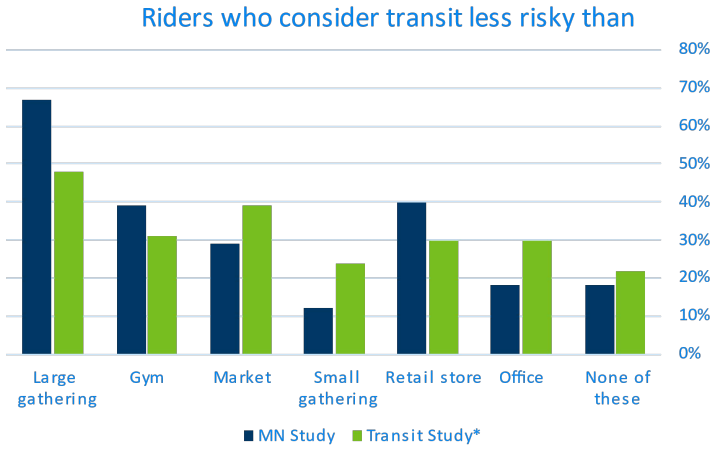


Figure 5.1 Perception among respondents of greater risk of contracting COVID-19 compared to using public transit. Multiple selections allowed; "None of these" is an exclusive answer. Findings are compared to results from a nationwide survey conducted by Transit. Source: Transit, "Rider Happiness Benchmarking Report," Spring 2021 – U.S. edition. *approximate values.

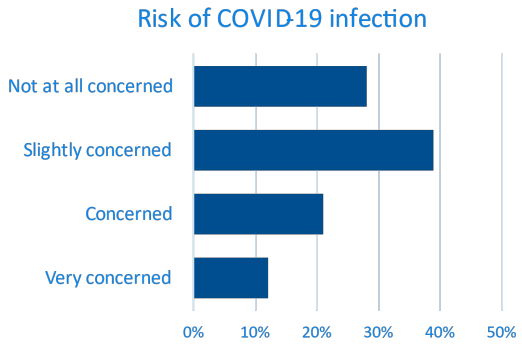


Figure 5.2 Concern about the risk of COVID-19 infection among respondents when using public transit services.

The next two tables present key information from the study. We asked survey respondents about which potential COVID-19 safety measures or general service improvements that could be implemented for

public transit services would increase their interest in using public transit as a means of understanding preferences among potential riders.

Table 5.1 displays the logistic regression results for 8 COVID-19 safety measures, plus "None of the above." The 8 measures are coded in the table by the list below, the full text of each measure was displayed to survey respondents.

1) **Sanitizer**: Provision of sanitizers at stops and within vehicles
2) **Face Mask**: Enforcing a face covering requirement
3) **Cleaning**: Frequent cleaning and disinfection of vehicles and stops
4) **Contactless Payment**: Contactless or mobile payment systems
5) **Screening Passengers**: Health screening of passengers before entering facilities/vehicles
6) **Distancing**: Safe physical distancing on transit vehicles
7) **Screening Drivers**: Health screening of bus drivers and conductors before every shift
8) **Ventilation**: Increase air ventilation and filtration

Table 5.1 Logistic regression of whether a particular COVID-19 safety measure will increase a respondent's interest in using ride public transit more. The outcome variable is binary of 0 = No and 1 = Yes. The reported coefficients are the calculated increase in the log odds (base e) for predicting if the respondent would select a given safety measure for a one unit increase in the explanatory variable. Statistical significance is denoted with asterisks: *p<0.10; **p<0.05; ***p<0.01. (N=758)

Explanatory Variables	Sanitizer	Face Mask	Cleaning	Contactless Payment	Screening Passengers	Distancing	Screening Drivers	Ventilation	None of the above
Total Selected	330 (44%)	333 (44%)	390 (51%)	269 (35%)	167 (22%)	306 (40%)	197 (26%)	348 (46%)	222 (29%)
White Alone	-0.256	-0.142	-0.257	-0.183	0.028	-0.05	-0.144	-0.083	0.404
Woman	0.116	0.503***	0.581***	0.315*	-0.169	0.348*	0.185	0.485***	-0.408**
30 years old and younger	0.086	0.089	0.293	-0.097	0.181	0.037	-0.137	0.041	-0.225
65 years old and older	-0.582**	-0.272	-0.485*	-1.028***	-0.31	-0.372	-0.096	-0.480*	0.673**
Born outside U.S.	-0.826**	-0.218	-0.547	-0.275	0.606	-0.46	0.384	-0.721*	0.283
Increased health risk of COVID-19 in Household	0.318**	0.365**	0.757***	0.073	0.186	0.293*	0.144	0.409**	-0.468**
Not Vaccinated	-0.795***	-1.528***	-0.862***	-0.900***	-1.142***	-1.242***	-1.435***	-1.202***	1.275***
Employed	-0.216	-0.518***	-0.222	-0.13	-0.319	-0.288	-0.564***	-0.355*	0.417**
Renter	0.299	0.277	0.1	0.328*	0.332	0.268	0.413**	0.181	-0.092
Income less than 25k	0.001	-0.336	-0.28	-0.27	-0.06	-0.515**	-0.363	0.03	0.126
Income 100k or greater	-0.361	0.02	0.121	-0.039	0.007	-0.281	-0.21	-0.046	0.414
Less than 1 Vehicle Per Driver in Household	-0.274	-0.042	-0.129	-0.397*	-0.259	-0.033	-0.237	-0.537***	0.006
Takes Trips of Less than 30 Minutes per Day	0.096	-0.105	0.102	-0.162	-0.095	-0.085	-0.014	0.025	0.316*
Hesitant to Use New Technology	-0.023	-0.304	-0.099	-0.027	0.102	0.079	-0.125	-0.454**	0.159
Frequency of Deliveries from Online Shopping	0.261**	0.134	0.199*	0.250**	0.369***	0.223**	0.176	0.187*	-0.269**
Used Public Transit during or before Pandemic	0.638***	0.741***	0.965***	0.636***	0.007	0.759***	0.537**	0.693***	-1.337***
Knows local Public Transit agency	0.161	-0.245	-0.083	0.261	0.061	-0.067	0.071	-0.056	0.048
Interest in Future Public Transit Use, No previous use	0.630***	1.009***	0.882***	0.693***	0.239	1.045***	0.151	0.962***	-1.365***
Lives in large urban area.	0.258	0.357*	0.411**	0.313*	0.232	0.103	0.257	0.258	-0.35
Constant	-0.702	-0.267	-0.778*	-1.038**	-1.612***	-0.759*	-0.973*	-0.444	-0.858*
Pseudo R-Squared	0.073	0.141	0.122	0.099	0.066	0.108	0.095	0.119	0.169

In Table 5.1, there are four explanatory variables that never have a significant result in any regression: White alone, 30 years old and younger, income 100k or greater, and knows local public transit agency. Hesitant to use new technology and less than 1 vehicle per driver in household are only significant in preference of the ventilation or filtration measure, both decreasing the likelihood. The remaining 13 variables are significant in at least 2 regressions.

- Sanitizer, Face Mask, Cleaning, Distancing, and Ventilation are the top five selected measures, with 40 to 51 percent of respondents.
- Screening Passengers and Screening Drivers were selected by the fewest number of respondents (22 to 26 percent). They also had the fewest number of significant variables in their regressions (2 and 4), typically decreasing likelihood. Although, renters and transit users are 50 percent and 70 percent more likely to select Screening Drivers.
- Not vaccinated was a significant variable in each regression, decreasing likelihood in all except none of the above. An unvaccinated respondent is over three times as likely to select none of the above. None of the Above is an exclusive answer, leading to significance in the other regressions. Not vaccinated was also significantly correlated with a decreased likelihood of interest in future transit use.
- Transit user is a significant variable in 7 of the 8 measures. A transit user is about twice as likely or more to select Face Mask, Cleaning, Distancing, or Ventilation.
- Interest in public transit is another significant variable in 6 of the 8 measures. Someone interested in using public transit is more than twice as likely to select Face Mask, Cleaning, Distancing, or Ventilation.
- Frequency of online shopping is a significant variable in 6 of the 8 measures. It typically increases the likelihood of selecting a particular measure from 20 to 30 percent.
- Woman and increased health risk of COVID-19 in household are both significant variables in 5 of the 8 measures. Increased risk in household generally increases likelihood of respondent selecting Sanitizer, Face Mask, Distancing, and Ventilation by 35 to 50 percent, though it increases the likelihood of a respondent selecting Cleaning by over 100 percent. The pattern is similar for the woman variable but it has significance in the Contactless Payment regression, not the Sanitizer regression, and the range of increase in all 5 regressions is about 40 to 80 percent.
- 65 years and older and employed have a significant positive influence on selecting None of the Above, about twice as likely and 50 percent more likely. 65 years and older is also negatively correlated with an interest in future transit use.
- The remaining explanatory variables are significant in 2 or 3 regressions. Living in an urban area increases the likelihood of selecting Face Mask, Cleaning, and Contactless Payment by about 36 to 50 percent.

Table 5.2 Logistic regression of whether a particular general service improvement will increase a respondent's interest in using public transit more. The outcome variable is binary of 0 = No and 1 = Yes. Statistical significance is denoted with asterisks: *p<0.10; **p<0.05; ***p<0.01. (N=758)

Explanatory Variables	Waiting Area	Real-time Info	Occupancy Info	Better Vehicles	Easier Access	Frequent and Fast	Lower Fares	Convenient Payment	None of the above
Total Selected	201 (27%)	230 (30%)	148 (20%)	189 (25%)	275 (36%)	297 (39%)	213 (28%)	179 (24%)	241 (32%)
White Alone	-0.297	-0.532**	-0.223	-0.159	-0.214	-0.224	-0.559**	-0.12	0.544*
Woman	0.09	-0.096	-0.055	-0.166	0.258	0.055	-0.225	0.042	-0.18
30 years old and younger	0.31	0.336*	0.644***	0.195	0.215	0.143	-0.409**	0.391*	-0.249
65 years old and older	-0.836**	-0.670**	-0.812**	-0.391	-0.288	-0.943***	-0.822***	-1.334***	0.478*
Born outside U.S.	-0.316	-0.819**	-0.798	0.043	0.031	-0.553	-0.339	-0.16	-0.061
Increased health risk of COVID-19 in Household	0.398**	0.203	0.465**	0.340*	0.300*	0.112	0.139	0.063	-0.362**
Not Vaccinated	-0.360*	-0.357*	-0.651***	-0.332	-0.478**	-0.551***	0.019	-0.247	0.447**
Employed	0.16	-0.257	-0.078	0.027	0.056	-0.031	-0.095	-0.12	0.015
Renter	-0.147	0.106	0.047	0.382*	0.004	0.388**	0.047	0.055	-0.018
Income less than 25k	0.131	-0.037	-0.43	0.178	-0.088	-0.257	0.032	0.088	0.185
Income 100k or greater	-0.273	-0.166	-0.622*	-0.007	-0.374	-0.264	-0.814***	-0.397	0.509*
Less than 1 Vehicle Per Driver in Household	-0.289	0.116	0.04	-0.331	-0.267	-0.258	-0.023	0.102	0.252
Takes Trips of Less than 30 Minutes per Day	-0.192	-0.244	0.088	-0.368*	-0.065	-0.256	-0.293	-0.178	0.257
Hesitant to Use New Technology	-0.129	-0.626***	-0.565**	-0.153	-0.273	-0.176	-0.322*	-0.578***	0.281
Frequency of Deliveries from Online Shopping	0.195*	-0.021	0.277**	0.151	0.097	0.122	-0.076	-0.01	-0.293**
Used Public Transit during or before Pandemic	0.592***	0.770***	0.874***	0.504**	0.419**	0.642***	0.531**	0.963***	-1.313***
Knows local Public Transit agency	0.235	0.305	0.264	0.248	0.049	0.02	-0.171	0.570**	-0.16
Interest in Future Public Transit Use, No previous use	0.673***	0.787***	1.291***	0.422*	0.782***	1.113***	0.800***	0.755***	-1.980***
Lives in large urban area.	0.274	4:12	0.506**	1:40	-0.151	0.089	-0.197	-0.099	0.023
Constant	-1.603***	-0.507	-2.325***	-1.549***	-0.755*	-0.45	0.216	-1.594***	-0.447
Pseudo R-Squared	0.073	0.09	0.133	0.059	0.046	0.089	0.061	0.105	0.139
N	758	758	758	758	758	758	758	758	758

Table 5.2 displays the logistic regression results for 8 COVID-19 safety measures, plus "None of the above." The 8 measures are coded in the table by the list below, the full text of each measure was displayed to survey respondents:

1) **Waiting Area**: More pleasant waiting area environment at stops
2) **Real-time Info**: Real-time info about transit vehicles/routes
3) **Occupancy Info**: Real-time bus occupancy information
4) **Better Vehicles**: More comfortable and safe vehicles
5) **Easier Access**: Easier access to transit stops
6) **Frequent and Fast**: More frequent and faster routes
7) **Lower Fares**: Have lower fares
8) **Convenient Payment**: More convenient payment options

In Table 5.2, there are four explanatory variables that are not significant in any regression: woman, employed, income less than 25k, and less than 1 vehicle per driver in household.

- Frequent and Fast, and Easier Access were the top two selected service improvements (39 percent and 36 percent); however, they would be number 6 and 7 when compared with COVID-19 safety measures. Renters, transit users, and interest in transit are the groups with a greater likelihood of selecting Frequent and Fast. Increased risk of COVId-19 in household, transit user, and interest in transit are the groups with greater likelihood of selecting Easier Access.
- Transit user and interest in transit are significant variables in each regression. These groups are 73 percent and 86 percent less likely to select None of the Above. Transit users are over twice as likely to select Real-Time Info, Occupancy Info, or Convenient Payment. Interest in transit respondents are over three times as likely to select Occupancy Info and Frequent and Fast.
- Foreign born and takes short trips were significant depressing variables in just one regression each. We cannot correctly interpret what it means to not select a service improvement. Knows local transit agency is only a significant variable in increasing the likelihood of a respondent selecting Convenient Payment (77 percent more likely). Lives in large urban area is only a significant variable in increasing the likelihood of a respondent selecting Occupancy Info (66 percent more likely).
- White alone, 65 years and older, not vaccinated, and high income ($100k or more) are significant increasing factors for selecting None of the Above, between 55 and 75 percent more likely.
- Hesitant to use new technology is a significant depressing variable in selecting Real-Time Info, Occupancy Info, Lower Fares, and Convenient Payment. They are about 45 percent less likely to select any of the three mobile technology improvements.
- 30 years and younger is a significant variable for the same for service improvements but this group is 40 to 90 percent more likely to be interested in the three mobile technology improvements. The have the greatest increase (90 percent) in the Occupancy Info regression.

We also asked how three specific interventions would affect a participant's likelihood in using public transit: face coverings, a contactless/mobile payment method, and an all-in-one trip planning tool (a trip

planning tool that integrates public transit with other shared mobility options such as ride hailing, carsharing, and bike/scooter sharing). Table 5.3 details which explanatory variables increase the probability of a respondent indicating that a certain intervention will increase their likelihood in using transit for each of the three interventions.

Table 5.3: Logistic regression for specific public transit intervention including a face covering requirement, a contactless payment system, and a trip planning tool. Each outcome variable is categorized as 1 (Yes) or 0 (No). The reported coefficients are the calculated increase in the log odds (base e) for predicting that a respondent respond "yes" a one unit increase in the explanatory variable. Statistical significance is denoted with asterisks: *p<0.10; **p<0.05; ***p<0.01. (N=758)

Explanatory Variables	Face Covering Requirement makes respondent *more* likely to use public transit	Contactless/Mobile payment method makes respondent *more* likely to use public transit	Trip planning tool makes respondent *more* likely to use public transit
Total Selected	235 (31%)	238 (31%)	185 (24%)
White Alone	-0.228	-0.149	-0.081
Woman	0.2	0.358*	-0.114
30 years old and younger	-0.368*	0.149	-0.098
65 years old and older	0.008	-1.129***	-0.809**
Born outside U.S.	-0.406	-0.118	0.342
Increased health risk of COVID-19 in Household	0.152	-0.045	0.168
Not Vaccinated	-1.594***	-0.960***	-0.799***
Employed	-0.346*	-0.192	0.029
Renter	0.132	0.245	0.313
Income less than 25k	-0.355	-0.338	-0.336
Income 100k or greater	-0.007	-0.044	-0.149
Less than 1 Vehicle Per Driver in Household	-0.139	-0.601***	-0.395
Takes Trips of Less than 30 Minutes per Day	-0.13	0.087	-0.005
Hesitant to Use New Technology	-0.574***	-0.653***	-0.402*
Frequency of Deliveries from Online Shopping	0.257**	0.276**	0.302**
Used Public Transit during or before Pandemic	0.793***	0.650***	0.477**
Knows local Public Transit agency	0.003	0.118	0.374*
Interest in Future Public Transit Use, No previous use	0.924***	0.830***	0.976***
Lives in large urban area.	0.373*	0.132	-0.379*
Constant	-0.734	-1.005**	-1.505***
Pseudo R-Squared	0.128	0.106	0.077

Results from Table 5.3 show:

- Thirty-one percent of respondents indicated that a Face Mask Requirement or Contactless/Mobile Payment option would make them more interested in using public transit.

- Several variables with significance have a decreasing effect on the likelihood that the respondent will indicate that a particular measure will make them more interested in using public transit: 30 years and older, 65 years and older, few vehicles per household, employed, not vaccinated, and hesitant to use new tech. Of these, employed, not vaccinated, and hesitant to use new tech have a significant increasing effect on the likelihood a respondent will indicate that a Face Mask Requirement will make them less interested in using public transit. Someone with household income equal to or less than $25,000 is also 52 percent more likely to indicate the same.
- For whether a Face Mask Requirement increases a respondent's interest in using public transit, online shopping, transit user, interest in transit, and urban resident are all significant increasing variables. Transit users and those interested in transit are over twice as likely to make this selection.
- For whether a Contactless/Mobile Payment option increases a respondent's interest in using public transit, woman, online shopping, transit user, and interest in transit are all significant increasing variables. Respondents interested in transit but have not used it are twice as likely to make this selection.
- For whether an all-in-one Trip Planning Tool will increase a respondent's interest in using public transit, knowing your regional/local transit agency, online shopping, transit user, and interest in transit are all significant increasing variables. Respondents interested in transit but have not used it are twice as likely to make this selection. Respondents living in urban areas are 31 percent less likely to make this selection.

In the final set of regressions about public transit, we asked respondents if COVID-19 safety measures or general service improvements were more important for increasing their interest in using transit. Respondents could indicate that there is no difference in importance between the two. Table 5.4 on the following page displays the logistic regression results investigating which explanatory variables are significantly associated with making either selection.

- More respondents indicated that COVID-19 Safety Measures have a greater importance than General Service Improvements. However, the largest group (44 percent) indicated that there is no difference in importance.
- Nine variables are statistically significant in the binary regression of whether a respondent indicates COVID-19 Safety Measures are more important. Five of the nine have a diminished chance, between 27 and 75 percent less likely.
- A renter is 41 percent more likely to indicate the COVID-19 safety measures are more important. Someone in a household with increased risk of COVID-19 is 64 percent more likely.
- Transit users and those interested in transit increase odd of affirmative indication in both regressions. Less than a third of transit users and of respondents interested in transit indicated no difference in importance.
- Someone 30 years and younger is twice as likely to indicate the General Service Improvements are more important.

Table 5.4: Logistic regression of whether respondents would consider COVID-19 safety measures or general service improvements as more important for increasing their likelihood of using transit. The reported coefficients are the calculated increase in the log odds (base e) for predicting the respondent's interest in using a particular mode for a one unit increase in the explanatory variable. Statistical significance is denoted with asterisks: *p<0.10; **p<0.05; ***p<0.01.

Explanatory Variables	COVID-19 Measures	Service Improvements
Total Selected	243 (32%)	181 (24%)
White Alone	-0.569**	-0.105
Woman	-0.321*	-0.011
30 years old and younger	-0.105	0.711***
65 years old and older	-0.299	-0.312
Born outside U.S.	-0.046	-0.174
Increased health risk of COVID-19 in Household	0.496***	-0.221
Not Vaccinated	-1.372***	0.278
Employed	-0.072	0.033
Renter	0.349*	-0.033
Income less than 25k	-0.554**	0.005
Income 100k or greater	-0.454*	0.139
Less than 1 Vehicle Per Driver in Household	-0.312	-0.304
Takes Trips of Less than 30 Minutes per Day	0.18	-0.192
Hesitant to Use New Technology	-0.014	-0.31
Frequency of Deliveries from Online Shopping	0.116	0.034
Used Public Transit during or before Pandemic	0.561***	0.437**
Knows local Public Transit agency	0.187	-0.034
Interest in Future Public Transit Use, No previous use	0.445*	0.546**
Lives in large urban area.	0.251	-0.031
Constant	-0.367	-1.278***
Pseudo R-Squared	0.114	0.053
N	758	758

CHAPTER 6: SHARED MOBILITY PERCEPTIONS AND PREFERENCES

We asked survey respondents which 12 potential COVID-19 safety measures would increase their interest in using car based shared mobility services. The full text of each provision was displayed to survey respondents. The safety measures have been short titled for reporting purposes in Table 6.1.

1. **Sanitizer**: Provide hand sanitizer in vehicles
2. **Face Mask**: Enforce a face covering requirement
3. **Cleaning**: Frequent cleaning and disinfection of vehicles
4. **Contactless Payment**: Contactless or mobile payment systems
5. **Screening Users**: Health screening of users before entering facilities / vehicles
6. **Distancing**: Safe physical distancing
7. **Screening Drivers**: Health screening of drivers or staff before every shift
8. **Ventilation**: Increase air ventilation and filtration
9. **Assurance**: Assurance that companies are concerned about health and safety
10. **Pledges**: Health and safety pledges of other users
11. **Detailed Info**: Getting detailed information about cleaning and safety procedures via video, detailed guides, or checklists
12. **Education**: Understand how drivers and staff are trained in sanitation and safety procedures

As shown in Table 6.1, sanitizer, Face Mask, Cleaning, and Ventilation are the top 4 selected measures, by at least 37 percent of respondents. Cleaning is the most selected (47 percent). Screening Users, Pledges, Detailed Info, and Education are selected the least, by less than 25 percent of respondents.

- Just over a third of respondents (36 percent) we're not interested in any COVID-19 safety measure (selected None of the Above). Four significant variables, income less than 25k, not vaccinated, hesitant to use new technology, and white alone, increase the likelihood of selecting None of the Above. As a result, these variables have negative associations with several other regressions; a lack of significance could indicate a larger number of respondents selecting a particular measure within the categorical variable but it is not statistically significant from the overall population.
- Two variables are not significantly associated with any regression: income over $100,000 and knowledge of local transit agency. Several others were only significantly associated with one of two regressions: both age variables, few vehicles per household, foreign born, and short daily trip duration.
- The employed variable is negatively associated with the 3 of the 4 least selected measures, they are 44 percent less likely to select Screening Users.
- The woman variable is positively associated with 3 of the 4 most selected measures; women are 75 percent more likely to select Sanitizer.
- Frequency of online shopping is positively associated with all four least selected measures plus Distancing; for each measure, someone shopping online at least once per week is 30 to 40 percent more likely to select the particular measure.

- Increased risk of COVID-19 in Household is positively associated with several most selected and least selected measures. They are over 50 percent more likely to select Sanitizer, Cleaning, Screening Drivers, and Detailed Info.
- The renter variable is positively associated with several measures. A renter is over 50 percent more likely to select Contactless Payment, Screening Users, Distancing and Ventilation.
- The urban variable is positively associated with Face Mask, Screening Drivers, and Education, increasing the likelihood of selectin each measure between 43 and 58 percent.
- The two transit variables, transit user and interest in using transit, are positively associated with several measures. Respondents in both groups are almost twice as likely to select Face Mask.
- Users of shared mobility are more likely to select several variables. They about 80 percent more likely to select Screening User, Screening Drivers, and Ventilation
- Respondents interested in using shared mobility are also more likely to select several variables. They're over twice as likely to select Assurance and Pledges.

Table 6.1 Logistic regression of whether a particular COVID-19 safety measure will increase a respondent's interest in using ride hailing, car share, or taxi services more. The outcome variable is binary of 0 = No and 1 = Yes. Statistical significance is denoted with asterisks: *p<0.10; **p<0.05; ***p<0.01. (N=758)

Explanatory Variables	Sanitizer	Face Mask	Cleaning	Contactless Payment	Screening User	Distancing	Screening Drivers	Ventilation	Assurance	Pledges	Detailed Info	Education	None of the above
Total Selected	287 (38%)	284 (37%)	353 (47%)	228 (30%)	149 (20%)	234 (31%)	214 (28%)	274 (36%)	207 (27%)	135 (18%)	140 (18%)	179 (24%)	273 (36%)
White Alone	-0.092	-0.241	-0.068	-0.543**	0.088	-0.324	-0.374	-0.035	-0.507**	0.306	0.13	-0.173	0.524*
Woman	0.563***	0.341*	0.346*	0.029	-0.048	0.149	0.159	0.292	0.284	-0.392*	-0.265	0.118	-0.252
<=30 years old	-0.001	0.058	-0.084	-0.117	0.025	-0.195	-0.213	-0.472**	-0.027	0.305	0.162	0.027	-0.12
>=65 years old	-0.281	-0.1	-0.27	-1.054***	-0.246	0.081	-0.042	-0.34	-0.093	-1.231***	-0.505	-0.01	0.398
Born outside U.S.	-0.212	0.068	-0.255	-0.935**	0.311	-0.22	0.292	-0.285	-0.058	0.25	-0.475	-0.116	-0.058
COVID risk in HH	0.438***	0.392**	0.456***	0.25	0.116	0.2	0.489***	0.268	0.271	0.13	0.432**	0.324*	-0.389**
Not Vaccinated	-0.692***	-1.330***	-0.731***	-0.732***	-1.122***	-0.698***	-1.311***	-0.755***	-0.742***	-1.050***	-0.721***	-0.837***	0.923***
Employed	-0.12	-0.236	-0.227	0.109	-0.582***	-0.213	-0.443**	-0.31	-0.243	-0.346	-0.446*	-0.487**	0.132
Renter	0.392**	0.175	0.196	0.555***	0.528**	0.457**	0.345*	0.439**	0.253	-0.128	0.307	0.225	-0.232
Income < 25k	-0.249	-0.428*	-0.301	-0.499**	-0.258	-0.516**	-0.672***	-0.515**	0.053	-0.105	-0.138	-0.275	0.386*
Income >= 100k	0.058	0.011	-0.157	-0.082	0.028	-0.089	-0.19	0.017	-0.034	-0.203	-0.044	0.236	-0.045
<1 Vehicle/Driver	-0.207	0.1	-0.338*	-0.287	-0.181	0.128	-0.011	-0.14	-0.044	0.261	0.029	-0.122	0.116
Trips <30 mins	-0.075	0.083	-0.19	-0.072	0.095	0.097	0.186	0.121	0.066	0.018	-0.437**	0.174	0.203
Hesitant to Use New Technology	-0.312*	-0.409**	-0.510***	-0.717***	0.221	-0.023	-0.183	-0.492***	-0.288	-0.054	-0.442*	-0.151	0.312*
#online deliveries	0.131	0.143	0.089	0.119	0.289**	0.332***	0.102	0.151	0.135	0.264**	0.285**	0.299**	-0.132
Used Transit	0.345*	0.626***	0.593***	0.449**	0.384	0.133	0.344	0.534***	0.33	0.499**	0.365	0.407*	-0.892***
Knows local Transit agency	-0.113	0.111	-0.064	0.172	-0.067	0.044	-0.104	0.031	0.136	0.05	0.17	-0.178	0.061
Interest in Future Transit Use	0.490**	0.673***	0.559**	0.504*	0.284	0.570**	0.223	0.591**	0.397	0.167	0.213	0.361	-0.756***
Other Shared Mobility User	0.244	0.326	0.262	0.383*	0.580**	0.449**	0.579***	0.584***	0.543**	0.495*	0.415*	0.357	-0.488**
Interest in Future Shared Mobility	0.112	0.550*	0.382	0.611**	0.386	0.293	0.556*	0.491*	0.988***	0.841**	0.166	0.248	-1.035***
In urban area	0.088	0.412**	0.179	0.031	0.328	0.126	0.356*	0.246	0.115	0.158	0.238	0.457**	-0.07
Constant	-1.094**	-1.106**	-0.341	-0.777	-2.164***	-1.446***	-1.024**	-1.144**	-1.500***	-2.131***	-2.014***	-1.721***	-0.383
Pseudo R2	0.067	0.129	0.082	0.118	0.085	0.065	0.11	0.093	0.076	0.101	0.088	0.072	0.13

We also asked survey respondents which general service improvements that could be implemented for car based shared mobility services would increase their interest in using car based shared mobility. Table 6.2 displays the logistic regression results for the four general service improvements, plus "none of the above".

Table 6.2 Logistic regression of whether a particular general service improvement will increase a respondent's interest in using ride hailing, car share, or taxi services more. The outcome variable is binary of 0 = No and 1 = Yes. Statistical significance is denoted with asterisks: *p<0.10; **p<0.05; ***p<0.01. (N=758)

Explanatory Variables	Larger service area	Lower fares	More comfortable vehicles	Safer vehicles	None of the above
Total Selected	235 (31%)	313 (41%)	138 (18%)	173 (23%)	274 (36%)
White Alone	-0.172	-0.378	-0.149	-0.569**	0.668**
Woman	0.158	-0.038	-0.26	0.024	0.154
30 years old and younger	-0.366*	-0.006	-0.174	0.456**	0.178
65 years old and older	-0.865***	-0.404	-0.683	-0.175	0.440*
Born outside U.S.	-1.017**	-0.365	0.237	0.613	-0.506
Increased health risk of COVID-19 in Household	0.066	0.233	-0.021	0.057	-0.08
Not Vaccinated	-0.271	-0.136	-0.111	-0.565**	0.420**
Employed	-0.453**	-0.012	0.390*	0.189	-0.091
Renter	-0.081	0.221	0.779***	0.06	-0.151
Income less than 25k	-0.275	-0.066	0.112	0.182	0.23
Income 100k or greater	-0.369	-0.228	0.065	0.116	0.516*
Less than 1 Vehicle Per Driver in Household	-0.760***	0.188	-0.183	-0.331	0.442**
Takes Trips of Less than 30 Minutes per Day	-0.168	-0.083	0.074	-0.292	0.277
Hesitant to Use New Technology	-0.316*	-0.406**	-0.435*	0.196	0.375**
Frequency of Deliveries from Online Shopping	0.041	-0.219*	0.214	0.276**	-0.162
Used Public Transit during or before Pandemic	0.732***	0.601***	0.34	0.343	-1.021***
Knows local Public Transit agency	0.067	-0.068	0.011	0.158	0.031
Interest in Future Public Transit Use, No previous use	0.721***	1.011***	0.019	0.351	-1.277***
Other Shared Mobility User	0.392*	0.511***	0.598**	0.649***	-0.742***
Interest in Future Shared Mobility Use, No previous use	0.399	0.946***	0.412	0.824**	-1.377***
Lives in large urban area.	-0.400**	-0.024	-0.005	-0.068	0.311
Constant	-0.271	-0.24	-2.380***	-2.038***	-0.792*
Pseudo R-Squared	0.078	0.082	0.083	0.093	0.147

As shown in Table 6.2, the top two selected items are Lower Fares and None of the Above, more comfortable vehicles is the least select item.

- Users of or respondents interested in public transit or other shared mobility are more likely to select Lower Fares. Respondents in the interested categories (public transit or other shared mobility) are more than twice as likely to select Lower Fares and Safer Vehicles.
- Several variables increase the likelihood of selecting None of the Above: 65 years or older, few vehicles per household, Income of $100,000 or greater, not vaccinated, hesitant to use new technology, and white alone. A white respondent is almost twice as likely to select None of the Above compared to non-white respondents.
- Five variables have no statistical significance in any regression in Table 5-2 including woman, increased risk of COVID-19 in household, income less than $25,000, takes trips less than 30 minutes per day, and knowledge of local transit agency.
- Respondents interested in using public transit are over twice as likely to select Larger Service Area or Lower Fares.
- Current transit users are over twice as likely to select Larger Service Srea and about 80 percent more likely to select Lower Fares.
- Urban respondents are about 30 percent less likely to select Larger Service area than rural respondents.
- Renters are over twice as likely to select More Comfortable Vehicles.
- Respondents 30 years and younger are about 60 percent more likely to select Safer Vehicles. Respondents shopping online at least once per week are about 30 percent more likely to select Safer Vehicles. Employed respondents are about 50 percent more likely to select More Comfortable Vehicles.
- Shared mobility users have a positive statistically significant result for each service improvement. They are about 80 percent more likely to select More Comfortable Vehicles and 90 percent more likely to select Safer Vehicles.

We further asked survey respondents which ten potential COVID-19 safety measures would increase their interest in using shared micro mobility services. The full text of each provision was displayed to survey respondents. The safety measures have short titled for reporting purposes in Table 6.3.

1. **Sanitizer**: Hand sanitizer available at stations
2. **Face Mask**: Enforce a face covering requirement
3. **Cleaning**: Frequent cleaning and disinfection of stations
4. **Contactless Payment**: Contactless or mobile payment systems
5. **Distancing**: Safe physical distancing for other riders
6. **Screening staff**: Health screening of staff before every shift
7. **Assurance**: Assurance that companies are concerned about health and safety
8. **Pledges**: Health and safety pledges of other users
9. **Detailed Info**: Getting detailed information about cleaning and safety procedures via video, detailed guides, or checklists
10. **Education**: Understand how staff are trained in sanitation and safety procedures

Table 6.3 Logistic regression of whether a particular COVID-19 safety improvement will increase a respondent's interest in using bike or scooter share more. The outcome variable is binary of 0 = No and 1 = Yes. Statistical significance is denoted with asterisks: *p<0.10; **p<0.05; ***p<0.01. (N=758)

Explanatory Variables	Sanitizer	Face Mask	Cleaning	Contactless Payment	Distancing	Screening	Assurance	Pledges	Detailed Info	Education	None of the above
Total Selected	216 (28%)	107 (14%)	206 (27%)	154 (20%)	116 (15%)	75 (10%)	122 (16%)	82 (11%)	92 (12%)	84 (11%)	423 (56%)
White Alone	-0.148	-0.077	-0.141	0.125	-0.406	-0.023	0.562	0.13	0.165	0.081	0.466*
Woman	0.098	0.1	-0.03	-0.28	0.292	-0.197	0.434*	-0.31	-0.133	0.003	-0.009
<=30 years old	0.331*	-0.185	0.307	0.495**	0.372	-0.081	0.081	0.236	-0.224	-0.447	-0.330*
>=65 years old	-0.657**	-0.265	-0.522*	-0.937**	-0.449	-0.495	-0.484	-0.707	-0.962**	-1.810***	0.720***
Born outside U.S.	0.323	-0.036	-0.337	-0.931*	-0.259	-0.14	0.561	-0.015	0.397	0.595	-0.083
COVID risk in HH	0.329*	0.335	0.268	0.147	0.272	0.252	0.252	0.128	-0.026	0.122	-0.374**
Not Vaccinated	-0.265	-0.688**	-0.302	-0.565**	-0.806***	-1.150***	-0.543**	-0.251	-0.383	-0.647**	0.433**
Employed	-0.06	0.032	-0.214	0.155	0.008	-0.408	0.005	-0.066	-0.404	-0.149	0.122
Renter	0.027	0.244	-0.166	0.489**	-0.009	0.296	0.196	0.463	0.089	0.058	0.2
Income < 25k	-0.178	-0.530*	0.078	-0.451*	-0.216	-0.426	-0.159	-0.066	-0.17	-0.062	0.248
Income >= 100k	-0.051	0.177	-0.303	-0.082	-0.212	-0.219	0.239	-0.012	0.147	-0.37	0.274
<1 Vehicle/Driver	-0.08	0.105	-0.560**	-0.066	0.077	0.083	-0.12	-0.24	0.053	-0.087	0.119
Trips <30 mins	-0.05	-0.07	-0.142	-0.247	-0.106	-0.393	-0.12	-0.004	-0.229	0.179	0.249
Hesitant to Use New Technology	0.015	0.187	-0.032	-0.25	0.037	0.317	-0.088	0.03	-0.186	-0.006	0.162
#online deliveries	0.077	0.250*	0.123	0.125	0.162	0.330**	0.297**	0.371**	0.254*	0.325**	-0.202*
Used Transit	0.227	0.653**	0.610***	0.532**	0.378	0.708**	0.721***	0.713**	0.426	0.219	-0.581***
Knows local Transit agency	0.073	-0.24	0.113	-0.046	-0.303	-0.664**	-0.204	-0.172	0	-0.247	0.058
Interest in Future Transit Use	0.614**	0.335	0.970***	0.873***	0.317	0.249	0.634**	0.584	0.44	0.42	-0.821***
Other Shared Mobility User	0.298	0.455*	0.095	-0.194	0.251	0.842**	0.483*	0.513	0.337	0.608*	-0.392**
Interest in Future Shared Mobility	0.109	0.143	0.365	-0.213	0.22	0.662	0.884**	0.875**	0.085	0.747*	-0.468*
In urban area	0.054	-0.038	0.1	-0.05	-0.039	-0.211	0.074	0.201	-0.014	0.338	0.039
Constant	-1.391***	-2.539***	-1.233**	-1.516***	-1.821***	-2.439***	-3.509***	-3.397***	-2.216***	-2.744***	0.249
Pseudo R-Squared	0.043	0.067	0.059	0.085	0.055	0.113	0.087	0.081	0.05	0.083	0.087

As shown in Table 6.3, Sanitizer and Cleaning were the top two selected COVID-19 safety measures by 28 percent and 27 percent of respondents. However, over 50 percent of respondents indicated that none of the displayed measures would increase their interest in using shared micro mobility, likely reflecting a lack interest overall in this mobility option.

- Respondents 65 years or older are about twice as likely to select None of the Above. Not vaccination and white alone respondents are 50 to 60 percent more likely to select None of the Above.
- Respondents more likely to select Sanitizer include 30 years or younger (39 percent), increased risk of COVID-19 in household (39%), and respondents interested in public transit (85 percent).
- Respondents more likely to select Cleaning include transit users (84 percent) and respondents interested in public transit (over twice as likely).
- All other measures accumulated between 10 and 20 percent of respondents.
- Shared mobility users are more likely to select Assurance (89 percent), Education (84 percent), Face Mask (58 percent), and Screening (over twice as likely).
- Respondents interested in using shared mobility are more likely to select Assurance (62 percent), Education (over twice as likely), and Pledges (over twice as likely).

We also asked survey respondents which general service improvements that could be implemented for shared mobility micro services would increase their interest in using shared micro mobility. Table 6.4 displays the logistic regression results for the four general service improvements, plus “none of the above”.

As shown in Table 6.4, the top selected service improvement is Easier Access, selected by 29 percent of respondents. However, 54 percent of respondents selected None of Above, reflecting a similar lack of interest as in Table 6.3.

- Respondents more likely to select Easier Access include transit users (88 percent), respondents interested in public transit (about 4 times as likely), and shared mobility users (46 percent).
- Respondents more likely to select None of the Above include 65 years or older (over twice as likely), not vaccinated (44 percent), trip durations less than 30 minutes per day (36 percent), and women (45 percent).
- Respondent interested in using shared mobility do not have a statistically significant association with any service improvement.
- Respondents 30 years or younger are more likely to select Lower Fares (47 percent) and More Comfortable Equipment (almost twice as likely).

Table 6.4 Logistic regression of whether a particular general service improvement will increase a respondent's interest in using bike or scooter share more. The outcome variable is binary of 0 = No and 1 = Yes. Statistical significance is denoted with asterisks: *p<0.10; **p<0.05; ***p<0.01. (N=758)

Explanatory Variables	Easier access	Lower fares	More comfortable equipment	Safer equipment	None of the above
Total Selected	217 (29%)	151 (20%)	93 (12%)	129 (17%)	406 (54%)
White Alone	0.014	-0.122	0.05	-0.089	-0.033
Woman	-0.211	-0.491**	-0.253	-0.043	0.371**
30 years old and younger	0.278	0.385*	0.668**	0.321	-0.545***
65 years old and older	-0.705**	-1.516***	-0.854	-0.341	0.925***
Born outside U.S.	-0.528	0.204	0.528	0.690*	-0.366
Increased health risk of COVID-19 in Household	0.026	0.446**	0.052	-0.122	-0.280*
Not Vaccinated	-0.503**	-0.01	-0.184	-0.420*	0.365**
Employed	0.146	0.222	0.096	0.246	0.062
Renter	0.177	-0.337	0.222	0.091	0.159
Income less than 25k	-0.134	0.199	0.148	0.204	0.166
Income 100k or greater	-0.052	-0.03	-0.017	0.282	-0.053
Less than 1 Vehicle Per Driver in Household	-0.520**	0.305	-0.27	-0.138	0.093
Takes Trips of Less than 30 Minutes per Day	-0.203	-0.435**	-0.508*	0.258	0.310*
Hesitant to Use New Technology	-0.233	-0.018	-0.151	0.359	0.114
Frequency of Deliveries from Online Shopping	0.018	-0.097	0.206	0.323**	-0.09
Used Public Transit during or before Pandemic	0.632***	0.508**	1.030***	0.564**	-0.820***
Knows local Public Transit agency	-0.034	-0.450**	0.076	-0.156	0.115
Interest in Future Public Transit Use, No previous use	1.398***	0.924***	1.210***	0.442	-1.400***
Other Shared Mobility User	0.376*	0.16	0.167	0.29	-0.331*
Interest in Future Shared Mobility Use, No previous use	0.096	-0.348	-0.817	0.072	-0.071
Lives in large urban area.	-0.154	0.185	0.122	0.185	0.199
Constant	-1.064**	-1.084**	-2.961***	-2.760***	0.256
Pseudo R-Squared	0.1	0.096	0.123	0.065	0.115

CHAPTER 7: CONCLUSIONS AND RECOMMENDATIONS

7.1 PUBLIC TRANSIT MEASURES

This section details the most preferred implementation measures for COVID-19 safety and general service improvements, with suggestions for prioritizing the most preferred strategies.

7.1.1 COVID-19 Safety Measures

The COVID-19 safety measures are ranked in order of overall preference. Additional details are provided about demographic associations and descriptive information.

Frequent Cleaning: This measure was described to respondents as "frequent cleaning and disinfection of vehicles and stops." Overall, it was selected by half of the respondents (51%). This measure had the strongest association with current transit users but the fourth strongest association with respondents interested in transit (but haven't used it). This measure was also more likely to be selected by women and respondents in rural areas and had the strongest association with respondents in a household with an increased risk from COVID-19.

Several transit agencies in the United States and around the world have implemented new cleaning procedures since the pandemic began.[2] There is a wide range of cleaning procedures that transit agencies can implement and tailor to their service. Both the Federal Transit Administration and the American Public Transportation Association have published guidance for cleaning public transit vehicles.[3,4] The resource intensity varies by cleaning strategy but overall is more intensive than the other COVID-19 safety measure list below.

Ventilation and Filtration: This measure was described to respondents as "increase air ventilation and filtration." Overall, it was selected by just under half of respondents (46%). This measure had the third strongest association with respondents interested in transit (but haven't used it) but was among the weaker associations with transit users (although still positive).

The FTA technical guidance also includes information about ventilation and filtration methods being tested by various transit agencies. Several methods have been researched throughout the pandemic. A transit agency in the United Kingdom is testing a new filter for a lower-cost method than a ventilation overhaul.[5] Transit agencies in Wisconsin and Hawaii have tested air purification systems on buses and

[2] Federal Transit Administration. 2022. *COVID-19 Recovery Practices in Transit.*
[3] ibid.
[4] American Public Transportation Association. 2020. *Cleaning and Disinfecting Transit Vehicles and Facilities During a Contagious Virus Pandemic.*
[5] Miriam Fauzi in Daily Beast. 2022. *This New Air Filter Could Make Public Transit Safe from COVID Again.*

smaller transit vehicles.[6,7] A new ventilation and filtration system to combat COVID-19 has an additional benefit of typically improving air quality overall, eliminating other harmful bacteria and viruses.

Face Mask Requirement: This measure was described to respondents as "enforcing a face covering requirement." Overall, it was selected by just under half of respondents (44%). This measure had the third strongest association with transit users and the second strongest association with respondents interested in transit (but haven't used it). This measure also had the strongest association with women.

This measure is likely one of the lowest cost and quickest to implement in response to a viral outbreak. A face mask requirement can be among the first steps taken during an epidemic to preserve transit service and rider confidence. Issues could arise regarding which personnel are to be tasked with enforcing the requirement, if needed.

Providing Sanitizer: This measure was described to respondents as "provision of sanitizers at stops and within vehicles." Overall, it was selected by just under half of respondents (44%). This measure was among the weakest associations with transit users and respondents interested in transit (but haven't used it).

Similar to face mask measures, sanitizer implementation can be quick and low-cost at the start of an epidemic.

Social Distancing: This measure was described to participants as "safe physical distancing on transit vehicles." Overall, it was selected by 40 percent of respondents (40%). This measure had the second strongest association with transit users and the strongest association with respondents interested in transit (but haven't used it). This measure was also more likely to be selected by women.

The Federal Emergency Management Agency (FEMA) released guidance for social distancing on public transportation early in the pandemic, citing strategies from several transit agencies.[8] Generally, this safety measure does not take much investment in new technology or equipment and can be deployed fairly quickly. However, costs can be associated with decreased levels of service to maintain social distancing.

Other Considerations: The top-five preferred COVID-19 safety measures all have positive associations with respondents who have an increased risk from COVID-19 in their household, including a potential increased threat to themselves.

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[6] Mass Transit. 2021. *Go Transit, Valley Transit equip fleets with Proactive Air and Surface Purification System from NSI Parts.*

[7] KHON. 2020. *TheBus and TheHandi-Van begin testing air purification systems.*

[8] Federal Emergency Management Agency. 2020. *COVID-19 Best Practices Information: Public Transportation Distancing*.

Contactless payment was only selected by 35 percent, but it was more likely to be chosen by transit users, respondents interested in transit, women, renters, and urban residents. This was the primary instance where renters, who overall are more likely to be interested in transit, had a positive association with a COVID-19 safety measure.

Respondents who are 65 years and older, not vaccinated, and have short daily trip durations (30 minutes or less) were more likely to select "none of the above." These characteristics were also not associated with an interest in using transit.

Screening of passengers and screening of drivers were the least preferred COVID-19 safety measures.

7.1.2 Service Improvements

The general service improvements are ranked in order of overall preference. Additional details are provided about demographic associations and descriptive information. Generally, the COVID-19 safety measures are selected by more respondents than the general service improvements. The top three improvements are included below.

Frequent and Fast: This measure was described to respondents as "more frequent and faster routes." Overall, it was selected by 39 percent of respondents (39%). This measure had the second strongest association with respondents interested in transit (but haven't used it) a positive association with renters.

Establishing more frequent and faster service is likely the most long-term and highest-cost implementation measure considered here, considering planning, operational, and equipment demands to reduce headways and trip duration.

Easier Access: This measure was described to respondents as "easier access to transit stops." Overall, it was selected by about a third of respondents (36%). This measure had the weakest association with transit users.

The National Aging and Disability Transportation Center has published a guide for creating accessible transit stops.[9] The strategies laid out in their guide are high-cost but typically less costly than frequency and route duration improvements; these access improvements also have medium- to long-term implementation timelines. In addition, this implementation measure is not applicable to transit agencies without fixed-route service.

Real-Time Info: This measure was described to respondents as "real-time info about transit vehicles and routes." Overall, it was selected by just under a third of respondents (30%). This measure is predicted to have a medium cost and medium implementation timeline. Transit agencies and smartphone app

[9] Bus Stop and Access Paths guidelines

creators continue to improve on the efficiency and accessibility of real-time information displayed to customers.

Other Considerations: Occupancy info, described as "real-time bus occupancy information," was selected by only a fifth of respondents (20%); however, this measure had the second strongest association with transit users and the strongest association with respondents interested in transit (but haven't used it). This service improvement is predicted to be medium to high cost, with a long-term implementation timeline. Occupancy info could be crowdsourced or measured through in-vehicle sensory technology, but either method would need an interface to display the information.

Convenient Payment, described as "more convenient payment options," was selected by a quarter of respondents (24%); however, this measure had the strongest association with transit users. It was also the only measure to have a positive association with respondents who could identify their local transit provider. This measure is predicted to have a medium cost and medium implementation timeline. MnDOT is funding the development and implementation of a contactless payment system in eight western Minnesota transit agencies; the University of Minnesota is leading the research component to investigate the perceptions and preferences of transit users regarding the new technology.

Those with increased health risk from COVID-19 in households clearly value COVID-19 safety measures; therefore, clear messaging to this segment of the population is warranted.

People with the following socio-demographic characteristics were more likely to select "none of the above" instead of a service improvement: respondents who were White, 65 years and older, not vaccinated, or who had an income of $100,000 or greater.

The least selected service improvements were improved waiting area, better vehicles, and lower fares. Although, lower fares had the third strongest association with respondents interested in transit (but haven't used it).

7.1.3 Specific Interventions and Implementation Balance

The survey also asked about three specific measures and whether it would increase the likelihood of a respondent being interested in using public transit. These measures included a face mask requirement, a contactless payment method, and a trip-planning tool. Transit users, respondents interested in transit (but haven't used it), and urban residents were more likely to be interested in using public transit with a face mask requirement.

Transit users and respondents interested in transit (but haven't used it) were more likely to indicate that a contactless payment method and a trip-planning tool would increase their interest in using transit; however, the association was stronger with the latter. Women were also more likely to indicate that a contactless payment method would increase their interest while respondents who knew their local transit agency were more likely to indicate that a trip-planning tool would increase their interest. In addition to the contactless payment project in western Minnesota, MnDOT has been funding the development and deployment of a trip planning tool in southern Minnesota.

The final part of the general public transit questions in the survey asked about the relative importance of COVID-19 safety measures compared to general service improvements. COVID-19 measures were slightly more important than service improvements in a head-to-head comparison, but the largest group of respondents indicated no preference. Respondents aged 18 to 30 were more likely to indicate that service improvements were more important.

7.1.4 Action Recommendations

Ultimately, each transit agency in Minnesota, with the guidance of MnDOT, is best suited to determine which measures will be cost-effective and how best to implement them. In this section, we provide a decision-making matrix (Figure 7.1) for the COVID-19 safety measures and the service improvements. Preference takes into account overall preference and the preference of the key transit audience. Cost considers both predicted cost level and the length of timeline implementation. The relationship between measures in the matrix should not be interpreted as exact or interval.

Low-cost measures appear to be actions that can be more easily altered in response to the intensity of viral outbreaks, while high-cost measures require significant time for development and discontinuance once implemented.

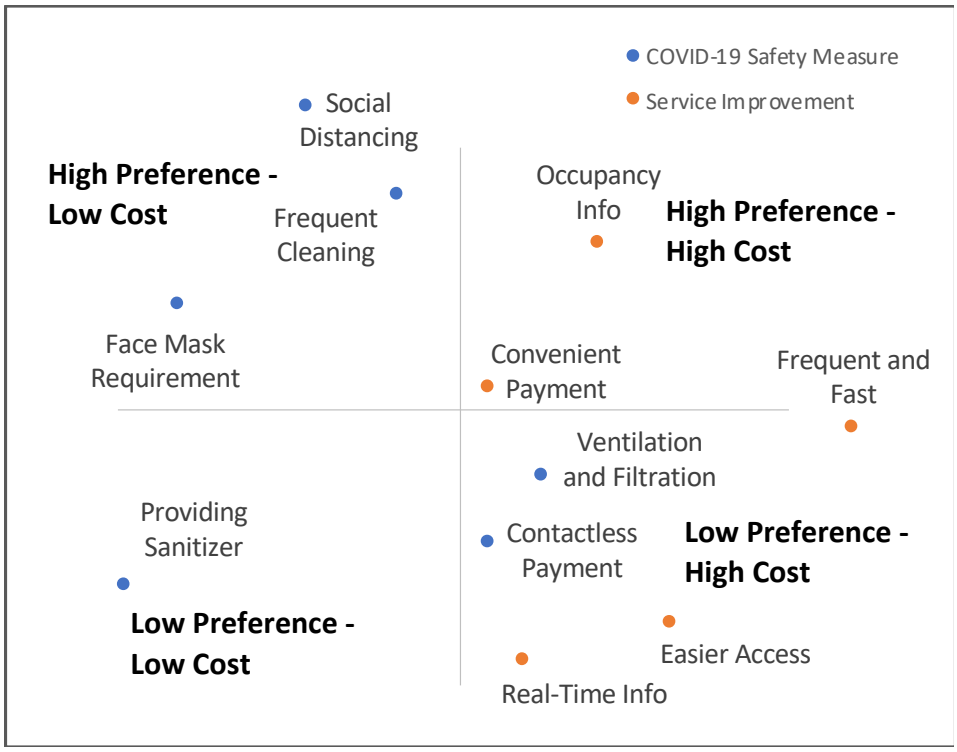

Figure 7.1 Decision-making matrix for the COVID-19 safety measures and the service improvements considered in this report.

7.2 CAR-BASED SHARED MOBILITY MEASURES

This section provides recommended action, informed by this research, for supporting car-based shared mobility services as they navigate airborne pandemic situations. Car-based shared mobility services differ from other transportation modes described in this research because they involve people sharing their personal property with others in turn for payments facilitated by an intermediary. For instance, Uber acts as a payment and reservation service for people who want to provide their vehicles to others for a fare, and for those who want a ride. This difference means that top-down action implementation is more complex than might be the case with a public transit service that has a hierarchical management system. Uber drivers can leave the service anytime if they disagree with the health and safety policies, and Uber has limited ability to enforce health-related policies. Therefore, action plans for car-based shared mobility services must rely heavily on influence, support, and persuasion.

Our survey results contain interesting and important characteristics of car-based shared mobility service users. For instance, White, 65 and older, and not vaccinated respondents' interest in using car-based shared mobility services is influenced little by COVID safety measures. Additionally, for unvaccinated respondents, COVID safety measures might decrease their interest in using a car-based shared mobility service. Requiring face coverings is likely to lead to a decreased likelihood of using car-based shared mobility services for unvaccinated respondents. Alternatively, respondents who haven't used public transit services in the past but who are interested in using public transit in the future, are more likely to use car-based shared mobility services when face covering requirements are in place.

7.2.1 Actions

Encourage car-based shared mobility companies and drivers to:

- Continue highlighting their health assurances and pledges for their customers.
- Ensure sanitizers are available to drivers by helping them connect with suppliers and potentially providing incentives to help defray the cost of purchasing sanitization supplies. Sanitation is particularly important to women.
- Promote their sanitization processes, face mask requirements, clearing protocols, and ventilation standards via online shopping ads. This is particularly important if reaching renters is a priority.
- Target messaging about safety measures toward people with increased health risks from COVID-19 in the household.

All safety measures for unvaccinated respondents are associated with decreased interest in using car-based shared mobility services. It's unclear what drives this difference in preferences; therefore, it is also difficult to identify an action plan to improve this situation. On the one hand, safety measures may decrease interest from potential customers. On the other hand, no safety measures would likely decrease interest from other potential customers, such as women and people with increased health risks. This appears to be an unavoidable trade-off; therefore, car-based shared mobility companies should be encouraged to further explore the root causes of these differences and better understand the trade-offs being made.

7.3 SHARED MICRO-MOBILITY MEASURES

Overall, most respondents are not interested in shared bike or scooter services, just a small fraction were using them in the pandemic. There is much less interest in COVID-19 safety measures and service improvements among these users.

7.3.1 COVID-19 Safety Measures and Service Improvements

Here are the few standout COVID-19 Safety measures:

- **Providing Sanitizer**: Hand sanitizer available at stations (28%).
- **Frequent Cleaning**: Frequent cleaning and disinfection of stations (27%).
- **Contactless Payment**: Contactless or mobile payment systems (20%).

Respondents aged 18 to 30 are more likely to indicate that providing sanitizer and contactless payment would increase their interest. Renters are also more likely to indicate the same for contactless payment.

Though not the top three, the following measures were more likely to be selected by respondents who use or are interested in shared mobility:

- **Company Assurances**: Assurance that companies are concerned about health and safety (16%).
- **Safety Pledges by Users**: Health and safety pledges of other users (11%).
- **Educate Users**: Understand how staff are trained in sanitation and safety procedures (11%).

The survey asked about four service improvements, which are ranked below in order of proportion. Transit users and respondents interested in public transit (but haven't used it) have a stronger association with easier access and safer equipment.

- **Easier Access** (29%)
- **Lower Fares** (20%)
- **Safer Equipment** (17%)
- **More Comfortable Equipment** (12%)

7.3.2 Summary

A higher percentage of respondents selected "did not have access" than "not interested" as the reason for why they did not use these modes during the pandemic. It could be prudent to continue testing the market for interest in shared bikes and scooters in micropolitan areas or regional centers in Greater Minnesota. We recommend that micro-mobility service providers focus on the top two or three measures in each category while including these efforts in their promotional materials.

7.4 LIMITATIONS

The context of the survey was the ongoing infectious disease pandemic, and the results were intended to inform planning during the same or a future epidemic of a similar nature. The survey findings must be interpreted with caution and attention to the limitation of the survey contexts. In addition, survey

respondents were likely to be affected by two macro-dynamics in the post-COVID society. The first was the almost global acceptance of online meetings as a better way to conduct most meetings. The second was the cultural polarization that made masking/social-distancing/not-gathering/not-ride-sharing or not-masking/not-social-distancing/gathering/ride-sharing into questions of identity. These macro-dynamics may have also impacted survey responses. For example, COVID-19 vaccination could be a proxy measure of the culture polarization macro-dynamics as vaccination was also reflective of masking and distancing decisions. The unvaccinated explanatory variable demonstrates a group of respondents not interested in transit or interventions to improve it. There is some interest in shared mobility services but again little interest in interventions. To a future planner, it is important to recognize that macro-dynamics could shift due to other unpredicted events and that the survey findings may not be applicable to predicting future interests.

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APPENDIX A: SURVEY INSTRUMENT

Qualtrics Survey Instrument

{Consent_lang}: [Insert short consent form]

{Consent}: Do you wish to participate in this study?

[select one]

Yes
No

{El_Age}: Are you 18 years or older?

[select one]

Yes
No

If {Consent} or {El_Age} = "No" → End of Survey

--- Page Break ---

Location

{Intro_location}: Thank you for participating in the study.

{County}: What Minnesota county do you live in? If you do not live in Minnesota, please exit the survey.

[select one]

- *List of MN Counties*
- I do not live in Minnesota

{Zipcode} What zip code do you live in?

[text entry, number validation, or drop-drown/selection based on "county x zip code" database?]

{Race}: What best describes your race or ethnicity? Select all that apply.

[select multiple]

American Indian – Dakota or Ojibwe
Other American Indian or Alaska Native
Asian – Hmong, Laos, or Vietnamese
Asian – Indian or Chinese
Other Asian or Pacific Islander
Black – Descendant of Slaves
Black – Somali
Other Black or African American
Latinx–Mexican
Other Latinx, Hispanic or Spanish origins
White
Some other race [text entry]

--- Page Break ---

Mode Use Questions

{Intro_mode }: The following questions ask about what transportation modes you typically use at three different time points: before COVID-19, during COVID-19, and in an ideal future when COVID-19 is not a concern and mode choices are widely available. We ask about the following modes:

- Drive Alone: you drive your own vehicle
- Carpool: you drive or ride with a family member, friend, or co-worker
- Carshare: you rent a vehicle for your personal use
- Ride Hailing: you use on-demand ride services provided by private companies
- Public Transit: you use services provided by public transit companies
- Shared Bike/Scooter: you use a shared bike or scooter for personal use
- Personal Bike/Scooter: you use your own bike or scooter

{Mode_pre}: Before the COVID-19 pandemic, how often did you typically use the following modes for any type of trip?

[multipart question; not at all, less than one day a week, 1–2 days a week, 3–4 days a week, 5 or more days a week]

Drive alone
Carpool
Carshare
Ride Hailing
Public Transit
Shared Bike
Shared Scooter
Personal Bike/scooter

{Mode_cc}: During the COVID-19 pandemic before vaccines were widely available, how often did you typically use the following modes for any type of trip?

[multipart question; not at all, less than one day a week, 1–2 days a week, 3–4 days a week, 5 or more days a week]

- Drive alone
- Carpool
- Carshare
- Ride Hailing
- Public Transit
- Shared Bike
- Shared Scooter
- Personal Bike/scooter

--- Page Break --- (required by display logic)

{Drive_never; If Mode_CC, Drive alone = “never”}: Why did you not at all use the mode: Drive Alone during the pandemic? (select all that apply)

[select multiple]

I did not have access
I was not interested in using it

I had access to a better alternative
Other [text entry]
None of the above

Repeat {Drive_never} question format for each mode

--- Page Break ---

{Mode_post}: If COVID-19 is no longer a threat and the following options are widely available and convenient to use, how often would you like to use the following mode for any type of trip?

[multipart question; not at all, less than one day a week, 1–2 days a week, 3–4 days a week, 5 or more days a week]

- Drive alone
- Carpool
- Carshare
- Ride Hailing
- Public Transit
- Shared Bike
- Shared Scooter
- Personal Bike/scooter

There will be some branching or filtering of respondents where {Mode_pre} ≠ "Carpool, Carshare, Ride Hail, Public Transit, Shared Bike/Scooter" or {Mode_cc} ≠ "Carpool, Carshare, Ride Hail, Public Transit, Shared Bike/Scooter" or {Mode_post} ≠ "Carpool, Carshare, Ride Hail, Public Transit, Shared Bike/Scooter"

--- Page Break ---

Coronavirus Questions

{Intro_Covid}: We will now ask some general questions related to your health and your actions during the COVID-19 pandemic.

{Covid_test}: To date, have you or any of your household members tested positive for COVID-19? (select all that apply)

[select multiple]

Yes, I have been tested positive
Yes, my household member(s) have been tested positive
No, neither I nor my household member(s) have been tested positive [exclusive]

{Covid_threat}: Do you or any of your household members have any underlying health conditions that make you more vulnerable than the average person to get COVID-19? (select all that apply)

[select multiple]

Yes, I have underlying health conditions
Yes, my household member(s) have underlying health conditions

No [exclusive]
I don't know [exclusive]

{Covid_vaccine}: Have you received the COVID-19 Vaccine?

[select one]

Yes, I'm partially vaccinated
Yes, I'm fully vaccinated
No, I have scheduled an appointment
No, I have not scheduled an appointment

{Covid_perception}: Do you agree with the following statements about your perceptions related to and actions over the past year and a half during the COVID-19 pandemic? (select all that apply)

[select multiple, randomize]

I wanted to know about and paid a lot of attention to the news related to the pandemic
I thought the probability of transmission of COVID-19 was high
I always wore a face mask when visiting public indoor spaces
I stayed socially distanced in public and avoided group gatherings
I avoided touching items in public that have been previously touched by other people
I frequently washed my hands with soap and water or used hand sanitizer
None of the above [exclusive]

{Percep_vac}: Now that over 70 percent of Minnesotans have received one dose of a COVID-19 vaccines, which of the following statements do you agree with? (select all that apply)

[select multiple, randomize]

I want to know about and pay a lot of attention to the news related to the pandemic
I think the probability of transmission of COVID-19 is high
I always wear a face mask when visiting public indoor spaces
I stay socially distanced in public and avoid group gatherings
I avoid touching items in public that have been previously touched by other people
I frequently wash my hands with soap and water or use hand sanitizer
None of the above [exclusive]

--- Page Break ---

Public Transit General Questions

{Intro_ptg}: This next portion will ask questions specific to public transit and other shared mobility. These next nine questions ask you about your perception of public transit in Greater Minnesota.

{Transit_heard}: Which of the following public transit providers have you heard of?

[select multiple, randomize]

[Displayed list of transit options dependent on respondent county]
None of the above

{Transit_comfort}: Currently, how concerned are you about the risk of COVID-19 infection when using public transit services?

[select one]

- Not concerned at all
- Slightly concerned
- Concerned
- Very concerned

{Transit_risk}: Where do you feel at greater risk of contracting COVID-19 compared to using public transit? (select all that apply)

[select multiple, randomize]

- Large gathering
- Gym
- Market
- Small gathering
- Retail store
- Office
- None of these [exclusive]

{Transit_measures}: Which of the following COVID-19 safety measures would increase your interest in using public transit? (select all that apply)

[select multiple, randomize]

- Provision of sanitizers at stops and within vehicles
- Enforcing a face covering requirement
- Frequent cleaning and disinfection of vehicles and stops
- Contactless or mobile payment systems
- Health screening of passengers before entering facilities/vehicles
- Safe physical distancing on transit vehicles
- Health screening of bus drivers and conductors before every shift
- Increase air ventilation and filtration
- Other [text entry]
- None of the above [exclusive]

{Transit_service}: Beside COVID-19 safety measures, which of the following service improvements would increase your interest in using public transit? (select all that apply)

[select multiple, randomize]

- More pleasant waiting area environment at stops
- Real-time info about transit vehicles/routes
- Real-time bus occupancy information
- More comfortable and safe vehicles
- Easier access to transit stops
- More frequent and faster routes
- Have lower fares
- More convenient payment options
- Other [text entry]
- None of the above [exclusive]

{Transit_balance}: Overall, do you think COVID-19 safety measures or general service improvements are more important in increasing your interest in using public transit?

[select one]

Covid-19 safety measures are more important
General service improvements are more important
There is no difference in importance

{Transit_facemasks}: How does a face covering requirement affect your decision to use public transit?

[select one]

Makes me less likely to use public transit
Does not affect my decision
Makes me more likely to use public transit

{Contactless_payment}: How does a contactless or mobile payment method affect your decision to use public transit?

[select one]

Makes me less likely to use public transit
Does not affect my decision
Makes me more likely to use public transit

{Tripplanning}: How does a trip planning tool that integrates public transit with other shared mobility options such as ride hailing, carsharing, and bike/scooter sharing affect your decision to use public transit?

[select one]

Makes me less likely to use public transit
Does not affect my decision
Makes me more likely to use public transit

--- Page Break ---

Public Transit Current Users

Respondent views section if {Mode_cc} = "Public Transit"

{Intro_ptc}: You indicated that you have used public transit during the pandemic, these next 4 questions ask questions about your perceptions of the public transit services that you used over the past year.

{Transit_use}: Which of the following Public Transit providers do you use? (select all that apply)

[select multiple]

[Displayed selection from {Transit_heard}]

{Transit_satisfaction}: Do you agree with the following statements about your local transit agency during the COVID-19 pandemic? (select all that apply)

[select multiple]

My local agency has done well enforcing a face covering requirement
My local agency has done well cleaning transit vehicles
My local agency has done well ventilating transit vehicles
My local agency has done well implementing safe physical distancing protocols
My local agency has done well informing me about service changes and disruptions
None of the above [exclusive]

{Measures_sat}: In general, how satisfied are you with your local agency's safety and health measures during COVID-19?

[select one]

Very satisfied
Satisfied
Dissatisfied
Very dissatisfied

{Reliable_sat}: In general, how satisfied are you with your local agency's transit service quality (e.g., service frequency, reliability, and coverage) during COVID-19?

[select one]

Very satisfied
Satisfied
Dissatisfied
Very dissatisfied

--- Page Break ---

Shared Mobility General Questions

{Intro_smg}: We'll now ask questions about the strategies that other shared mobility companies could implement to attract more riders. We first ask about vehicle-based shared mobility (ride hailing, car share, or taxi services) then shared micro mobility (bike and scooter share).

{Ride_covid}: Which of the following COVID-19 safety measures would increase your interest in using ride hailing, car share, or taxi services more? (select all that apply)

[select multiple, randomize]

Provision of hand sanitizers within vehicles
Enforcing a face covering requirement
Frequent cleaning and disinfection of vehicles
Contactless or mobile payment systems
Health screening of users before entering facilities/vehicles
Safe physical distancing
Health screening of drivers or staff before every shift
Increase air ventilation and filtration
Assurance that companies are concerned about health and safety
Health and safety pledges of other users

Getting detailed information about cleaning and safety procedures via video, detailed guides, or checklists
Understanding how drivers and staff are trained in sanitation and safety procedures
Other [text entry]
None of the above [exclusive]

{Ride_cleaning; If Ride_more, "Frequent cleaning and disinfection of vehicles" IS selected}: How frequently would you like the vehicle cleaned?

[select one]

Less than once a week
1–2 times a week
3–4 times a week
5–6 times a week
Daily
More than once a day
After every ride

{Ride_service}: Beside COVID-19 safety measures, which of the following service improvements would increase your interest in using ride hailing, car share, or taxi services? (select all that apply)

[select multiple]

Larger service area
Lower fares
More comfortable vehicles
Safer vehicles
Other [text entry]
None of the above [exclusive]

{Ride_balance}: Overall, do you think COVID-19 safety measures or general service improvements are more important in increasing your interest in using ride hailing, car share, or taxi services more?

[select one]

Covid-19 safety measures are more important
General service improvements are more important
There is no difference in importance

{Ride_facecovering}: How does a face covering requirement affect your decision to use ride hailing, car sharing, or taxi services?

[select one]

Makes me less likely to use these services
Does not affect my decision
Makes me more likely to use these services

--- Page Break ---

{Micro_covid}: The questions on this page ask about bike share and scooter share services. Which of the following COVID-19 safety measures would increase your interest in using bike or scooter share more? (select all that apply)

[select multiple]

- Hand sanitizer available at bike stations
- Enforcing a face covering requirement
- Frequent cleaning and disinfection of bikes and bike stations
- Contactless or mobile payment systems
- Safe physical distancing for other riders
- Health screening of staff before every shift
- Assurance that companies are concerned about health and safety
- Health and safety pledges of other users
- Getting detailed information about cleaning and safety procedures via video, detailed guides, or checklists
- Understanding how staff are trained in sanitation and safety procedures
- Other [text entry]
- None of the above [exclusive]

{Micro_cleaning; If Micro_covid, "Frequent cleaning and disinfection …" IS selected}: How frequently would you like a bike or scooter cleaned?

[select one]

- Less than once a week
- 1–2 times a week
- 3–4 times a week
- 5–6 times a week
- Daily
- More than once a day
- After every ride

{Micro_service}: Besides COVID-19 safety measures, which of the following service improvements would increase your interest in using bike or scooter share? (select all that apply)

[select multiple]

- Easier access to a bike or scooter
- Lower fares
- More comfortable equipment
- Safer equipment
- Other [text entry]
- None of the above [exclusive]

{Micro_balance}: Overall, do you think COVID-19 safety measures or general service improvements are more important in increasing your interest in using bike or scooter share more?

[select one]

- Covid-19 safety measures are more important
- General service improvements are more important
- There is no difference in importance

--- Page Break ---

Shared Mobility Current Users

Respondent views section if {Mode_cc} = "Carpool" or "Carshare" or "Ride Hailing" or "Shared Bike/Scooter"

{SMC_intro}: You indicated that you have used shared mobility during the pandemic, these next questions will ask about your perceptions of shared mobility over the past year.

--- Page Break --- (For Survey Flow Logic)

{Ride_comp; If respondent is using Ride Hailing during the pandemic}: What ride hailing services do you use regularly?
[text entry]

{Ride_measures; If respondent is using Ride Hailing during the pandemic}: Do you agree with the following statements about the ride share service that you used the most frequently during the COVID-19 pandemic. (select all that apply)
[select multiple, randomize]

- My ride share agency has done well enforcing a face covering requirement
- My ride share agency has done well cleaning vehicles
- My ride share agency has done well ventilating vehicles
- My ride share agency has done well implementing safe physical distancing protocols
- My ride share agency has done well informing me about service changes and disruptions
- None of the above [exclusive]

{Ride_sat; If respondent is using Ride Hailing during the pandemic}: In general, how satisfied are you with your ride share service's safety and health measures during COVID-19?
[select one]

- Very satisfied
- Satisfied
- Dissatisfied
- Very dissatisfied

{Ride_rely; If respondent is using Ride Hailing during the pandemic}: In general, how satisfied are you with your ride share service's service quality (e.g., service reliability and coverage) during COVID-19?
[select one]

- Very satisfied
- Satisfied
- Dissatisfied
- Very dissatisfied

--- Page Break --- (For Survey Flow Logic)

{Car_comp; If respondent is using Carsharing during the pandemic}: What carsharing services do you use regularly?
[text entry]

{Car_measures; If respondent is using Carsharing during the pandemic}: Do you agree with the following statements about the car share service that you used the most frequently during the COVID-19 pandemic. (select all that apply)
[select multiple, randomize]
- My car share agency has done well enforcing a face covering requirement
- My car share agency has done well cleaning vehicles
- My car share agency has done well ventilating vehicles
- My car share agency has done well implementing safe physical distancing protocols
- My car share agency has done well informing me about service changes and disruptions
- None of the above [exclusive]

{Car_sat; If respondent is using Carsharing during the pandemic}: In general, how satisfied are you with your car share service's safety and health measures during COVID-19?
[select one]
- Very satisfied
- Satisfied
- Dissatisfied
- Very dissatisfied

{Car_rely; If respondent is using Carsharing during the pandemic}: In general, how satisfied are you with your car share service's service quality (e.g., service reliability and coverage) during COVID-19?
[select one]
- Very satisfied
- Satisfied
- Dissatisfied
- Very dissatisfied

--- Page Break --- (For Survey Flow Logic)

{Bike_comp; If respondent is using Bike sharing during the pandemic}: What bike sharing services do you use regularly?
[text entry]

{Bike_measures; If respondent is using Bike sharing during the pandemic}: Do you agree with the following statements about the bike share service that you used the most frequently during the COVID-19 pandemic. (select all that apply)
[select multiple, randomize]
- My bike share agency has done well enforcing a face covering requirement
- My bike share agency has done well cleaning equipment
- My bike share agency has done well implementing safe physical distancing protocols
- My bike share agency has done well informing me about service changes and disruptions

None of the above [exclusive]

{Bike_sat; If respondent is using Bike sharing during the pandemic}: In general, how satisfied are you with your bike share service's safety and health measures during COVID-19?
[select one]
Very satisfied
Satisfied
Dissatisfied
Very dissatisfied

{Bike_rely; If respondent is using Bike sharing during the pandemic}: In general, how satisfied are you with your bike share service's service quality (e.g., service reliability and coverage) during COVID-19?
[select one]
Very satisfied
Satisfied
Dissatisfied
Very dissatisfied

--- Page Break --- (For Survey Flow Logic)

{Scoot_comp; If respondent is using Scooter sharing during the pandemic}: What scooter sharing services do you use regularly?
[text entry]

{Scoot_measures; If respondent is using Scooter sharing during the pandemic}: Do you agree with the following statements about the scooter share service that you used the most frequently during the COVID-19 pandemic. (select all that apply)
[select multiple, randomize]
My scooter share agency has done well enforcing a face covering requirement
My scooter share agency has done well cleaning equipment
My scooter share agency has done well implementing safe physical distancing protocols
My scooter share agency has done well informing me about service changes and disruptions
None of the above [exclusive]

{Scoot_sat; If respondent is using Scooter sharing during the pandemic}: In general, how satisfied are you with your scooter share service's safety and health measures during COVID-19?
[select one]
Very satisfied
Satisfied
Dissatisfied
Very dissatisfied

{Scoot_rely; If respondent is using Scooter sharing during the pandemic}: In general, how satisfied are you with your scooter share service's service quality (e.g., service reliability and coverage) during COVID-19?

[select one]

Very satisfied
Satisfied
Dissatisfied
Very dissatisfied

Autonomous Vehicles Questions[10]

{Intro_AV}: This second to last section asks about your perception of autonomous vehicles.

Autonomous vehicles (AVs) use technology to steer, accelerate, and brake with little to no human input. Some vehicles still require a human to monitor the roadway, while other vehicles require no human intervention. AVs could pick you up and drop you off where and when you need. You could hail this vehicle on-demand with your smartphone or connect with it in a hub location. Shared autonomous vehicles (SAVs) transport multiple people at once.

{AV_familiar}: How familiar are you with autonomous vehicles that can self-drive?

[select one]

I have never heard of AVs
I am somewhat familiar with AVs
I am very familiar with AVs

{AV_use}: If autonomous vehicles were available today for you to use, what would be your most preferred way to use them? Current costs of an AV range from $70,000 to $150,000.

[select one]

Own AVs and use them only for personal use
Own an AV and earn extra income on the side by making it available to other users while not used by you.
Own an AV and earn extra income on the side by providing rides to other passengers while you use it
Use an AV as the need arises for personal use
Use AVs for shared transportation operated by a service provider (taxi, public transit, ride-hailing service)
Use AVs for e-commerce and delivery to my home.

{AV_use}: Which of the following trips are you likely to use AVs for once they become available.

[select multiple]

Commute trips to work or school

[10] The questions from this section are from Menon et al_2020.

Trips for errands, such as to the grocery store.
Trips for leisure with friends and family
Trips for business
Long distance trips (over 50 miles)

{AV_change}: How has the COVID-19 pandemic changed your opinion about using emerging transportation technologies such as autonomous vehicles?

[select one]

I view them more negatively
My opinion has not changed
I view them more positively

---Page Break---

Socio-Demographic Questions

{Demo_Intro}: This is the last section of the survey. We will ask socio-demographic questions about yourself and your household.

{Age}: What is your age?

[range, 18–100]

{Gender}: What is your gender?

[select one]

Woman
Man
Non-binary
Prefer to self-describe (text entry)

{Native_born}: Were you born in the United States?

[select one]

Yes
No

{Education}: What is your highest level of education?

[select one]

Less than a high school diploma
Highschool Diploma
Some College
Associate degree
Bachelor's degree
Graduate/Professional Degree

{Income} What was your pre-tax annual household income in 2020?

[select one]

Less than $25,000
$25,000-$49,999

$50,000-$99,999
$100,000-$149,999
$150,000-$249,999
$250,000 or more

{Income_change}: How does your household income in 2020 compare to your income in 2019?

[select one]

Much greater than 2019
About the same
Much less than 2019

{Home_own}: Do you own or rent your current home?

[select one]

Rent
Own
Other [text entry]

{Household}: Who lives in your household with you?

[select multiple]

No One [exclusive option]
Spouse/Partner
Children under 6
Children aged 6 – 17
Children aged 18 or older
Roommate(s)
Parents
Other [text entry]

{Home_license}: How many licensed drivers are there in your household?

[select one]

0
1
2
3 or more

{Home_vehicles}: How many working vehicles (including cars, pickup trucks, SUVs, and vans) are there available to your household?

[select one]

0
1
2
3 or more

{Home_Bike}: How many working bicycles are available to your household?

[select one]

0
1
2

3 or more

{Employment}: As of today, what is your employment status?

[select one]

Employed Full Time
Employed Part Time
Unemployed Looking for Work
Unemployed Not Looking for Work
Retired
Primarily Self-Employed
Unpaid Volunteer or Intern
Homemaker or Stay at Home

{Essential, If Employment = "Employed…" or "Primarily Self…" or "Unpaid…"}: Do you work in any of the following fields:

Building maintenance and repair (e.g., electrician, plumber)
Defense
Delivery and postal service
Grocery, pharmacy, convenience
Human services (e.g., food bank, homeless shelter)
Manufacturing
Medical and health care
Public safety (e.g., law enforcement, fire, security, EMT)
Sanitation
Transportation and logistics
Utilities (e.g., water, electricity)
Other essential services

[select one]

Yes
No

{Work_home; If Employment ≠ "Unemployed…" or "Retired" or "Homemaker…"}: Do you currently work from home?

[select one]

Yes
No

{Work_homefrequency; If Work_home = "Yes"}: How many days do you work from home during a typical week?

[select one]

Less than one day a week
1-2 days a week
3-4 days a week
5 or more days a week

{Work_office}: Do you have a primary work location outside your home?

[select one]

Yes

No, I work in various locations outside home
No, I work entirely from home

{Office_location; If Work_office = "Yes"}: What is the zip code of your primary work location?
[Text entry, number validation]

{Office_frequency; If Work_office = "Yes"}: How many days do you work at this location during a typical week?
[select one]
Less than one day a week
1–2 days a week
3–4 days a week
5 or more days a week

{Teleshop}: In general, how many days do you receive deliveries from online shopping at home during a typical week?
[select one]
Less than one day a week
1–2 days a week
3–4 days a week
5 or more days a week

{Trip_duration}: In general, how much time do you spend travelling to various places during a typical week?
[slider]
Less than 30 minutes per day
30–60 minutes per day
1–2 hours per day
2–4 hours per day
5 or more hours per day

{New_tech}: When it comes to new technology, what best describes you?
[select one]
I am skeptical of new technologies and use them only when I have to
I am usually one of the last people I know to use new technologies
I use new technologies when most of the people I know use them
I like new technologies and use them before most people I know
I love new technologies and am among the first to experiment and use them