Supplemental Draft Environmental Impact Statement and Updated Draft Section 4(f) Evaluation

APPENDIX B

COVID-19 TRAVEL ANALYSIS AND MONITORING PLAN

Introduction

MDOT SHA recognizes the substantial impact of COVID-19 on current transportation patterns throughout the region. We understand COVID-19 is impacting all Marylanders today – in how we work, in how we spend our free time, and in how we travel. While MDOT's number one priority is the health and safety of Marylanders, we are continuing with our efforts to ensure transportation improvements are being developed to meet our State's needs not only for today but for the next 20-plus years. We are aware of the reduced traffic on interstates such as I-495 and I-270 due to the initial COVID-19 stay-at-home order and subsequent "safer at home" advisory and travel restrictions. MDOT SHA also acknowledges the uncertainty surrounding post-shutdown traffic levels and transit use. There is no definitive traffic model to predict how this unprecedented global pandemic will affect long-term future traffic projections and transit use. MDOT SHA is committed to tracking trends in travel behavior and monitoring traffic volumes over time as businesses and schools reopen. We will evaluate and consider all new information that becomes available to ensure the solutions will meet the needs of Marylanders now and in the future.

With the changes to traffic volumes and operations experienced over the last year in the region and nationally, questions have been raised regarding the long-term need for the Managed Lanes on I-495 and I-270 under potential changes to economic activity and travel behavior. Understanding the impacts, both short and long-term, includes three key perspectives:

1. Historical Context
2. Active Monitoring of Travel Behavior
3. Estimating Potential Impacts of Permanent Shifts in Travel Behavior

This technical memorandum summarizes MDOT SHA's plan to monitor travel patterns throughout the pandemic as part of development of the FEIS for the I-495 & I-270 Managed Lanes Study, and to conduct sensitivity analyses and modeling to confirm that capacity improvements would still be required on I-495 and I-270 if future traffic demand is lower than pre-pandemic forecasts. In addition, MDOT SHA will stay abreast of available information, research, and guidance within the larger transportation industry, such as presentations from the Transportation Research Board and reports from the National Capital Region Transportation Planning Board, related to ongoing and long-term travel impacts associated with the COVID-19 pandemic. Relevant resources have been compiled (attached) and the list will be updated as additional information becomes available.

Historical Context

Background

Past economic events and societal changes have had an impact on travel, but as the economy recovered and travel increased, it exacerbated underlying deficiencies in the system. For example, the most recent event was the recession that occurred in 2007 and 2008. This recession had a prolonged impact well into 2010 and beyond. The recession was compounded with a dramatic increase in fuel costs that further suppressed travel. Looking at recent MDOT SHA Mobility Reports, the trend indicates that traffic returned to 2007 levels by 2015 (Source: MDOT SHA 2016 Highway Mobility Report) and continued to significantly increase through 2017, as shown in Figure 1.

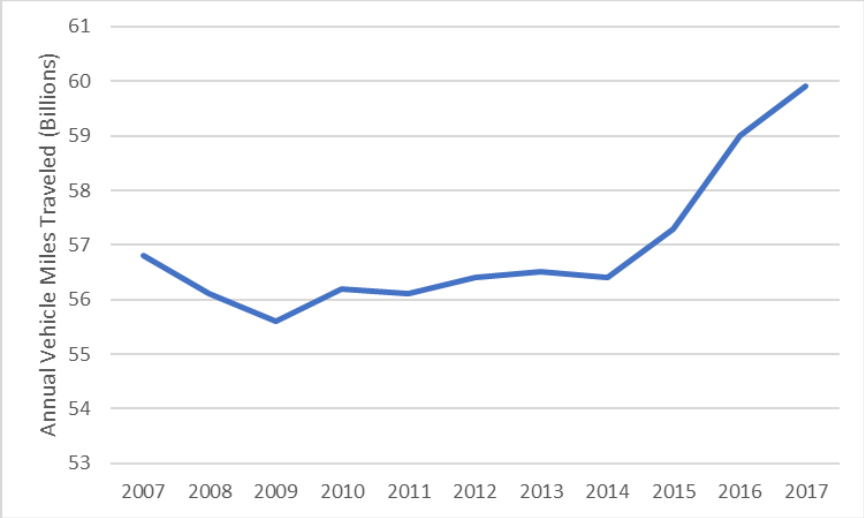

Figure 1: VMT Growth Trends in Maryland (Source; MDOT SHA Mobility Reports)

Approach

The purpose of this task is to identify major economic or societal events that occurred in the past 20 to 30 years and compare those events with travel data from MDOT SHA, the Virginia Department of Transportation (VDOT), and the Metropolitan Washington Council of Governments (MWCOG) for the Baltimore / Washington DC region to identify trends and understand the long-term travel impact from these events. The following metrics will be investigated:

1. **Daily Traffic Volumes** - A set of locations will be identified on I-495 in Virginia as well as on I-270 and I-495 in Maryland. Average Annual Daily Traffic (AADT) will be obtained from VDOT and MDOT SHA at these locations. Where possible, monthly traffic volume data will also be obtained.

2. **Regional Travel** - In addition to the volumes at specific locations, Vehicle Miles Traveled (VMT) at the county level will be used to evaluate travel activity for the region.

3. **Transit Trips** - Given the multimodal nature of the Baltimore / Washington Region, historical levels of transit ridership will be obtained from major transit operators in the region.

4. **Economic Indicators** - The trends in travel will be compared against identified economic indicators from MWCOG, such as:
    a. Population
    b. Regional Unemployment
    c. Household-to-Employment Ratio
    d. Baltimore / Washington DC Gross Domestic Product

Deliverables

A briefing document will be prepared to highlight the above findings in a graphical and accessible document suitable for decision-makers and the public.

Active Monitoring of Travel Behavior

Approach

As the Managed Lanes Study progresses, it is important to monitor how multimodal travel begins to return to the system as economic activity resumes in the region. Several potential real-time data sources can be used to assess travel demand and operations.

The following data sources will be tracked for updates on current travel:

1. **Travel Conditions**
    a. Permanent traffic count stations
    b. VMT by County
    c. RITIS data (travel speed and congestion data integrated from various sources, including INRIX)
    d. WMATA ridership
2. **Demand**
    a. School openings / virtual learning status by County in region (K-12, colleges)
    b. Monthly reports of unemployment claims (nationally, regionally, and statewide)
    c. Quarterly reports of Gross Domestic Product
3. **Policy**
    a. Public Health Policy
    b. Federal, state, and local mandates for social distancing
4. **Health Conditions**
    a. New cases of COVID
    b. Development of vaccine

This data will be updated throughout the development of the FEIS to determine how travel behavior changes over time as a result of the pandemic. This will ensure that the latest available information is considered prior to the Record of Decision.

Deliverables

A memo was developed in August 2020 and updated on June 24, 2021 (see Attachment A) summarizing the analysis of COVID-19 related traffic impacts on the I-495 and I-270 corridors in Maryland during the first 15 months of the pandemic. This memo will be included in the Supplemental DEIS for review by stakeholders and the public. The information and traffic charts in the memo will continue to be updated regularly throughout the project, and an updated memo will be included in the FEIS.

In addition to the project-specific information that will be shared in the memo described above, MDOT posts frequent updates to statewide trends in the use of their services, including statewide weekly traffic volumes, statewide weekly truck volumes, MDTA customer traffic (toll roads), MTA services (transit), BWI passenger traffic (air travel), and Seagirt Monthly Container Counts (shipping) on the following website, which will be used to track statewide travel trends: https://www.mdot.maryland.gov/tso/Pages/Index.aspx?PageId=141

Estimating Potential Impacts of Permanent Shifts in Travel Behavior

Approach

Long-term impacts to travel behavior may occur well after the threat of COVID-19 has passed. These impacts may be experienced by both travel demand and travel supply:

- ***Travel demand changes*** may be associated with continued work-from-home policies for both traditional and non-traditional sectors of the economy; changes to discretionary trip making; further reliance on e-Commerce; reduction of travel from areas outside the region; and/or migration from urban centers and dense developments to suburban and rural areas, due to lingering social distancing concerns.
- ***Travel supply (capacity) changes*** may include increased social distance requirements, such as reduced on-board transit capacity or reductions in ride-sharing.

Sensitivity Analysis Using the MWCOG Regional Forecasting Model for 2045

To understand the impacts these changes may have to regional travel in the future, and more specifically to the I-495 and I-270 corridors and the potential Managed Lanes, a series of model scenarios for various levels of travel demand changes will be developed, as shown in Table 1. The intent of this analysis is to understand the sensitivities of the forecasts under various future growth scenarios, since it is unknown how the pandemic will impact travel in the long term. Therefore, multiple future-year scenarios will be evaluated. Scenario 1 would represent a business-as-usual condition without any stay-at-home or other policies in place, similar to a pre-COVID-19 condition. It is reflective of the model parameters used in the 2045 baseline MWCOG model. Scenario 2 provides a baseline for comparison as it represents a sustained level of COVID related restrictions similar to what was experienced in the second half of 2020. This scenario represents the high level of potential long-term impact and provides an opportunity to compare and validate the sensitivity of the model against data observed in the fall of 2020. Scenario 3 represents a low level of long-term impact for each of the Demand Factors. Additional scenarios will be modeled to focus on certain demand factors to better understand specific impacts on overall travel in the corridor and the region as a whole.

Table 1: Sensitivity Analysis of Long-Term Travel Demand Changes

Demand Factor	Parameter	Scenario 1 – Pre COVID	Scenario 2 – High COVID Impact	Scenario 3 – Low COVID Impact
Work-from-Home (WFH)	Home-Based-Work Productions	2045 baseline MWCOG	High WFH for WFH-eligible Industries[1]	Low WFH for WFH-eligible Industries[1]
	Home-Based-Work Attractions	2045 baseline MWCOG	High WFH for WFH-eligible Industries[1]	Low WFH for WFH-eligible Industries[1]
Changes in Non-Home-Based Travel	Non-Home-Based	2045 baseline MWCOG	Related to WFH[1]	Related to WFH[1]
Distance Learning	Home-Based-School Trips	2045 baseline MWCOG	75% Reduction	5% Reduction
Other Home-Based Trips	Discretionary Trips[2] Shopping Trips	2045 baseline MWCOG	5% Increase No Change	5% Increase No Change
Long Distance Travel	External Auto Airport Trips Visitor Trips	2045 baseline MWCOG	5% Reduction 75% Reduction 75% Reduction	No Change 5% Reduction 5% Reduction
Truck Trips	Commercial Vehicles Truck Trips	2045 baseline MWCOG	10% Increase 15% Decrease	5% Increase 5% Decrease

[1] WFH-eligible industries will be defined based on Census data available for NAICS categories (e.g., insurance, finance, professional services, etc.). Not WFH-eligible industries may include schools, construction, healthcare.

[2] Discretionary activity would include non-work and non-shopping trips (e.g., trips to restaurants, recreation events, social events, church services, etc.).

The factors listed in Table 1 will be equated to model parameters in the MWCOG Regional Travel Demand Model. For example, work-from-home impacts will be represented by changing the Home-Based-Work (HBW) production rates in the model as well as associated attractions, resulting in reduced work trips for eligible employees. Data used by the team has identified that most WFH is associated with higher income and office-related jobs. Therefore, the HBW production rate adjustments for WFH are assigned to higher income households. To account for the change in job locations (from office to home), the work attractions are similarly reduced for office jobs to account for the change in productions. Discretionary and shopping travel will be implemented in similar ways with a reduction to the home-based production rates for these trip types. To compensate for higher levels of eCommerce, the rates associated with commercial vehicle and truck trips in the region will be increased to account for the greater demand for delivery activity. External demand impacts will be made by reducing the growth in traffic at the external stations in the model. The amount of reduction will need to be determined.

Given the multimodal nature of the region and high transit ridership, a separate scenario will be evaluated that builds upon the changes in demand and adds a corresponding decrease in transit service. The decrease in transit service would be consistent with changing market needs with fewer trips being made and reduction in capacity due to social distancing. A service level reduction of 10% will be combined with Scenario 3.

Each of the scenarios (five scenarios from Table 1 and the decreased transit version of Scenario 3) will be tested using 2045 forecasts for population and households consistent with the 2.3.75 version of the MWCOG Regional Travel Demand Model. Each scenario will be run using the Alternative 1 (No Build scenario) and one Build alternative (the Preferred Alternative).

Results of the scenarios will be evaluated for overall trends in regional VMT by county, on freeways and arterials, as well as utilization of I-495 and I-270.

Sensitivity Analysis Using the VISSIM Simulation Model

Sensitivity analysis runs will also be completed using VISSIM simulation software under a range of potential demand scenarios (based on the traffic monitoring findings and the results from the MWCOG scenario analysis) to confirm that the study area would continue to meet the purpose and need criteria if future traffic demand is lower than pre-pandemic forecasts, and also to demonstrate that the project would continue to provide operational benefits such as reduced delays, increased person throughput, and more reliable travel times for cars, buses, and freight.

Deliverables

A briefing document will be prepared to highlight the above findings in a graphical and accessible document suitable for decision-makers and the public. A companion technical white-paper suitable for a technical audience will be produced to document the detailed approach and findings. The documentation will include charts and tables from the MWCOG modeling output and a summary of traffic metrics from the VISSIM sensitivity analysis runs demonstrating the need for the project under various potential demand scenarios and the projected operational benefits.

Attachments

A) Memorandum: COVID-19 Impacts on the I-495 and I-270 Corridors by CDM Smith, Updated 6/24/2021
B) Presentation: How Much Will COVID-19 Affect Travel Behavior? by the National Academies of Sciences Engineering and Medicine Transportation Research Board, 6/1/2020
C) Presentation: COVID-19 Impacts on Managed Lanes by the National Academies of Sciences Engineering and Medicine Transportation Research Board, 6/25/2020
D) Memorandum: Transportation Impacts of the COVID-19 Pandemic in the National Capital Region by the National Capital Region Transportation Planning Board Technical Committee, 9/3/2020
E) Presentation: Commuter Connections 2020 Employer Telework Survey – Coronavirus Pandemic Survey Results by the National Capital Region Transportation Planning Board Technical Committee, 9/16/2020
F) Report: Capital COVID-19 Snapshot: Safe Return to Work by the Greater Washington Partnership, summarizing results from a survey conducted in August 2020.
G) Presentation: Visualizing Effects of COVID-19 on Transportation: A One-Year Retrospective by the National Academies of Sciences Engineering and Medicine Transportation Research Board, 3/8/2021

Attachment A

Memorandum: COVID-19 Impacts on the I-495 and I-270 Corridors by CDM Smith, Updated 6/24/2021

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June 24, 2021

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Baltimore MD 21202

Subject: COVID-19 Impacts on the I-495 and I-270 Corridors Report Update

Dear Mr. Holcombe:

This letter report provides an updated analysis of COVID-19-related traffic impacts on the Maryland I-495 and I-270 corridors using Maryland SHA permanent traffic count station data. An analysis of regional COVID-19-related travel data from other sources is also provided for context. This report updates the initial analysis which was presented in the "Draft COVID-19 Impact on the I-495 and I-270 Corridors" letter report, dated August 6th, 2020. In addition to providing the most recent trends, this report includes a more detailed analysis of the traffic impacts by time of day compared to the original report.

The COVID-19 Pandemic and Traffic

The COVID-19 pandemic continues to impact many aspects of society and the economy, including traffic levels, in a variety of ways. Beginning in March 2020, the pandemic caused significant reductions in traffic around the U.S. including in Maryland. Both direct impacts due to stay-at-home-type orders and indirect impacts due to the economic recession were experienced. In the over 15 months since the beginning of the pandemic, as the pandemic and societal responses to the pandemic have evolved, traffic impacts have also changed. **Table 1** provides COVID-19 pandemic-related traffic impact factors that were observed statistically or anecdotally during the first year of the pandemic and apply to Maryland. The factors are grouped into positive, negative, and varied travel impacts. **Table 2** shows a timeline of COVID-19-related mandates and events in Maryland.

Recent events in the timeline of COVID-19 mandates in Maryland reflect an improving pandemic-related situation, especially since spring 2021. This coincided with vaccine eligibility opening to all Maryland residents during this time. As the pandemic situation has improved in recent months, certain factors shown in **Table 1** that were observed in the first year of the pandemic have changed. Some of these are driven by a quicker than expected increase in demand for travel and leisure activities in recent months. For example, fuel prices have increased significantly in the past several months driven especially by increasing demand. Also, longer-distance domestic vacation and leisure travel is also rebounding very quickly as shown in the most recent airline ticketing trends.

Commercial shipping activity, which had recovered to pre-pandemic levels in many sectors even by fall 2020, continues to be strong. This is partially driven by significant growth in e-commerce during the pandemic.

Looking to the future, the medium and long-term impacts of several of the factors continue to be actively discussed and researched in the transportation industry, including related to transit usage, e-commerce, telecommuting, and residential and job location patterns. Discussion and research related to these factors will continue to be closely monitored by the project team. For example, trends in fall 2021 will be closely monitored as many employers are expected to implement new work from home and travel policies and to see if the wave of leisure and vacation travel expected in summer 2021 continues into the fall.

Table 1 – COVID-19 Traffic Impact Factors During the First Year of the Pandemic (March 2020 to February 2021)

Positive Traffic Impacts		Negative Traffic Impacts		Varied Traffic Impacts	
Passenger Cars	**Commercial Vehicles**	**Passenger Cars**	**Commercial Vehicles**	**Passenger Cars**	**Commercial Vehicles**
• Health concerns with transit causing shifts to vehicular travel in urban areas • Lower fuel prices • On-demand delivery services using personal vehicles including food	• Accelerated trends in e-commerce growth	• Reduced travel due to stay at home orders • Employment losses • Telecommuting • Ongoing avoidance of less-critical travel due to health concerns • Accelerated trends in e-commerce growth • Lower population growth due to lower immigration	• Less shipping activity and deliveries related to declines in economic activity	• Shifts to relatively more local vacation and leisure activity • Shifts in residential and job location patterns	• Supply chain changes, for example related to international trade

Table 2 (cont. on next page) – Timeline of COVID-19 Mandates and Events in Maryland

Calendar Year	Date	Description
2020	March 12	- Gatherings of more than 250 people banned - Schools closed until March 27th
2020	March 16	- Gatherings of more than 50 people banned - All bars and restaurants closed
2020	March 19	- Gatherings of more than 10 people banned - Transit for essential travel only
2020	March 23	- Non-essential businesses closed
2020	March 30	- Residents ordered to stay-at-home indefinitely, persons traveling into Maryland are required to self-quarantine for 14 days.
2020	April 17	- Schools closed through May 15th
2020	April 18	- Residents ordered to wear face masks in public settings
2020	May 6	- Schools closed through the end of the academic year
2020	May 15	- Statewide Stay at Home order replaced by Safer at Home advisory. Some jurisdictions began Stage One of "Maryland Strong: Roadmap to Recovery" program but most social distancing measures generally remain in place.
2020	June 5	- Maryland began moving to Stage Two of "Maryland Strong: Roadmap to Recovery" with the opening of businesses including manufacturing, construction, retail shops, specialty vendors, wholesalers, warehouses, and professional offices. Additionally, personal services(including salons, massage, and tattoo parlors) resumed operations at 50 percent capacity and the state government returned to more normal operations
2020	June 12	- Additional Stage Two openings occurred including indoor dining and pools at 50 percent capacity and outdoor amusements at full capacity
2020	June 19	- Additional Stage Two openings occurred including indoor fitness activities at 50 percent capacity and casinos, arcades, and malls at full capacity. Schools and child care centers also began partial reopening
2020	July 29	- An increase in COVID-19 hospitalizations in Maryland resulted in a pause in reopening plans. - Maryland residents were strongly advised to postpone or cancel travel to states with COVID-19 positivity testing rates of greater than or equal to 10 percent.
2020	July 31	- An expanded statewide face mask order went into effect.
2020	August 27	- All schools in Maryland authorized to reopen
2020	September 4	- Maryland began moving to Stage Three of the "Maryland Strong: Roadmap to Recovery" with additional safe and gradual openings. Effective September 4th at 5 PM, outdoor venues may open to general public at 50% capacity or 250 people, whichever is less. Capacity for retail establishments and religious facilities increased from 50 to 75 percent. Indoor theaters may open to the general public at 50% capacity, or 100 people per auditorium—whichever is less
2020	September 21	- Expanded capacity for indoor dining, from 50 to 75 percent, was put into place

Table 2 (continued) – Timeline of COVID-19 Mandates and Events in Maryland

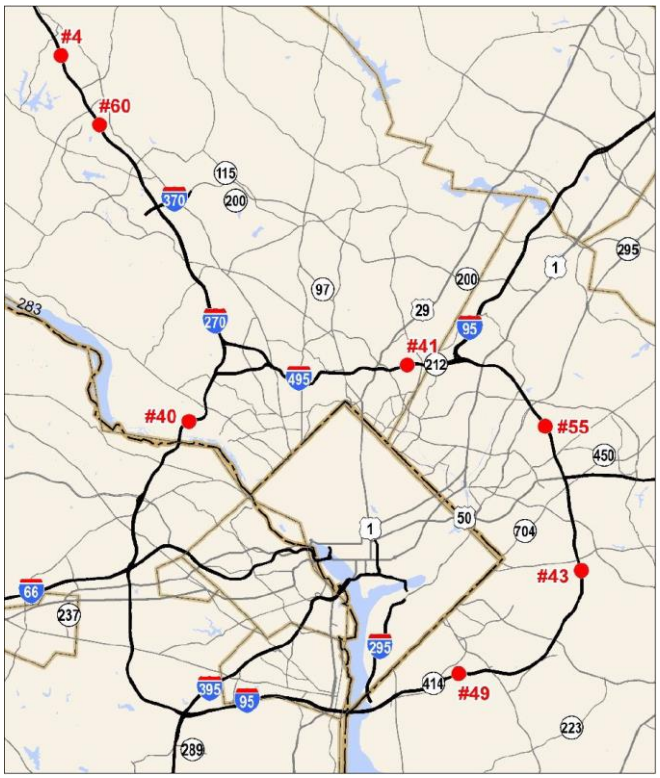
Calendar Year	Date	Description
2020	October 1	- Capacity limits on child care facilities lifted; indoor visitings allowed at nursing homes
2020	November 5	- Maryland enters red zone for coronavirus case rates; Travel advisory to avoid travel to and from states with positivity rates for 10% or higher renewed.
2020	November 20	- Hospital visitations restricted until further notice. Nursing home visitations limited to compassionate care visits. - Retail businesses and religious institutions back to Stage Two 50% capacity restrictions. Restaurants and Bars to close by 10 PM. - Fans restricted at any professional or collegiate stadiums and racetracks.
2020	December 14	- First COVID-19 vaccine administered in Maryland
2021	January 18	- Maryland moves to Phase 1B of the COVID-19 vaccine protocols to include all Marylanders 75 and older, as well as anyone of any age living in assisted living or independent living facilities and developmental disabilities and behavioral health group homes, K-12 teachers, education staff and child care providers.
2021	January 25	- Maryland moves to Phase 1C of the COVID-19 vaccine protocols to include adults 65 and older, U.S. Postal Service employees and essential workers in manufacturing and agriculture.
2021	March 12	- Capacity limits lifted on outdoor and indoor dining, retail businesses, religious facilities and personal services. - Large Outdoor and Indoor venues may operate at up to 50% capacity. - Quarantine requirements lifted on out of state travel.
2021	March 23	- Maryland moves to Phase 2A of the COVID-19 vaccine protocols to include all Marylanders, aged 60 and older.
2021	March 30	- Maryland moves to Phase 2B of the COVID-19 vaccine protocols to include all Marylanders, aged 16 and older with underlying health conditions.
2021	April 6	- COVID-19 vaccine eligibility opens for all Marylanders, aged 16 and older at any of the state's mass vaccination sites.
2021	April 12	- COVID-19 vaccine eligibility opens for all Marylanders, aged 16 and older at any vaccine provider in the state.
2021	April 28	- Maryland's statewide outdoor mask mandate lifted
2021	May 15	- All remaining capacity restrictions lifted on all indoor entertainment venues and conventions, and all outdoor entertainment, art, and sports venues, including all ticketed events. - All remaining capacity and distancing restrictions lifted on indoor and outdoor dining. - Maryland's indoor mask mandate lifted except for public transportation, health care settings and schools.
2021	May 31	- 70% of adults in Maryland have received at least one dose of the COVID-19 vaccine.
2021	June 15	- State of emergency in Maryland lifted with most pandemic-related orders ending as of July 1, 2021.

Traffic Analysis Methodology

Traffic trends on the I-495 and I-270 project corridor were analyzed using data from SHA permanent count stations (ATRs). The six ATR locations on these corridors used for the analysis are listed below and are shown in **Figure 1.**

- I-495 ATR #40: At Persimmon Tree Road
- I-495 ATR #41: West of MD 650
- I-495 ATR #55: At Good Luck Road
- I-495 ATR #43: South of MD 214
- I-270 ATR #4: South of MD 121
- I-270 ATR #60: South of Middlebrook Road

Figure 1 – Permanent Traffic Count Station (ATR) Locations on I-495 and I-270



Note: Location #49 was not used in this analysis

The hourly data for the ATR locations was downloaded from the MDOT SHA Internet Traffic Monitoring System website or obtained from SHA Traffic Monitoring System Team Data Services Division staff. Breakdowns of the data by vehicle classification, which were used from past years at some ATR locations, was no longer available at any of the I-495 and I-270 ATR locations for the years needed for the COVID-19 analysis. Therefore, the COVID-19 impact analysis was performed based on total traffic.

The daily COVID-19 impact data analysis methodology is described below:

1. Data for 2020 before the COVID-19 impact (from January 2020 to early March 2020) was compared to similar data by day for 2019 to estimate an annual 2019 to 2020 traffic change (growth) rate by ATR location. Note that the comparison was made by shifting the comparison dates to the same day of week rather than the same exact date. For example, Sunday March 1, 2020 was compared to Sunday March 3, 2019.
2. The pre-COVID-19 traffic change (growth) rates were applied to corresponding data by day from the year before the pandemic (March 2019 to February 2020). This resulted in an

estimate of March to February traffic levels without the COVID-19 impact. Only one year of traffic change rates were applied to the estimated traffic without the COVID-19 impact.

3. The estimated traffic without the COVID-19 impact was compared with actual traffic since March 2020 to estimate an impact due to COVID-19. This analysis methodology accounts for seasonal impacts on traffic.

The analysis of hourly impacts was conducted by directly comparing traffic in the hours on average weekdays before the pandemic with traffic in the hours since the pandemic. No traffic change (growth) rates were applied to the hourly data from before the pandemic in this comparison. This was because some time periods at some ATR locations experienced severe congestion and queuing so traffic change (growth) rates would not be able to be applied consistently to all hours. Rather than attempting to apply varied traffic change (growth) rates by time of day, the hourly data post-pandemic was directly compared to data from pre-pandemic.

Daily and Monthly Analysis Results

Figure 2 shows the seven-day rolling average COVID-19 impact results by ATR location and **Figure 3** shows the results for all ATR locations combined for both the daily trend and the seven-day rolling average trend. **Table 3** also estimates the results by month by ATR location. The most recent month of May 2021 has an estimated COVID-19 impact of about -11 percent at all locations which is the lowest monthly impact since the beginning of the pandemic.

Some observations based on **Table 3** include that the variation of impacts between ATR locations has narrowed over time. In April to August 2020 the range of estimated COVID-19 impacts by ATR location varied by ten to 13 percentage points. ATRs #43 and #55 on the east I-495 beltway showed the least negative impacts in the earlier pandemic periods, from the beginning of the pandemic through September 2020. Over those same months ATR #40 showed the most severe impacts. The variation in more recent months has been much lower at consistently around five percentage points. The lower variation over time may be due to some COVID-19 impact factors (see **Table 1**) evening out over time across the locations as the recovery continues.

From **Table 3**, the total estimated COVID-19 impacts for all ATR locations was the highest in April 2020 at -52 percent. There was a significant recovery in May 2020 through July 2020 to -17 percent, followed by a more gradual recovery through October 2020 to -16 percent. Impacts became gradually more severe in November 2020 and the winter months of December 2020, January 2021, and February 2021, due to an elevated number of new COVID-19 cases, although February impacts were also severely impacted by weather events making the trend in that month misleading. Following this, the traffic has recovered to levels much better than October 2020, to an estimated -14 percent impact in March 2021, -13 percent in April 2021, and -11 percent in May 2021 as vaccinations became available to more of the population and restrictions were lifted.

Figure 2 – Estimated Seven-Day Rolling Average COVID-19 Impacts by Day by Location

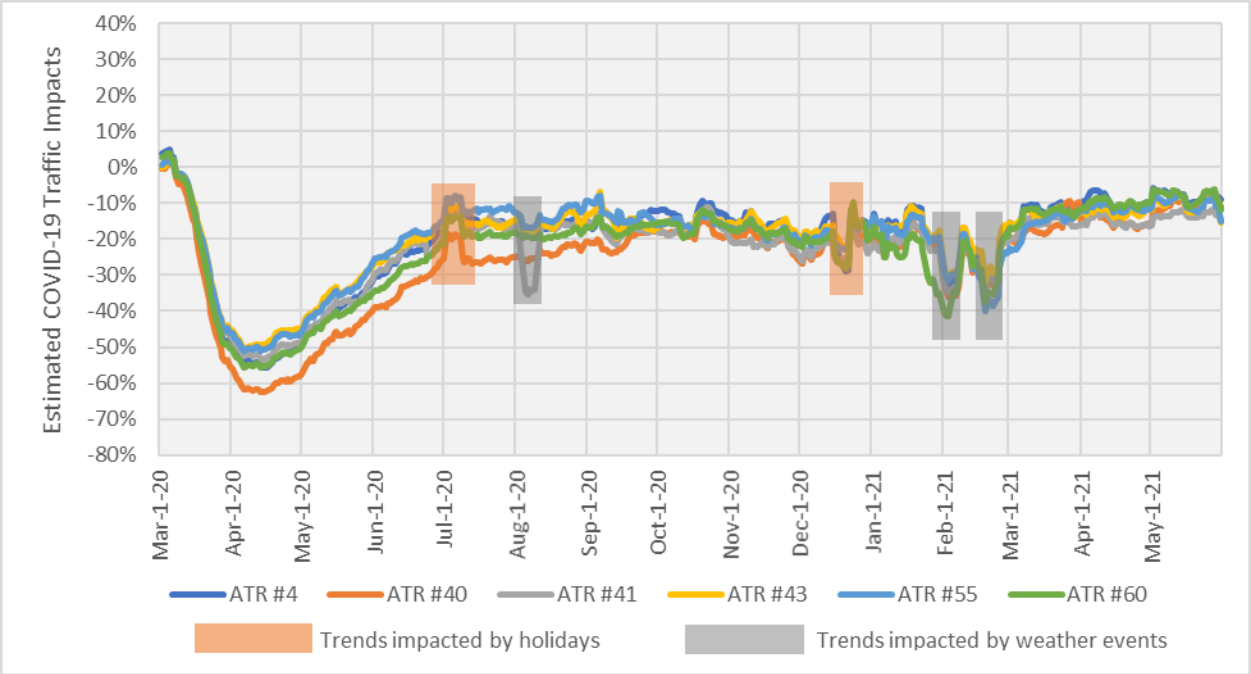


Figure 3 – Estimated COVID-19 Impacts by Day for all ATR Locations

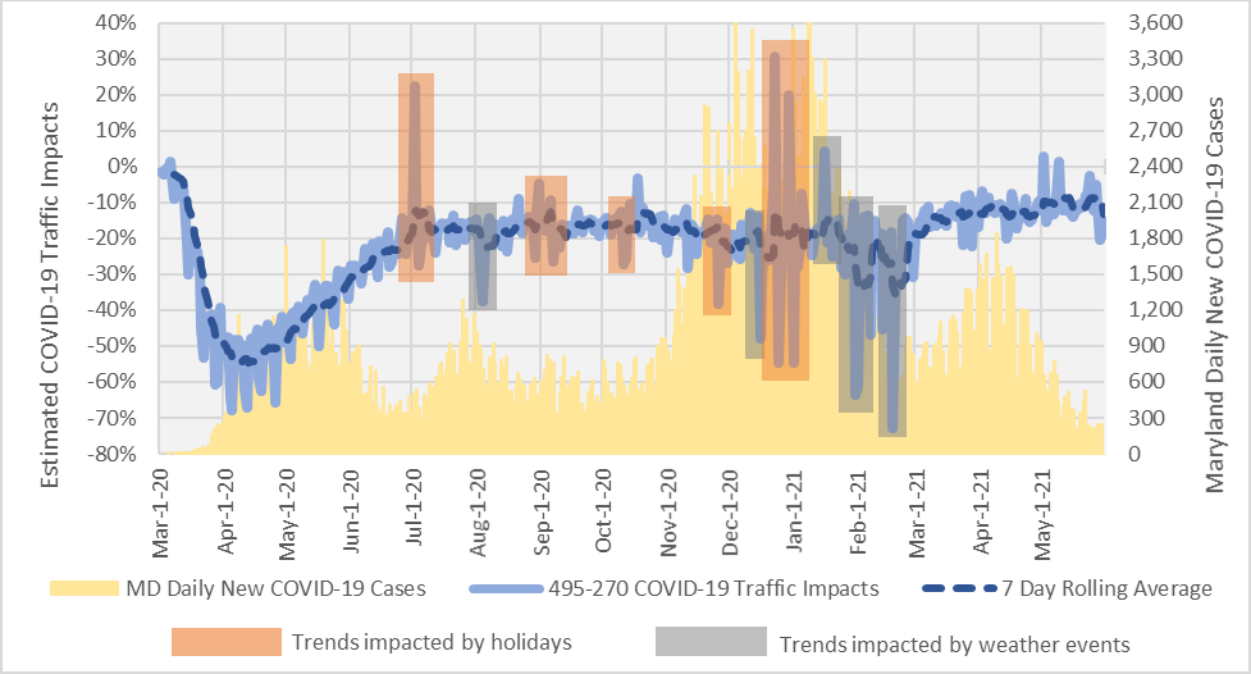


Table 3 – Estimated COVID-19 Impacts by Month by Location

Calendar Year	Month	ATR #4	ATR #40	ATR #41	ATR #43	ATR #55	ATR #60	Total All Locations
2020	March	-24%	-28%	-22%	-21%	-22%	-24%	-24%
2020	April	-52%	-60%	-50%	-47%	-48%	-53%	-52%
2020	May	-38%	-46%	-38%	-34%	-34%	-40%	-38%
2020	June	-23%	-32%	-23%	-20%	-19%	-27%	-24%
2020	July	-15%	-25%	-16%	-15%	-11%	-18%	-17%
2020	August	-16%	-23%	-20%	-15%	-13%	-18%	-18%
2020	September	-14%	-21%	-18%	-15%	-14%	-17%	-17%
2020	October	-13%	-18%	-16%	-15%	-15%	-16%	-16%
2020	November	-17%	-21%	-22%	-16%	-18%	-18%	-19%
2020	December	-19%	-22%	-22%	-17%	-18%	-21%	-20%
2021	January	-19%	-22%	-22%	-18%	-20%	-27%	-22%
2021	February	-25%	-28%	-27%	-23%	-29%	-28%	-27%
2021	March	-11%	-16%	-15%	-13%	-15%	-12%	-14%
2021	April	-10%	-15%	-15%	-12%	-11%	-10%	-13%
2021	May	-8%	-10%	-14%	-11%	-11%	-9%	-11%

In addition to the total trend at all ATR locations, **Figure 3** also shows a graph of the Maryland daily new COVID-19 cases, as reported by the Maryland Department of Health[1]. The total ATR traffic declines were most severe in mid-April 2020 as the first wave of new cases were growing. New cases peaked in mid-May then steadily declined through late June 2020. During this time a steady recovery in traffic occurred. The traffic impact trend improved only slightly through October during the time when the daily new cases fluctuated but remained relatively low. New COVID-19 cases started increasing significantly again starting late October and correspondingly the traffic levels dropped in November 2020. This trend continued through January 2021. With the decrease in new cases and improved access to COVID-19 vaccination, traffic levels recovered starting March 2021. The peak in new cases in late March through April 2021 did not appear to impact the traffic

[1] https://coronavirus.maryland.gov/datasets/mdcovid19-totalcasesstatewide

recovery trend. Towards the end of May 2021, the number of new COVID-19 cases in Maryland were the lowest since the beginning of the pandemic in March 2020.

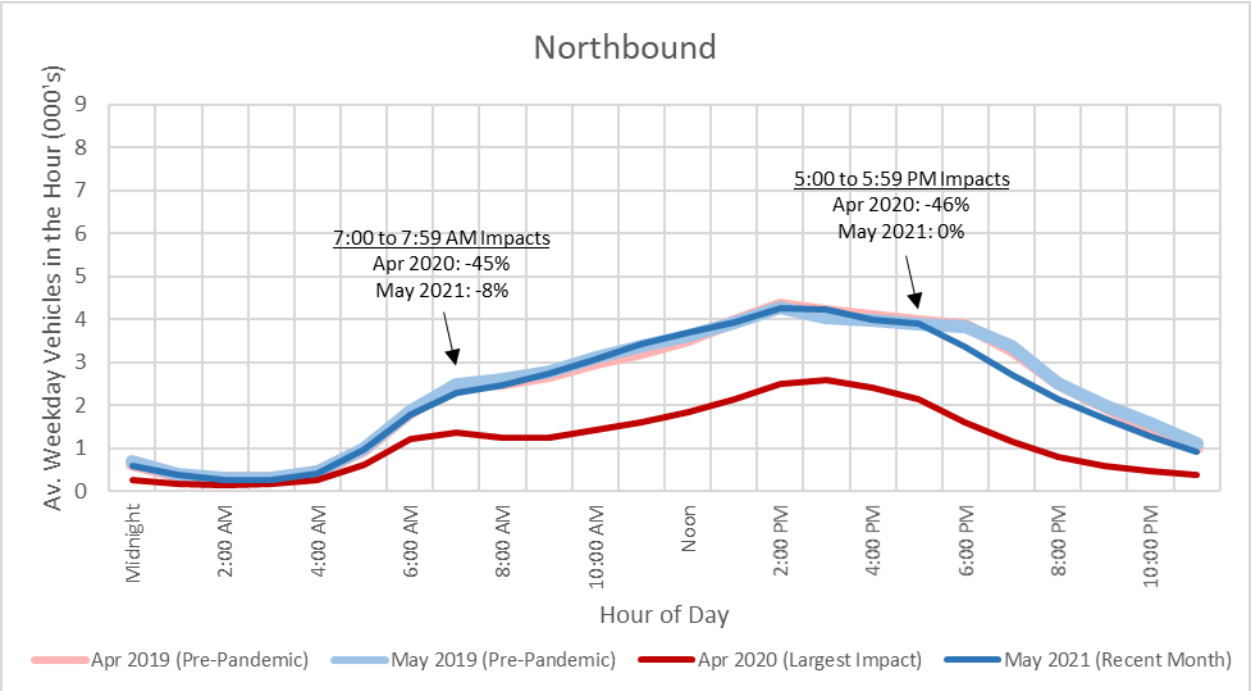
Hourly Analysis Results

The COVID-19 impacts shown previously on a daily basis were found to vary when considering the results by time period, especially for sections of I-495 and I-270 that experienced the most severe congestion and queuing before the pandemic. As described in more detail in this section, it was found that afternoon hours have recovered to closer to pre-pandemic levels compared to morning hours.

Figure 4 through **Figure 9** show impacts by hour of day for both directions of travel at each of the six ATR locations. The figures include average Monday to Friday weekday traffic for April 2019 (wide pink line) and May 2019 (wide light blue line) which are pre-pandemic months, April 2020 (red line) which had the largest pandemic traffic impacts of any month, and the most recent month, May 2021 (dark blue line). Callouts on each figure show the 7:00 to 7:59 AM hour and 5:00 to 5:59 PM hour traffic comparison of pre-pandemic versus post pandemic for April 2019 versus April 2020 and May 2019 versus May 2021. Unique trends can be observed at ATR #40 Eastbound (Inner Loop) during the PM peak hours in **Figure 6** and at ATR #41 Westbound (Outer Loop) during the AM peak hours in **Figure 7**. At ATR #40 Eastbound (Inner Loop) the PM peak traffic volumes are substantially higher than pre-pandemic. This is due to the pre-COVID-19 traffic flow being depressed due to severe congestion and queuing at this location, which is north of the American Legion Bridge, during the PM peak. Because overall daily demand is lower and bottlenecks have been less severe since the beginning of the COVID-19 pandemic, traffic can flow at higher levels at this location during the PM peak hours that were previously the most congested. A similar but less extreme situation can be observed at ATR #41 Westbound (Outer Loop) during the AM peak. Reviewing all figures, it can be observed that weekday 5:00 to 5:59 PM traffic at all locations and directions except ATR #40 westbound (**Figure 6**) has recovered to at least -3 percent of average May 2019 levels for that hour in May 2021. Only one ATR location and direction, ATR #60 southbound (**Figure 5**), has recovered to this close to 2019 levels in the 7:00 to 7:59 AM hour.

Figure 10 is similar to **Figures 4** through **Figure 9** but includes traffic data from all six ATR locations in both directions added together. The overall differences in recovery by time of day can be seen in this graphic. The overall recovery in May 2021 is shown to be closer to 2019 levels between noon and 5:59 PM (ranging from -5 percent to +1 percent difference depending on the hour) compared to 6:00 AM to 11:59 AM (ranging from -19 percent to -7 percent difference), the evening hours (ranging from -7 percent to -16 percent difference), and the overnight hours (ranging from -9 percent to -20 percent difference).

Figure 4 – Average Weekday Hourly Traffic at I-270 ATR Location #04



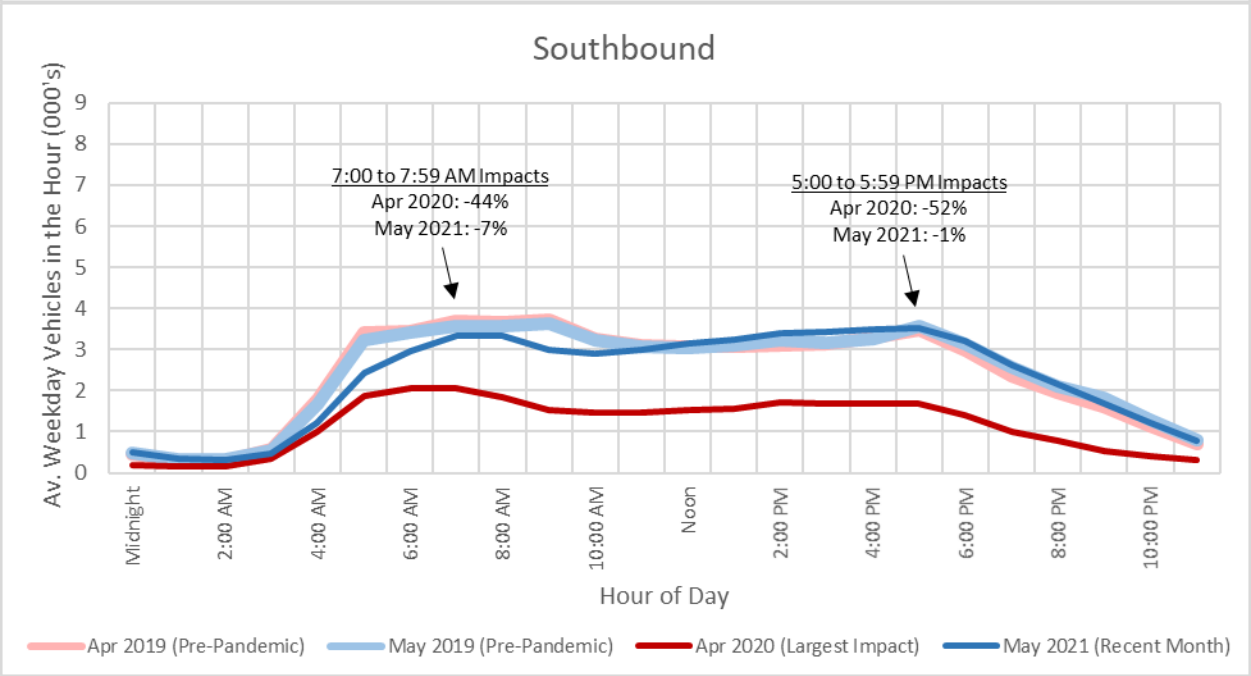
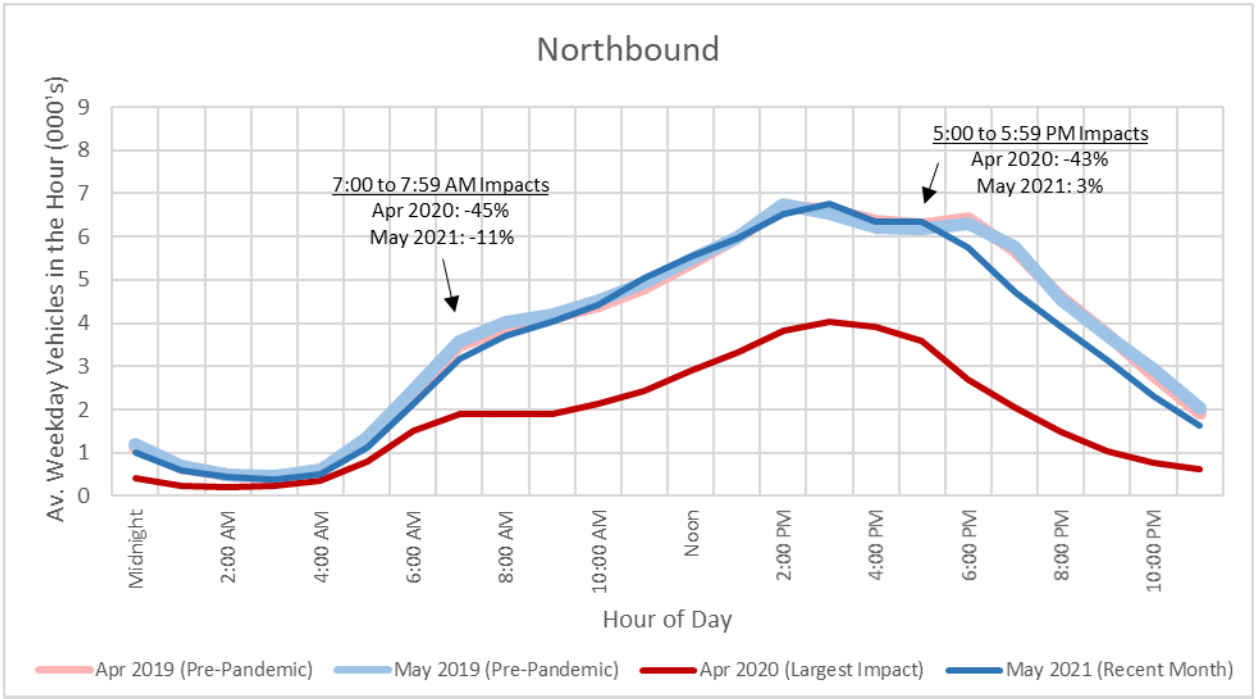


Figure 5 – Average Weekday Hourly Traffic at I-270 ATR Location #60



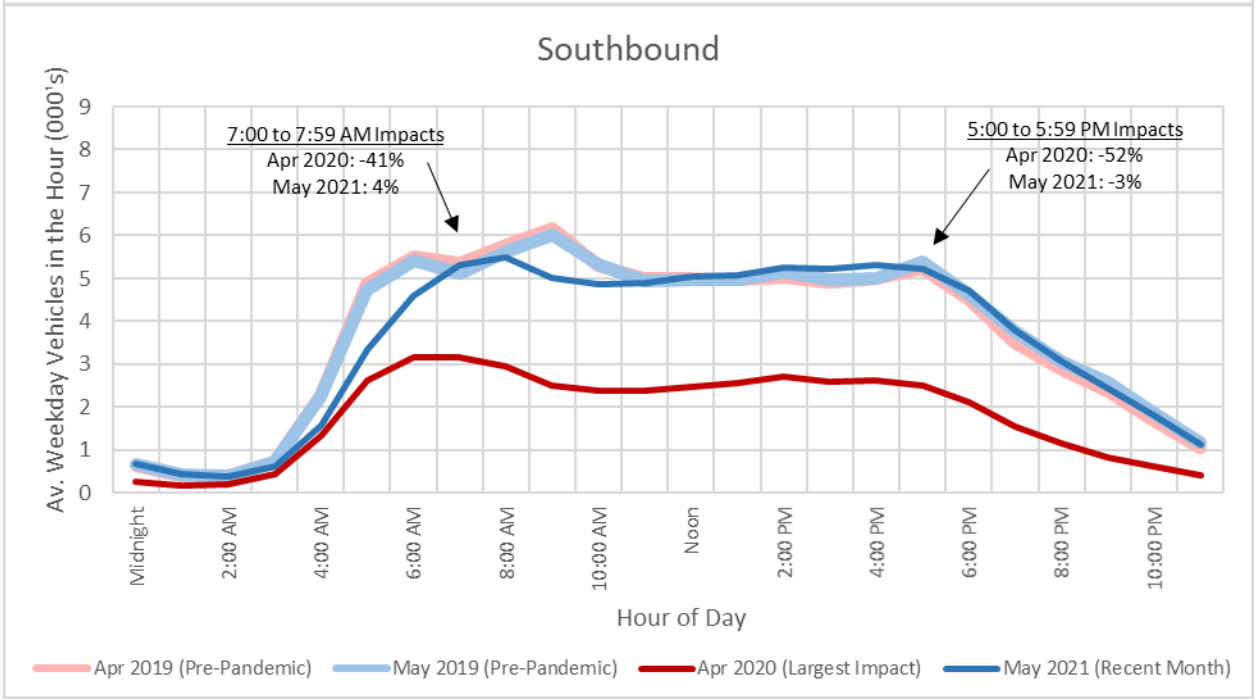
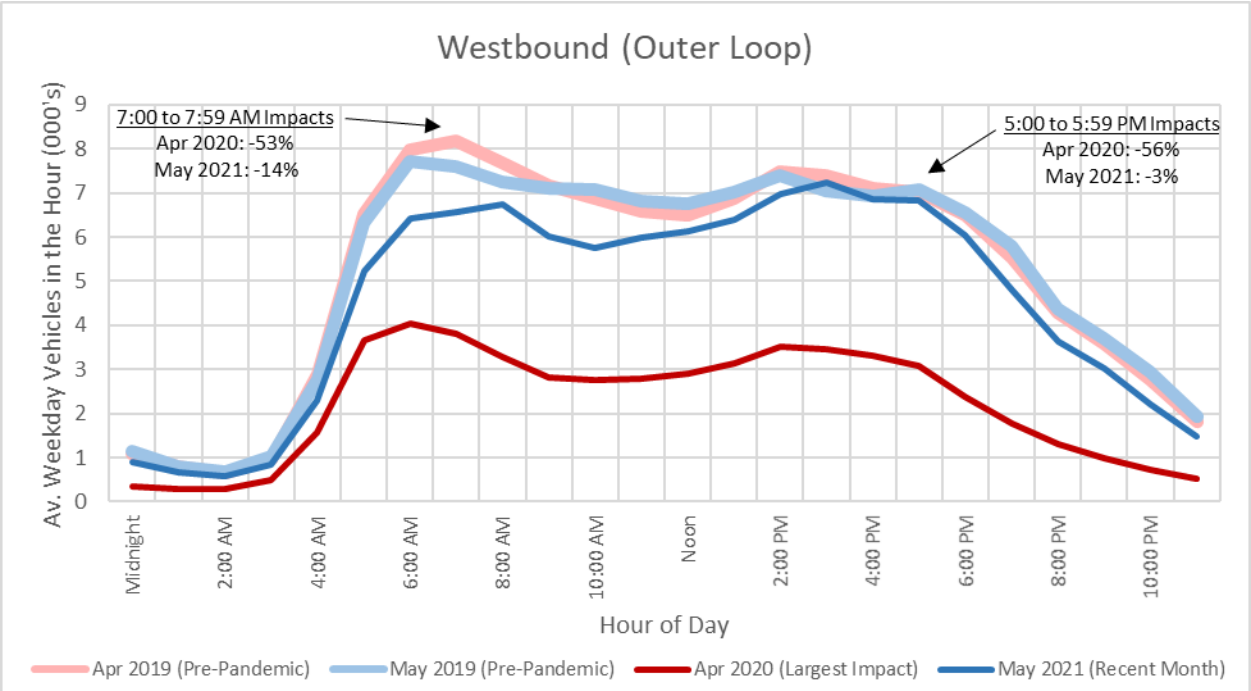


Figure 6 – Average Weekday Hourly Traffic at I-495 ATR Location #40



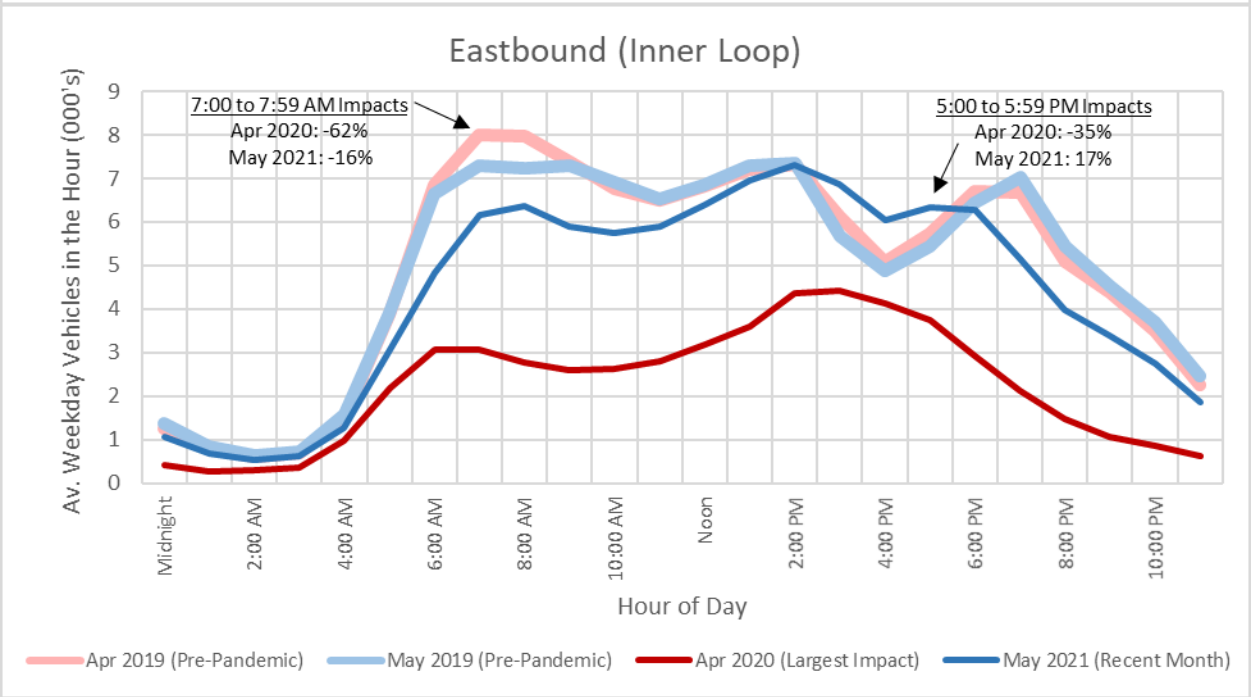
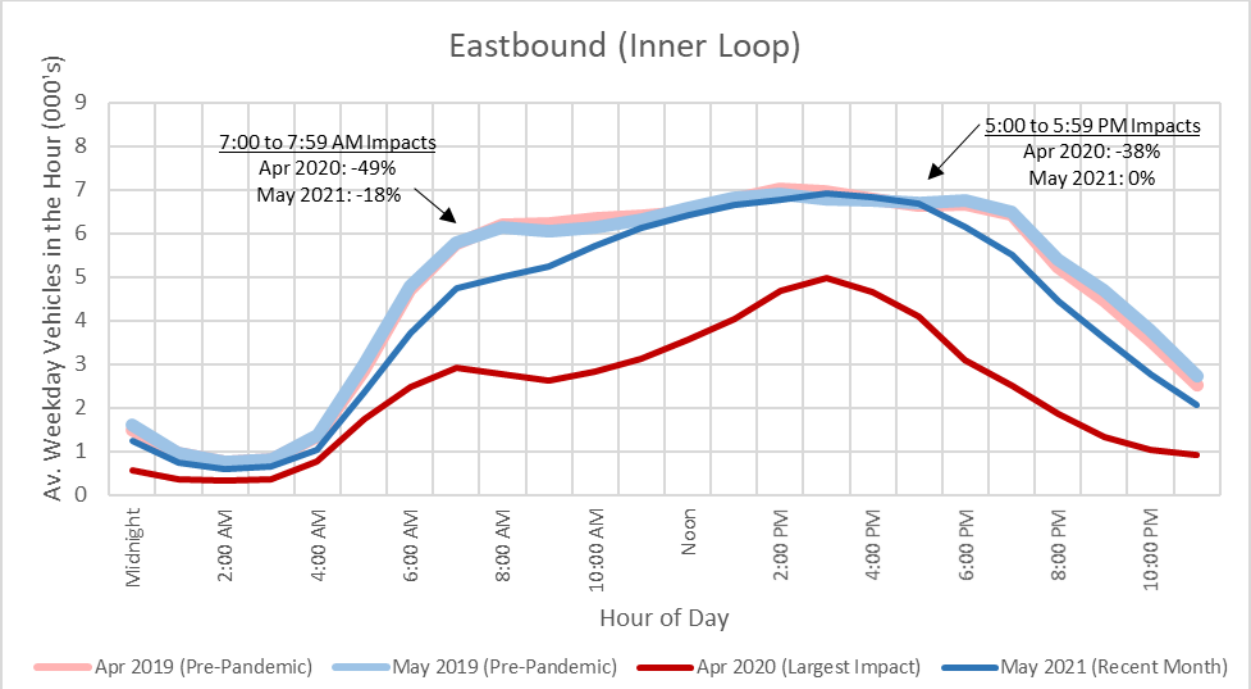


Figure 7 – Average Weekday Hourly Traffic at I-495 ATR Location #41



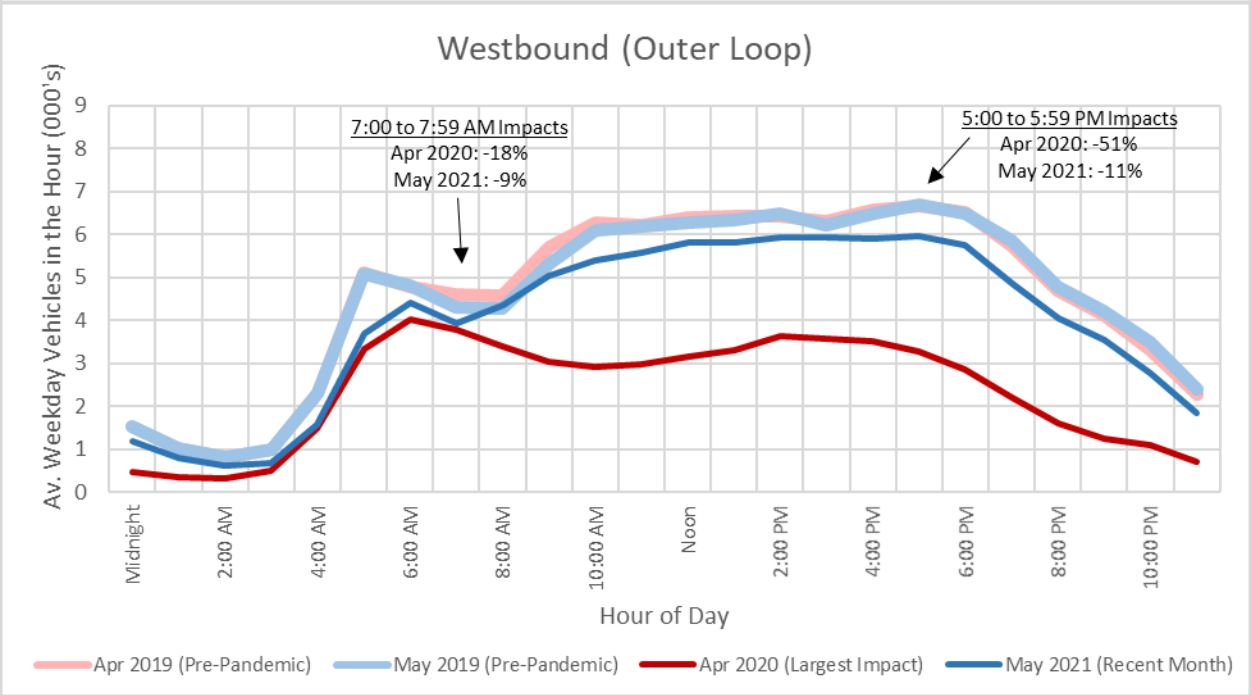
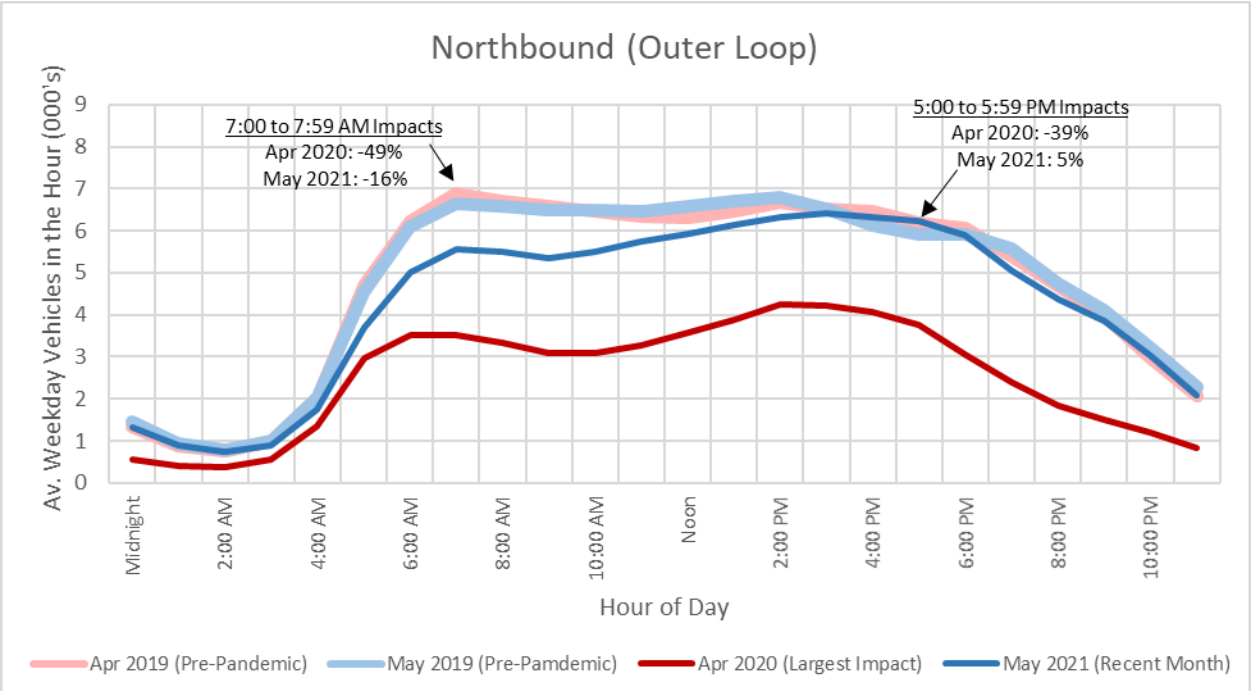


Figure 8 – Average Weekday Hourly Traffic at I-495 ATR Location #55



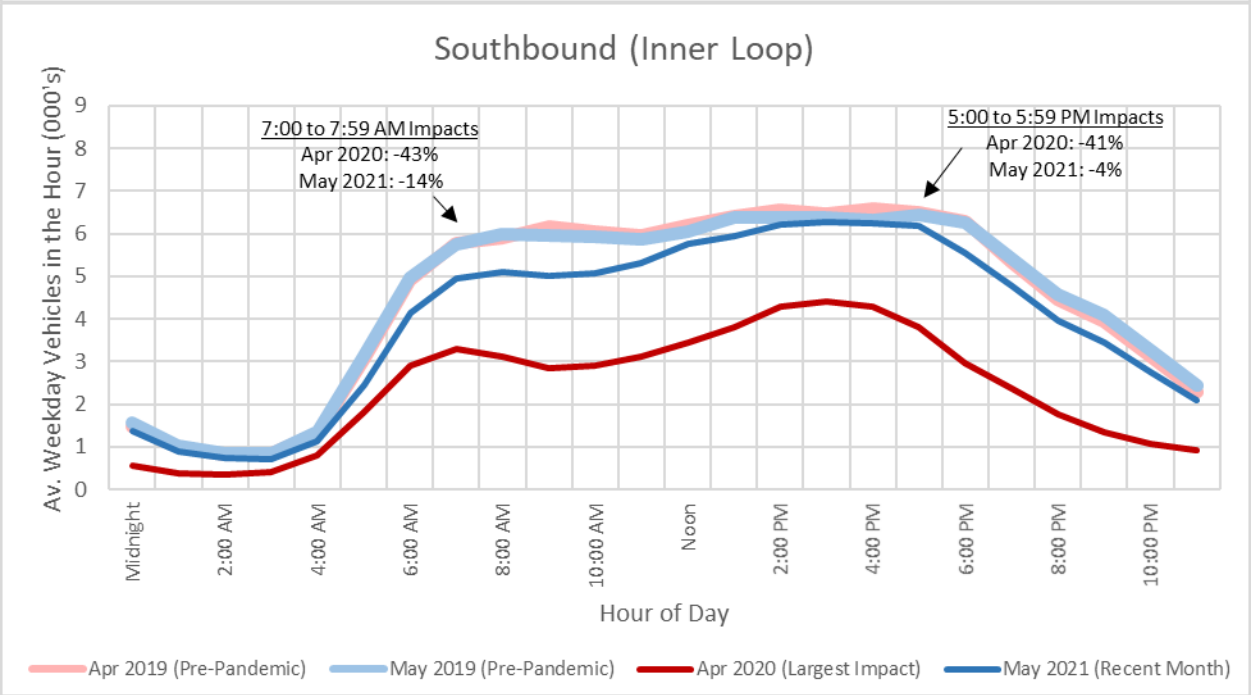
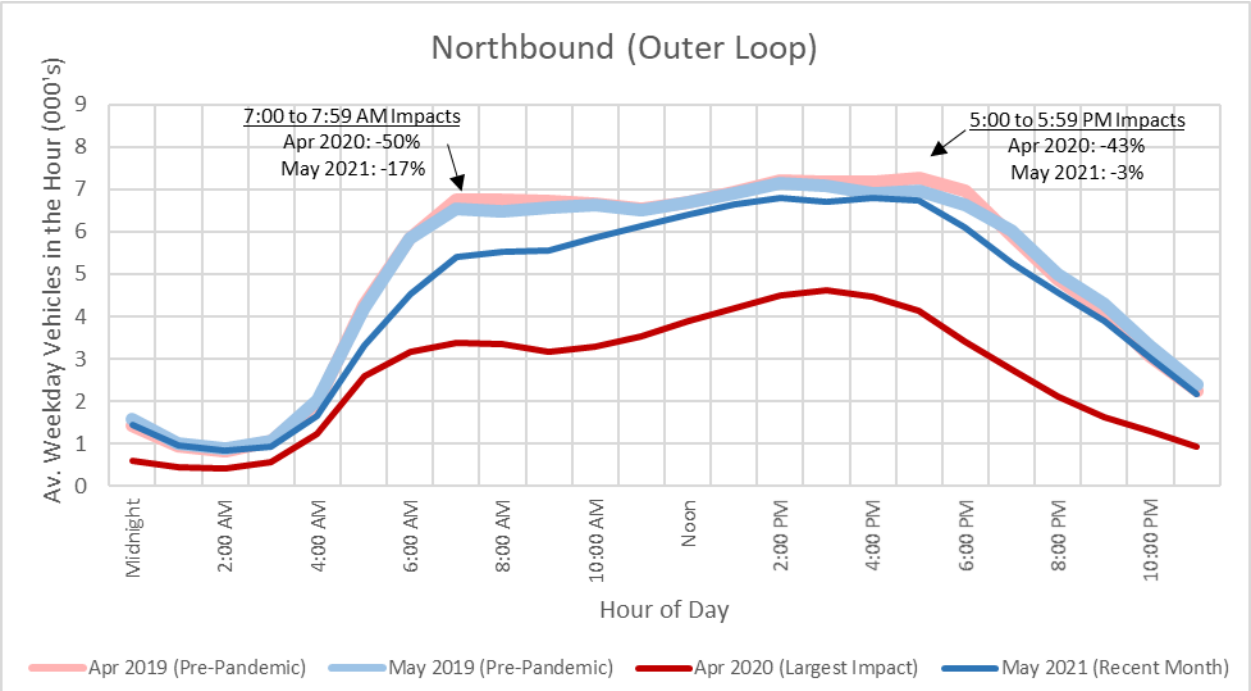


Figure 9 – Average Weekday Hourly Traffic at I-495 ATR Location #43



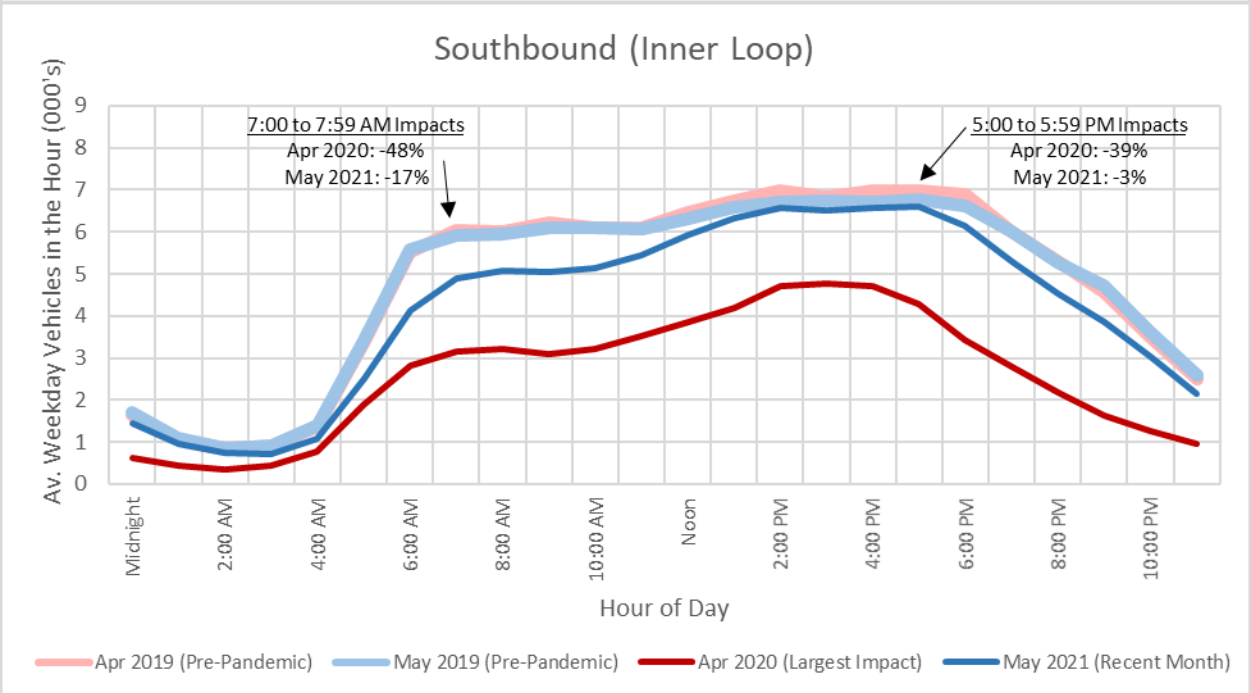
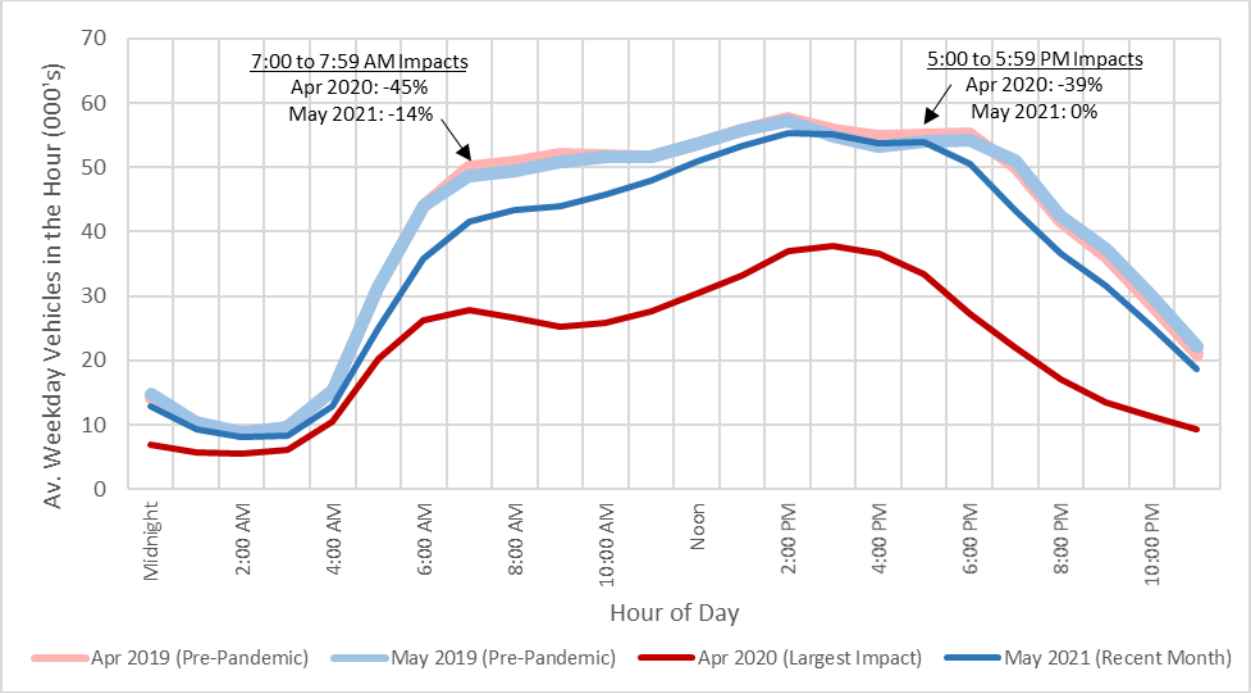


Figure 10 – Average Weekday Hourly Traffic at All ATR Locations in Both Directions



More detailed average weekday results by location and by hour are included in tables in **Appendix A** of this report. Data in these tables since the beginning of the pandemic is shown for key months corresponding to the trends discussed previously on the bottom of page 6 in context of **Table 3.** The data for months since the beginning of the pandemic is compared with the same month pre-pandemic. Both the absolute difference and percentage difference in traffic levels are shown. Note that overall trends listed in the "Total" row of these tables may be different than the results shown previously in **Table 3** due to the different data comparison approaches used as described previously in the Traffic Analysis Methodology section of this report and because the appendix tables include average weekday data and **Table 3** includes data from all days.

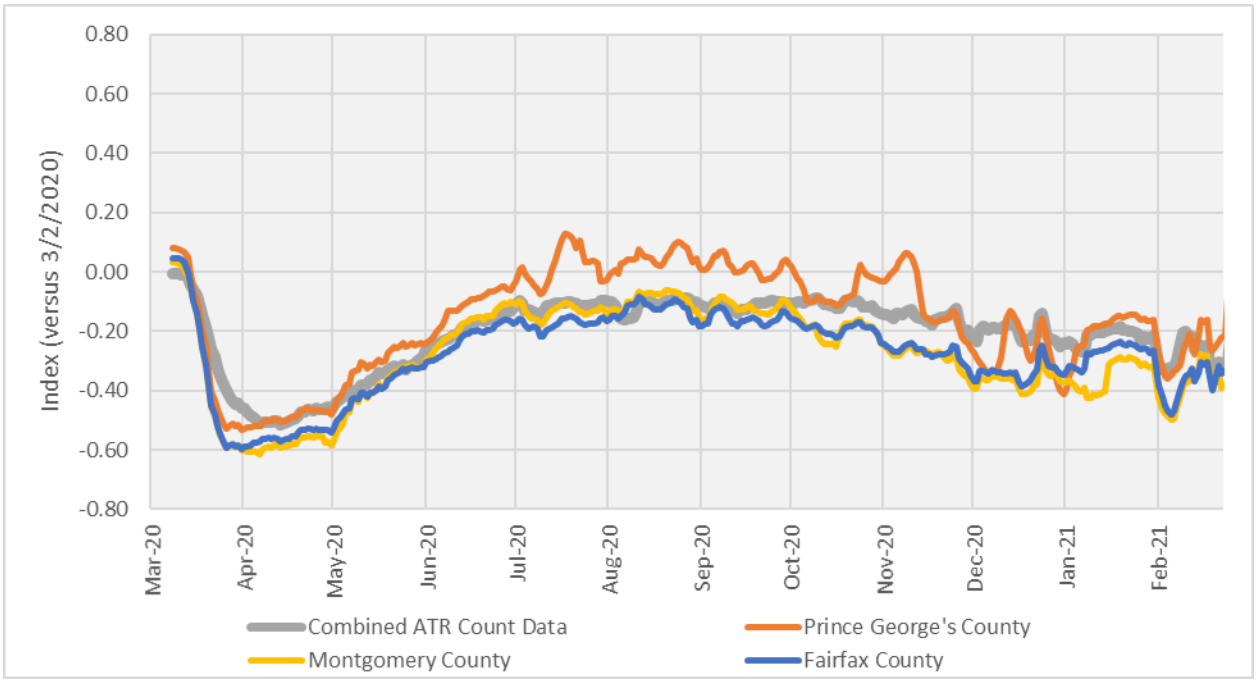
Sample Results from Other Sources

This section provides analysis based on other sources as context to the analysis of ATR data. Because a full year of pre-pandemic data is not available for many of these other sources, comparisons to the ATR data are made in this section based on indexing back to early March 2020.

Streetlight

Figure 11 provides COVID-19 VMT indexed to March 2, 2020 from the transportation analytics provider Streetlight. Streetlight began releasing VMT by county estimates via a map interface for viewing on their website during the pandemic[2]. Only data through February 2021 is shown due to instability in the data observed starting March 2021. Data from Montgomery County, Prince George's County, and Fairfax County is shown. Also, the total combined ATR data indexed to March 2, 2020 is shown for context. The ATR data follows a generally similar pattern to the county-level VMT data.

Figure 11 – Index of Vehicle Miles Traveled by County based on Streetlight Data

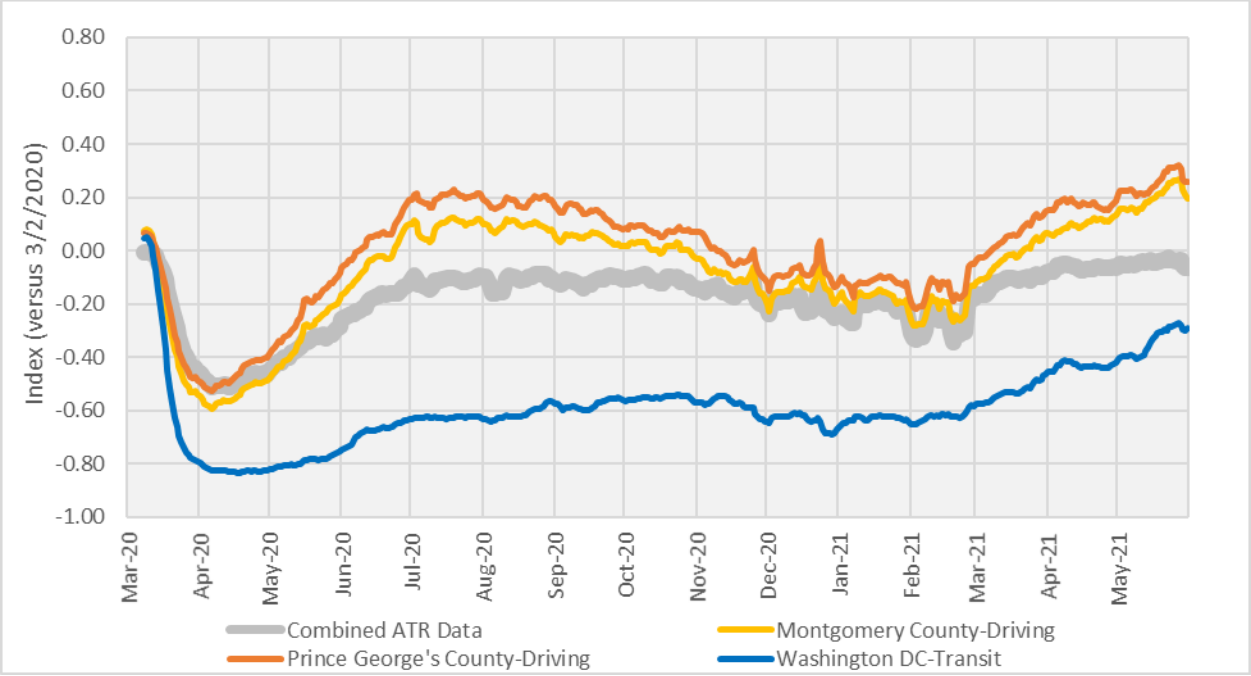


[2] https://www.streetlightdata.com/vmt-monitor-by-county/#emergency-map-response

Apple

Figure 12 shows an index of the frequency of requests for directions in Apple Maps based on data made available by Apple[3]. An index of the combined ATR data is shown for comparison. The direction request trend lines for driving in Montgomery and Prince George's Counties showed more of a recovery than the ATR data starting mid-May 2020 and continued through mid-November, after which the recovery stayed similar to the ATR data through the end of February 2021. Starting March 2021, the trend lines for driving in Montgomery and Prince George's counties showed a much stronger recovery compared to the ATR data. This likely indicates that requests for directions are an imperfect measure of overall travel trends. Requests for directions are likely more weighted toward recreational and leisure-type trips where travelers are more likely to need directions compared to more routine trips. However, it is helpful to see that the overall directions of change are similar. Also, the other trend line on the graphic, the Washington DC transit trend line, is interesting for comparison purposes. Even though the transit trend seems to be recovering since March 2021, it is still lagging below the driving trends. This is similar to reports around the country of transit ridership showing less recovery than driving.

Figure 12 – Index of Frequency of Requests for Directions in Apple Maps



[3] https://www.apple.com/covid19/mobility

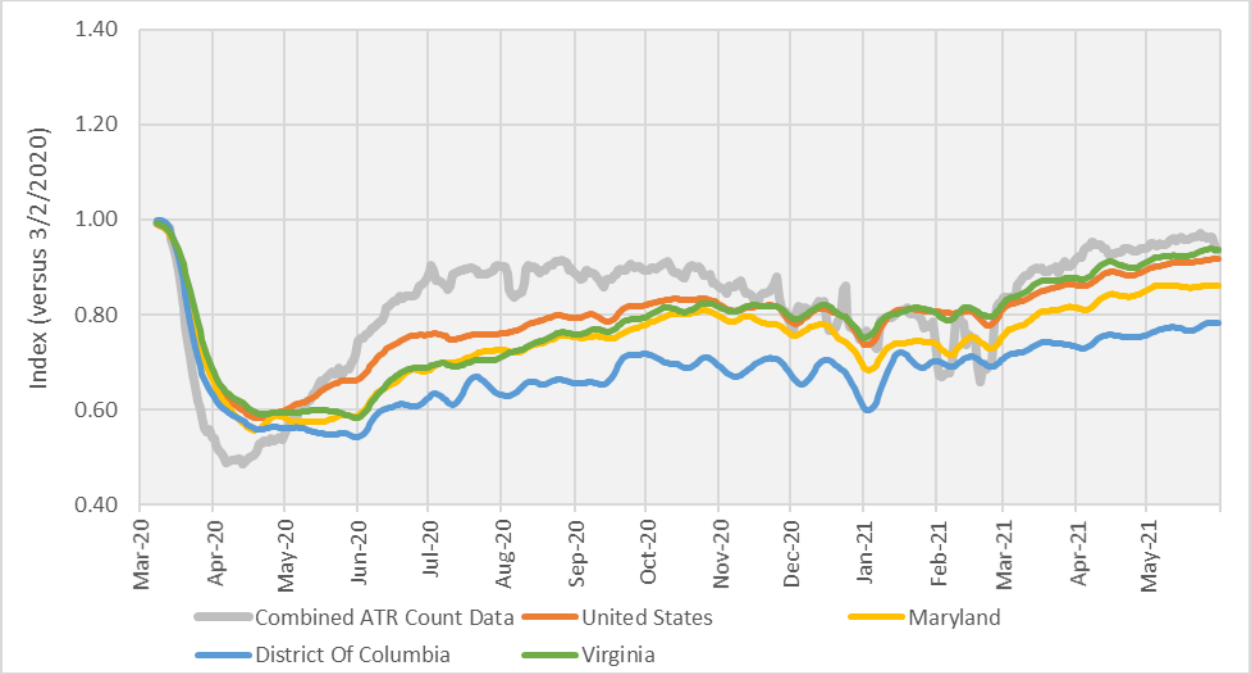
Moody's Back-to-Normal Index

Figure 13 shows the Back-to-Normal Index (BNI) provided by Moody's analytics/CNN Business[4] for U.S., Maryland, Virginia, and Washington, D.C. The index ranges from zero, representing no economic activity, to 100%, representing the economy returning to its pre-pandemic level in 2020. This index is composed of a composite trend of 37 indicators. Some of the key indicators are Moody's GDP model, seated restaurant diners from OpenTable, the Google Workplace Mobility Index, airline traveler throughput from the Transportation Security Administration, small businesses hours worked from Homebase, new home listings from Zillow, petroleum products supplied from the Energy Information Administration, railroad traffic from the Association of American Railroads, unemployment insurance claims, the Purchase Activity Index from Mortgage Bankers Association the Moody's Business Confidence Index, and employment rates from the Bureau of Labor Statistics.

The composite trend is indexed to February 29, 2020 equals one. For the purpose of this report, the composite trend is indexed to March 2, 2020 to maintain consistency with indexing for the other data sources shown in this section. The combined ATR data is also shown in a similar index format for comparison. Both the BNI and ATR data indices showed steep declines through mid-April 2020. The BNI recovery was more gradual than the ATR recovery through November 2020 after which ATR data and BNI indices either decreased slightly or stayed flat due to the increase in COVID-19 cases in the winter months. The recovery again started towards the end of February 2021 and continued through the end of May 2021. Most recently the BNI for Washington D.C. has had less recovery compared to Maryland. Maryland has had less recovery than Virginia and the United States as a whole, which are both tracking closely together.

[4] Official Moody's Analytics Store: Purchase Research & Data Online (economy.com)

Figure 13 – Index of Moody's Back-to-Normal Index



Metropolitan Washington Council of Governments (MWCOG)

A MWCOG presentation titled "COVID-19 Impacts in Metropolitan Washington"[5] from May 6, 2021 is available. The presentation includes several slides discussing the impacts of COVID-19 pandemic on transportation in the Washington D.C. region. The following is stated on slide 16: "Regional traffic volumes, which in April 2020 had dipped below 50% of 2019 volumes, had recovered to over 80% of 2019 volumes by July, and continued a slow recovery through October 2020. Volumes, however, decreased once again region-wide in the following months". The graphic on the same slide shows that there was an impact of -17.2 percent in the month of October 2020 and decreased slightly to a -18.7 percent and -19.3 percent in November and December respectively. The graphic also shows that traffic further declined to -20.9 percent in January 2021 and -26.7 percent in February 2021, compared to the same months in 2020. These trends are similar to the average impacts for all ATR locations by month, as shown previously in **Table 3**.

[5] https://www.mwcog.org/documents/2021/05/21/covid-19-impacts-in-metropolitan-washington-covid19-telework/

Maryland Transportation Authority (MDTA)

Materials for a June 24, 2021 Maryland Transportation Authority (MDTA) board meeting included graphics showing the COVID-19 impacts experienced in the MDTA toll facilities[6]. The estimated COVID-19 impact trend shown for the MDTA Legacy system in May 2021 (the most recent month in the graphic) was about -5 percent for passenger cars and about +5 percent for commercial vehicles. The Legacy system includes seven bridge and tunnel tolling locations around the state of Maryland with the most traveled facilities in Baltimore or on I-95 north of Baltimore. A separate COVID-19 impact trend graphic includes the trend for the Intercounty Connector, a MDTA toll facility mostly in Montgomery County in the northern Washington D.C. suburbs. This facility had an estimated COVID-19 impact of about -20 percent in May 2021. The MDTA Legacy system COVID-19 impact is several percentage points better than that of the total ATR COVID-19 impact in May 2021 of -11 percent for I-495 and I-270 shown previously in **Table 3.** However, the ATR recovery trend is better than the MDTA Intercounty Connector recovery trend.

News Article

A WTOP news article titled "DC region's rush hour traffic is back" [7] published on May 26, 2021 discusses that the afternoon rush hour traffic, on May 21. 2021, on the Capital Beltway near the American Legion Bridge peaked at the highest level since March 2020 and surpassed the 2019 daily average traffic volume. The article also mentions that preliminary data from MDOT indicates that rush hours are different from that pre-pandemic with rush hours starting later, ending earlier and there is more mid-day traffic than before. The trends described in this article are in line with the ATR data analyzed in this report.

* * *

These trends will continue to be closely monitored by CDM Smith. Please reach out to us should you have any questions or concerns.

Sincerely,

Ronald Davis, III
Project Manager
CDM Smith Inc.

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[6] See page 7 of "Electronic Tolling: Post Transition Operations and Traffic & Revenue" section (overall pdf page 60) of: https://mdta.maryland.gov/sites/default/files/Files/Meeting_Schedules/Materials/2021_0624%20-%20REVISED%20Board%20Materials.pdf

[7] https://wtop.com/dc-transit/2021/05/dc-regions-rush-hour-traffic-is-back/

Appendix A

Table A1 – Average Weekday Hourly Traffic Comparison at I-270 Northbound ATR Location #04

	Pre-Pandemic Hourly Traffic (thousands)					Post-Pandemic Hourly Traffic (thousands)					Absolute Difference (thousands)					Percentage Difference				
											Apr 2020 vs.	Jun 2020 vs.	Oct 2020 vs.	Jan 2021 vs.	May 2021 vs.	Apr 2020 vs.	Jun 2020 vs.	Oct 2020 vs.	Jan 2021 vs.	May 2021 vs.
Hour	Apr 2019	May 2019	Jun 2019	Oct 2019	Jan 2020	Apr 2020	Jun 2020	Oct 2020	Jan 2021	May 2021	Apr 2019	Jun 2019	Oct 2019	Jan 2020	May 2019	Apr 2019	Jun 2019	Oct 2019	Jan 2020	May 2019
Midnight	0.6	0.7	0.8	0.7	0.6	0.3	0.5	0.5	0.4	0.6	-0.4	-0.3	-0.2	-0.1	-0.1	-58%	-38%	-25%	-25%	-13%
1:00 AM	0.4	0.4	0.4	0.4	0.4	0.2	0.3	0.3	0.3	0.4	-0.2	-0.1	-0.1	-0.1	0.0	-58%	-34%	-23%	-25%	-8%
2:00 AM	0.3	0.3	0.3	0.3	0.3	0.1	0.2	0.2	0.2	0.3	-0.1	-0.1	-0.1	-0.1	0.0	-50%	-30%	-23%	-26%	-10%
3:00 AM	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.3	-0.1	-0.1	0.0	0.0	0.0	-44%	-23%	-14%	-18%	-12%
4:00 AM	0.5	0.4	0.5	0.5	0.4	0.3	0.4	0.4	0.3	0.4	-0.2	-0.1	0.0	0.0	0.0	-42%	-11%	-10%	-12%	-6%
5:00 AM	1.0	1.0	1.0	1.0	0.8	0.6	1.0	0.9	0.8	1.0	-0.3	0.0	0.0	0.0	0.0	-34%	-5%	-5%	-5%	-3%
6:00 AM	1.8	1.9	1.9	1.8	1.6	1.2	1.7	1.6	1.4	1.8	-0.6	-0.1	-0.2	-0.2	-0.1	-34%	-7%	-10%	-11%	-4%
7:00 AM	2.5	2.5	2.6	2.5	2.3	1.4	2.1	2.2	1.9	2.3	-1.1	-0.5	-0.3	-0.3	-0.2	-45%	-18%	-13%	-15%	-8%
8:00 AM	2.5	2.6	2.7	2.6	2.3	1.2	2.2	2.3	2.1	2.5	-1.3	-0.6	-0.2	-0.2	-0.1	-50%	-20%	-8%	-9%	-5%
9:00 AM	2.7	2.8	2.9	2.7	2.4	1.2	2.4	2.5	2.1	2.7	-1.5	-0.5	-0.1	-0.2	0.0	-54%	-18%	-5%	-9%	-2%
10:00 AM	3.0	3.1	3.2	3.0	2.6	1.4	2.8	2.9	2.4	3.1	-1.6	-0.5	0.0	-0.2	-0.1	-53%	-15%	-2%	-8%	-2%
11:00 AM	3.2	3.4	3.5	3.2	2.9	1.6	3.0	3.2	2.7	3.4	-1.6	-0.5	0.0	-0.2	0.1	-51%	-13%	-1%	-8%	2%
Noon	3.5	3.6	3.7	3.5	3.3	1.8	3.2	3.5	3.0	3.7	-1.7	-0.5	0.0	-0.3	0.1	-48%	-14%	0%	-9%	2%
1:00 PM	4.0	3.9	3.9	3.9	3.8	2.1	3.5	3.8	3.3	3.9	-1.8	-0.4	-0.2	-0.5	0.0	-46%	-10%	-4%	-13%	0%
2:00 PM	4.3	4.3	4.3	4.2	4.2	2.5	3.9	4.2	3.7	4.3	-1.8	-0.4	0.0	-0.6	0.0	-42%	-9%	-1%	-13%	0%
3:00 PM	4.2	4.0	4.0	4.0	4.1	2.6	3.8	4.1	3.7	4.2	-1.6	-0.2	0.1	-0.4	0.2	-38%	-5%	2%	-9%	5%
4:00 PM	4.1	4.0	3.8	4.0	3.9	2.4	3.7	3.9	3.5	4.0	-1.7	-0.2	-0.1	-0.4	0.0	-41%	-5%	-2%	-9%	0%
5:00 PM	4.0	3.9	3.8	4.0	3.8	2.1	3.5	3.8	3.4	3.9	-1.8	-0.3	-0.3	-0.4	0.0	-46%	-8%	-7%	-10%	0%
6:00 PM	3.9	3.8	3.8	3.8	3.5	1.6	2.7	3.2	2.7	3.4	-2.3	-1.1	-0.6	-0.7	-0.4	-59%	-30%	-16%	-21%	-12%
7:00 PM	3.3	3.4	3.3	3.4	3.0	1.2	2.1	2.5	2.0	2.7	-2.1	-1.2	-0.9	-1.0	-0.7	-65%	-38%	-27%	-33%	-20%
8:00 PM	2.5	2.5	2.5	2.5	2.1	0.8	1.6	1.8	1.5	2.2	-1.7	-0.9	-0.7	-0.7	-0.4	-68%	-37%	-27%	-31%	-14%
9:00 PM	2.0	2.0	2.0	1.9	1.7	0.6	1.2	1.4	1.1	1.7	-1.4	-0.8	-0.6	-0.6	-0.3	-71%	-41%	-29%	-37%	-15%
10:00 PM	1.5	1.6	1.6	1.4	1.3	0.5	0.9	1.0	0.8	1.3	-1.0	-0.7	-0.4	-0.4	-0.3	-69%	-43%	-29%	-36%	-19%
11:00 PM	1.0	1.1	1.2	1.0	0.9	0.4	0.7	0.7	0.6	0.9	-0.7	-0.5	-0.3	-0.3	-0.2	-63%	-42%	-28%	-33%	-17%
Total	57.0	57.5	58.0	56.6	52.2	28.3	47.4	51.3	44.1	54.9	-28.6	-10.6	-5.3	-8.1	-2.6	-50%	-18%	-9%	-15%	-5%

Table A2 – Average Weekday Hourly Traffic Comparison at I-270 Southbound ATR Location #04

	Pre-Pandemic Hourly Traffic (thousands)					Post-Pandemic Hourly Traffic (thousands)					Absolute Difference (thousands)					Percentage Difference				
Hour	Apr 2019	May 2019	Jun 2019	Oct 2019	Jan 2020	Apr 2020	Jun 2020	Oct 2020	Jan 2021	May 2021	Apr 2020 vs. Apr 2019	Jun 2020 vs. Jun 2019	Oct 2020 vs. Oct 2019	Jan 2021 vs. Jan 2020	May 2021 vs. May 2019	Apr 2020 vs. Apr 2019	Jun 2020 vs. Jun 2019	Oct 2020 vs. Oct 2019	Jan 2021 vs. Jan 2020	May 2021 vs. May 2019
Midnight	0.4	0.5	0.5	0.4	0.4	0.2	0.4	0.4	0.4	0.5	-0.3	-0.1	0.0	0.0	0.0	-57%	-26%	-6%	-5%	4%
1:00 AM	0.3	0.3	0.4	0.3	0.3	0.1	0.3	0.3	0.3	0.3	-0.2	-0.1	0.0	0.0	0.0	-54%	-23%	-6%	-8%	3%
2:00 AM	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.3	0.3	-0.1	-0.1	0.0	0.0	0.0	-47%	-21%	-11%	-12%	-2%
3:00 AM	0.6	0.5	0.6	0.6	0.5	0.3	0.5	0.5	0.4	0.5	-0.2	-0.1	-0.1	-0.1	-0.1	-41%	-19%	-21%	-21%	-12%
4:00 AM	1.8	1.7	1.7	1.8	1.7	1.0	1.3	1.3	1.1	1.2	-0.8	-0.3	-0.5	-0.6	-0.4	-44%	-20%	-27%	-35%	-26%
5:00 AM	3.4	3.2	3.2	3.4	3.2	1.9	2.5	2.4	2.2	2.4	-1.5	-0.7	-1.0	-1.0	-0.8	-45%	-23%	-28%	-33%	-25%
6:00 AM	3.4	3.4	3.4	3.4	3.2	2.1	2.8	2.9	2.5	3.0	-1.4	-0.6	-0.5	-0.7	-0.4	-40%	-17%	-16%	-22%	-13%
7:00 AM	3.7	3.6	3.6	3.5	3.4	2.1	3.0	3.2	2.8	3.3	-1.6	-0.6	-0.2	-0.6	-0.2	-44%	-16%	-7%	-18%	-7%
8:00 AM	3.7	3.6	3.6	3.6	3.4	1.8	2.8	3.2	2.8	3.3	-1.8	-0.8	-0.4	-0.7	-0.2	-50%	-22%	-12%	-19%	-7%
9:00 AM	3.7	3.6	3.7	3.7	3.4	1.5	2.5	2.9	2.3	3.0	-2.2	-1.2	-0.8	-1.1	-0.6	-59%	-31%	-21%	-33%	-18%
10:00 AM	3.3	3.2	3.3	3.1	3.0	1.5	2.5	2.7	2.3	2.9	-1.8	-0.9	-0.4	-0.7	-0.3	-55%	-26%	-14%	-23%	-10%
11:00 AM	3.1	3.1	3.2	3.0	2.8	1.5	2.5	2.7	2.3	3.0	-1.6	-0.6	-0.3	-0.5	-0.1	-53%	-20%	-9%	-17%	-3%
Noon	3.1	3.1	3.2	3.0	2.9	1.5	2.6	2.9	2.6	3.1	-1.5	-0.5	-0.1	-0.3	0.1	-50%	-17%	-2%	-11%	3%
1:00 PM	3.1	3.1	3.2	3.0	2.9	1.6	2.7	3.0	2.7	3.2	-1.5	-0.5	0.0	-0.2	0.1	-49%	-15%	1%	-7%	5%
2:00 PM	3.1	3.2	3.3	3.1	3.0	1.7	2.9	3.2	2.9	3.4	-1.4	-0.5	0.1	-0.1	0.2	-45%	-14%	4%	-2%	5%
3:00 PM	3.1	3.2	3.2	3.2	3.0	1.7	2.9	3.2	3.0	3.4	-1.5	-0.4	0.1	0.0	0.2	-47%	-11%	2%	-1%	8%
4:00 PM	3.3	3.3	3.4	3.4	3.2	1.7	2.9	3.4	3.0	3.5	-1.6	-0.5	0.0	-0.1	0.2	-48%	-13%	-1%	-4%	7%
5:00 PM	3.5	3.6	3.6	3.6	3.3	1.7	3.0	3.5	3.0	3.5	-1.8	-0.6	-0.1	-0.3	0.0	-52%	-17%	-4%	-8%	-1%
6:00 PM	3.0	3.1	3.2	3.1	2.7	1.4	2.6	3.1	2.5	3.2	-1.6	-0.7	0.0	-0.2	0.1	-53%	-20%	0%	-7%	2%
7:00 PM	2.4	2.6	2.6	2.5	2.1	1.0	2.0	2.5	1.8	2.6	-1.4	-0.6	0.1	-0.3	0.0	-58%	-23%	2%	-15%	1%
8:00 PM	1.9	2.1	2.2	1.9	1.5	0.8	1.6	1.8	1.4	2.1	-1.2	-0.6	-0.1	-0.2	0.0	-60%	-26%	-4%	-12%	1%
9:00 PM	1.6	1.8	1.9	1.5	1.3	0.5	1.3	1.3	1.0	1.7	-1.0	-0.6	-0.2	-0.2	-0.1	-66%	-30%	-14%	-17%	-8%
10:00 PM	1.1	1.3	1.3	1.1	0.9	0.4	0.9	1.0	0.8	1.2	-0.7	-0.4	-0.1	-0.1	-0.1	-64%	-33%	-10%	-11%	-5%
11:00 PM	0.7	0.8	0.9	0.7	0.6	0.3	0.6	0.7	0.5	0.8	-0.4	-0.2	-0.1	-0.1	0.0	-57%	-28%	-7%	-14%	-2%
Total	57.6	58.2	59.6	57.1	53.0	28.4	47.5	52.3	44.8	55.6	-29.2	-12.1	-4.8	-8.2	-2.5	-51%	-20%	-8%	-15%	-4%

Table A3 – Average Weekday Hourly Traffic Comparison at I-270 Northbound ATR Location #60

Hour	Pre-Pandemic Hourly Traffic (thousands)					Post-Pandemic Hourly Traffic (thousands)					Absolute Difference (thousands)					Percentage Difference				
	Apr 2019	May 2019	Jun 2019	Oct 2019	Jan 2020	Apr 2020	Jun 2020	Oct 2020	Jan 2021	May 2021	Apr 2020 vs. Apr 2019	Jun 2020 vs. Jun 2019	Oct 2020 vs. Oct 2019	Jan 2021 vs. Jan 2020	May 2021 vs. May 2019	Apr 2020 vs. Apr 2019	Jun 2020 vs. Jun 2019	Oct 2020 vs. Oct 2019	Jan 2021 vs. Jan 2020	May 2021 vs. May 2019
Midnight	1.1	1.2	1.3	1.2	1.0	0.4	0.7	0.9	0.7	1.0	-0.7	-0.6	-0.4	-0.3	-0.2	-63%	-44%	-31%	-33%	-16%
1:00 AM	0.7	0.7	0.8	0.7	0.6	0.2	0.4	0.5	0.4	0.6	-0.4	-0.3	-0.2	-0.2	-0.1	-66%	-43%	-30%	-34%	-12%
2:00 AM	0.5	0.5	0.5	0.5	0.5	0.2	0.3	0.4	0.3	0.4	-0.3	-0.2	-0.1	-0.2	-0.1	-57%	-37%	-27%	-35%	-12%
3:00 AM	0.4	0.4	0.5	0.4	0.4	0.2	0.3	0.4	0.3	0.4	-0.2	-0.2	-0.1	-0.1	-0.1	-48%	-32%	-18%	-28%	-12%
4:00 AM	0.6	0.6	0.6	0.6	0.5	0.3	0.5	0.5	0.4	0.5	-0.3	-0.1	-0.1	-0.1	-0.1	-42%	-18%	-15%	-22%	-15%
5:00 AM	1.3	1.4	1.4	1.3	1.1	0.8	1.2	1.1	0.9	1.1	-0.5	-0.2	-0.2	-0.1	-0.2	-36%	-14%	-15%	-14%	-18%
6:00 AM	2.4	2.5	2.5	2.3	2.0	1.5	2.1	2.0	1.7	2.1	-0.8	-0.3	-0.4	-0.3	-0.3	-36%	-14%	-16%	-16%	-12%
7:00 AM	3.5	3.6	3.7	3.6	3.2	1.9	2.9	3.0	2.5	3.2	-1.6	-0.8	-0.6	-0.7	-0.4	-45%	-23%	-17%	-22%	-11%
8:00 AM	3.9	4.0	4.2	4.1	3.7	1.9	3.1	3.5	2.8	3.7	-2.0	-1.1	-0.7	-0.8	-0.3	-51%	-26%	-16%	-23%	-8%
9:00 AM	4.1	4.2	4.4	4.2	3.7	1.9	3.4	3.7	2.8	4.0	-2.2	-1.0	-0.5	-0.9	-0.2	-54%	-23%	-12%	-24%	-4%
10:00 AM	4.4	4.5	4.7	4.5	3.9	2.1	3.9	4.2	3.1	4.4	-2.3	-0.9	-0.3	-0.8	-0.1	-51%	-19%	-6%	-19%	-2%
11:00 AM	4.8	4.9	5.1	4.8	4.3	2.4	4.3	4.7	3.6	5.0	-2.4	-0.8	-0.1	-0.7	0.1	-49%	-16%	-3%	-17%	2%
Noon	5.4	5.5	5.6	5.5	5.0	2.9	4.8	5.3	4.2	5.5	-2.5	-0.8	-0.2	-0.9	0.1	-46%	-14%	-3%	-18%	2%
1:00 PM	6.0	6.0	6.1	6.1	5.8	3.3	5.2	5.7	4.7	6.0	-2.6	-0.9	-0.4	-1.1	0.0	-44%	-15%	-6%	-19%	0%
2:00 PM	6.7	6.7	6.7	6.7	6.6	3.8	5.8	6.4	5.3	6.5	-2.8	-0.9	-0.3	-1.3	-0.2	-43%	-13%	-4%	-19%	-3%
3:00 PM	6.6	6.5	6.6	6.7	6.7	4.0	5.9	6.6	5.5	6.8	-2.6	-0.7	-0.1	-1.2	0.2	-39%	-10%	-1%	-17%	4%
4:00 PM	6.4	6.2	6.1	6.3	6.2	3.9	5.9	6.5	5.0	6.3	-2.4	-0.3	0.2	-1.2	0.1	-38%	-5%	3%	-19%	2%
5:00 PM	6.3	6.2	6.1	6.3	6.0	3.6	5.7	6.3	4.7	6.4	-2.7	-0.4	0.0	-1.3	0.2	-43%	-7%	0%	-21%	3%
6:00 PM	6.4	6.3	6.3	6.3	5.9	2.7	4.4	5.4	3.4	5.8	-3.7	-1.9	-0.8	-2.5	-0.5	-58%	-30%	-13%	-42%	-9%
7:00 PM	5.7	5.8	5.6	5.8	5.3	2.0	3.5	4.5	2.8	4.7	-3.6	-2.1	-1.3	-2.4	-1.0	-64%	-37%	-23%	-46%	-18%
8:00 PM	4.6	4.5	4.5	4.6	4.0	1.5	2.7	3.3	2.1	3.9	-3.1	-1.7	-1.3	-1.9	-0.6	-68%	-38%	-28%	-48%	-13%
9:00 PM	3.8	3.7	3.9	3.6	3.2	1.0	2.1	2.5	1.5	3.1	-2.7	-1.8	-1.2	-1.8	-0.6	-72%	-47%	-33%	-54%	-16%
10:00 PM	2.8	3.0	3.1	2.7	2.4	0.8	1.5	1.8	1.2	2.3	-2.0	-1.5	-0.9	-1.3	-0.6	-73%	-50%	-35%	-52%	-22%
11:00 PM	1.9	2.0	2.2	1.9	1.7	0.6	1.1	1.3	1.0	1.6	-1.3	-1.0	-0.7	-0.7	-0.4	-67%	-47%	-33%	-41%	-20%
Total	90.1	90.9	92.6	90.9	83.7	44.3	71.9	80.3	61.0	85.6	-45.8	-20.7	-10.6	-22.7	-5.3	-51%	-22%	-12%	-27%	-6%

Table A4 – Average Weekday Hourly Traffic Comparison at I-270 Southbound ATR Location #60

Hour	Pre-Pandemic Hourly Traffic (thousands)					Post-Pandemic Hourly Traffic (thousands)					Absolute Difference (thousands)					Percentage Difference				
	Apr 2019	May 2019	Jun 2019	Oct 2019	Jan 2020	Apr 2020	Jun 2020	Oct 2020	Jan 2021	May 2021	Apr 2020 vs. Apr 2019	Jun 2020 vs. Jun 2019	Oct 2020 vs. Oct 2019	Jan 2021 vs. Jan 2020	May 2021 vs. May 2019	Apr 2020 vs. Apr 2019	Jun 2020 vs. Jun 2019	Oct 2020 vs. Oct 2019	Jan 2021 vs. Jan 2020	May 2021 vs. May 2019
Midnight	0.6	0.7	0.7	0.6	0.6	0.3	0.5	0.6	0.5	0.7	-0.4	-0.2	0.0	-0.1	0.0	-60%	-30%	-6%	-13%	2%
1:00 AM	0.4	0.4	0.5	0.4	0.4	0.2	0.4	0.4	0.4	0.4	-0.2	-0.1	0.0	0.0	0.0	-54%	-23%	-5%	-12%	5%
2:00 AM	0.4	0.4	0.4	0.4	0.4	0.2	0.4	0.4	0.3	0.4	-0.2	-0.1	0.0	-0.1	0.0	-45%	-19%	-9%	-13%	-3%
3:00 AM	0.7	0.7	0.8	0.8	0.7	0.4	0.6	0.6	0.6	0.6	-0.3	-0.2	-0.2	-0.1	-0.1	-39%	-22%	-21%	-19%	-15%
4:00 AM	2.3	2.3	2.3	2.3	2.2	1.3	1.7	1.7	1.5	1.6	-0.9	-0.5	-0.6	-0.7	-0.7	-42%	-23%	-28%	-34%	-30%
5:00 AM	4.9	4.7	4.7	4.9	4.6	2.6	3.5	3.4	3.0	3.4	-2.3	-1.2	-1.6	-1.6	-1.4	-46%	-26%	-32%	-34%	-29%
6:00 AM	5.5	5.4	5.4	5.6	5.2	3.1	4.4	4.4	3.9	4.6	-2.4	-1.1	-1.2	-1.3	-0.8	-43%	-19%	-21%	-25%	-15%
7:00 AM	5.4	5.1	5.4	5.4	5.2	3.2	4.6	5.1	4.5	5.3	-2.2	-0.8	-0.3	-0.7	0.2	-41%	-15%	-6%	-13%	4%
8:00 AM	5.8	5.6	5.7	5.9	5.6	3.0	4.5	5.3	4.6	5.5	-2.8	-1.2	-0.7	-0.9	-0.1	-49%	-21%	-11%	-17%	-2%
9:00 AM	6.2	6.0	6.1	6.2	5.6	2.5	4.1	4.7	3.9	5.0	-3.7	-1.9	-1.5	-1.7	-1.0	-60%	-32%	-24%	-30%	-16%
10:00 AM	5.3	5.3	5.5	5.4	5.0	2.4	4.0	4.4	3.8	4.9	-2.9	-1.5	-0.9	-1.2	-0.5	-55%	-27%	-18%	-24%	-9%
11:00 AM	5.0	4.9	5.2	5.0	4.7	2.4	4.0	4.4	3.8	4.9	-2.6	-1.2	-0.6	-0.9	-0.1	-52%	-23%	-12%	-20%	-1%
Noon	5.0	5.0	5.2	5.0	4.7	2.5	4.2	4.7	4.0	5.0	-2.5	-1.1	-0.4	-0.8	0.1	-51%	-20%	-7%	-16%	1%
1:00 PM	5.0	5.0	5.2	5.0	4.7	2.6	4.2	4.7	4.1	5.1	-2.4	-1.0	-0.3	-0.6	0.1	-48%	-19%	-6%	-12%	2%
2:00 PM	5.0	5.2	5.3	5.1	4.8	2.7	4.4	4.9	4.3	5.3	-2.3	-0.9	-0.2	-0.5	0.1	-46%	-17%	-4%	-10%	2%
3:00 PM	4.9	5.0	5.1	5.1	4.7	2.6	4.2	4.9	4.3	5.2	-2.3	-0.9	-0.2	-0.4	0.3	-47%	-17%	-4%	-9%	6%
4:00 PM	5.0	5.0	5.2	5.3	4.8	2.6	4.2	5.1	4.3	5.3	-2.4	-1.0	-0.2	-0.5	0.3	-48%	-19%	-4%	-11%	6%
5:00 PM	5.3	5.4	5.5	5.6	5.1	2.5	4.1	5.1	4.2	5.2	-2.8	-1.4	-0.5	-0.8	-0.2	-52%	-25%	-9%	-17%	-3%
6:00 PM	4.5	4.6	4.8	4.8	4.2	2.1	3.5	4.6	3.5	4.7	-2.4	-1.3	-0.2	-0.7	0.1	-53%	-28%	-4%	-17%	1%
7:00 PM	3.5	3.8	3.9	3.7	3.2	1.5	2.8	3.6	2.5	3.8	-2.0	-1.1	-0.2	-0.6	0.0	-56%	-29%	-5%	-20%	1%
8:00 PM	2.9	3.1	3.2	2.8	2.4	1.2	2.3	2.6	1.9	3.1	-1.7	-0.9	-0.2	-0.5	0.0	-60%	-29%	-8%	-20%	1%
9:00 PM	2.4	2.6	2.7	2.3	2.0	0.8	1.8	1.9	1.5	2.4	-1.5	-0.9	-0.4	-0.5	-0.1	-65%	-34%	-17%	-25%	-5%
10:00 PM	1.7	1.9	2.0	1.7	1.4	0.6	1.2	1.5	1.2	1.8	-1.0	-0.7	-0.2	-0.3	0.0	-62%	-37%	-13%	-18%	-3%
11:00 PM	1.0	1.2	1.2	1.0	1.0	0.4	0.8	0.9	0.8	1.1	-0.6	-0.4	-0.1	-0.2	0.0	-61%	-35%	-8%	-20%	-2%
Total	88.5	89.2	92.0	90.6	83.1	43.8	70.3	79.9	67.4	85.4	-44.8	-21.7	-10.7	-15.7	-3.8	-51%	-24%	-12%	-19%	-4%

Table A5 – Average Weekday Hourly Traffic Comparison at I-495 Eastbound (Inner Loop)
ATR Location #40

	Pre-Pandemic Hourly Traffic (thousands)					Post-Pandemic Hourly Traffic (thousands)					Absolute Difference (thousands)					Percentage Difference				
Hour	Apr 2019	May 2019	Jun 2019	Oct 2019	Jan 2020	Apr 2020	Jun 2020	Oct 2020	Jan 2021	May 2021	Apr 2020 vs. Apr 2019	Jun 2020 vs. Jun 2019	Oct 2020 vs. Oct 2019	Jan 2021 vs. Jan 2020	May 2021 vs. May 2019	Apr 2020 vs. Apr 2019	Jun 2020 vs. Jun 2019	Oct 2020 vs. Oct 2019	Jan 2021 vs. Jan 2020	May 2021 vs. May 2019
Midnight	1.3	1.4	1.5	1.3	1.1	0.4	0.7	0.8	0.8	1.1	-0.8	-0.7	-0.5	-0.3	-0.3	-68%	-50%	-36%	-29%	-22%
1:00 AM	0.8	0.8	0.9	0.7	0.7	0.3	0.5	0.5	0.5	0.7	-0.5	-0.4	-0.2	-0.2	-0.2	-64%	-46%	-25%	-33%	-21%
2:00 AM	0.6	0.6	0.7	0.6	0.6	0.3	0.4	0.5	0.4	0.5	-0.3	-0.3	-0.1	-0.2	-0.1	-52%	-38%	-18%	-29%	-17%
3:00 AM	0.7	0.7	0.7	0.7	0.7	0.4	0.5	0.6	0.5	0.6	-0.3	-0.2	-0.1	-0.1	-0.1	-48%	-30%	-14%	-21%	-15%
4:00 AM	1.5	1.6	1.7	1.7	1.5	1.0	1.2	1.3	1.2	1.3	-0.5	-0.5	-0.4	-0.3	-0.3	-35%	-31%	-22%	-19%	-19%
5:00 AM	3.9	3.9	4.0	4.0	3.6	2.2	2.9	3.0	2.7	3.1	-1.7	-1.1	-0.9	-0.9	-0.9	-44%	-27%	-23%	-24%	-22%
6:00 AM	6.8	6.6	6.9	6.6	6.1	3.1	4.2	4.4	4.1	4.8	-3.8	-2.7	-2.2	-1.9	-1.8	-55%	-39%	-33%	-32%	-27%
7:00 AM	8.0	7.3	7.9	7.9	7.4	3.1	4.5	5.5	5.0	6.2	-4.9	-3.4	-2.4	-2.3	-1.1	-62%	-43%	-31%	-32%	-16%
8:00 AM	8.0	7.2	7.8	7.8	7.3	2.8	4.5	5.7	5.3	6.4	-5.2	-3.3	-2.2	-2.0	-0.9	-65%	-43%	-28%	-28%	-12%
9:00 AM	7.4	7.3	7.3	7.2	6.8	2.6	4.4	5.2	4.7	5.9	-4.8	-2.8	-2.0	-2.1	-1.4	-65%	-39%	-28%	-31%	-19%
10:00 AM	6.8	6.9	6.9	6.4	6.0	2.6	4.6	5.0	4.5	5.7	-4.1	-2.3	-1.4	-1.5	-1.2	-61%	-34%	-22%	-25%	-17%
11:00 AM	6.5	6.5	6.5	6.1	5.8	2.8	4.8	5.2	4.6	5.9	-3.7	-1.7	-0.9	-1.1	-0.6	-57%	-26%	-15%	-20%	-10%
Noon	6.8	6.8	6.8	6.5	6.4	3.2	5.3	5.8	5.1	6.4	-3.6	-1.6	-0.7	-1.3	-0.5	-53%	-23%	-11%	-20%	-7%
1:00 PM	7.2	7.3	7.3	6.7	7.1	3.6	5.9	6.4	5.8	6.9	-3.6	-1.3	-0.3	-1.3	-0.3	-50%	-18%	-4%	-19%	-5%
2:00 PM	7.3	7.3	7.2	7.2	7.3	4.4	6.8	7.2	6.8	7.3	-3.0	-0.4	0.0	-0.5	0.0	-40%	-6%	0%	-6%	-1%
3:00 PM	6.1	5.7	5.8	6.6	6.7	4.4	6.5	7.0	6.8	6.9	-1.7	0.7	0.4	0.1	1.2	-28%	12%	6%	2%	21%
4:00 PM	5.1	4.9	5.1	5.7	6.2	4.1	6.3	6.4	6.4	6.0	-1.0	1.2	0.7	0.2	1.2	-19%	23%	12%	4%	24%
5:00 PM	5.7	5.4	5.7	6.2	6.2	3.7	5.8	6.6	6.0	6.3	-2.0	0.1	0.4	-0.1	0.9	-35%	2%	6%	-2%	17%
6:00 PM	6.7	6.5	6.7	6.8	6.3	2.9	4.9	5.8	5.0	6.3	-3.8	-1.7	-1.0	-1.3	-0.2	-56%	-26%	-14%	-20%	-3%
7:00 PM	6.7	7.0	7.0	6.4	5.6	2.1	3.8	4.7	3.7	5.2	-4.5	-3.1	-1.7	-1.9	-1.9	-68%	-45%	-27%	-34%	-27%
8:00 PM	5.1	5.4	5.4	4.9	4.2	1.5	2.8	3.4	2.7	4.0	-3.6	-2.6	-1.5	-1.5	-1.4	-71%	-48%	-31%	-35%	-27%
9:00 PM	4.4	4.5	4.6	4.0	3.6	1.1	2.1	2.6	2.2	3.4	-3.3	-2.5	-1.3	-1.4	-1.1	-75%	-54%	-34%	-39%	-25%
10:00 PM	3.5	3.7	3.8	3.1	2.8	0.9	1.7	2.1	1.8	2.8	-2.6	-2.1	-1.1	-1.0	-1.0	-75%	-55%	-34%	-37%	-26%
11:00 PM	2.3	2.5	2.7	2.2	1.8	0.6	1.2	1.4	1.2	1.9	-1.6	-1.5	-0.7	-0.6	-0.6	-72%	-56%	-34%	-31%	-24%
Total	119.0	118.1	120.9	117.3	111.6	54.0	86.6	97.2	88.1	105.4	-65.0	-34.4	-20.1	-23.5	-12.7	-55%	-28%	-17%	-21%	-11%

Table A6 – Average Weekday Hourly Traffic Comparison at I-495 Westbound (Outer Loop)
ATR Location #40

	Pre-Pandemic Hourly Traffic (thousands)					Post-Pandemic Hourly Traffic (thousands)					Absolute Difference (thousands)					Percentage Difference				
Hour	Apr 2019	May 2019	Jun 2019	Oct 2019	Jan 2020	Apr 2020	Jun 2020	Oct 2020	Jan 2021	May 2021	Apr 2020 vs. Apr 2019	Jun 2020 vs. Jun 2019	Oct 2020 vs. Oct 2019	Jan 2021 vs. Jan 2020	May 2021 vs. May 2019	Apr 2020 vs. Apr 2019	Jun 2020 vs. Jun 2019	Oct 2020 vs. Oct 2019	Jan 2021 vs. Jan 2020	May 2021 vs. May 2019
Midnight	1.1	1.1	1.2	1.0	0.9	0.3	0.6	0.7	0.6	0.9	-0.8	-0.6	-0.3	-0.3	-0.2	-69%	-49%	-30%	-31%	-21%
1:00 AM	0.8	0.8	0.8	0.7	0.7	0.3	0.4	0.5	0.5	0.7	-0.5	-0.4	-0.2	-0.2	-0.1	-64%	-47%	-25%	-33%	-17%
2:00 AM	0.7	0.7	0.7	0.6	0.6	0.3	0.4	0.5	0.4	0.6	-0.4	-0.3	-0.1	-0.2	-0.1	-54%	-42%	-24%	-28%	-16%
3:00 AM	1.0	1.0	1.1	1.0	1.0	0.5	0.7	0.8	0.7	0.8	-0.5	-0.4	-0.2	-0.2	-0.2	-49%	-37%	-22%	-24%	-18%
4:00 AM	2.9	2.8	3.0	2.9	2.8	1.6	2.1	2.2	2.0	2.3	-1.3	-0.9	-0.7	-0.8	-0.5	-46%	-29%	-23%	-27%	-17%
5:00 AM	6.5	6.3	6.7	6.4	6.0	3.7	4.8	5.0	4.5	5.2	-2.9	-2.0	-1.4	-1.5	-1.1	-44%	-29%	-22%	-26%	-17%
6:00 AM	8.0	7.7	8.1	7.5	6.9	4.0	5.3	5.7	5.2	6.4	-3.9	-2.8	-1.8	-1.7	-1.3	-49%	-35%	-24%	-24%	-17%
7:00 AM	8.2	7.6	8.2	8.0	7.5	3.8	5.4	6.1	5.5	6.6	-4.4	-2.8	-1.9	-2.0	-1.0	-53%	-34%	-23%	-26%	-14%
8:00 AM	7.7	7.3	7.8	7.7	7.0	3.3	4.9	6.1	5.5	6.7	-4.4	-2.8	-1.7	-1.5	-0.5	-57%	-36%	-21%	-22%	-7%
9:00 AM	7.2	7.1	7.4	7.3	6.0	2.8	4.6	5.5	4.8	6.0	-4.4	-2.8	-1.8	-1.2	-1.1	-61%	-38%	-25%	-20%	-15%
10:00 AM	6.9	7.1	7.3	7.0	5.7	2.8	4.6	5.2	4.6	5.8	-4.1	-2.7	-1.7	-1.0	-1.3	-60%	-37%	-25%	-18%	-19%
11:00 AM	6.6	6.8	7.1	6.5	5.7	2.8	4.7	5.3	4.7	6.0	-3.8	-2.4	-1.2	-0.9	-0.8	-58%	-34%	-18%	-17%	-12%
Noon	6.5	6.8	6.9	6.4	5.8	2.9	4.9	5.5	5.1	6.1	-3.6	-2.1	-0.9	-0.7	-0.6	-55%	-30%	-14%	-12%	-9%
1:00 PM	6.9	7.0	7.1	6.8	6.0	3.1	5.1	5.8	5.3	6.4	-3.7	-2.0	-1.0	-0.6	-0.6	-55%	-28%	-14%	-11%	-9%
2:00 PM	7.5	7.4	7.2	7.4	6.8	3.5	5.7	6.5	5.9	7.0	-4.0	-1.5	-0.9	-0.8	-0.4	-53%	-21%	-13%	-13%	-6%
3:00 PM	7.4	7.1	7.1	7.3	7.0	3.4	5.7	6.9	6.3	7.2	-3.9	-1.4	-0.4	-0.6	0.2	-53%	-20%	-6%	-9%	3%
4:00 PM	7.1	6.9	7.0	7.0	6.5	3.3	5.5	6.6	6.0	6.9	-3.8	-1.5	-0.4	-0.4	-0.1	-54%	-21%	-5%	-7%	-1%
5:00 PM	7.0	7.1	7.2	6.7	6.6	3.1	5.3	6.5	5.9	6.8	-3.9	-1.9	-0.3	-0.7	-0.2	-56%	-26%	-4%	-11%	-3%
6:00 PM	6.5	6.6	6.8	6.5	6.1	2.4	4.1	5.6	4.7	6.0	-4.1	-2.7	-0.8	-1.4	-0.5	-63%	-40%	-13%	-23%	-8%
7:00 PM	5.5	5.8	5.9	5.5	5.0	1.8	3.1	4.3	3.4	4.8	-3.8	-2.7	-1.3	-1.6	-1.0	-68%	-47%	-23%	-32%	-17%
8:00 PM	4.3	4.4	4.5	4.1	3.6	1.3	2.4	3.1	2.4	3.6	-3.0	-2.0	-1.0	-1.2	-0.7	-70%	-45%	-24%	-34%	-17%
9:00 PM	3.6	3.7	3.7	3.3	2.9	1.0	2.0	2.3	1.8	3.0	-2.6	-1.7	-0.9	-1.1	-0.7	-72%	-47%	-29%	-39%	-19%
10:00 PM	2.8	2.9	2.9	2.5	2.2	0.7	1.4	1.7	1.4	2.2	-2.0	-1.5	-0.7	-0.8	-0.7	-74%	-51%	-30%	-38%	-25%
11:00 PM	1.8	1.9	2.0	1.6	1.4	0.5	1.0	1.2	0.9	1.5	-1.3	-1.0	-0.4	-0.5	-0.5	-71%	-51%	-27%	-36%	-24%
Total	124.3	123.9	127.9	121.7	110.5	53.3	84.9	99.7	88.3	109.7	-71.1	-43.0	-22.1	-22.3	-14.2	-57%	-34%	-18%	-20%	-11%

Table A7 – Average Weekday Hourly Traffic Comparison at I-495 Eastbound (Inner Loop)
ATR Location #41

	Pre-Pandemic Hourly Traffic (thousands)					Post-Pandemic Hourly Traffic (thousands)					Absolute Difference (thousands)					Percentage Difference				
Hour	Apr 2019	May 2019	Jun 2019	Oct 2019	Jan 2020	Apr 2020	Jun 2020	Oct 2020	Jan 2021	May 2021	Apr 2020 vs. Apr 2019	Jun 2020 vs. Jun 2019	Oct 2020 vs. Oct 2019	Jan 2021 vs. Jan 2020	May 2021 vs. May 2019	Apr 2020 vs. Apr 2019	Jun 2020 vs. Jun 2019	Oct 2020 vs. Oct 2019	Jan 2021 vs. Jan 2020	May 2021 vs. May 2019
Midnight	1.5	1.6	1.7	1.5	1.4	0.6	0.9	1.0	0.9	1.2	-1.0	-0.8	-0.5	-0.5	-0.4	-63%	-45%	-35%	-36%	-23%
1:00 AM	0.9	1.0	1.1	0.9	0.9	0.3	0.6	0.6	0.5	0.7	-0.6	-0.5	-0.3	-0.4	-0.2	-63%	-43%	-36%	-39%	-23%
2:00 AM	0.8	0.8	0.8	0.7	0.7	0.3	0.5	0.5	0.4	0.6	-0.4	-0.3	-0.3	-0.3	-0.2	-59%	-40%	-37%	-41%	-21%
3:00 AM	0.8	0.8	0.9	0.8	0.8	0.4	0.5	0.5	0.5	0.6	-0.4	-0.3	-0.3	-0.3	-0.2	-55%	-38%	-35%	-38%	-20%
4:00 AM	1.3	1.4	1.4	1.3	1.2	0.8	1.0	1.1	0.9	1.0	-0.6	-0.4	-0.3	-0.4	-0.3	-43%	-27%	-22%	-29%	-24%
5:00 AM	2.9	3.0	2.9	3.0	2.7	1.8	2.4	2.4	2.0	2.4	-1.1	-0.4	-0.6	-0.7	-0.6	-39%	-16%	-19%	-24%	-20%
6:00 AM	4.7	4.8	4.6	4.6	4.1	2.5	3.5	3.5	3.0	3.7	-2.2	-1.0	-1.1	-1.1	-1.1	-47%	-23%	-23%	-26%	-22%
7:00 AM	5.8	5.8	5.6	5.6	5.3	2.9	4.2	4.6	3.9	4.7	-2.8	-1.4	-1.0	-1.4	-1.0	-49%	-25%	-19%	-26%	-18%
8:00 AM	6.2	6.1	6.0	6.2	5.6	2.8	4.3	4.7	4.1	5.0	-3.4	-1.7	-1.5	-1.5	-1.2	-55%	-29%	-24%	-27%	-19%
9:00 AM	6.2	6.1	6.0	6.1	5.6	2.6	4.4	4.7	4.1	5.3	-3.6	-1.6	-1.4	-1.6	-0.8	-58%	-27%	-23%	-27%	-13%
10:00 AM	6.3	6.1	6.1	6.1	5.6	2.8	4.8	5.0	4.3	5.7	-3.5	-1.2	-1.0	-1.3	-0.4	-55%	-20%	-17%	-23%	-7%
11:00 AM	6.4	6.3	6.3	6.1	5.9	3.1	5.2	5.3	4.7	6.1	-3.3	-1.1	-0.8	-1.2	-0.2	-51%	-17%	-12%	-20%	-3%
Noon	6.5	6.6	6.5	6.4	6.4	3.6	5.7	6.0	5.3	6.4	-2.9	-0.8	-0.4	-1.1	-0.2	-45%	-12%	-6%	-17%	-2%
1:00 PM	6.8	6.8	6.7	6.5	6.9	4.0	6.3	6.5	5.9	6.7	-2.7	-0.4	0.0	-1.0	-0.2	-40%	-6%	0%	-14%	-2%
2:00 PM	7.0	6.9	6.8	6.8	7.0	4.7	6.9	6.9	6.4	6.8	-2.3	0.1	0.2	-0.6	-0.1	-33%	1%	3%	-9%	-2%
3:00 PM	7.0	6.8	6.9	6.9	7.1	5.0	6.8	7.0	6.6	6.9	-2.0	0.0	0.1	-0.4	0.1	-29%	-1%	2%	-6%	2%
4:00 PM	6.8	6.8	6.9	6.7	6.9	4.7	6.7	7.0	6.5	6.8	-2.1	-0.2	0.4	-0.4	0.1	-31%	-3%	6%	-6%	1%
5:00 PM	6.6	6.7	6.8	6.5	6.4	4.1	6.2	6.8	6.0	6.7	-2.5	-0.6	0.3	-0.4	0.0	-38%	-9%	4%	-7%	0%
6:00 PM	6.7	6.8	6.7	6.7	6.2	3.1	5.1	6.1	5.1	6.2	-3.6	-1.7	-0.6	-1.1	-0.6	-54%	-25%	-8%	-18%	-9%
7:00 PM	6.4	6.5	6.4	6.3	5.6	2.5	4.2	5.3	4.0	5.5	-3.9	-2.2	-1.0	-1.5	-1.0	-61%	-34%	-17%	-28%	-15%
8:00 PM	5.2	5.4	5.4	5.2	4.4	1.9	3.3	3.8	3.0	4.4	-3.4	-2.1	-1.3	-1.4	-0.9	-65%	-39%	-26%	-32%	-18%
9:00 PM	4.5	4.7	4.7	4.2	3.7	1.3	2.6	2.9	2.3	3.6	-3.1	-2.2	-1.3	-1.5	-1.1	-70%	-46%	-32%	-39%	-23%
10:00 PM	3.6	3.8	3.8	3.3	2.9	1.0	2.0	2.3	1.8	2.8	-2.5	-1.8	-1.0	-1.1	-1.0	-71%	-48%	-32%	-39%	-26%
11:00 PM	2.5	2.7	2.8	2.4	2.1	0.9	1.5	1.7	1.4	2.1	-1.6	-1.2	-0.7	-0.7	-0.7	-64%	-45%	-29%	-34%	-24%
Total	113.4	114.1	113.7	110.8	105.4	57.6	89.8	96.3	83.6	102.1	-55.8	-23.9	-14.5	-21.8	-12.1	-49%	-21%	-13%	-21%	-11%

Table A8 – Average Weekday Hourly Traffic Comparison at I-495 Westbound (Outer Loop)
ATR Location #41

	Pre-Pandemic Hourly Traffic (thousands)					Post-Pandemic Hourly Traffic (thousands)					Absolute Difference (thousands)					Percentage Difference				
Hour	Apr 2019	May 2019	Jun 2019	Oct 2019	Jan 2020	Apr 2020	Jun 2020	Oct 2020	Jan 2021	May 2021	Apr 2020 vs. Apr 2019	Jun 2020 vs. Jun 2019	Oct 2020 vs. Oct 2019	Jan 2021 vs. Jan 2020	May 2021 vs. May 2019	Apr 2020 vs. Apr 2019	Jun 2020 vs. Jun 2019	Oct 2020 vs. Oct 2019	Jan 2021 vs. Jan 2020	May 2021 vs. May 2019
Midnight	1.5	1.5	1.7	1.5	1.3	0.5	0.9	0.9	0.8	1.2	-1.1	-0.8	-0.6	-0.4	-0.3	-70%	-46%	-38%	-33%	-22%
1:00 AM	1.0	1.0	1.1	1.0	0.9	0.3	0.6	0.6	0.6	0.8	-0.7	-0.5	-0.3	-0.3	-0.2	-66%	-44%	-35%	-36%	-23%
2:00 AM	0.8	0.8	0.9	0.8	0.7	0.3	0.5	0.5	0.5	0.6	-0.5	-0.4	-0.3	-0.3	-0.2	-59%	-41%	-33%	-35%	-25%
3:00 AM	1.0	1.0	1.0	1.0	1.0	0.5	0.7	0.7	0.6	0.7	-0.5	-0.4	-0.3	-0.3	-0.3	-49%	-34%	-31%	-35%	-30%
4:00 AM	2.3	2.3	2.3	2.5	2.3	1.5	1.9	1.9	1.5	1.6	-0.8	-0.4	-0.6	-0.7	-0.7	-36%	-19%	-24%	-32%	-32%
5:00 AM	5.1	5.1	4.9	5.1	4.9	3.3	4.0	4.1	3.5	3.7	-1.8	-0.8	-1.0	-1.4	-1.4	-35%	-17%	-20%	-29%	-27%
6:00 AM	4.8	4.8	4.7	4.5	4.5	4.0	5.1	4.8	4.4	4.4	-0.8	0.4	0.3	-0.1	-0.4	-16%	8%	7%	-1%	-8%
7:00 AM	4.6	4.3	4.2	4.3	4.3	3.8	5.1	4.9	4.5	3.9	-0.8	0.8	0.6	0.2	-0.4	-18%	20%	14%	5%	-9%
8:00 AM	4.6	4.3	4.3	4.6	4.4	3.4	4.8	5.1	4.7	4.4	-1.2	0.5	0.6	0.3	0.1	-26%	12%	13%	6%	2%
9:00 AM	5.7	5.3	5.4	5.7	5.5	3.0	4.6	5.1	4.4	5.1	-2.7	-0.8	-0.6	-1.1	-0.3	-47%	-15%	-11%	-20%	-5%
10:00 AM	6.3	6.1	6.1	6.1	5.6	2.9	4.7	5.1	4.5	5.4	-3.4	-1.5	-0.9	-1.1	-0.7	-53%	-24%	-16%	-20%	-11%
11:00 AM	6.2	6.2	6.3	6.0	5.8	3.0	4.9	5.2	4.7	5.6	-3.2	-1.4	-0.8	-1.1	-0.6	-52%	-22%	-13%	-19%	-10%
Noon	6.4	6.3	6.2	6.2	6.1	3.1	5.1	5.4	5.0	5.8	-3.2	-1.1	-0.8	-1.0	-0.5	-51%	-17%	-12%	-17%	-7%
1:00 PM	6.4	6.3	6.4	6.3	6.2	3.3	5.3	5.7	5.3	5.8	-3.1	-1.0	-0.6	-0.9	-0.5	-48%	-16%	-9%	-14%	-8%
2:00 PM	6.4	6.5	6.3	6.5	6.6	3.6	5.8	6.0	5.6	5.9	-2.8	-0.6	-0.5	-1.0	-0.5	-43%	-9%	-7%	-15%	-8%
3:00 PM	6.3	6.2	6.2	6.6	6.5	3.6	5.6	5.9	5.6	5.9	-2.7	-0.6	-0.6	-0.9	-0.3	-43%	-9%	-10%	-14%	-4%
4:00 PM	6.6	6.5	6.6	6.6	6.4	3.5	5.5	6.0	5.5	5.9	-3.1	-1.0	-0.6	-0.9	-0.6	-47%	-16%	-8%	-14%	-9%
5:00 PM	6.7	6.7	6.5	6.4	6.3	3.3	5.3	5.9	5.3	6.0	-3.4	-1.2	-0.5	-0.9	-0.7	-51%	-19%	-7%	-15%	-11%
6:00 PM	6.5	6.5	6.5	6.2	5.9	2.9	4.6	5.5	4.7	5.8	-3.6	-1.8	-0.7	-1.3	-0.7	-56%	-28%	-11%	-22%	-11%
7:00 PM	5.7	5.9	5.8	5.7	5.0	2.2	3.8	4.6	3.5	4.9	-3.5	-2.0	-1.1	-1.4	-1.0	-62%	-34%	-19%	-29%	-17%
8:00 PM	4.7	4.8	4.9	4.6	3.8	1.6	3.3	3.5	2.7	4.1	-3.1	-1.6	-1.1	-1.2	-0.7	-66%	-32%	-24%	-30%	-15%
9:00 PM	4.1	4.2	4.3	3.9	3.3	1.3	2.8	2.7	2.1	3.6	-2.9	-1.5	-1.2	-1.2	-0.7	-70%	-35%	-31%	-35%	-15%
10:00 PM	3.3	3.5	3.8	3.1	2.6	1.1	2.3	2.2	1.8	2.8	-2.2	-1.5	-0.9	-0.8	-0.7	-67%	-40%	-30%	-32%	-21%
11:00 PM	2.3	2.4	2.5	2.1	1.8	0.7	1.5	1.5	1.2	1.8	-1.6	-1.1	-0.6	-0.6	-0.6	-68%	-43%	-29%	-35%	-24%
Total	109.4	108.6	108.9	106.8	101.8	56.9	88.8	93.9	83.3	95.5	-52.6	-20.1	-13.0	-18.6	-13.0	-48%	-18%	-12%	-18%	-12%

Table A9 – Average Weekday Hourly Traffic Comparison at I-495 Northbound (Outer Loop)
ATR Location #55

	Pre-Pandemic Hourly Traffic (thousands)					Post-Pandemic Hourly Traffic (thousands)					Absolute Difference (thousands)					Percentage Difference				
Hour	Apr 2019	May 2019	Jun 2019	Oct 2019	Jan 2020	Apr 2020	Jun 2020	Oct 2020	Jan 2021	May 2021	Apr 2020 vs. Apr 2019	Jun 2020 vs. Jun 2019	Oct 2020 vs. Oct 2019	Jan 2021 vs. Jan 2020	May 2021 vs. May 2019	Apr 2020 vs. Apr 2019	Jun 2020 vs. Jun 2019	Oct 2020 vs. Oct 2019	Jan 2021 vs. Jan 2020	May 2021 vs. May 2019
Midnight	1.3	1.5	1.6	1.3	1.2	0.5	1.1	1.1	0.9	1.3	-0.8	-0.5	-0.2	-0.2	-0.1	-60%	-31%	-14%	-20%	-9%
1:00 AM	0.9	0.9	1.0	0.9	0.8	0.4	0.8	0.7	0.7	0.9	-0.5	-0.3	-0.1	-0.2	0.0	-53%	-27%	-14%	-18%	-3%
2:00 AM	0.7	0.8	0.8	0.8	0.7	0.4	0.6	0.6	0.6	0.7	-0.4	-0.2	-0.1	-0.2	0.0	-49%	-25%	-16%	-22%	-5%
3:00 AM	1.0	1.0	1.0	1.0	1.0	0.5	0.8	0.8	0.7	0.9	-0.4	-0.3	-0.2	-0.2	-0.1	-45%	-25%	-22%	-24%	-10%
4:00 AM	2.0	2.0	2.1	2.2	2.0	1.3	1.7	1.7	1.5	1.7	-0.7	-0.4	-0.5	-0.5	-0.3	-35%	-19%	-24%	-25%	-15%
5:00 AM	4.7	4.5	4.5	4.9	4.4	3.0	3.6	3.5	3.1	3.7	-1.7	-1.0	-1.3	-1.2	-0.8	-37%	-21%	-28%	-28%	-19%
6:00 AM	6.2	6.1	6.0	6.1	5.5	3.5	4.5	4.4	4.0	5.0	-2.7	-1.5	-1.7	-1.5	-1.1	-44%	-25%	-28%	-28%	-18%
7:00 AM	6.9	6.6	6.5	6.7	6.0	3.5	4.8	5.0	4.5	5.6	-3.4	-1.7	-1.7	-1.6	-1.1	-49%	-26%	-25%	-26%	-16%
8:00 AM	6.7	6.6	6.5	6.8	6.0	3.3	4.9	5.2	4.6	5.5	-3.4	-1.6	-1.6	-1.5	-1.1	-50%	-24%	-24%	-25%	-16%
9:00 AM	6.6	6.5	6.5	6.5	6.0	3.1	4.8	4.9	4.2	5.3	-3.5	-1.7	-1.6	-1.8	-1.2	-53%	-26%	-25%	-30%	-18%
10:00 AM	6.5	6.5	6.3	6.1	5.6	3.1	4.9	5.0	4.4	5.5	-3.4	-1.3	-1.1	-1.2	-1.0	-52%	-21%	-18%	-21%	-15%
11:00 AM	6.3	6.5	6.3	6.0	5.6	3.3	5.3	5.3	4.8	5.7	-3.0	-1.0	-0.7	-0.8	-0.7	-48%	-16%	-12%	-15%	-11%
Noon	6.3	6.6	6.2	6.1	5.9	3.6	5.7	5.6	5.1	5.9	-2.7	-0.5	-0.5	-0.8	-0.6	-43%	-8%	-8%	-13%	-10%
1:00 PM	6.5	6.7	6.6	6.4	6.2	3.9	6.0	5.8	5.4	6.1	-2.6	-0.6	-0.6	-0.8	-0.5	-40%	-9%	-9%	-12%	-8%
2:00 PM	6.7	6.8	6.5	6.6	6.5	4.2	6.4	6.2	5.8	6.3	-2.4	-0.2	-0.4	-0.7	-0.5	-36%	-3%	-7%	-10%	-7%
3:00 PM	6.5	6.5	6.5	6.6	6.5	4.2	6.3	6.3	5.8	6.4	-2.3	-0.1	-0.2	-0.7	-0.1	-35%	-2%	-4%	-10%	-1%
4:00 PM	6.5	6.1	6.3	6.4	6.2	4.1	6.3	6.5	5.9	6.3	-2.4	0.0	0.1	-0.3	0.2	-37%	1%	1%	-4%	3%
5:00 PM	6.2	5.9	6.0	6.1	5.6	3.7	6.0	6.4	5.6	6.2	-2.4	0.1	0.3	0.0	0.3	-39%	1%	5%	-1%	5%
6:00 PM	6.1	5.9	6.1	5.9	5.3	3.1	5.2	5.7	4.7	5.9	-3.0	-0.8	-0.2	-0.5	0.0	-49%	-13%	-3%	-10%	0%
7:00 PM	5.4	5.6	5.5	5.4	4.5	2.4	4.3	4.7	3.6	5.0	-3.0	-1.2	-0.6	-0.9	-0.5	-55%	-21%	-12%	-20%	-9%
8:00 PM	4.7	4.8	4.9	4.4	3.6	1.8	3.7	3.7	2.9	4.4	-2.8	-1.2	-0.8	-0.7	-0.4	-61%	-24%	-17%	-21%	-8%
9:00 PM	4.0	4.1	4.2	3.7	3.1	1.5	3.2	3.0	2.4	3.8	-2.5	-1.0	-0.7	-0.7	-0.3	-63%	-24%	-19%	-23%	-7%
10:00 PM	3.0	3.2	3.4	2.8	2.4	1.2	2.6	2.4	2.0	3.0	-1.8	-0.8	-0.4	-0.4	-0.2	-60%	-24%	-14%	-18%	-6%
11:00 PM	2.1	2.3	2.3	1.9	1.7	0.8	1.7	1.7	1.4	2.1	-1.2	-0.6	-0.3	-0.3	-0.2	-60%	-27%	-14%	-19%	-9%
Total	113.6	114.0	113.5	111.5	102.2	60.5	95.1	96.3	84.5	103.5	-53.1	-18.4	-15.2	-17.7	-10.5	-47%	-16%	-14%	-17%	-9%

Table A10 – Average Weekday Hourly Traffic Comparison at I-495 Southbound (Inner Loop)
ATR Location #55

	Pre-Pandemic Hourly Traffic (thousands)					Post-Pandemic Hourly Traffic (thousands)					Absolute Difference (thousands)					Percentage Difference				
Hour	Apr 2019	May 2019	Jun 2019	Oct 2019	Jan 2020	Apr 2020	Jun 2020	Oct 2020	Jan 2021	May 2021	Apr 2020 vs. Apr 2019	Jun 2020 vs. Jun 2019	Oct 2020 vs. Oct 2019	Jan 2021 vs. Jan 2020	May 2021 vs. May 2019	Apr 2020 vs. Apr 2019	Jun 2020 vs. Jun 2019	Oct 2020 vs. Oct 2019	Jan 2021 vs. Jan 2020	May 2021 vs. May 2019
Midnight	1.5	1.6	1.7	1.5	1.3	0.6	1.0	1.2	1.0	1.4	-0.9	-0.7	-0.3	-0.3	-0.2	-61%	-39%	-22%	-24%	-13%
1:00 AM	1.0	1.0	1.1	1.0	0.9	0.4	0.7	0.8	0.7	0.9	-0.6	-0.4	-0.2	-0.3	-0.1	-61%	-40%	-22%	-27%	-14%
2:00 AM	0.8	0.8	0.9	0.8	0.8	0.3	0.5	0.6	0.6	0.7	-0.5	-0.3	-0.2	-0.2	-0.1	-59%	-38%	-22%	-28%	-11%
3:00 AM	0.8	0.9	0.9	0.9	0.8	0.4	0.6	0.7	0.6	0.7	-0.4	-0.3	-0.2	-0.2	-0.1	-50%	-31%	-22%	-27%	-16%
4:00 AM	1.3	1.4	1.4	1.4	1.3	0.8	1.1	1.1	0.9	1.1	-0.5	-0.3	-0.3	-0.3	-0.2	-39%	-20%	-24%	-26%	-18%
5:00 AM	3.0	3.1	3.1	3.2	2.8	1.8	2.5	2.4	2.0	2.4	-1.2	-0.6	-0.8	-0.8	-0.7	-39%	-18%	-26%	-28%	-22%
6:00 AM	4.9	5.0	4.9	4.9	4.4	2.9	4.0	3.7	3.2	4.1	-2.0	-1.0	-1.2	-1.2	-0.9	-41%	-19%	-24%	-27%	-17%
7:00 AM	5.8	5.7	5.7	5.6	5.1	3.3	4.8	4.6	4.0	4.9	-2.5	-0.9	-1.0	-1.1	-0.8	-43%	-16%	-18%	-22%	-14%
8:00 AM	5.9	6.0	5.9	6.1	5.5	3.1	4.8	4.8	4.3	5.1	-2.8	-1.1	-1.3	-1.2	-0.9	-47%	-18%	-21%	-23%	-15%
9:00 AM	6.2	6.0	6.1	5.9	5.4	2.9	4.8	4.6	4.1	5.0	-3.3	-1.3	-1.3	-1.3	-1.0	-54%	-21%	-21%	-24%	-16%
10:00 AM	6.1	5.9	6.1	5.6	5.2	2.9	5.0	4.7	4.1	5.1	-3.1	-1.2	-0.9	-1.0	-0.8	-52%	-19%	-16%	-20%	-14%
11:00 AM	6.0	5.9	6.1	5.6	5.3	3.1	5.2	5.1	4.4	5.3	-2.8	-0.9	-0.5	-0.9	-0.6	-47%	-15%	-10%	-18%	-9%
Noon	6.2	6.1	6.3	6.0	5.7	3.5	5.6	5.5	4.9	5.8	-2.8	-0.7	-0.5	-0.9	-0.3	-44%	-11%	-8%	-15%	-5%
1:00 PM	6.4	6.4	6.4	6.2	6.1	3.8	5.9	5.8	5.3	5.9	-2.6	-0.5	-0.4	-0.8	-0.4	-41%	-7%	-7%	-13%	-7%
2:00 PM	6.6	6.4	6.3	6.7	6.6	4.3	6.3	6.2	5.9	6.2	-2.3	-0.1	-0.4	-0.7	-0.2	-34%	-1%	-7%	-10%	-2%
3:00 PM	6.5	6.4	6.4	6.6	6.5	4.4	6.3	6.3	6.0	6.3	-2.1	-0.1	-0.3	-0.5	-0.1	-32%	-1%	-5%	-8%	-2%
4:00 PM	6.6	6.3	6.4	6.5	6.4	4.3	6.2	6.4	5.8	6.2	-2.3	-0.2	-0.1	-0.6	-0.1	-35%	-3%	-2%	-9%	-1%
5:00 PM	6.5	6.5	6.3	6.6	6.2	3.8	5.8	6.3	5.5	6.2	-2.7	-0.5	-0.3	-0.6	-0.3	-41%	-8%	-4%	-10%	-4%
6:00 PM	6.3	6.3	6.3	6.3	5.6	3.0	4.7	5.5	4.7	5.6	-3.3	-1.5	-0.8	-0.9	-0.7	-53%	-24%	-13%	-16%	-11%
7:00 PM	5.3	5.4	5.5	5.6	4.7	2.4	3.9	4.8	3.7	4.8	-3.0	-1.6	-0.8	-1.0	-0.7	-56%	-29%	-14%	-21%	-12%
8:00 PM	4.5	4.6	4.6	4.5	3.7	1.8	3.2	3.6	2.8	4.0	-2.7	-1.4	-0.9	-0.9	-0.6	-60%	-30%	-20%	-23%	-14%
9:00 PM	3.9	4.1	4.1	3.8	3.3	1.3	2.7	2.9	2.2	3.4	-2.6	-1.4	-0.9	-1.0	-0.6	-66%	-35%	-24%	-31%	-16%
10:00 PM	3.1	3.3	3.4	3.0	2.6	1.1	2.1	2.3	1.8	2.7	-2.1	-1.3	-0.7	-0.7	-0.5	-66%	-39%	-22%	-28%	-16%
11:00 PM	2.3	2.4	2.5	2.2	1.9	0.9	1.6	1.8	1.5	2.1	-1.4	-0.9	-0.5	-0.4	-0.3	-60%	-36%	-21%	-23%	-14%
Total	107.5	107.3	108.3	106.5	98.2	57.0	89.2	91.6	80.2	96.1	-50.5	-19.1	-14.9	-18.0	-11.3	-47%	-18%	-14%	-18%	-10%

Table A11 – Average Weekday Hourly Traffic Comparison at I-495 Northbound (Outer Loop)
ATR Location #43

	Pre-Pandemic Hourly Traffic (thousands)					Post-Pandemic Hourly Traffic (thousands)					Absolute Difference (thousands)					Percentage Difference				
Hour	Apr 2019	May 2019	Jun 2019	Oct 2019	Jan 2020	Apr 2020	Jun 2020	Oct 2020	Jan 2021	May 2021	Apr 2020 vs. Apr 2019	Jun 2020 vs. Jun 2019	Oct 2020 vs. Oct 2019	Jan 2021 vs. Jan 2020	May 2021 vs. May 2019	Apr 2020 vs. Apr 2019	Jun 2020 vs. Jun 2019	Oct 2020 vs. Oct 2019	Jan 2021 vs. Jan 2020	May 2021 vs. May 2019
Midnight	1.4	1.6	1.7	1.4	1.3	0.6	1.2	1.2	1.1	1.4	-0.8	-0.5	-0.2	-0.2	-0.1	-58%	-31%	-11%	-14%	-9%
1:00 AM	0.9	1.0	1.1	0.9	0.9	0.4	0.8	0.8	0.8	1.0	-0.5	-0.3	-0.1	-0.1	0.0	-53%	-27%	-8%	-16%	-4%
2:00 AM	0.8	0.9	0.9	0.8	0.8	0.4	0.7	0.8	0.7	0.8	-0.4	-0.3	-0.1	-0.1	0.0	-49%	-28%	-8%	-15%	-5%
3:00 AM	1.0	1.0	1.1	1.0	1.0	0.6	0.8	0.9	0.8	0.9	-0.5	-0.3	-0.2	-0.2	-0.1	-47%	-28%	-17%	-21%	-13%
4:00 AM	2.0	2.0	2.0	2.2	2.0	1.2	1.6	1.6	1.5	1.7	-0.7	-0.4	-0.5	-0.5	-0.4	-38%	-22%	-24%	-24%	-18%
5:00 AM	4.3	4.2	4.2	4.4	4.0	2.6	3.3	3.3	2.9	3.3	-1.7	-0.9	-1.1	-1.1	-0.9	-39%	-21%	-26%	-27%	-21%
6:00 AM	5.8	5.8	5.8	6.0	5.3	3.2	4.2	4.1	3.8	4.5	-2.7	-1.6	-1.8	-1.5	-1.3	-46%	-27%	-31%	-29%	-22%
7:00 AM	6.8	6.5	6.5	6.5	6.0	3.4	4.7	4.9	4.4	5.4	-3.4	-1.8	-1.6	-1.6	-1.1	-50%	-27%	-24%	-27%	-17%
8:00 AM	6.8	6.5	6.6	6.7	6.1	3.3	4.9	5.3	4.7	5.5	-3.4	-1.7	-1.4	-1.4	-1.0	-51%	-26%	-20%	-23%	-15%
9:00 AM	6.7	6.6	6.7	6.6	6.0	3.2	5.0	5.1	4.6	5.6	-3.6	-1.8	-1.5	-1.4	-1.0	-53%	-26%	-23%	-23%	-15%
10:00 AM	6.7	6.6	6.6	6.4	5.8	3.3	5.2	5.3	4.8	5.9	-3.4	-1.5	-1.1	-1.0	-0.8	-50%	-22%	-18%	-17%	-12%
11:00 AM	6.5	6.5	6.5	6.3	5.7	3.5	5.5	5.5	5.1	6.1	-3.0	-1.0	-0.8	-0.6	-0.4	-46%	-16%	-13%	-10%	-6%
Noon	6.7	6.7	6.7	6.4	6.1	3.9	5.9	5.9	5.6	6.4	-2.8	-0.8	-0.5	-0.5	-0.3	-42%	-12%	-7%	-8%	-5%
1:00 PM	6.9	6.9	6.9	6.8	6.4	4.2	6.2	6.2	5.9	6.7	-2.7	-0.7	-0.5	-0.5	-0.3	-39%	-10%	-8%	-8%	-4%
2:00 PM	7.2	7.1	7.1	7.2	6.8	4.5	6.5	6.7	6.4	6.8	-2.7	-0.6	-0.5	-0.4	-0.3	-37%	-9%	-7%	-6%	-5%
3:00 PM	7.2	7.1	7.2	7.2	7.0	4.6	6.7	6.9	6.5	6.7	-2.6	-0.6	-0.3	-0.5	-0.4	-36%	-8%	-5%	-7%	-5%
4:00 PM	7.2	6.9	7.1	7.2	6.8	4.5	6.8	6.9	6.3	6.8	-2.7	-0.3	-0.3	-0.5	-0.1	-38%	-4%	-4%	-7%	-2%
5:00 PM	7.3	7.0	7.0	7.0	6.5	4.1	6.3	6.7	6.0	6.7	-3.1	-0.7	-0.2	-0.5	-0.2	-43%	-10%	-3%	-8%	-3%
6:00 PM	7.0	6.6	6.7	6.7	5.9	3.4	5.5	5.9	5.0	6.1	-3.6	-1.2	-0.8	-0.9	-0.5	-51%	-18%	-12%	-15%	-8%
7:00 PM	5.9	6.0	5.8	5.8	4.8	2.7	4.5	4.9	3.8	5.2	-3.2	-1.3	-0.9	-0.9	-0.8	-53%	-22%	-16%	-19%	-13%
8:00 PM	4.9	5.0	5.1	4.6	3.8	2.1	3.8	3.9	3.1	4.5	-2.8	-1.4	-0.8	-0.7	-0.4	-57%	-27%	-16%	-18%	-9%
9:00 PM	4.1	4.3	4.5	3.8	3.2	1.6	3.1	3.1	2.5	3.9	-2.5	-1.3	-0.8	-0.7	-0.4	-60%	-30%	-20%	-22%	-9%
10:00 PM	3.1	3.3	3.5	2.9	2.5	1.3	2.5	2.4	2.1	3.0	-1.8	-1.0	-0.5	-0.4	-0.3	-58%	-28%	-16%	-16%	-9%
11:00 PM	2.2	2.4	2.5	2.1	1.8	0.9	1.8	1.8	1.5	2.2	-1.3	-0.7	-0.3	-0.3	-0.2	-58%	-29%	-15%	-16%	-9%
Total	119.4	118.6	120.3	117.0	106.2	63.6	97.5	100.3	89.8	107.2	-55.8	-22.7	-16.7	-16.4	-11.5	-47%	-19%	-14%	-15%	-10%

Table A12 – Average Weekday Hourly Traffic Comparison at I-495 Southbound (Inner Loop)
ATR Location #43

	Pre-Pandemic Hourly Traffic (thousands)					Post-Pandemic Hourly Traffic (thousands)					Absolute Difference (thousands)					Percentage Difference				
Hour	Apr 2019	May 2019	Jun 2019	Oct 2019	Jan 2020	Apr 2020	Jun 2020	Oct 2020	Jan 2021	May 2021	Apr 2020 vs. Apr 2019	Jun 2020 vs. Jun 2019	Oct 2020 vs. Oct 2019	Jan 2021 vs. Jan 2020	May 2021 vs. May 2019	Apr 2020 vs. Apr 2019	Jun 2020 vs. Jun 2019	Oct 2020 vs. Oct 2019	Jan 2021 vs. Jan 2020	May 2021 vs. May 2019
Midnight	1.7	1.7	1.9	1.6	1.4	0.6	1.2	1.2	1.1	1.5	-1.0	-0.7	-0.3	-0.3	-0.2	-62%	-37%	-21%	-24%	-14%
1:00 AM	1.1	1.1	1.2	1.0	1.0	0.4	0.8	0.8	0.7	0.9	-0.6	-0.4	-0.2	-0.3	-0.2	-60%	-34%	-18%	-26%	-14%
2:00 AM	0.9	0.9	0.9	0.9	0.8	0.4	0.6	0.7	0.6	0.8	-0.5	-0.3	-0.2	-0.2	-0.1	-58%	-37%	-23%	-27%	-13%
3:00 AM	0.9	0.9	1.0	0.9	0.8	0.4	0.6	0.7	0.6	0.7	-0.5	-0.3	-0.2	-0.2	-0.2	-52%	-33%	-22%	-25%	-23%
4:00 AM	1.4	1.4	1.4	1.5	1.3	0.8	1.1	1.1	0.9	1.1	-0.6	-0.3	-0.4	-0.4	-0.3	-42%	-23%	-26%	-29%	-22%
5:00 AM	3.4	3.4	3.4	3.5	3.1	1.9	2.6	2.5	2.1	2.5	-1.4	-0.8	-0.9	-0.9	-0.9	-43%	-24%	-27%	-30%	-26%
6:00 AM	5.5	5.6	5.3	5.4	4.7	2.8	3.8	3.9	3.2	4.1	-2.7	-1.5	-1.5	-1.5	-1.4	-49%	-28%	-28%	-31%	-26%
7:00 AM	6.0	5.9	5.7	5.8	5.4	3.1	4.5	4.8	3.9	4.9	-2.9	-1.3	-1.1	-1.5	-1.0	-48%	-22%	-18%	-28%	-17%
8:00 AM	6.0	5.9	5.9	6.0	5.5	3.2	4.6	5.0	4.2	5.1	-2.8	-1.3	-1.0	-1.3	-0.9	-46%	-22%	-16%	-24%	-14%
9:00 AM	6.2	6.1	6.1	6.0	5.7	3.1	4.8	5.0	4.2	5.0	-3.1	-1.3	-1.1	-1.5	-1.1	-50%	-21%	-18%	-26%	-18%
10:00 AM	6.1	6.1	6.0	5.8	5.5	3.2	4.9	5.1	4.4	5.1	-2.9	-1.1	-0.7	-1.1	-1.0	-47%	-18%	-12%	-21%	-16%
11:00 AM	6.1	6.1	6.1	5.8	5.6	3.5	5.3	5.5	4.7	5.4	-2.6	-0.8	-0.3	-0.9	-0.6	-42%	-14%	-6%	-17%	-11%
Noon	6.5	6.3	6.4	6.2	6.1	3.9	5.7	6.0	5.2	5.9	-2.6	-0.7	-0.1	-0.9	-0.4	-40%	-11%	-2%	-14%	-6%
1:00 PM	6.7	6.6	6.6	6.6	6.5	4.2	6.1	6.2	5.7	6.3	-2.5	-0.6	-0.4	-0.9	-0.3	-38%	-8%	-5%	-13%	-4%
2:00 PM	7.0	6.7	6.8	7.1	7.0	4.7	6.5	6.6	6.3	6.6	-2.3	-0.3	-0.4	-0.7	-0.2	-33%	-5%	-6%	-10%	-2%
3:00 PM	6.8	6.7	6.8	7.0	6.9	4.8	6.6	6.5	6.3	6.5	-2.1	-0.2	-0.5	-0.6	-0.2	-30%	-3%	-7%	-9%	-4%
4:00 PM	7.0	6.7	6.8	6.9	6.8	4.7	6.6	6.6	6.1	6.6	-2.2	-0.2	-0.3	-0.7	-0.1	-32%	-3%	-4%	-10%	-2%
5:00 PM	7.0	6.8	6.9	7.0	6.6	4.3	6.3	6.8	6.0	6.6	-2.7	-0.6	-0.2	-0.6	-0.2	-39%	-9%	-3%	-9%	-3%
6:00 PM	6.9	6.6	6.8	6.8	6.2	3.4	5.3	6.2	5.1	6.2	-3.5	-1.5	-0.6	-1.0	-0.4	-50%	-22%	-9%	-17%	-7%
7:00 PM	6.0	6.0	6.1	6.1	5.1	2.8	4.4	5.3	4.1	5.3	-3.2	-1.7	-0.9	-1.1	-0.7	-54%	-28%	-14%	-21%	-12%
8:00 PM	5.3	5.3	5.3	5.2	4.2	2.2	3.8	4.1	3.2	4.5	-3.1	-1.6	-1.1	-1.1	-0.7	-59%	-30%	-21%	-25%	-14%
9:00 PM	4.6	4.7	4.8	4.3	3.6	1.6	3.1	3.2	2.5	3.9	-2.9	-1.7	-1.0	-1.1	-0.9	-65%	-34%	-24%	-31%	-18%
10:00 PM	3.5	3.6	3.9	3.3	2.8	1.3	2.4	2.6	2.0	3.0	-2.2	-1.4	-0.7	-0.8	-0.6	-64%	-37%	-22%	-29%	-16%
11:00 PM	2.5	2.6	2.7	2.3	2.0	1.0	1.7	1.9	1.5	2.1	-1.5	-1.0	-0.5	-0.5	-0.4	-62%	-37%	-20%	-25%	-17%
Total	114.9	113.7	114.9	113.0	104.7	62.3	93.3	98.3	84.6	100.7	-52.6	-21.6	-14.7	-20.2	-13.1	-46%	-19%	-13%	-19%	-11%

Attachment B

Presentation: How Much Will COVID-19 Affect Travel Behavior? by the National Academies of Sciences Engineering and Medicine Transportation Research Board, 6/1/2020


UIC ENGINEERING
How Much Will COVID-19 Affect Travel Behavior?
Monday, June 1
2:00 - 3:30 Eastern
The National Academies of
SCIENCES • ENGINEERING • MEDICINE
TRB
TRANSPORTATION RESEARCH BOARD
#TRBwebinar
#COVID19

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Future Cities

Livability

ICT

Public Health

Mobility

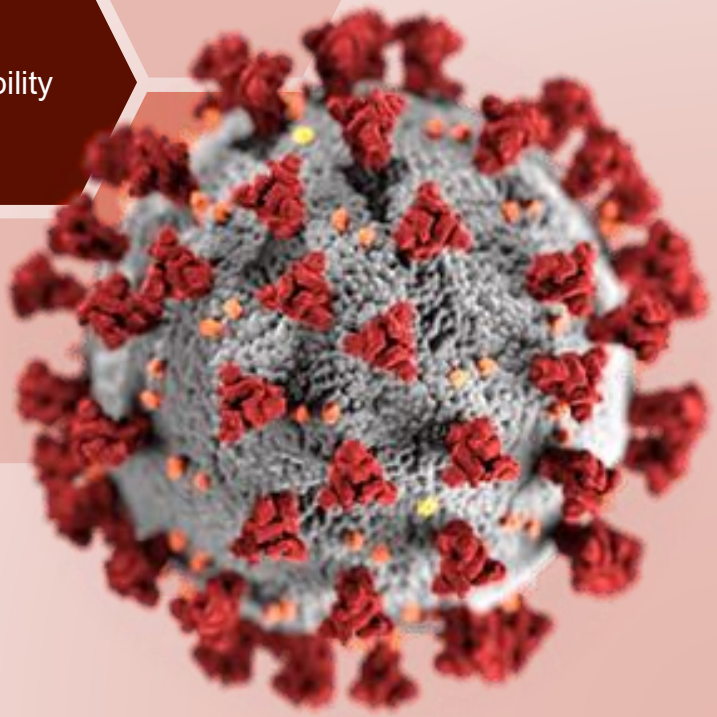
Safety

Equity

Environment

Sustainability

Resiliency



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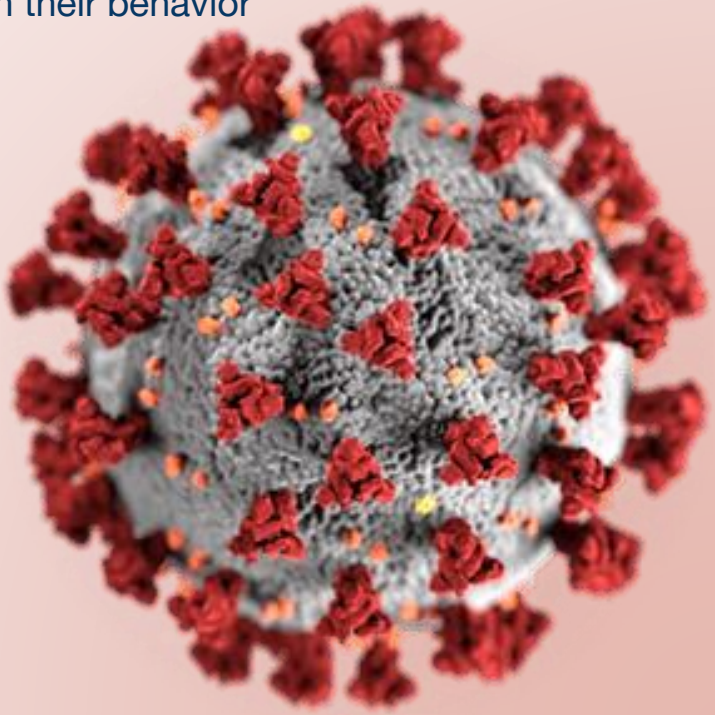
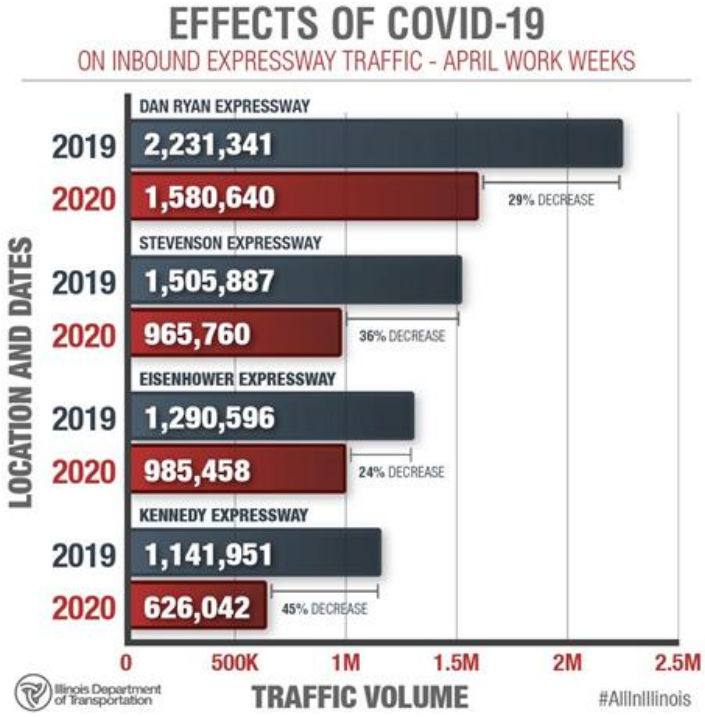
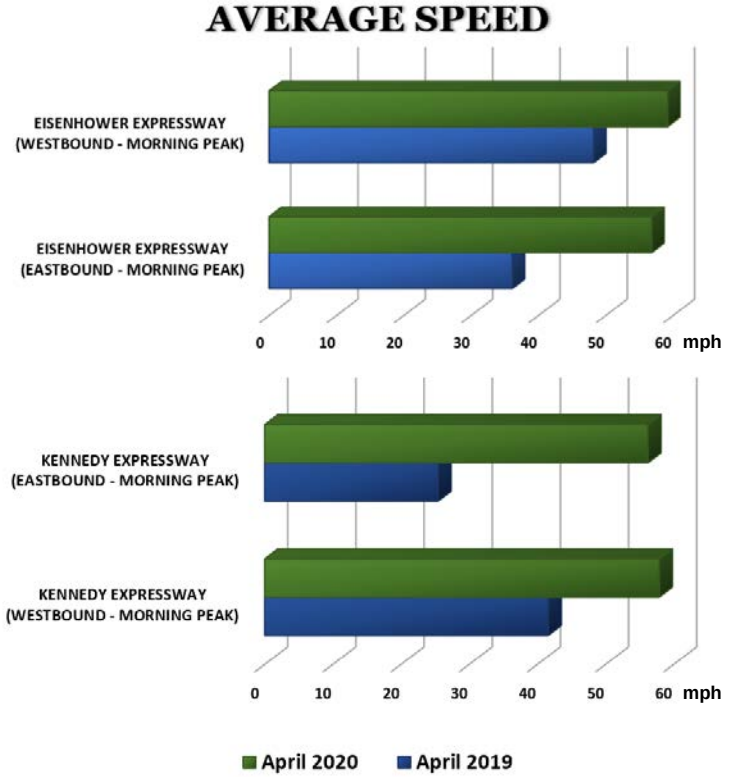
COVID-19

- On March 11, 2020, the World Health Organization (WHO) recognised the COVID-19 outbreak as a pandemic calling for global attention
- The COVID-19 pandemic has forced rapid, large changes in U.S. households' social dynamics resulting in substantial changes in their behavior
- A sharp transition from a reality of long commutes, in-person classes and business meetings, and in-store shopping to telecommuting, online classes and business meetings, and online shopping even for groceries







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OUTLINE

- INTRODUCTION
- ANALYSIS
  - Survey & Demographics
  - Health & Exposure Risk
  - Risk Perceptions
  - Air Travel
  - Shopping Habits & Attitudes
  - Economic Impacts
  - Working from Home
- FUTURE INSIGHTS
  - Planning Towards More Sustainable Future
  - Industries
  - Autonomous Vehicles
  - Digital Twin: ADAPTS Agent-based Model
- SUMMARY AND REMARKS

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Survey & Demographics

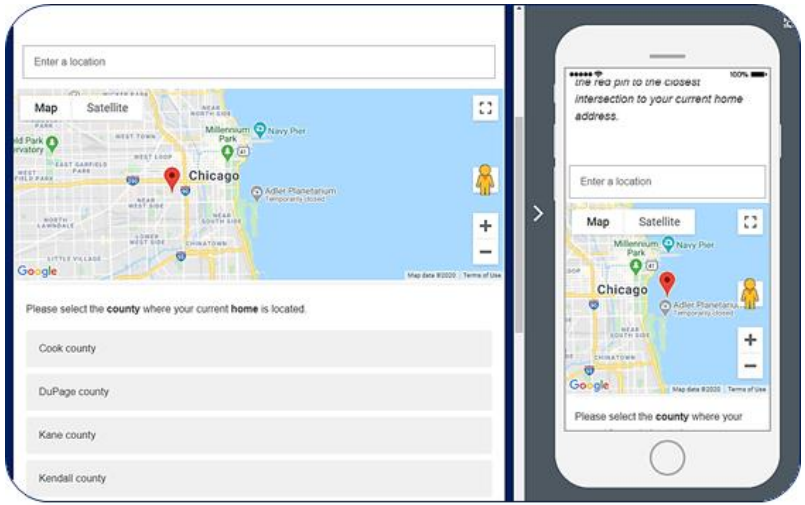
Online survey: *stated preference & revealed preference*

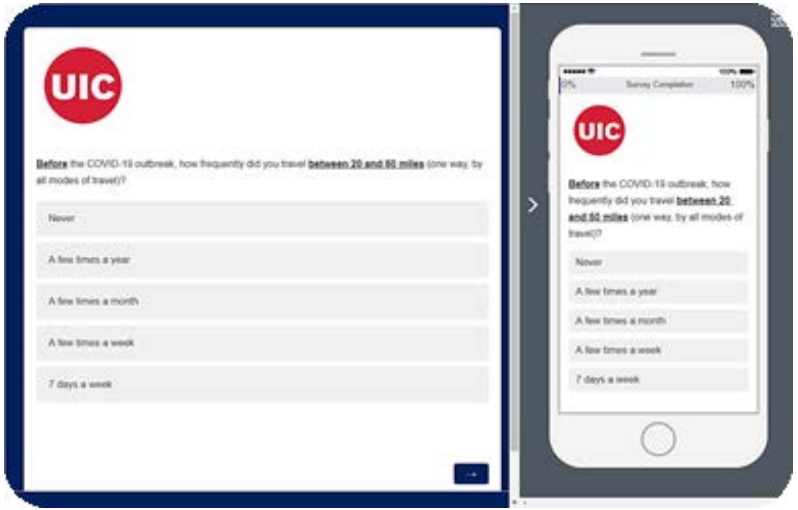
Study area: the Chicago Metropolitan Area

Survey duration: April 25 - May 20

Sample size: 906 valid responses

UIC IRB protocol: #2020-0395





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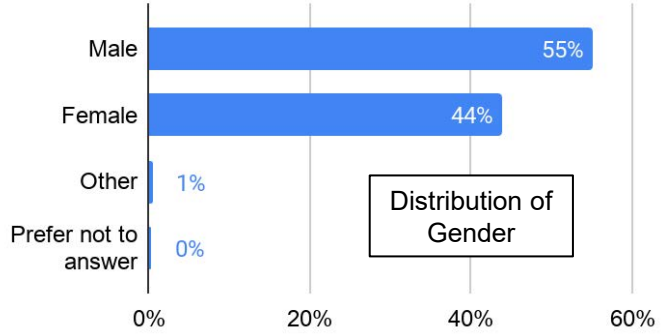
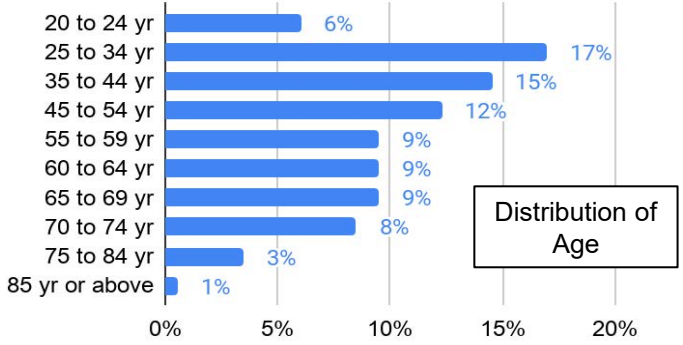
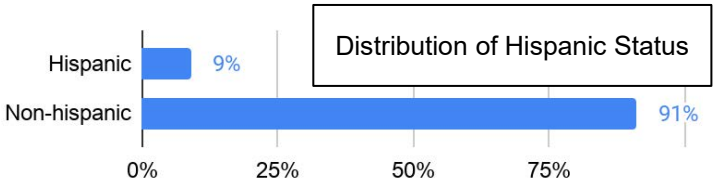
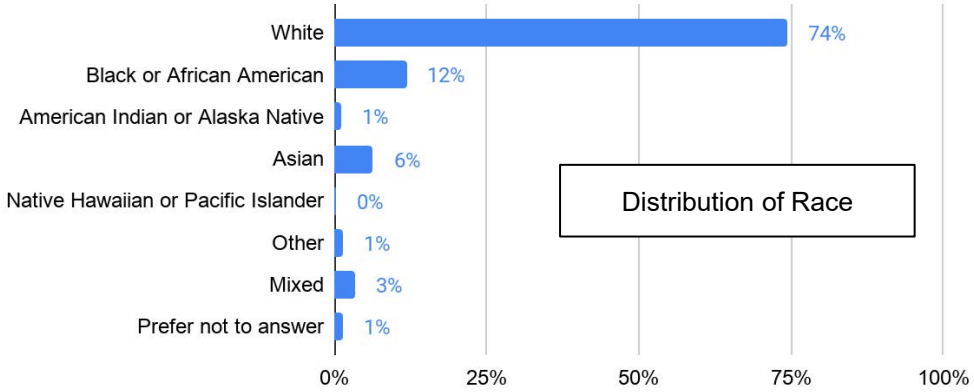
Survey & Demographics









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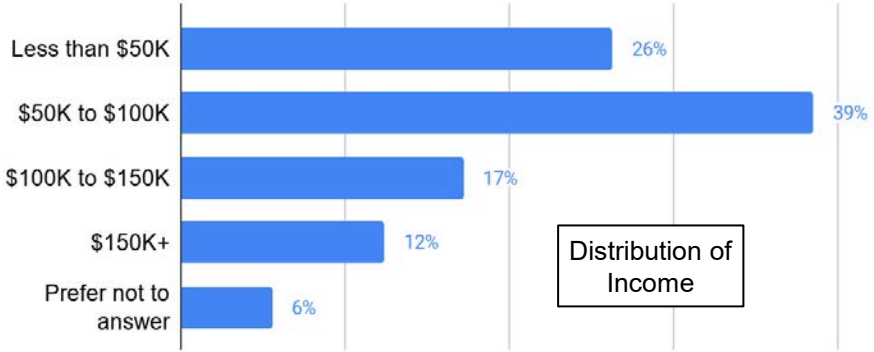
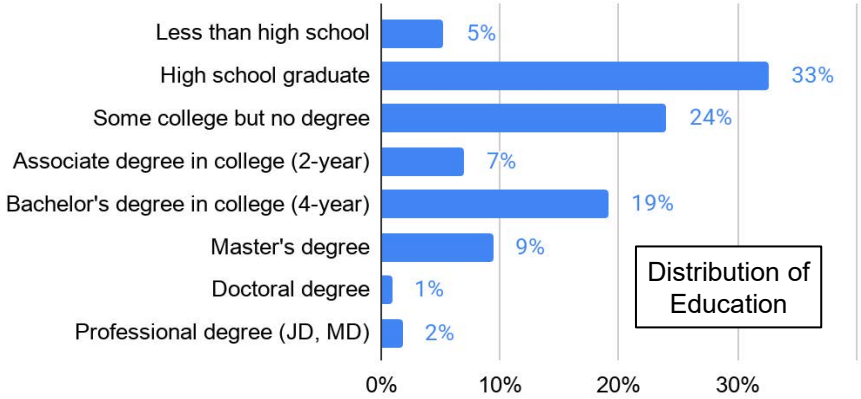
Survey & Demographics





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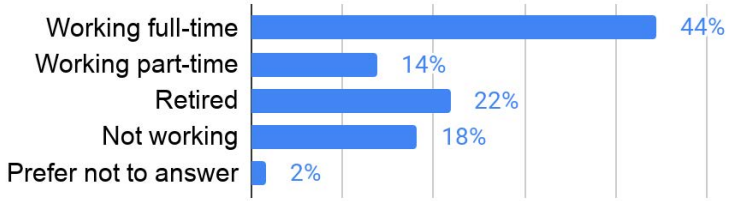
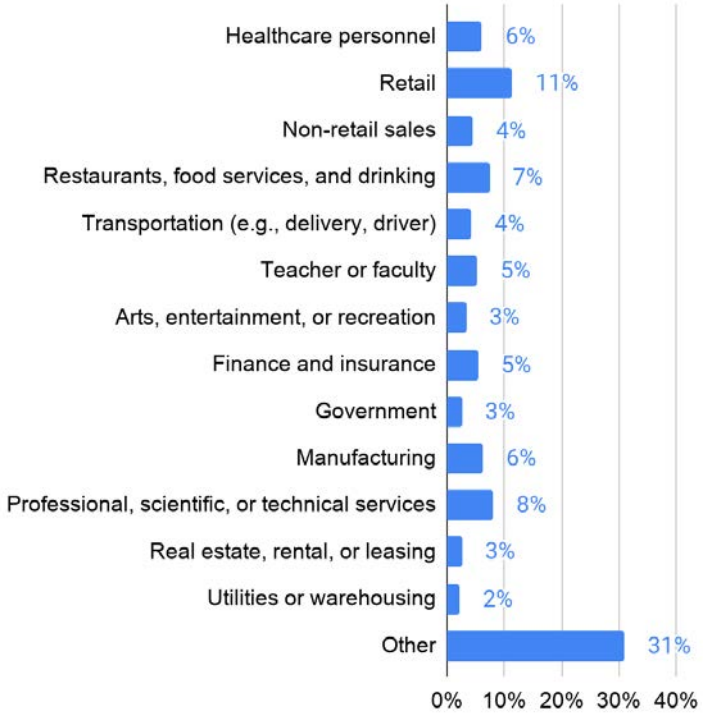
Survey & Demographics

Distribution of the work status (before the pandemic)



Distribution of job categories (before the pandemic)



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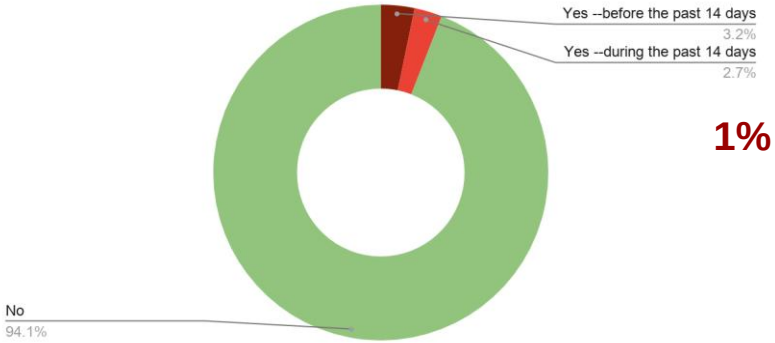
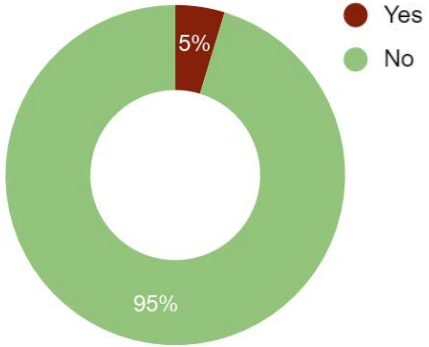
Health & Exposure Risk

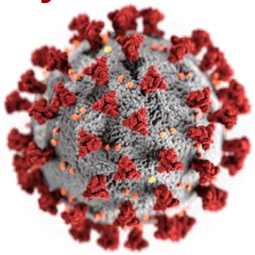
Had close contact with confirmed cases of COVID-19



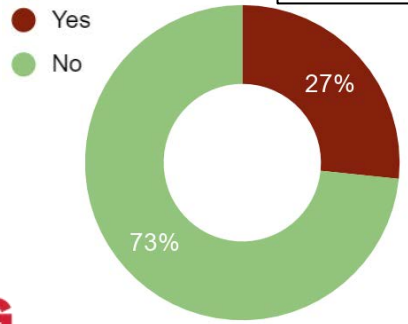
Had COVID-19 symptoms in the past 14 days



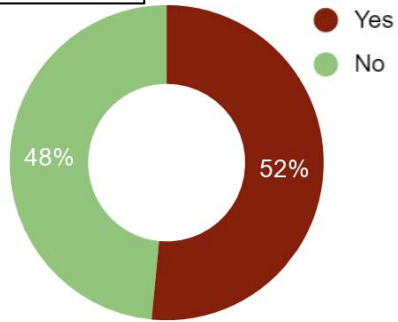
1% actually catched the virus!



Have pre-existing conditions



Younger than 65



Older than 65

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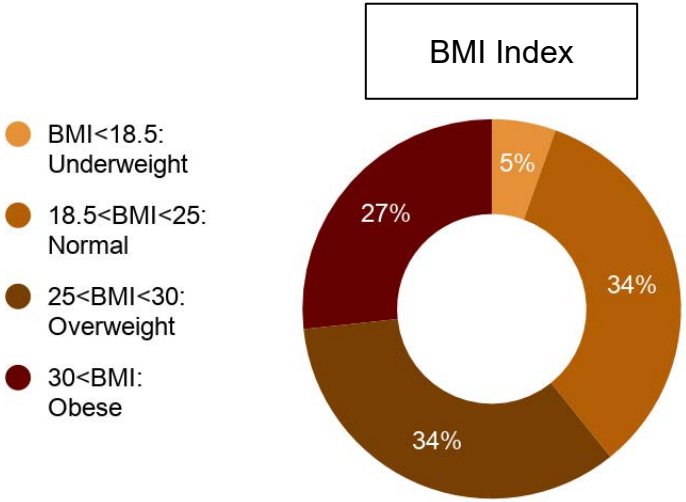
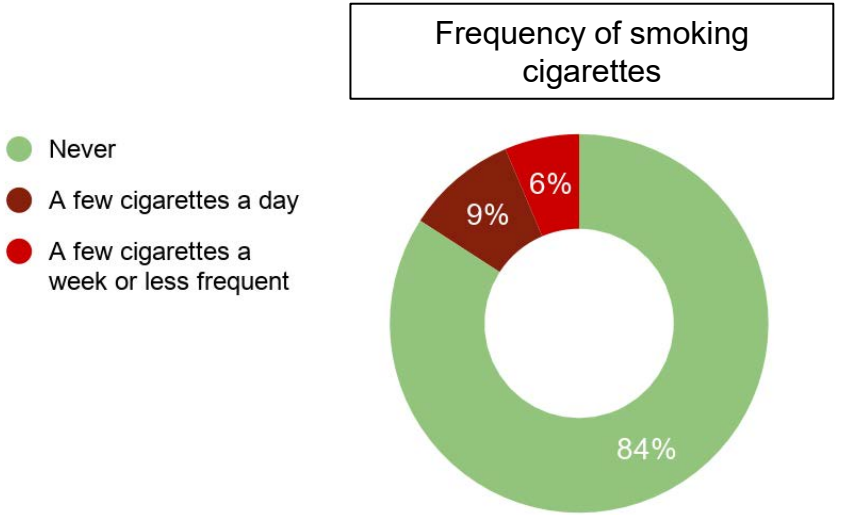
Health & Exposure Risk





Adult Body Mass Index

(reference: Centers for Disease Control and Prevention)

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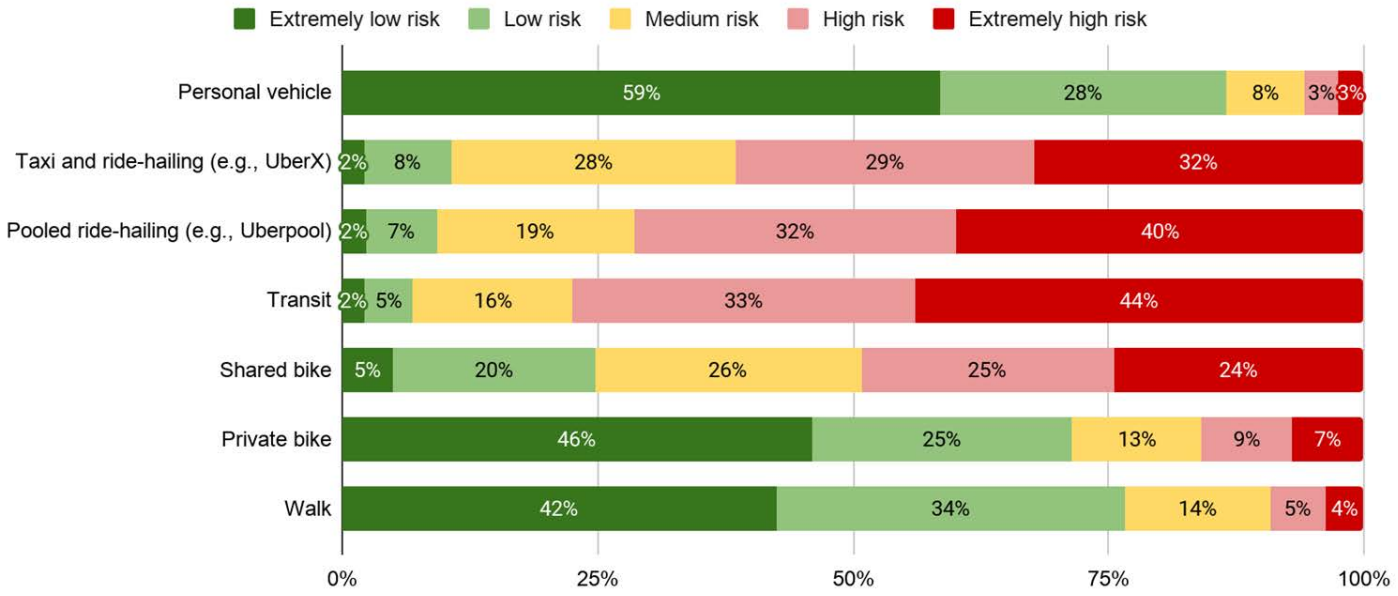
Risk Perceptions

Perceived risk of traveling with different modes during the COVID-19 pandemic



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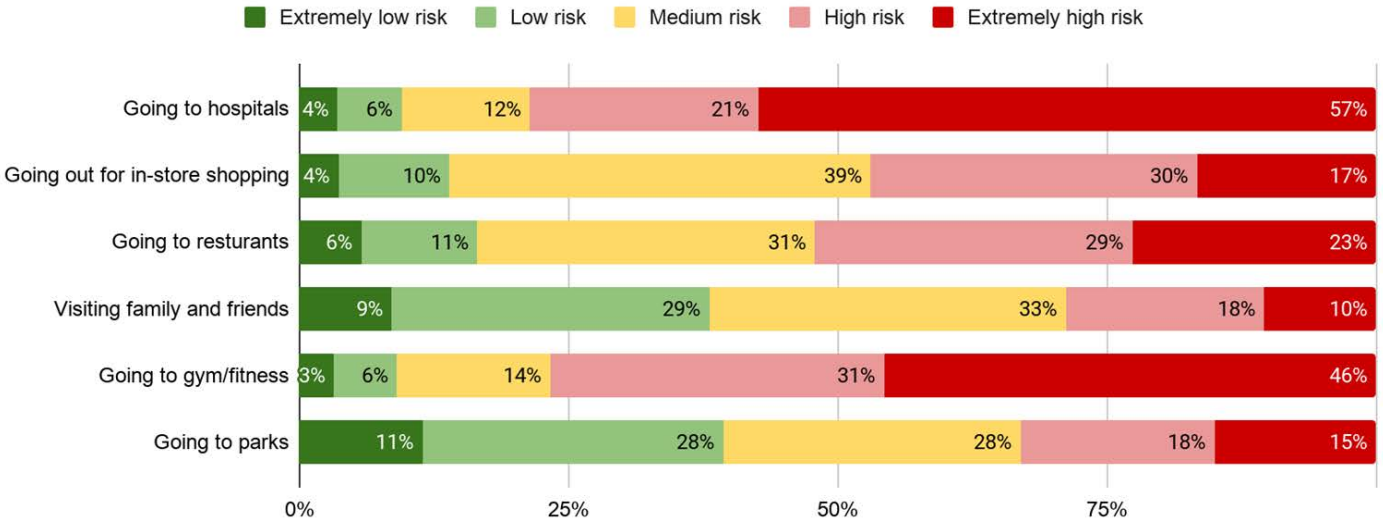
Risk Perceptions

Perceived risk of performing different activities during the COVID-19 pandemic



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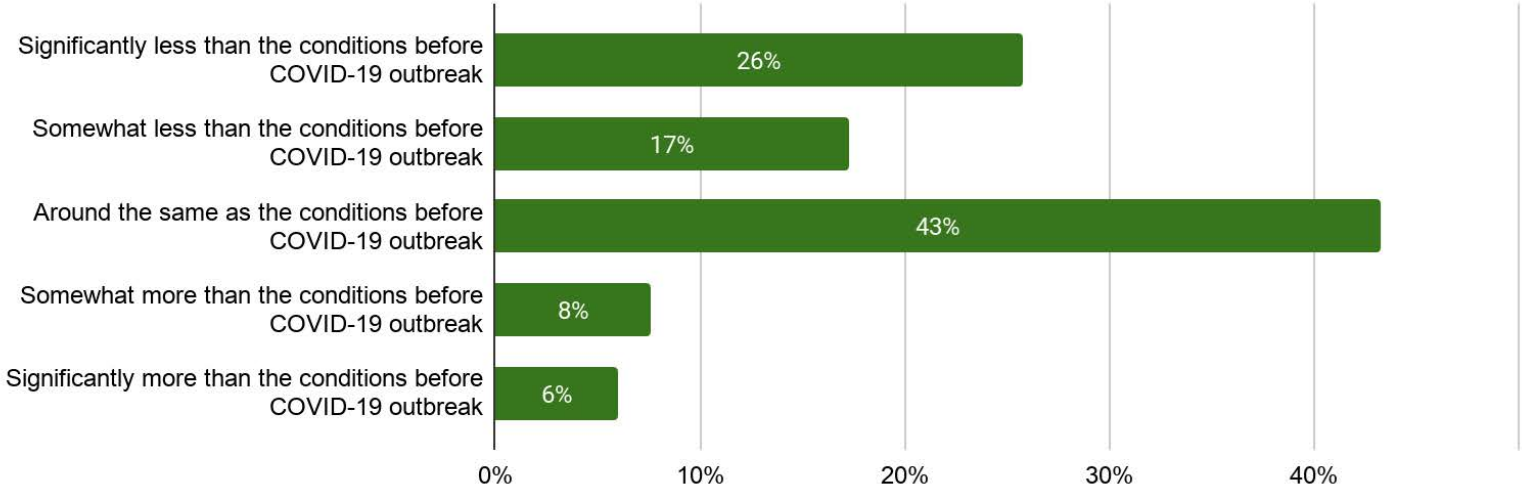
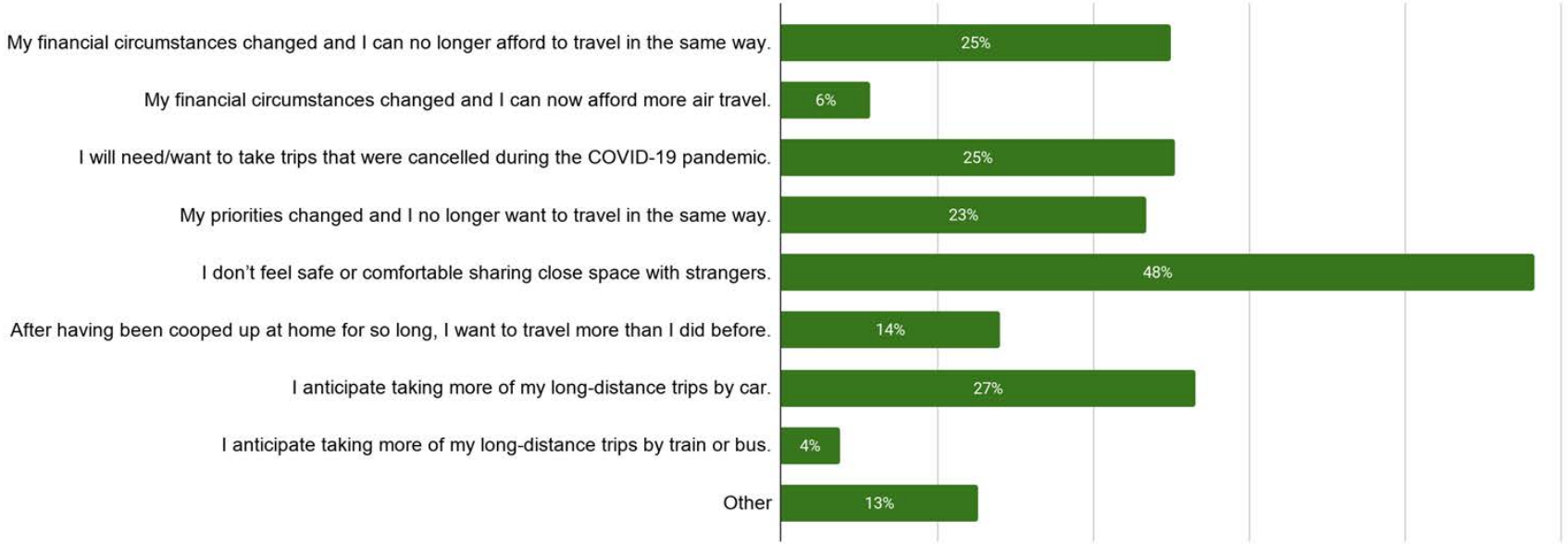
Expected change in airplane travels once the COVID-19 is no longer a threat as compared to the before-pandemic situations



Air Travel

Reasons behind the expected change in airplane travels once the COVID-19 is no longer a threat as compared to the before-pandemic situations



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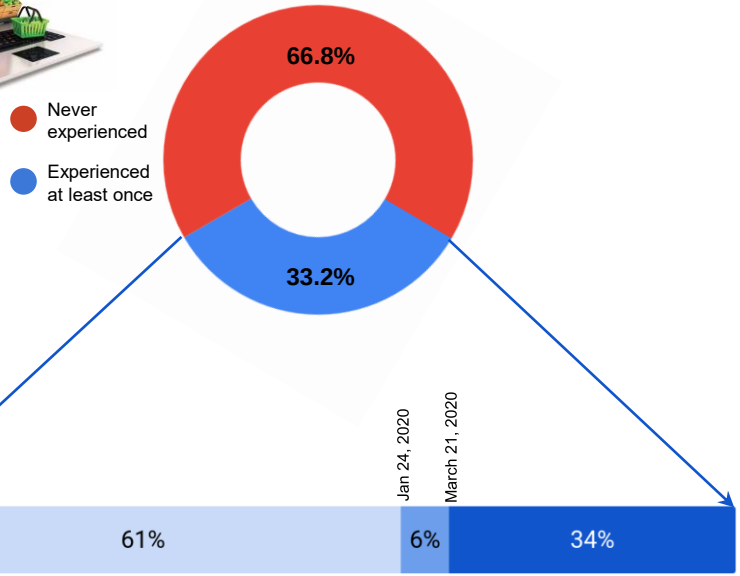
Shopping Habits & Attitudes

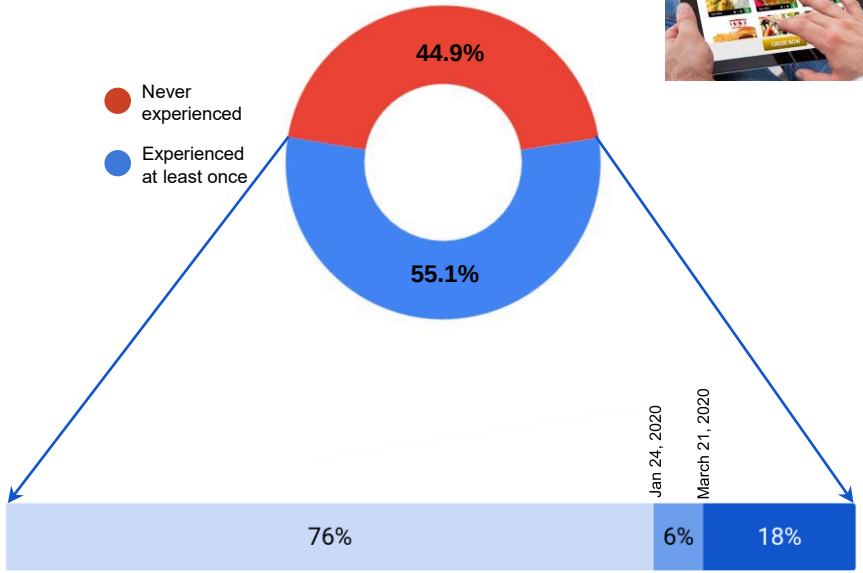
Online grocery shopping



First time experience:

- Before the first confirmed case in Illinois
- Between the first confirmed case & the Stay-at-home order
- After the Stay-at-home order in Illinois

Order food online from restaurants



First time experience:

- Before the first confirmed case in Illinois
- Between the first confirmed case & the Stay-at-home order
- After the Stay-at-home order in Illinois

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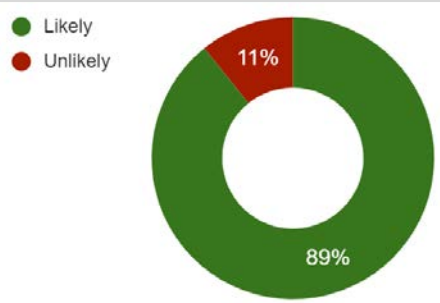
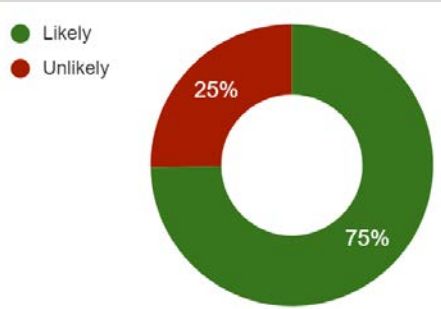
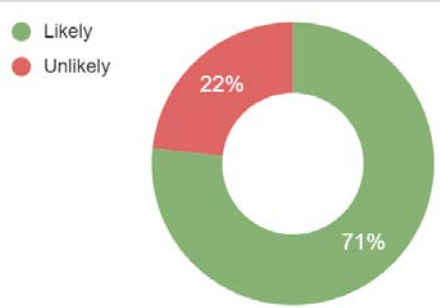
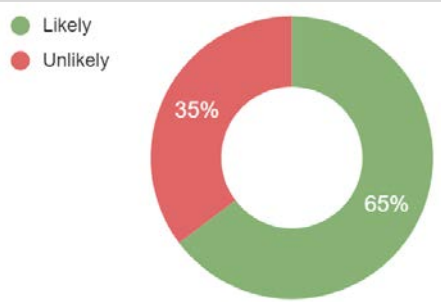
Shopping Habits & Attitudes

Online shopping more frequently in the future as compared to before-pandemic?

	Online grocery shopping	Order food online from restaurants
In the first few months after the pandemic is over		
Far after the pandemic is over		

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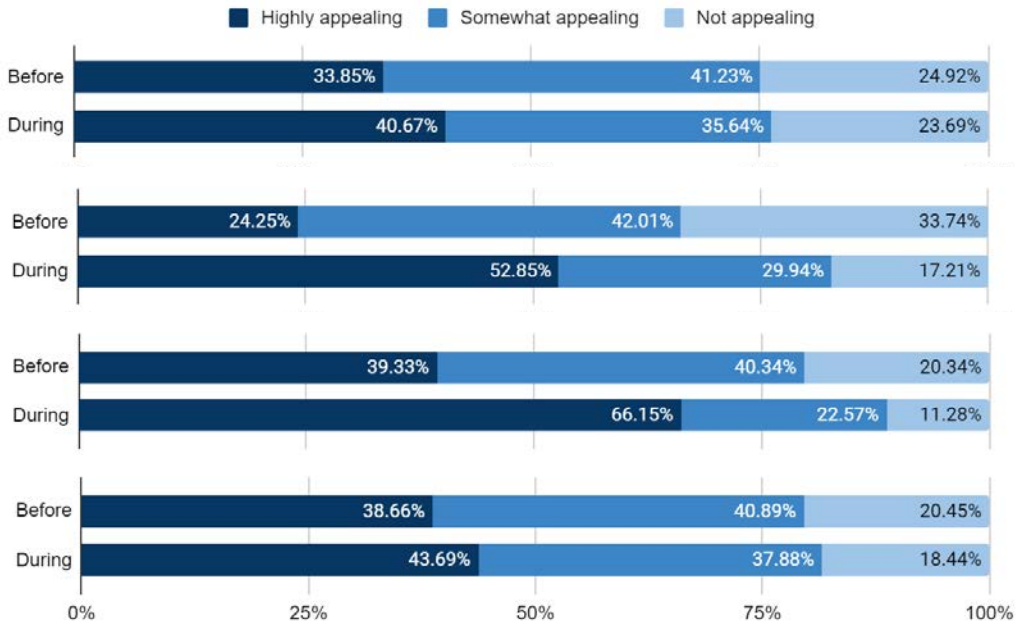
Shopping Habits & Attitudes

Motivations for online shopping before vs. during the COVID-19 outbreak



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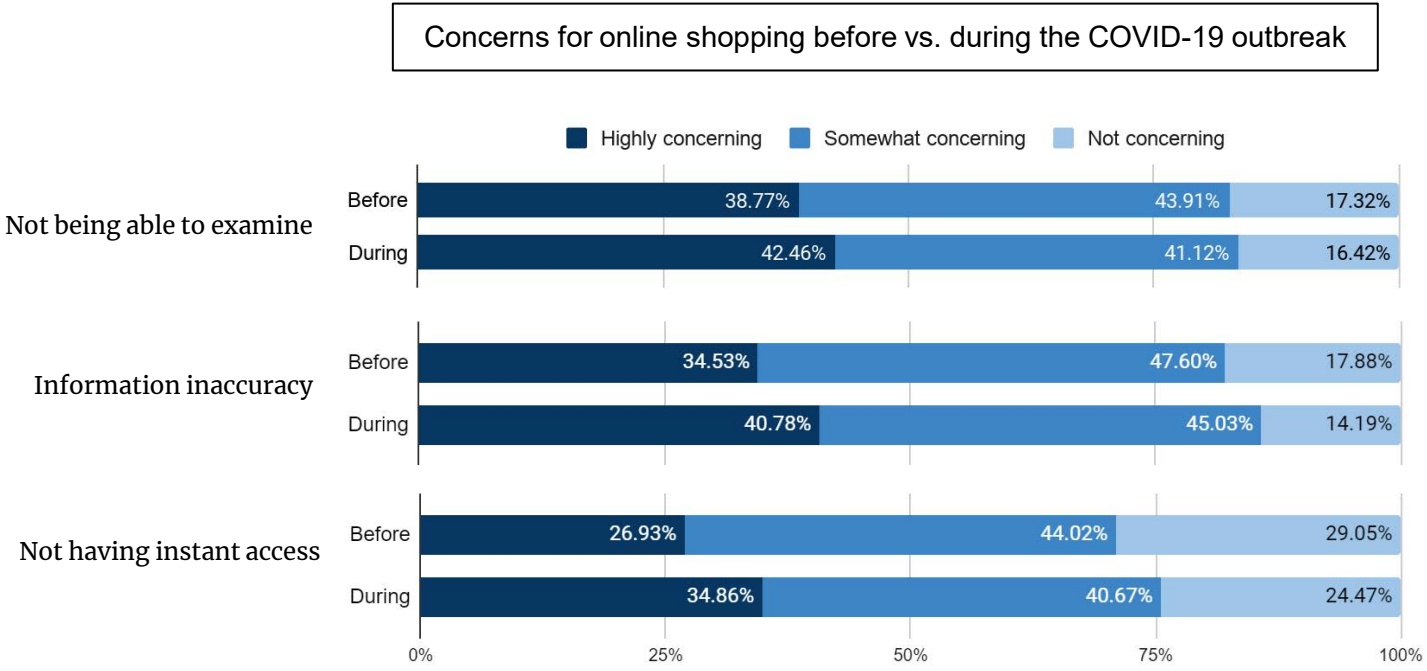
Shopping Habits & Attitudes



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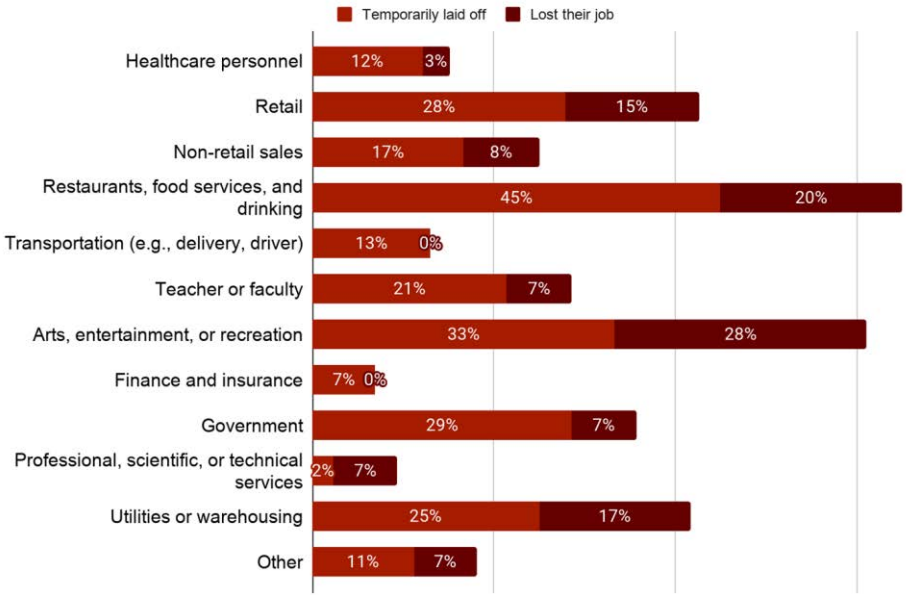
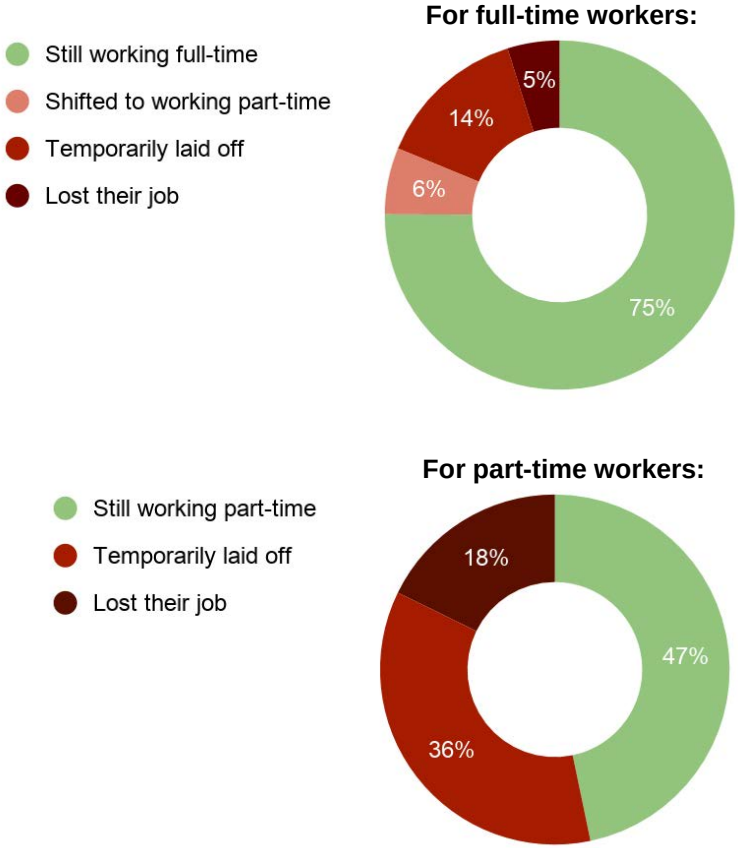
Economic Impacts

Lost job/Temporary laid off during the pandemic by job category



Change in employment status during the pandemic



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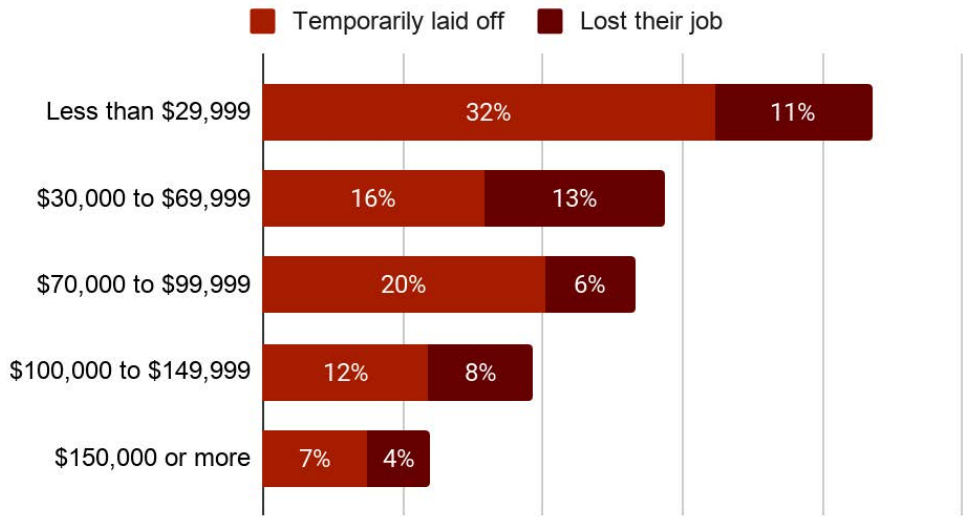
Economic Impacts

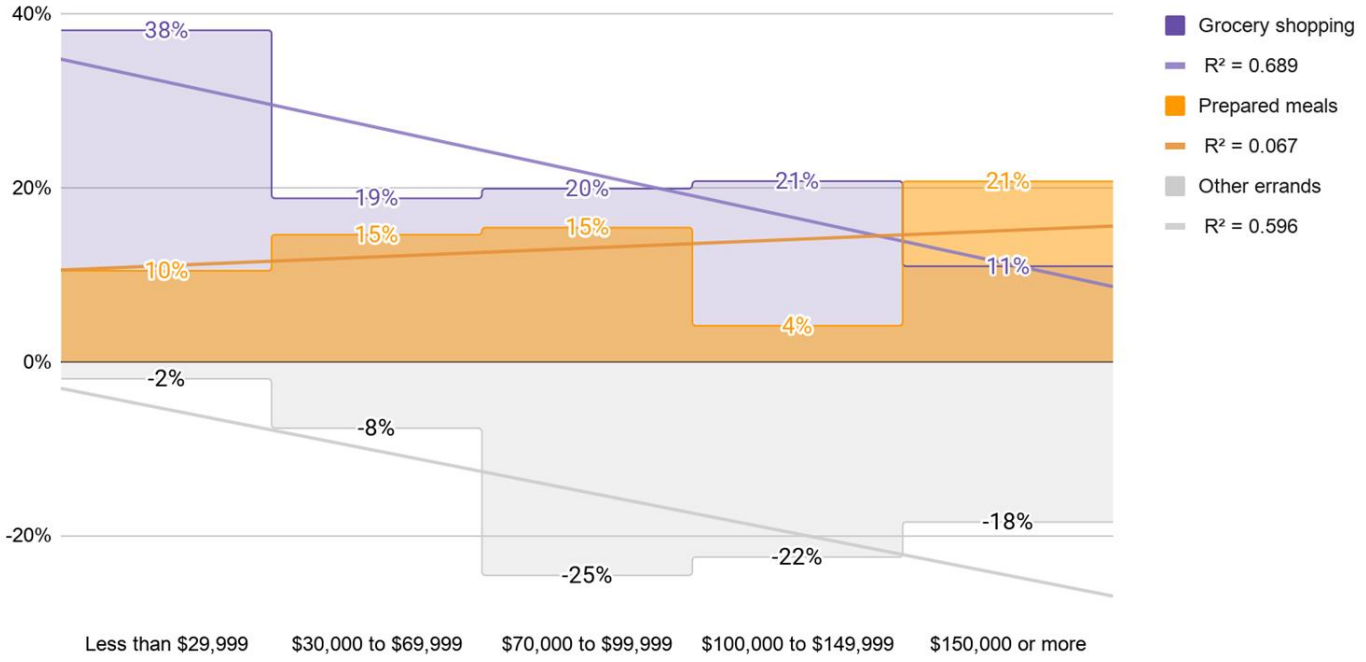
Lost job/Temporary laid off during the pandemic by income category



UIC ENGINEERING

Economic Impacts

Change in shopping expenditure during the pandemic: Shopping for groceries, prepared meals, & errands



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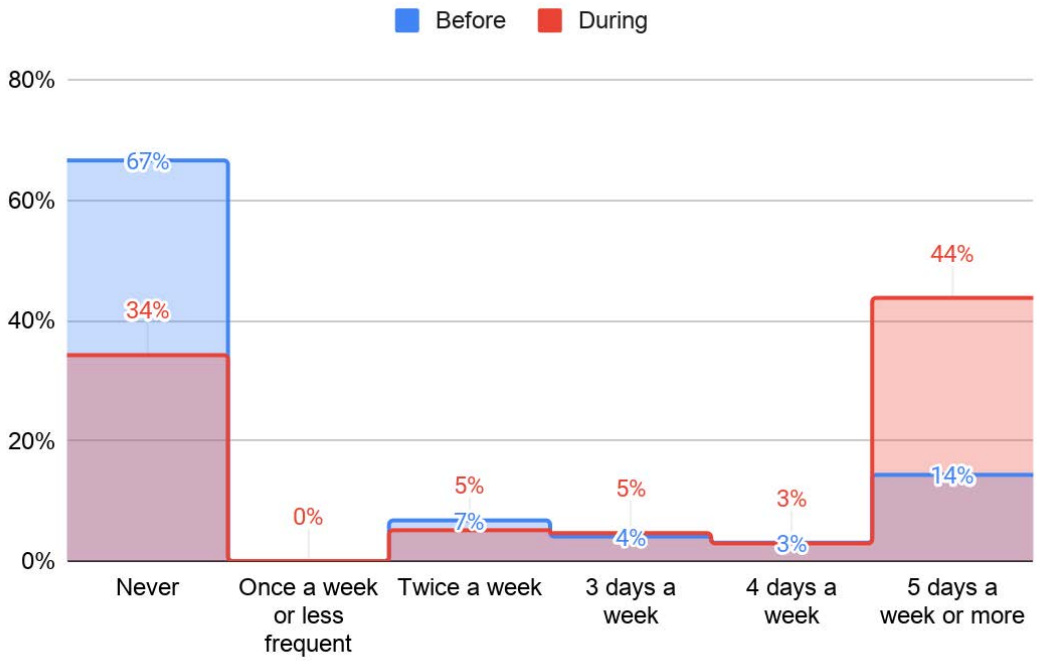
Working From Home

Frequency of working from home, Before and During the COVID-19 outbreak



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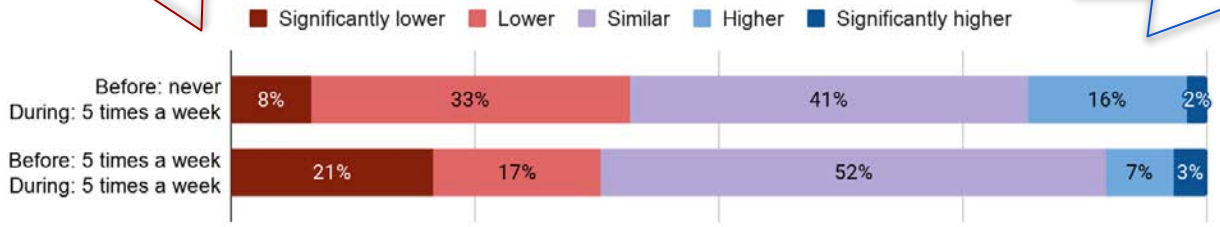
Working From Home

- More distractions at home
- Lack of comfortable work environment

- No commuting time to work
- More casual environment at home



Workers' self-evaluation of the productivity of working from home during the COVID-19 pandemic

FUTURE INSIGHTS

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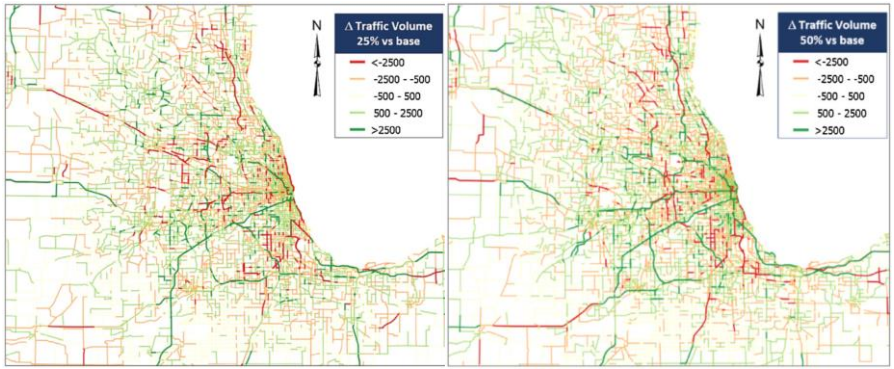
FUTURE INSIGHTS

Planning Towards More Sustainable Future

- Teleworking carries much more potential than we thought before
  - A considerable portion of people fairly happy with their productivities at home, but not everyone:
    - Not having comfortable work environments at home
    - Distractions at home are important
  - Reducing the pollutants while keeping the individuals and firms productive.



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FUTURE INSIGHTS

Planning Towards More Sustainable Future

- Promoting micro-mobility
  - Bikes and scooters
  - Safe and accessible substitutes for transit in the pandemic situations

- Expectations on housing industry
  - Large Multi-story buildings in the suburban areas
  - People would be more interested in homes

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FUTURE INSIGHTS

Industries

- Expectations on Air-travel & Urban Mobility Industries
  - Air-travel to road trips
  - Autonomous vehicles
  - Vehicle body sizes/types
  - TNC services to carry goods

FUTURE INSIGHTS

Industries

- Expectations on online shopping industry
  - Growth in the market of online shopping -- at least for groceries and from restaurants
    - Online shopping for groceries grew faster
    - Still online shopping from restaurants is more popular
  - The growth persists in the future, even far after the pandemic is over
    - ICT
    - Vehicle ownership

https://www.mondanite.net/best-5-online-shopping-sites-for-women/

https://www.flickr.com/photos/91261194@N06/49804563978

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FUTURE INSIGHTS

Autonomous Vehicles

More effective to promote AVs over non-AVs

- AVs make road trips easier
- AVs enable people to work in vehicles

More challenging to promote shared & pooled shared AVs over privately-owned AVs

- People have more concerns about shared-mobility

https://www.autonews.com/sponsored/autonomous-vehicles-automotive-and-transportation-disruption

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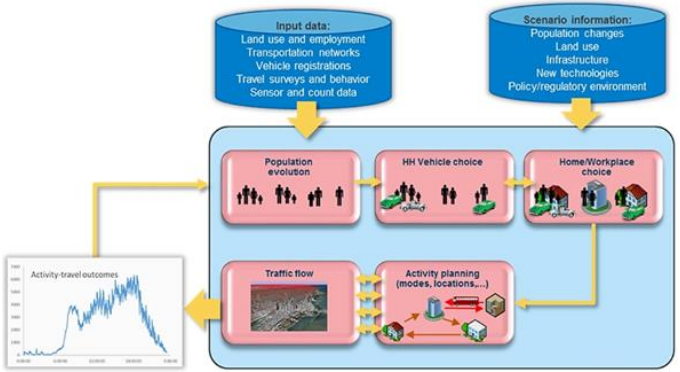
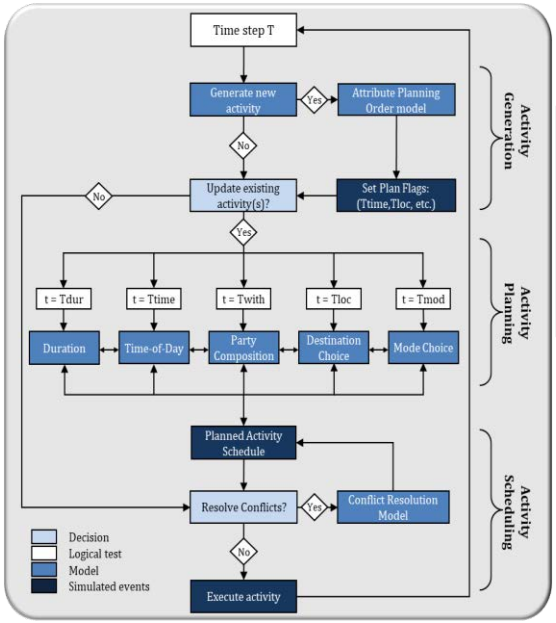
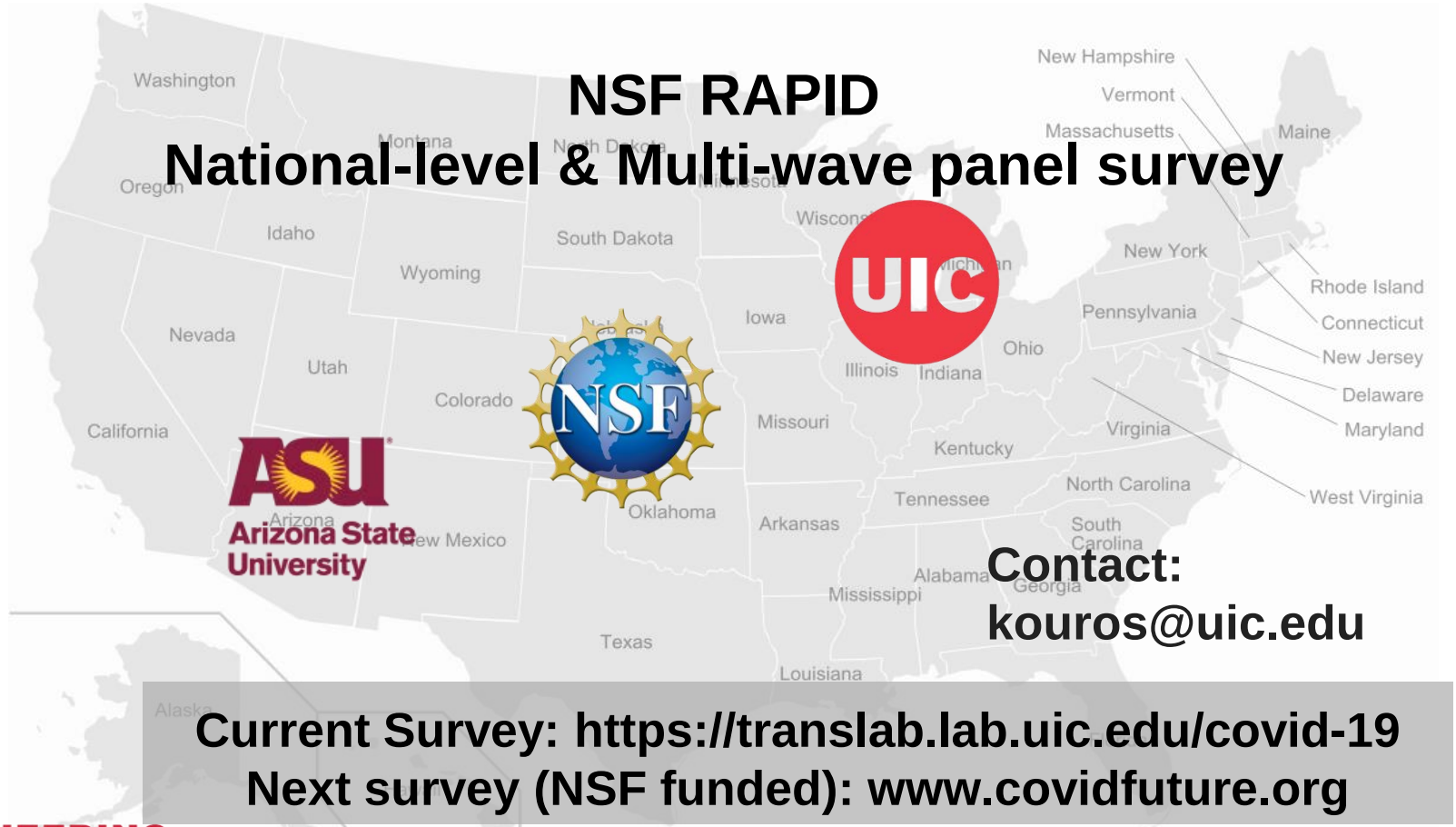
FUTURE INSIGHTS

Digital Twin: ADAPTS Agent-based Model

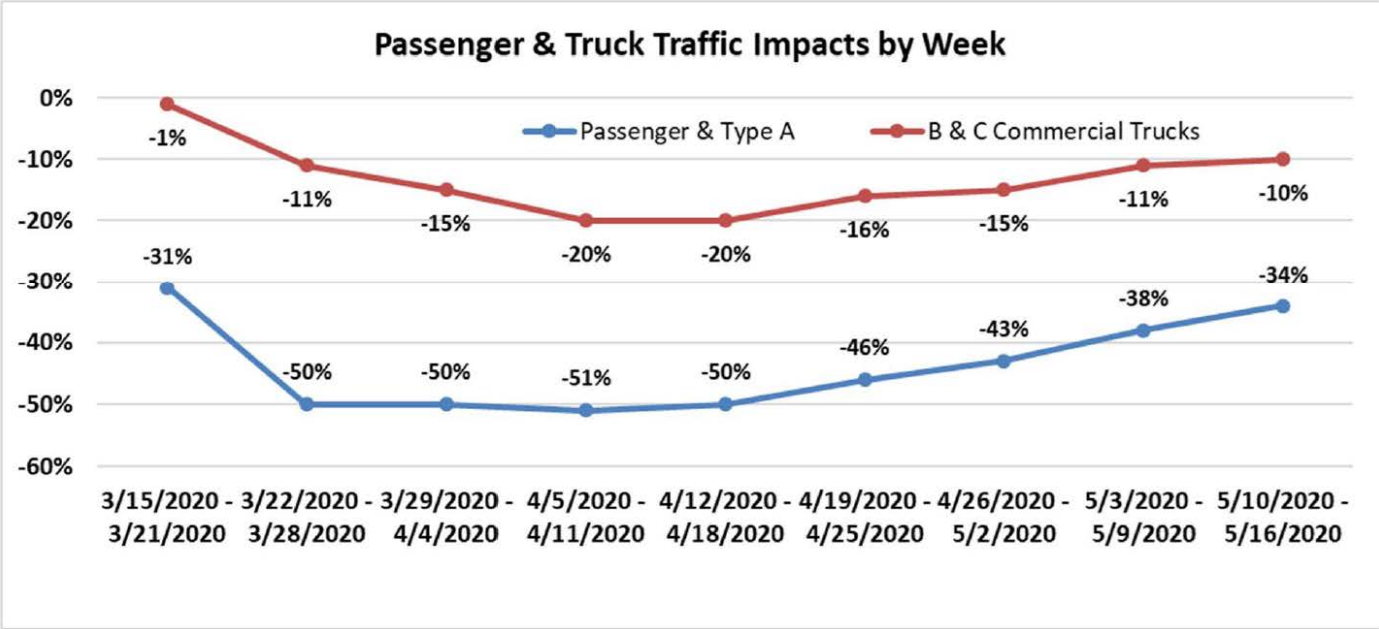




Next Phase of the Research ...

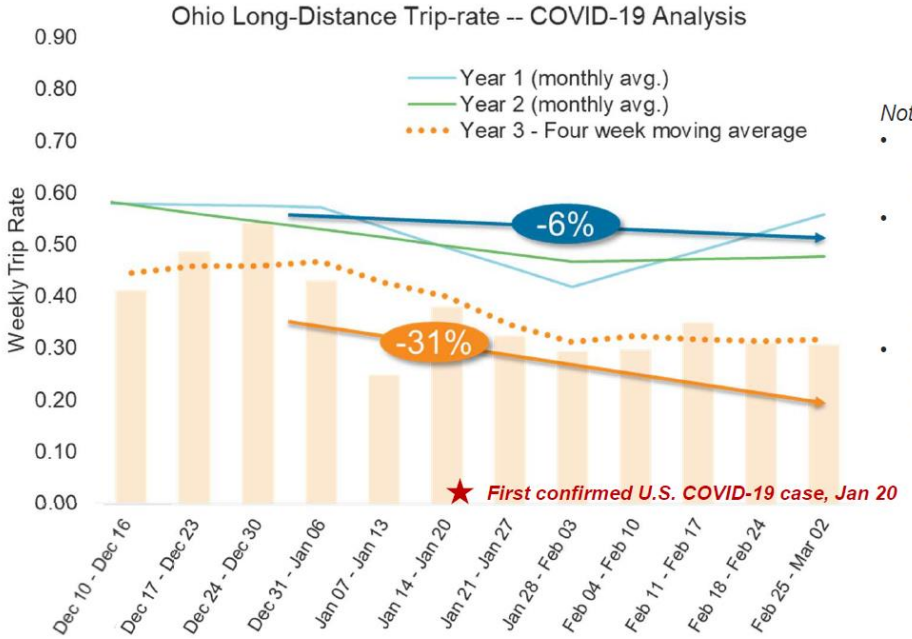


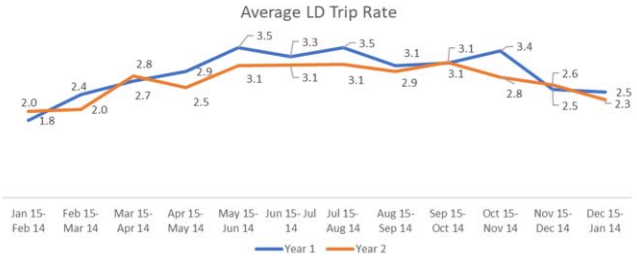
- Affected Everyone's Travel



Data Source: ODOT Technical Services, Traffic Monitoring, Permanent Count Stations, Average daily count by day of week March-May 2019 compared to actual count by specific day in 2020.

- Long-Distance trip rates were lower than expected starting mid-January.



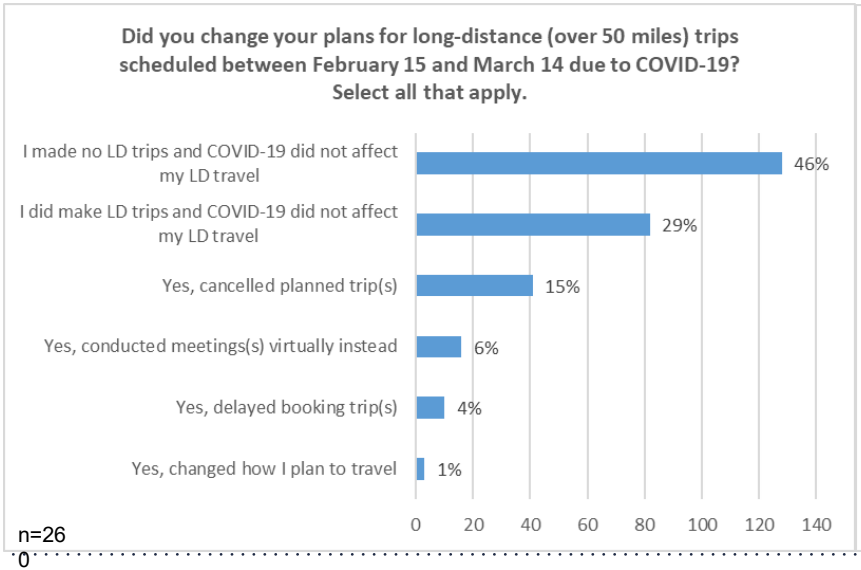


Notes:

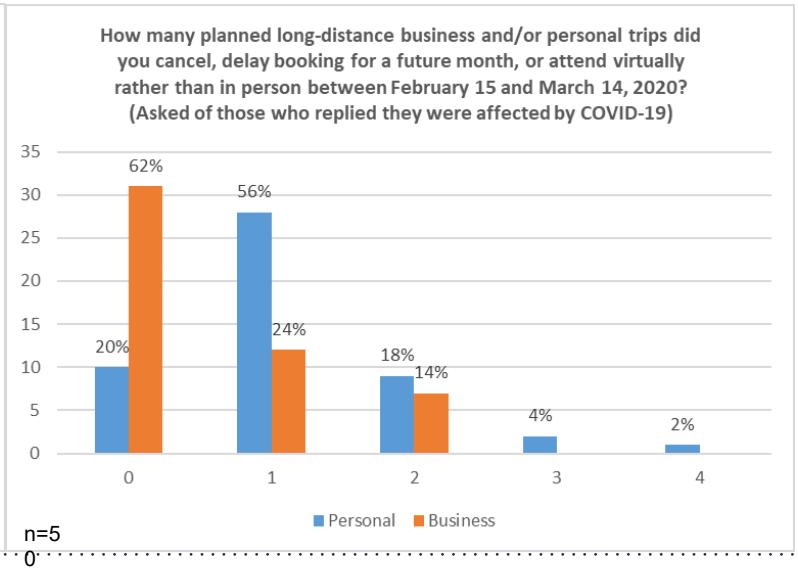
- *Year 1,2 shown as average weekly trip rate by month*
- *Year 1,2 data wraps years (Y1 ran Jan-Jan; Y2 Feb-Feb) while Year 3 is sequential (Mar-Mar)*
- *Rate changes shown based on December and February monthly averages*

Data Source: Unweighted Ohio Long-Distance HTS

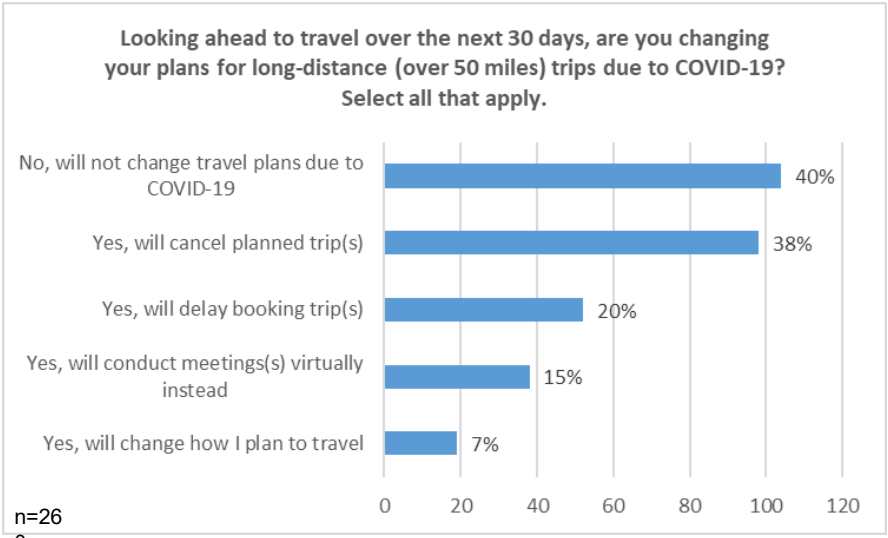
- 38% of those with LD trips planned February 15- March 14, 2020 were affected in due to COVID-19



- Personal travel was more affected than Business travel.
- Both were affected for 18% of respondents.



- Asked the week of March 15, 2020.
- Unfortunately, we neglected to ask if no LD trips were planned.
- Previous 2 years showed 73% of respondents made a LD trip from March 15-April 14

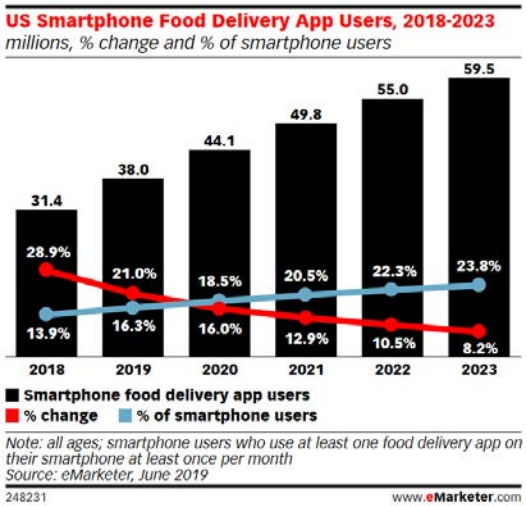


- Presumably, 13% of LD travelers did not think that their LD trips would be affected by COVID-19.
- This is potentially correct.
  - Many still made personal LD trips.
  - Some made unplanned LD trips.

Changes for Shopping

- Online grocery shopping and 3rd Party Food Delivery was already experiencing anticipated growth.
- Probably will level off to already expected levels by a Facility's Design Year (~2045)
- Hence, low-risk of affecting facility demand and design.

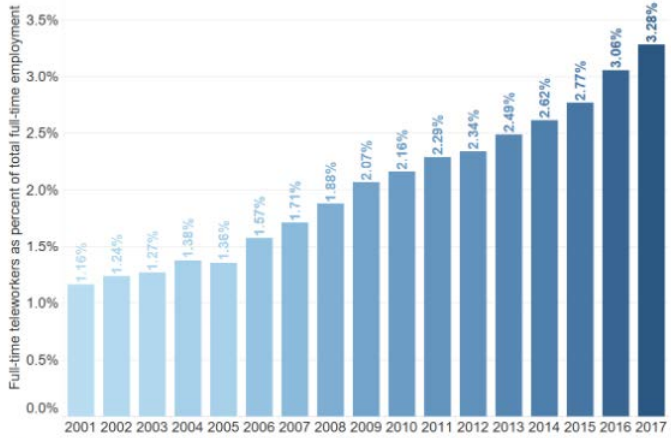
Source: https://www.statista.com/chart/14854/online-food-and-alcohol-sales-in-the-us/ July 2018



Source: https://www.emarketer.com/content/us-food-delivery-app-usage-will-approach-40-million-users-in-2019

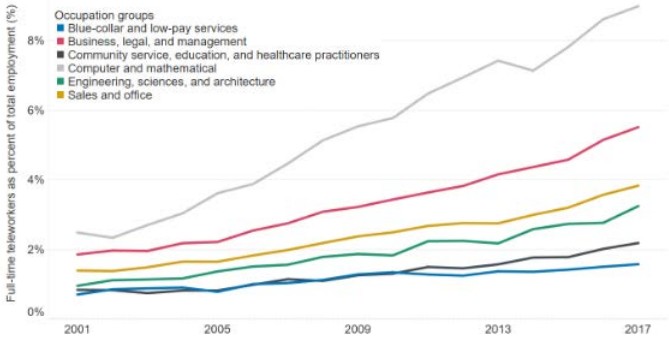
- While telecommuting was already expected to rise, the number of companies noting "just how well" telecommuting has worked for their business will probably increase this trend.
- Potential for decreased traffic to CBDs, leading to lower peak period congestion.
- Adds risk for overdesign of expensive downtown facilities

Chart 1: Full-time employees primarily working from home as a percent of total full-time employment, 2001 to 2017.



Source: American Community Survey; IPUMS-USA, University of Minnesota.

Chart 2: Full-time teleworkers as a percent of total full-time employment by occupation group, 2001 to 2017.



Source: American Community Survey; IPUMS-USA, University of Minnesota.

Source: https://www.conference-board.org/blog/labor-markets/Teleworking-Rapid-Expansion-Continues

- Prior research shows that mode use as a child persists over one's life
  - "Role of Childhood Context and Experience in Shaping Activity-Travel Choices in Adulthood" (Long, K. et al, TRR 2673, 2019)
  - "Mobility Biographies in Three Generations – Socialization Effects on Commute Mode Choice" (Doring, L. et al, Transportation Research Procedia 1, 2014)
  - "Travel Socialization: A Social Theory of Travel Mode Behavior" (Basington, H., International Journal of Sustainable Transportation, 2008)
  - "Childhood Influences on Adult Travel Mode Choice" (Johansson, M., International Conference of Traffic and Transport Psychology, 2005)

- "Bicycles are the new toilet paper" – Landis-Hanley, J. *The Guardian*, 21 Apr 2020
- Hard to quantify or even guess just what these effects might be
  - Will children or even adults continue to use active modes?
  - What trip purposes?
    - School, shopping, personal business, other errands?
  - Increase demand for non-motorized facilities?
- Perhaps increased importance for Routine Accommodation policies

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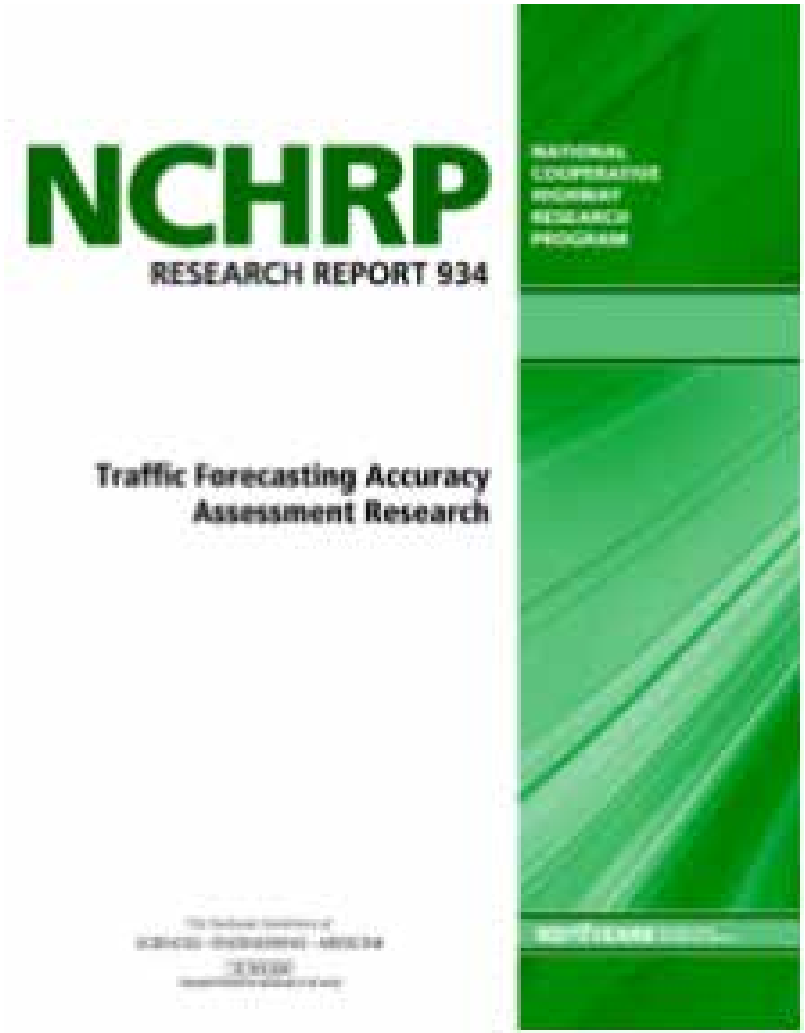
TRB Resources

- Blog: **Telework transportation research in light of the COVID-19 pandemic**



Get Involved with TRB

- Getting involved is free!
- Join a Standing Committee (http://bit.ly/TRBstandingcommittee)
- Become a Friend of a Committee (http://bit.ly/TRBcommittees)
  - Networking opportunities
  - May provide a path to become a Standing Committee member
- For more information: www.mytrb.org
  - Create your account
  - Update your profile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Transportation Research Board

#TRBwebinar
#COVID19

TRB turns 100 on November 11, 2020

Help TRB:

- Promote the value of transportation research;
- Recognize, honor, and celebrate the TRB community; and
- Highlight 100 years of accomplishments.

Learn more at

www.TRB.org/Centennial

#TRB100

MOVING IDEAS: ADVANCING SOCIETY—100 YEARS OF TRANSPORTATION RESEARCH

Attachment C

Presentation: COVID-19 Impacts on Managed Lanes by the National Academies of Sciences Engineering and Medicine Transportation Research Board, 6/25/2020

The National Academies of
SCIENCES · ENGINEERING · MEDICINE

TRANSPORTATION RESEARCH BOARD

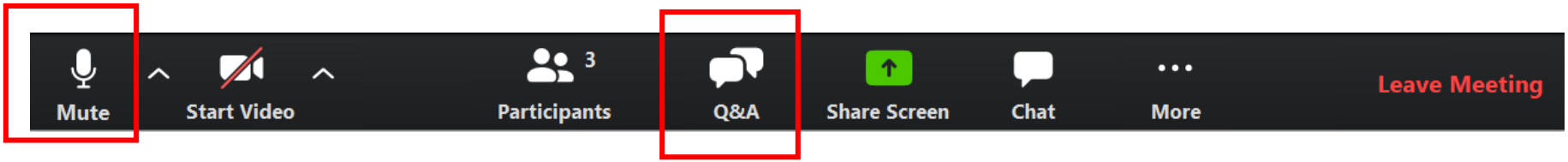
TRB Webinar: COVID-19 Impacts on Managed Lanes

June 25, 2020

@NASEMTRB
#TRBwebinar
#COVID19

Questions and Answers

Please type your questions into your webinar control panel



We will read your questions out loud, and answer as many as time allows

#TRBwebinar
#COVID19

COVID-19 Response
Bay Area Express Lanes

Lisa Klein
Director, Field Operations and Asset Management
Metropolitan Transportation Commission

TRB Webinar
June 25, 2020

BAY AREA EXPRESS LANES

COVID-19 Shelter-in-Place Regional Traffic Impacts

Traffic volumes decreased significantly:

- Bay Area Bridges: ⬇44% to 61%
- I-80 (Alameda County): ⬇40%
- US-101 (San Mateo County): ⬇60+%
- I-680 (Contra Costa County) Express Lanes Corridor: ⬇60+%

Traffic volumes reached their lowest point by late March / early April

Bay Bridge – Jan 2020

Bay Bridge – Mar 2020

Bay Area Express Lanes

About MTC's I-680 Express Lanes in Contra Cost County

- 12-mile corridor between Walnut Creek and Dublin, CA
- Heavily congested in the northern half of the corridor
- 31,000 Average Daily Express Lane Trips (pre COVID-19)

Regional Express Lane Tolling Ceased March 20
Restarted June 1

Express Lane Tolling Decisions

Bay Area Express Lane Operators Acted Jointly

Decision to Suspend Tolling

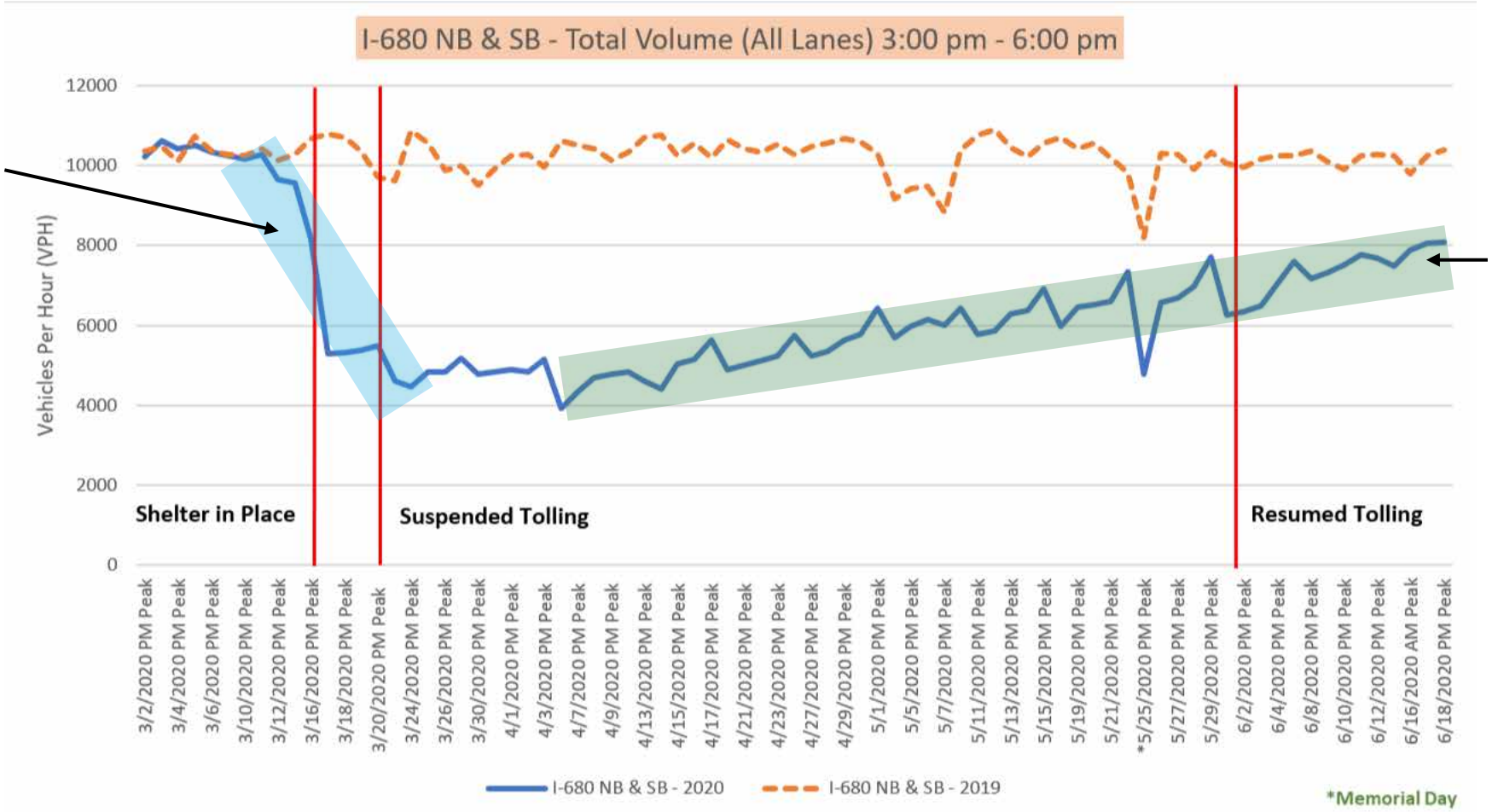
- Significant reduction in corridor traffic
- Free-up CHP enforcement for more critical tasks
- Relieve workload on back-office contractor

Decision to Resume Tolling

- Steady increase in corridor traffic
- Easing of public health orders
- Other CA EL Operators continued tolling

I-680 Traffic Trends During COVID-19

55% decline in traffic volumes in two-week period (3/10 – 3/24)



Steady rise in traffic volumes since 4/7. As of 6/18, corridor traffic volumes are down 22% compared to their pre COVID-19 levels.

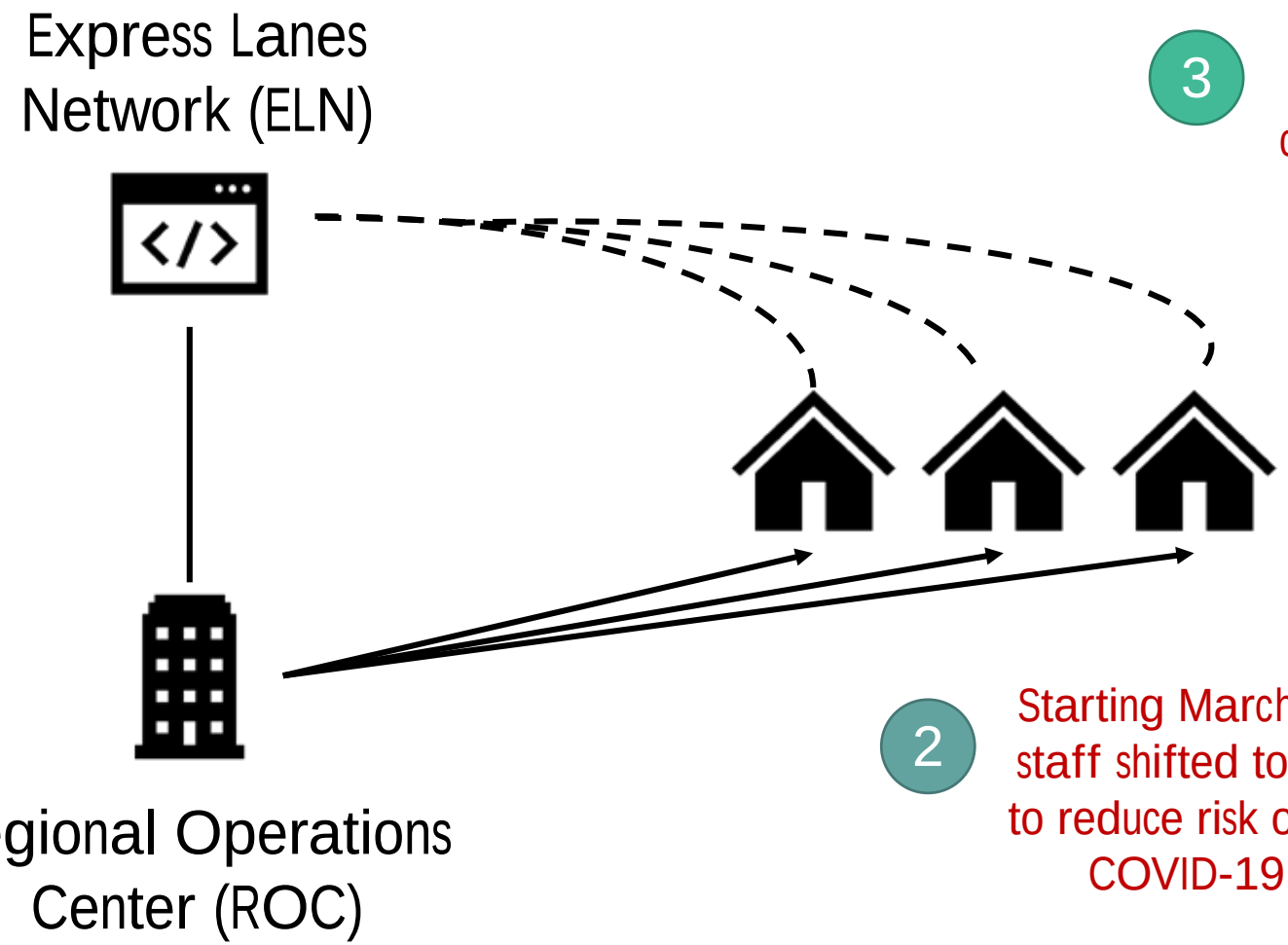
I-680 Traffic Since Restart of Tolling

Peak Period (3:00 pm – 6:00 pm) Most Congested Tolling Zone

	Express Lane		
	Pre COVID-19 Pandemic	6/11/2020	% Difference
Average Toll	$8.00	$1.00	-88%
Average Speed	67 MPH	78 MPH	+16%
Average Volume	1,029 VPH	585 VPH	-43%

	General Purpose Lanes		
	Pre COVID-19 Pandemic	6/11/2020	% Difference
Average Toll	N/A	N/A	N/A
Average Speed	57 MPH	68 MPH	+19%
Average Volume	1,458 VPH	1,314 VPH	-10%

Remote Operation of Express Lanes



1

Pre COVID-19, EL Ops staff accessed the ELN directly through a closed network portal from the ROC.

2

Starting March 13th, EL Ops staff shifted to remote work to reduce risk of exposure to COVID-19 infection.

3

EL Ops staff continue operations remotely by connecting to the ELN via a secure Virtual Private Network (VPN).

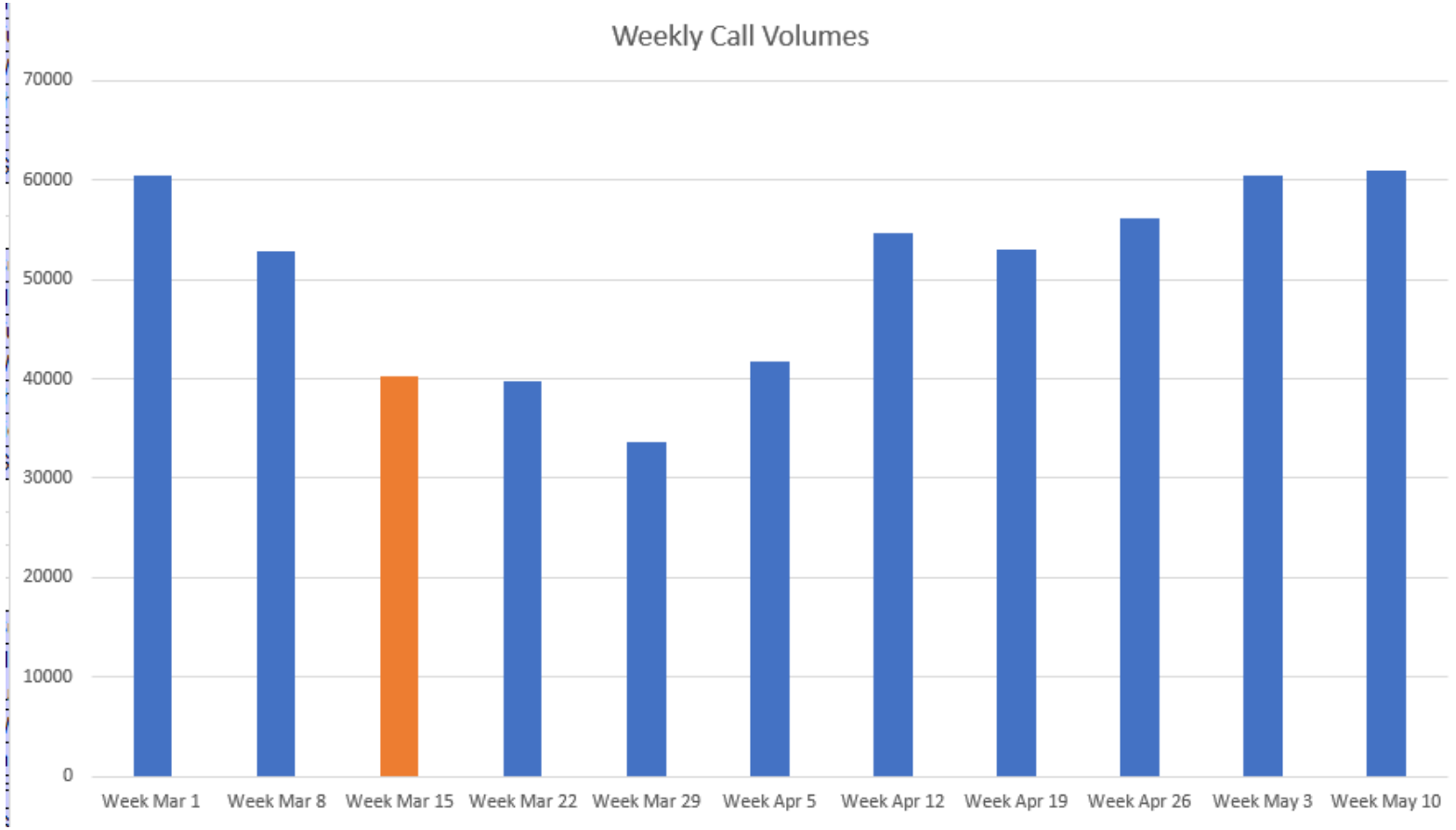
Regional FasTrak Operations Significantly Affected

- Suspended cash collection on seven toll bridges
- Sent ~1.4 M invoices in each of April and May
- Suspended escalation for toll violations for all facilities

BAY AREA EXPRESS LANES

FasTrak Regional Customer Service Center Call Volumes

Call volumes declined by ~50% in the first weeks of shelter-in-place



Regional Customer Service Center COVID Impacts

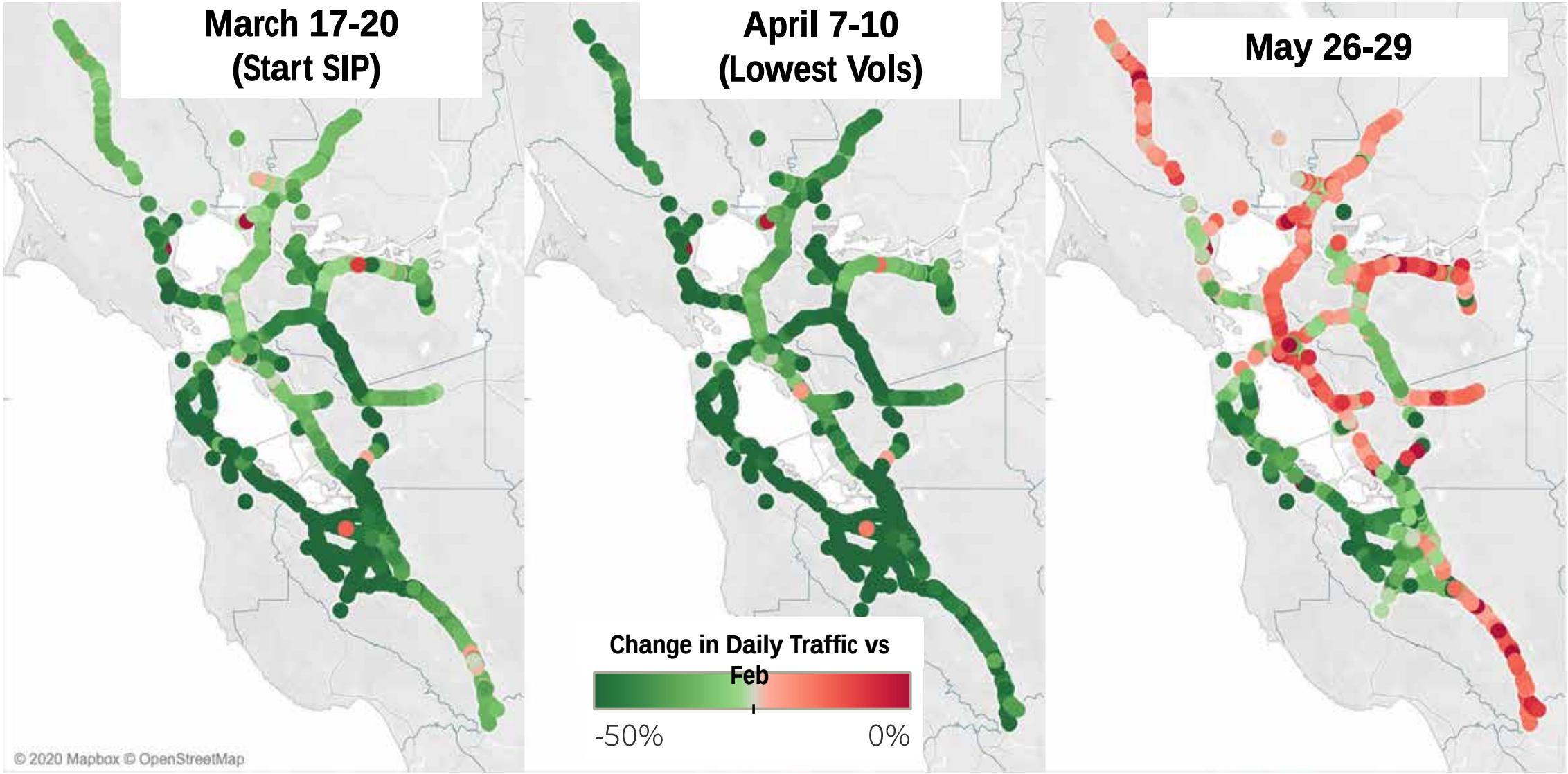
Operational Impacts

- Operations consistent with health ordinance for essential work
- Operational hours reduced; walk in center closed
- Sending toll notices with $0 penalty

Staffing Impacts

- Initial absenteeism between 40%-60%
- Recruiting to replace agents
- Work from home
  - Non-phone personnel in April
  - Phone agents in progress

Planning for the Future (3 – 12 months)
Uneven Return of Traffic



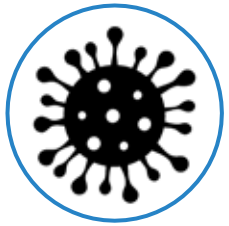
Source: Caltrans PeMS

More Unknowns than Knowns

Economic Recovery / Schools

Social/Business Practices (telecommuting, use of transit & carpooling)

Traffic



2nd Wave?

Managed lanes / technology provide operational flexibility

- Proceed as planned for new express lanes, opening later this year
- Formalize all electronic tolling on region's toll bridges

LA Metro ExpressLanes

COVID-19
Response

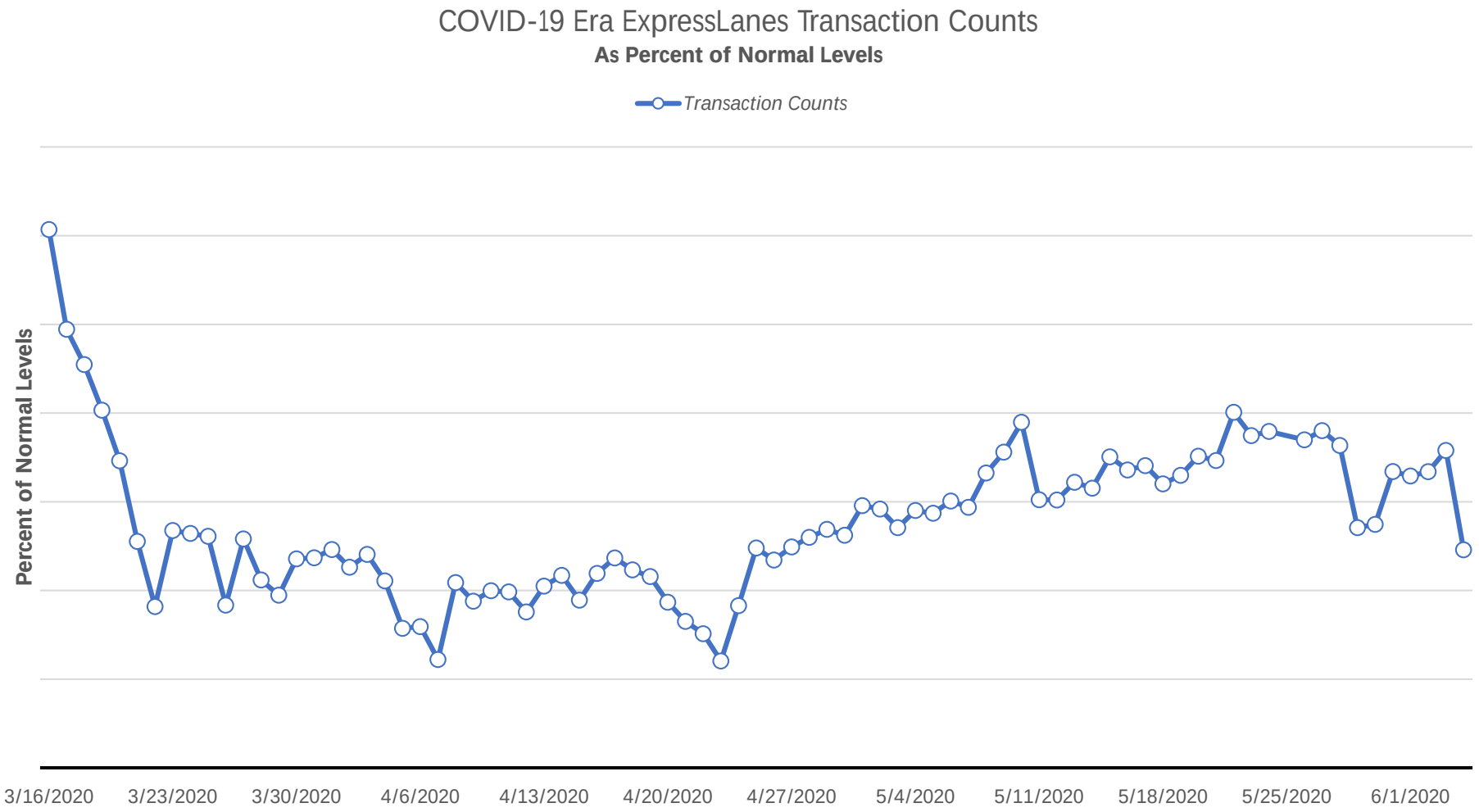
Metro

LA Metro COVID-19 Response

- March 19 – County of Los Angeles issues Safer at Home order (Ph 2:May 8)
  - Metro & ExpressLanes staff implement Work from Home (WFH) policy
  - Headquarters (Gateway Building) remains open
  - ExpressLanes closes Torrance Service Center
  - 20 Customer Service Representatives issued “Thin Clients” to receive calls remotely
  - Consultants, BOS, & RTCS remain engaged and in the field or work remotely
- End of March/early April Metro initiates minimum pricing on all corridors
- June 9 Metro re-establishes dynamic pricing on all corridors

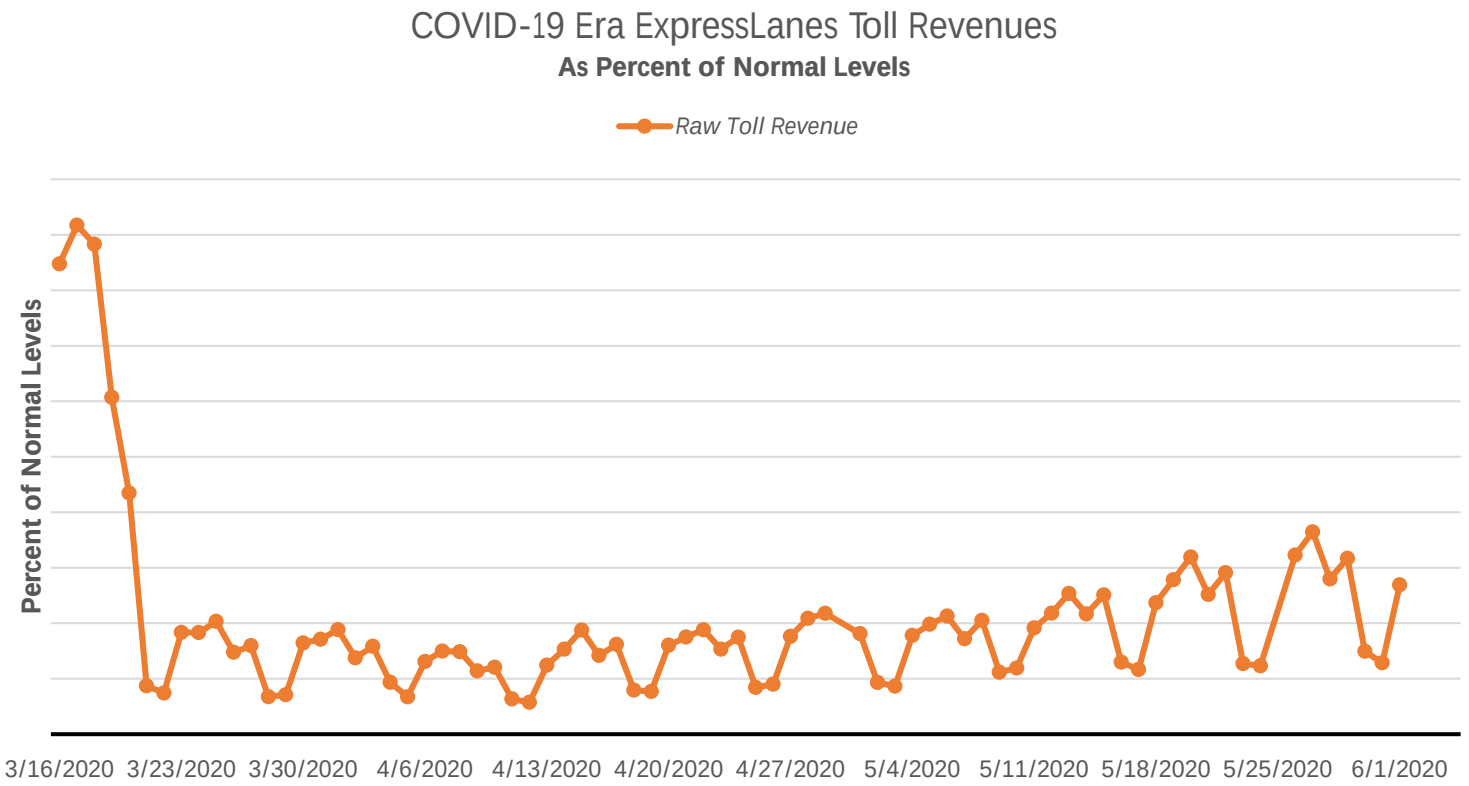
Metro

Traffic Volumes



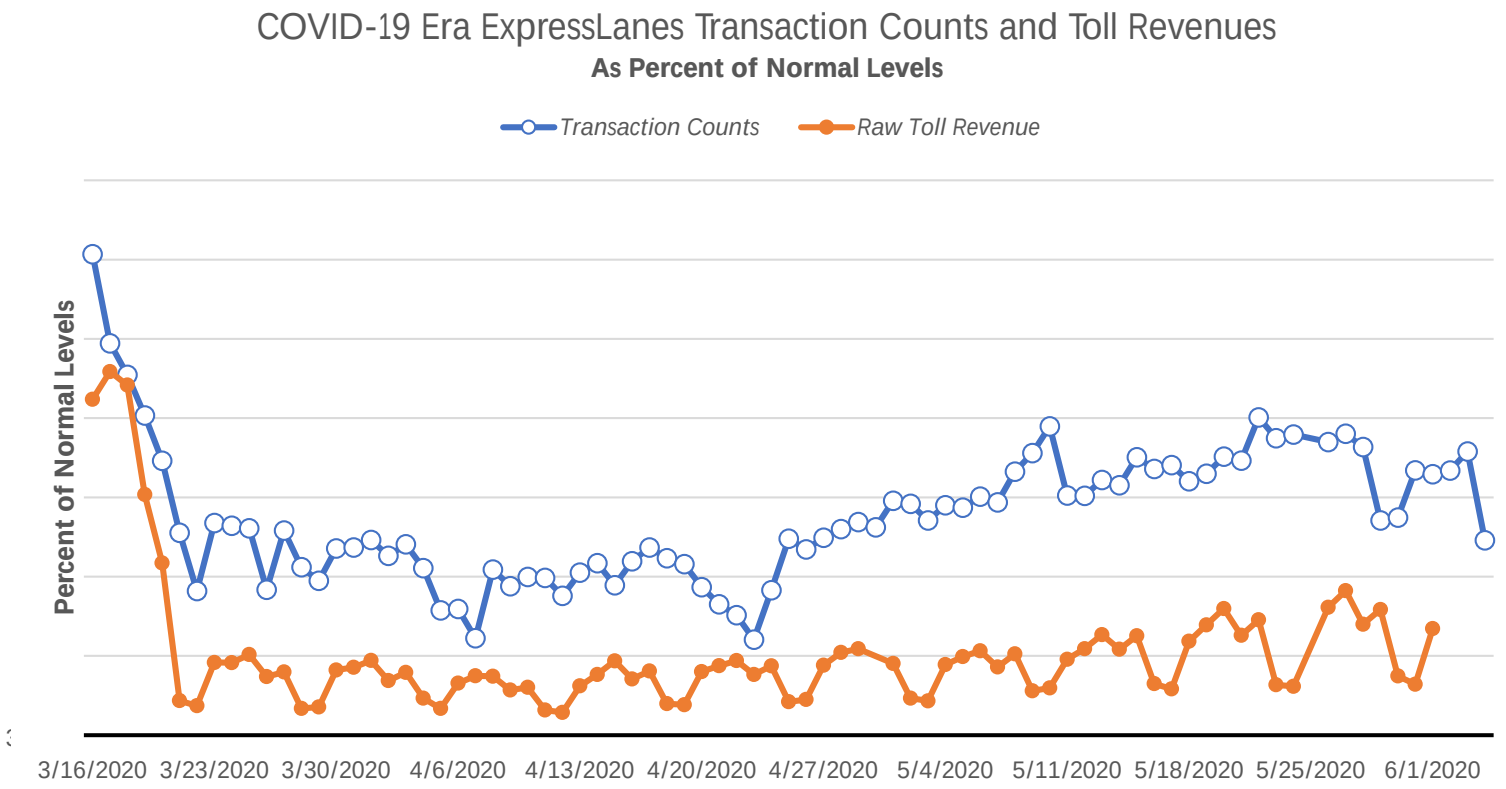
Metro

Revenue Volumes



Metro

Traffic and Revenue Volumes



Metro

LA Metro COVID-19

Next Steps:

- I-105 Environmental & Design (Ongoing)
- Dynamic Pricing (June 9)
- Open Service Center (July 6)
- Occupancy Detection System (August 1)
- Metro HQ (Gateway) Reopens (August – TBD)
- Normal Operations (October – December 2020)
- TIFIA LOI for 105 (2021, planned)

Metro

LA Metro COVID-19

Mark Linsenmayer
LA Metro
Deputy Executive Officer
Congestion Reduction

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Metro

The Effects of COVID-19 on MnPASS Express Lanes

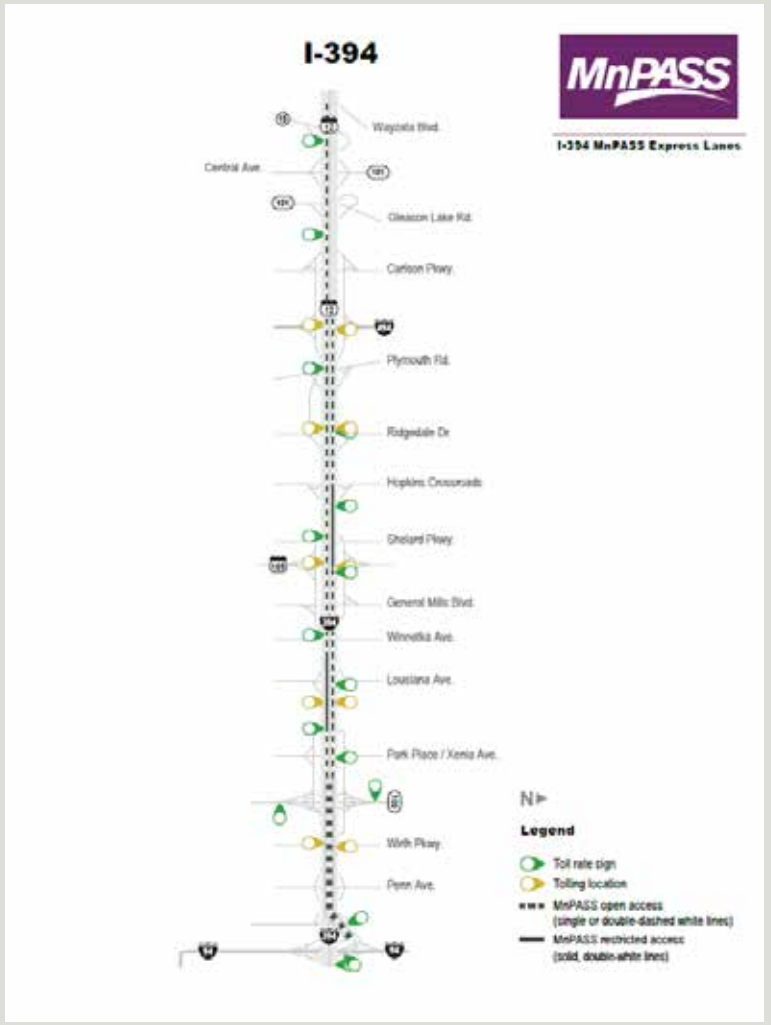
Kiet Ly, PE

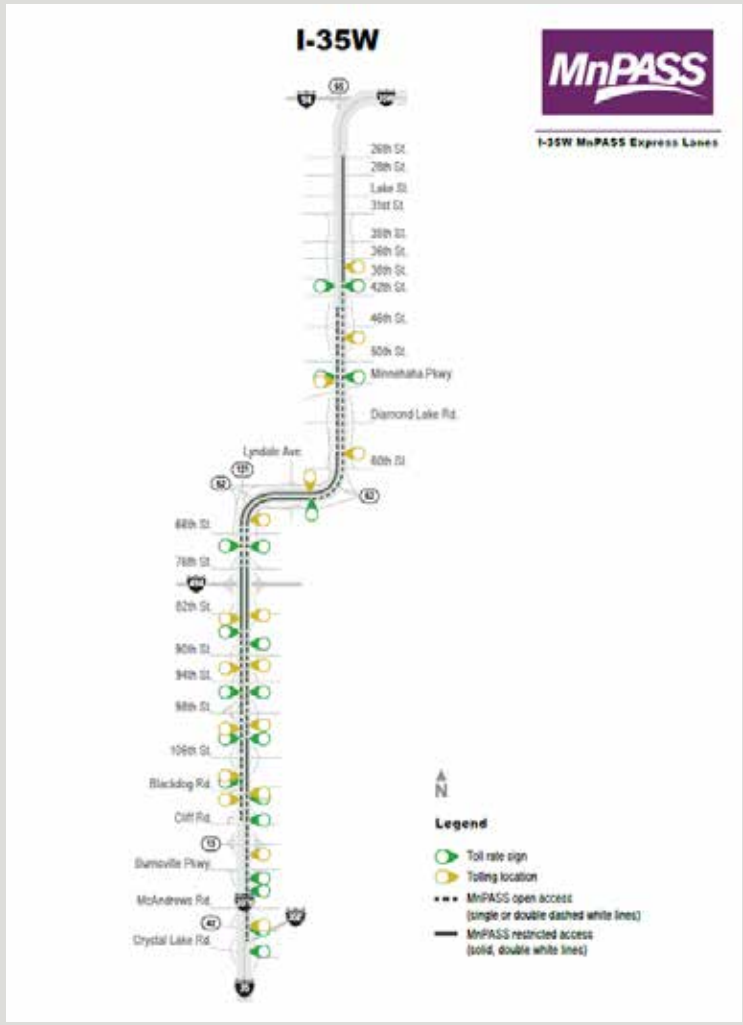
MnPASS Operations Engineer

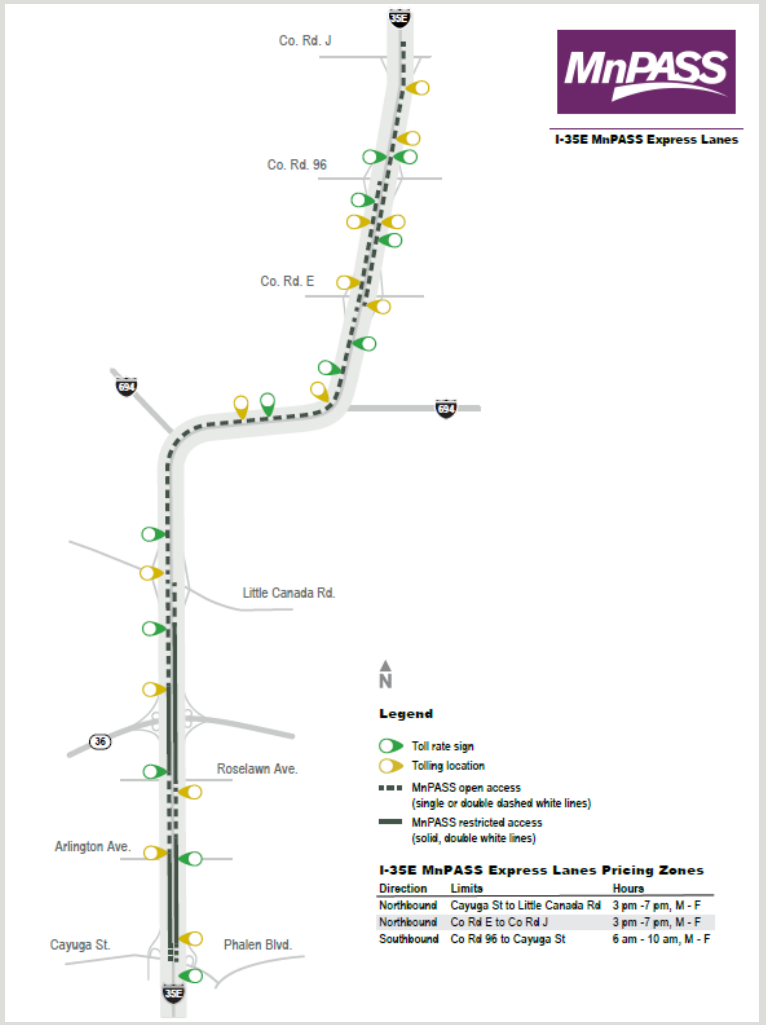
June 25, 2020

DEPARTMENT OF TRANSPORTATION

MnPASS Corridors Overview







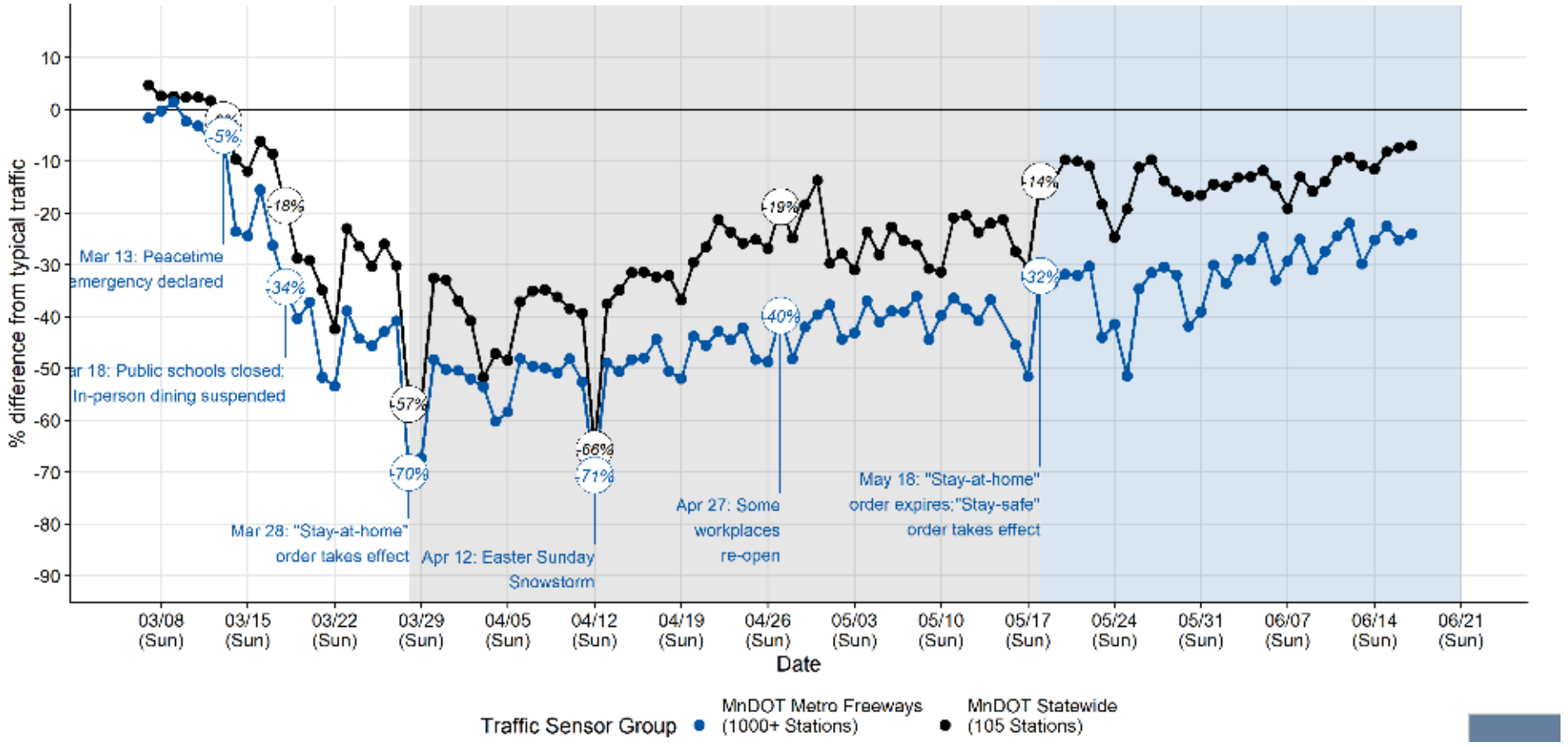
MnPASS Express Lanes

- MnPASS = MN's system of priced managed lanes
  (or High Occupancy Toll Lanes)
- MnPASS lanes currently in operation:
  - I-394 since 2005
  - I-35W since 2009
  - I-35E since 2015

- MnPASS is a key strategy for improving the efficiency of the region's highway and transit systems by providing a reliable, less congested option during peak travel times.

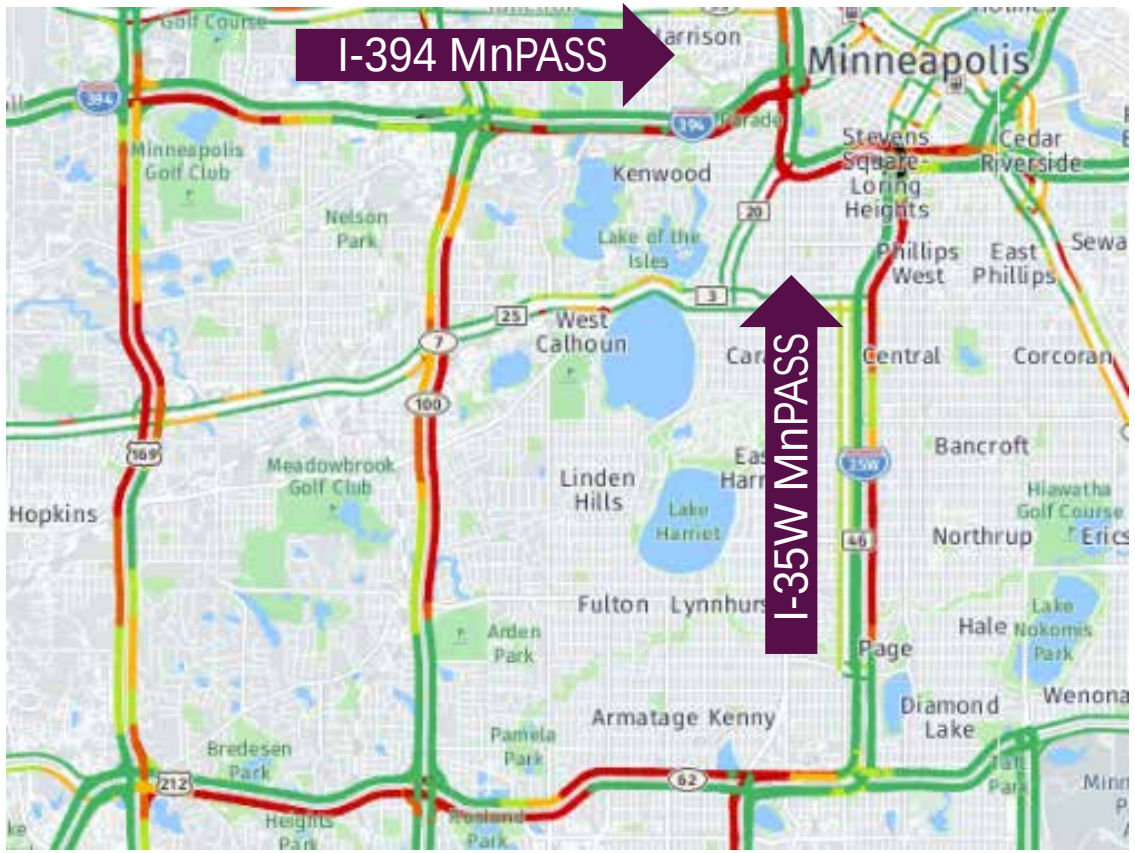
Traffic Travel Demand

Travel decreased steadily in the days following the first COVID-19 case in Minnesota

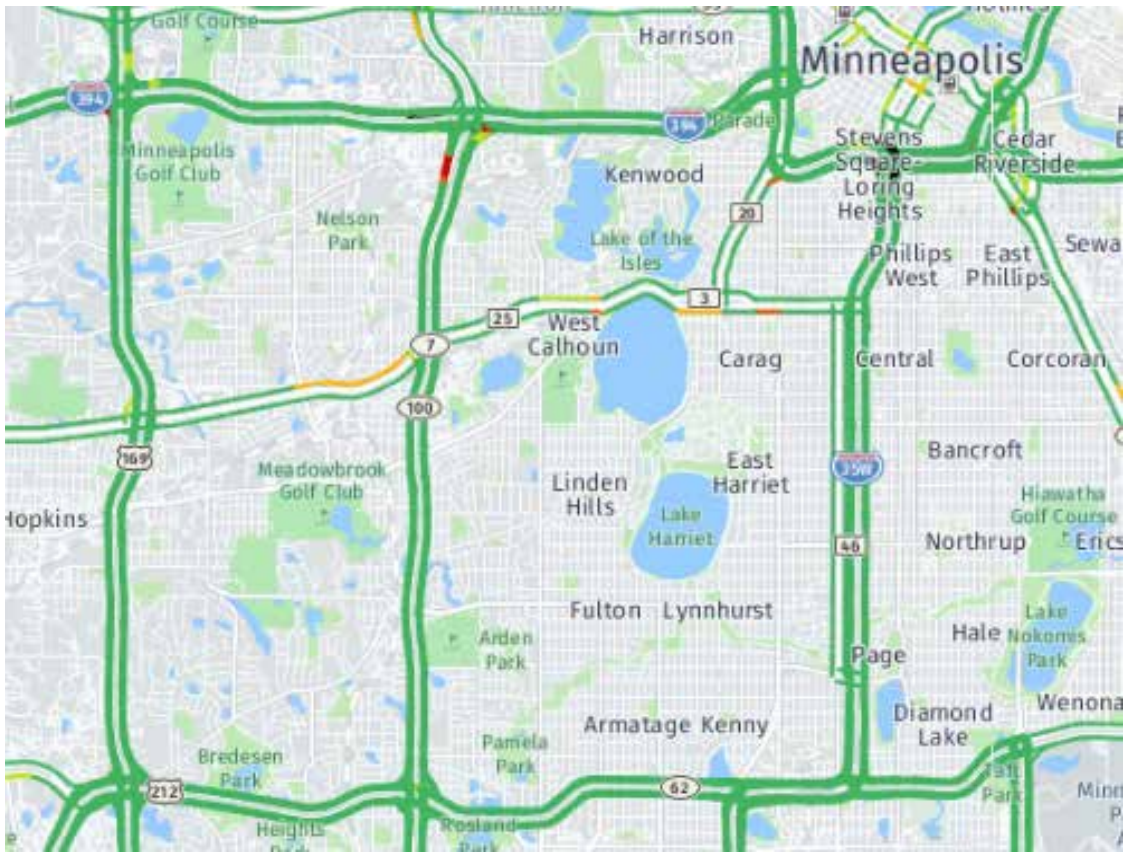


Congestion Levels

March 4th @ 8AM – before COVID-19 emergency



March 25th @ 8AM – after COVID-19 emergency



Operation Background

- MnPASS operations background
  - Customer Service Center at Golden Valley office
  - Approximately 50,000 accounts and over 67,000 transponders/tags
  - 3 CSRs; 1 CSR supervisor; 1 CSC manager and 1 project manager
- When Peace Time Emergency declared, our contract consultant established a new protocol to provide our services remotely
  - Discontinued walk-in service due to reduction of walk-in customers (a couple a day)
  - Set up CSRs to be able to access the back-office system remotely
  - Two staff report twice a week to handle mail and phone messages

COVID-19 Effects on MnPASS Operations

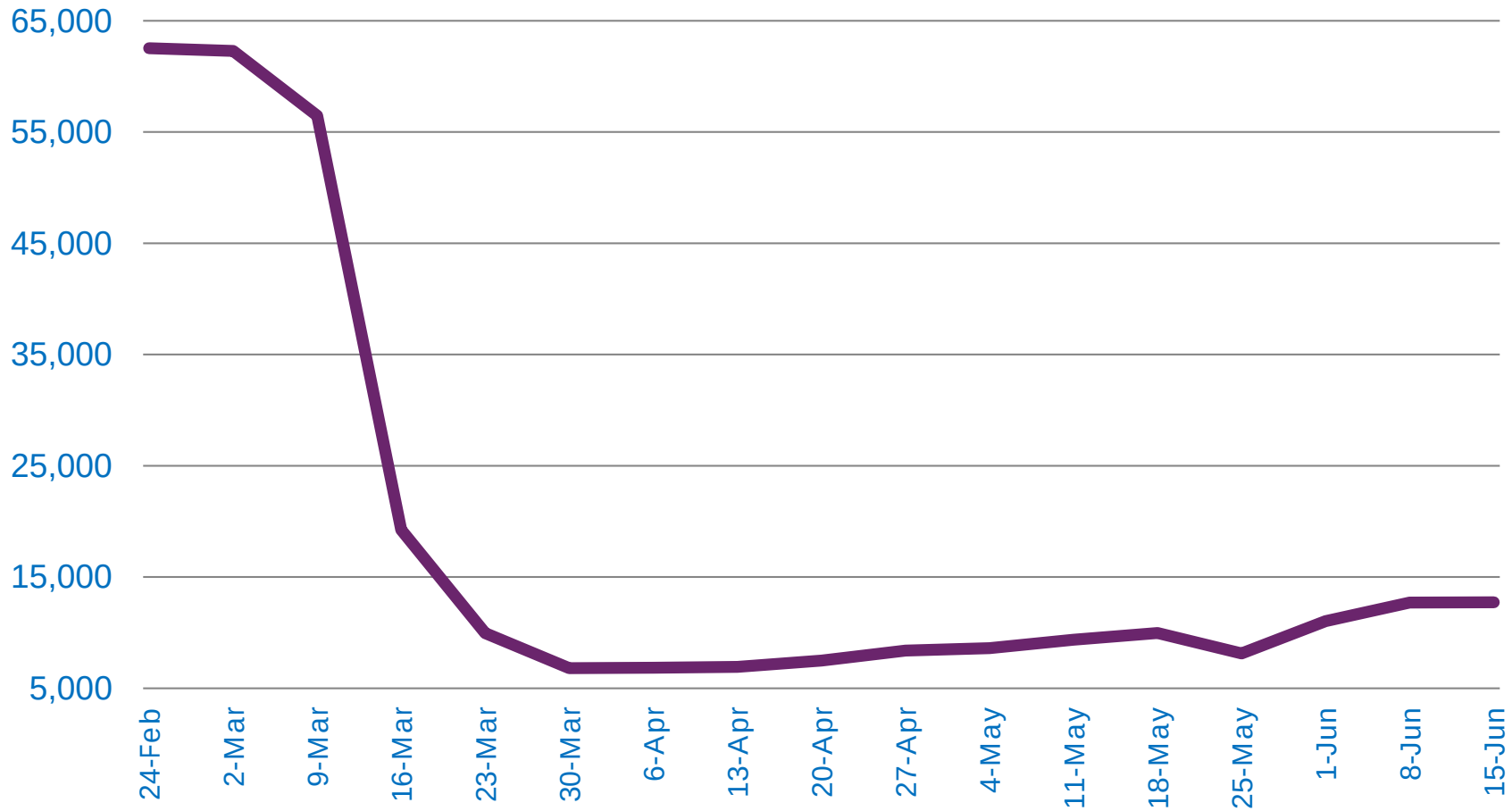
Average Monthly	Before COVID-19	After COVID-19	% Change
Inbound Calls	787	122	-84%
Outbound Calls	281	250	-11%
Emails	266	546	105%
Chats	145	155	7%
Walk-ins	76	0	-100%
Accounts Opened	486	42	-91%
Accounts Closed	92	86	-7%
Tags Requested	781	127	-84%

COVID-19 Effects on MnPASS Operations

	Before COVID-19	After COVID-19	% Change
Average Monthly Toll Transactions (Trips)	258,103	36,169	-86%
Average Monthly Toll Revenue	$431,180.44	$14,788.75	-97%
Average Toll	$1.67	$0.41	-76%
Average Daily Toll Transactions (Trips)	12,340	1,722	-86%
Average Daily Toll Revenue	$20,614.20	$704.23	-97%

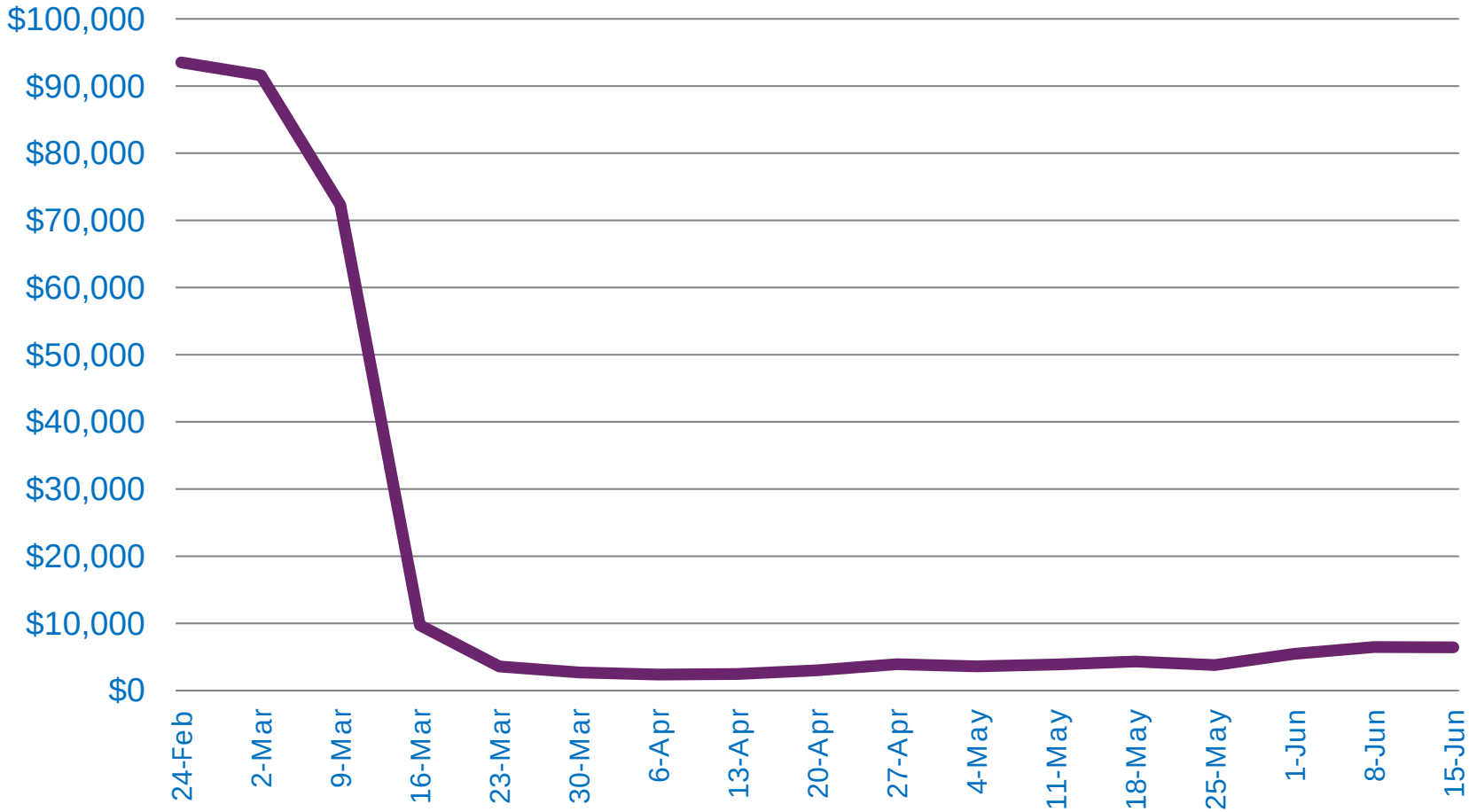
COVID-19 Effects on MnPASS Operations

Weekly Trips

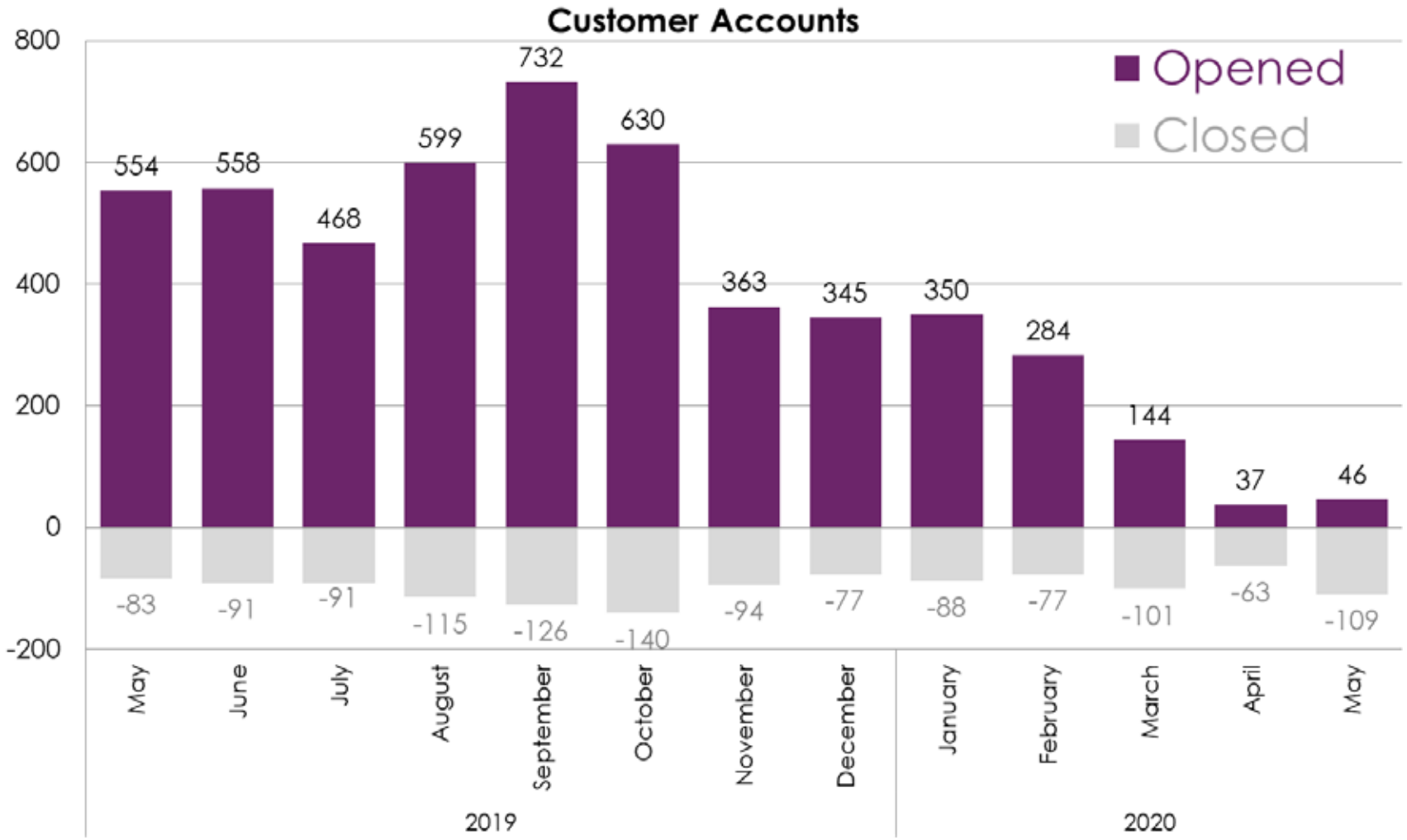


COVID-19 Effects on MnPASS Operations

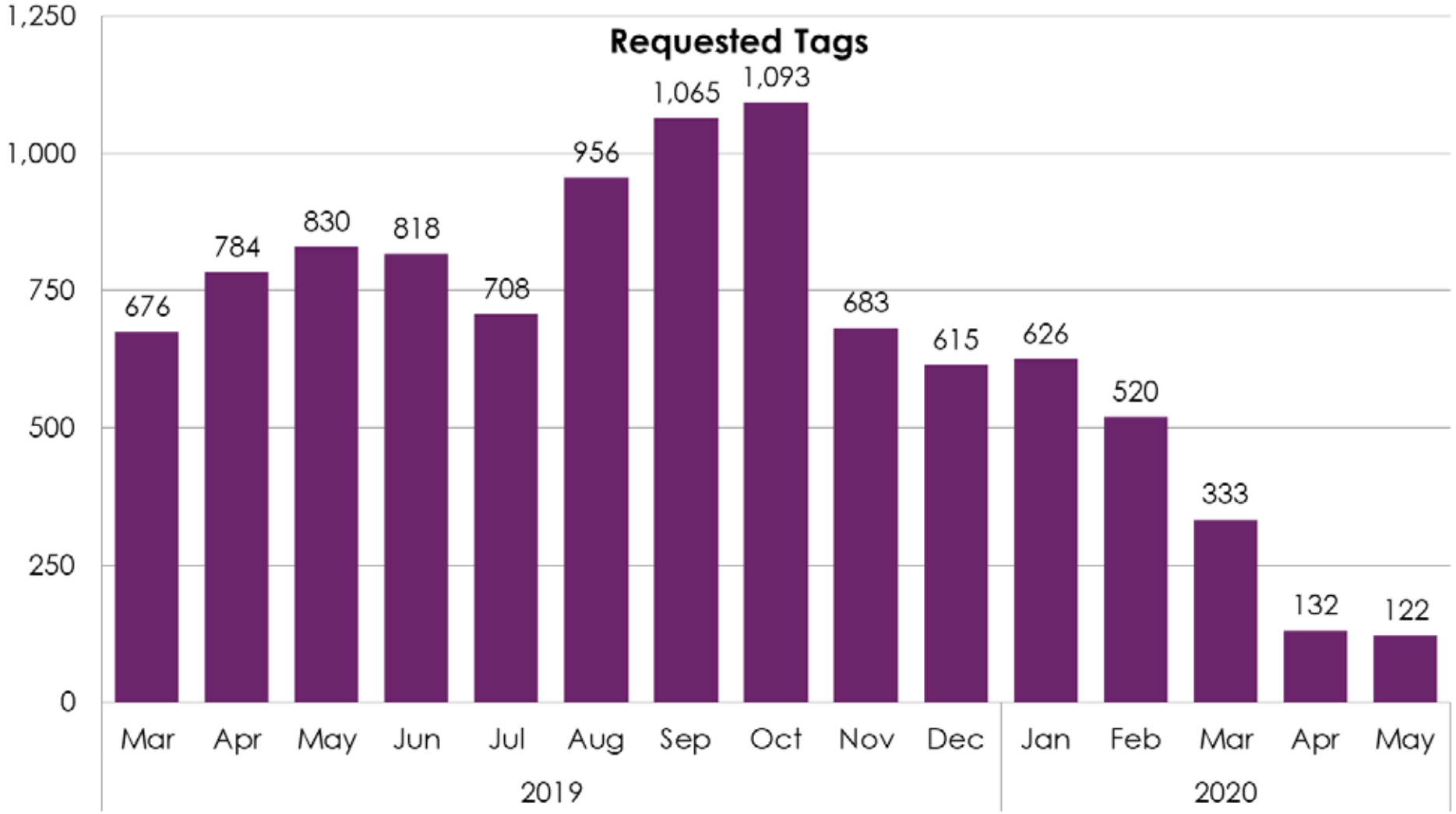
Weekly Toll Revenue



COVID-19 Effects on MnPASS Operations



COVID-19 Effects on MnPASS Operations



Conclusion

- Significant impacts on our operations.
- Continue to operate with our current protocol.
- We will operate normal when the economy and travel demands are recovered.

Thank you!

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Webinar Presenters

Lisa Klein

METROPOLITAN TRANSPORTATION COMMISSION

Mark Linsenmayer

Metro

Kiet Ly

DEPARTMENT OF TRANSPORTATION

Moderator: Darren Henderson

wsp

TRB Resources

- Consensus Study Report: *Renewing the National Commitment to the Interstate Highway System: A Foundation for the Future*
- *NCHRP Research Report 835: Guidelines for Implementing Managed Lanes*
- *NCHRP Research Report 860: Assessing the Environmental Justice Effects of Toll Implementation or Rate Changes: Guidebook and Toolbox*
- *NCHRP Synthesis Report 540: Leveraging Private Capital for Infrastructure Renewal*
- *NCFRP Research Report 39: Freight Transportation Resilience in Response to Supply Chain Disruptions*
- Traffic management webinars

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Attachment D

Memorandum: Transportation Impacts of the COVID-19 Pandemic in the National Capital Region by the National Capital Region Transportation Planning Board Technical Committee, 9/3/2020

National Capital Region
Transportation Planning Board

TPB Travel Forecasting Subcommittee
September 18, 2020
Item 2

MEMORANDUM

TO: TPB Technical Committee

FROM: Andrew Meese, TPB Systems Performance Planning Director

SUBJECT: Transportation Impacts of the COVID-19 Pandemic in the National Capital Region

DATE: September 3, 2020 (Revised)

INTRODUCTION

The COVID-19 pandemic and associated precautions since March 2020 have had profound impacts on travel and transportation systems in the National Capital Region. This memorandum compiles information from a variety of sources to provide snapshots of the magnitude and trends of these changes in the initial months of this disruptive pandemic period. Summary presentations are planned for the September 4, 2020 TPB Technical Committee meeting and at a future TPB meeting.

The purpose of this work activity is to examine the data availability on various aspects of travel, and to understand the fidelity and limitations of the data, to help assess the true nature/extent of change in travel and usage of the transportation service and infrastructure. At the present time, staff has not conducted any analysis to assess system performance and or draw conclusions to inform future planning and programming.

This work activity is the beginning of efforts towards better understanding the impacts with the intention of determining the aspects of transportation system that the region will need to address to be more resilient and more equitable in the future. A meaningful analysis of this unprecedented change in the supply and demand on transportation needs accurate, representative, comprehensive data on the demand and supply sides. For example, while the pandemic-related restrictions on movement have impacted travel demand, the personal and public health nature of the pandemic has affected the ability to provide transportation service – particularly public transportation. Regionally, fares contribute about 30% (ranging from 10% to 70% on different systems) of the operating costs of providing public transportation. Inability to collect these fares (on systems that have suspended fare collection due to pandemic social distancing precautions) and reduced travel (particularly on the rail systems) have impacted the financial viability of public transportation. At the same time, transit agencies have had to consider rider and employee health risks, and undertake both additional cleaning/disinfecting and equipment modification (e.g., driver shields) activities, while maintaining as much transit service as feasible. This comes at a time when these services have been most needed – especially the bus services.

Emergency orders in the District of Columbia, Maryland, and Virginia impacting travel were issued in the general time period of March 5 through 20, 2020. The COG website at www.mwcog.org/about-us/covid-19/ provides information about declarations as well as links to data sources about COVID-19 and its (non-transportation) impacts.

STRUCTURE OF THIS MEMORANDUM

TPB staff compiled data and information from a variety of sources to examine the COVID-19 pandemic's transportation impacts from several perspectives. These data differ in geography, time scales, and methodologies because of the variety of mostly non-COG/TPB sources, but individually and collectively provide insights (though not necessarily definitive conclusions) on regional impacts. Caveats include that the scope, timeliness, and consistent or continued availability of data from outside sources are beyond the control of TPB staff, potentially limiting further staff analysis. In some cases, anomalous information in data from external sources could not be explained, and for now, those sources have not been included in this memorandum. Additionally, a separate future effort is anticipated to examine transit impacts in more detail, especially for Metrobus and Metrorail.

Information is grouped into three main sections: Travel and Roadway Traffic Volumes Impacts; Transit and Walking; and Safety, Speeds, and Other Impacts. Each section contains multiple subsections with one or more information sources each, providing a variety of snapshots.

TRAVEL AND ROADWAY TRAFFIC VOLUME IMPACTS

1. ROADWAY TRAFFIC VOLUMES

Snapshot: Roadway traffic volumes in the National Capital Region, which in April 2020 had dipped below 50% of 2019 volumes, by July had recovered to over 80% of 2019 volumes. The magnitude of these trends varied among the core jurisdictions, inner suburbs, and outer suburbs.

Figure 1 shows traffic volumes at over 60 continuous count stations at locations around the TPB modeled region (larger than the TPB membership area itself). Volumes at these pinpoint locations were down generally almost 50% in the month of April 2020 compared to April 2019, but by July 2019, had risen to be just about 19% less than July 2019 levels. Visualizations of weekly average daily traffic and average hourly traffic by month are also shown.

Figures 2 through 4 show these traffic volumes summarized for three jurisdictional groupings in the modeled area: core, inner, and outer jurisdictions. Figure 2 shows that the central jurisdictions showed the largest decrease with a monthly average percent change in traffic of almost 60 percent from 2019 levels during April and still more than 30 percent off in July compared to the previous year. Figures 3 and 4 show that the inner jurisdictions and outer jurisdictions had changes in traffic volumes more consistent with regional levels, with the outer jurisdictions registering the smallest decrease in traffic volumes among the three jurisdictional groups.

Figure 1: Traffic Counts and Percentage Changes at Permanent County Stations in the TPB Modeled Region (Source: TPB)

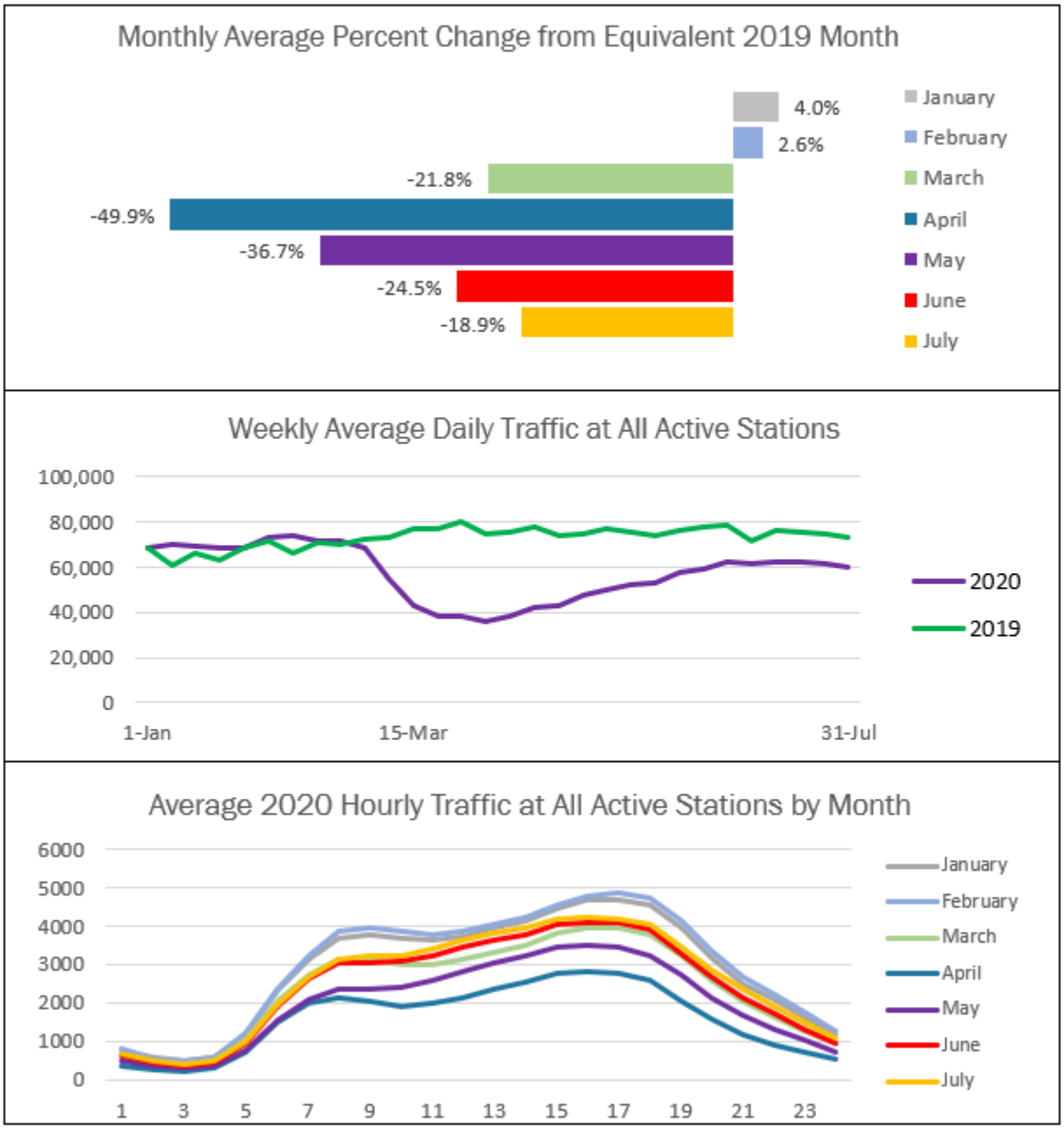
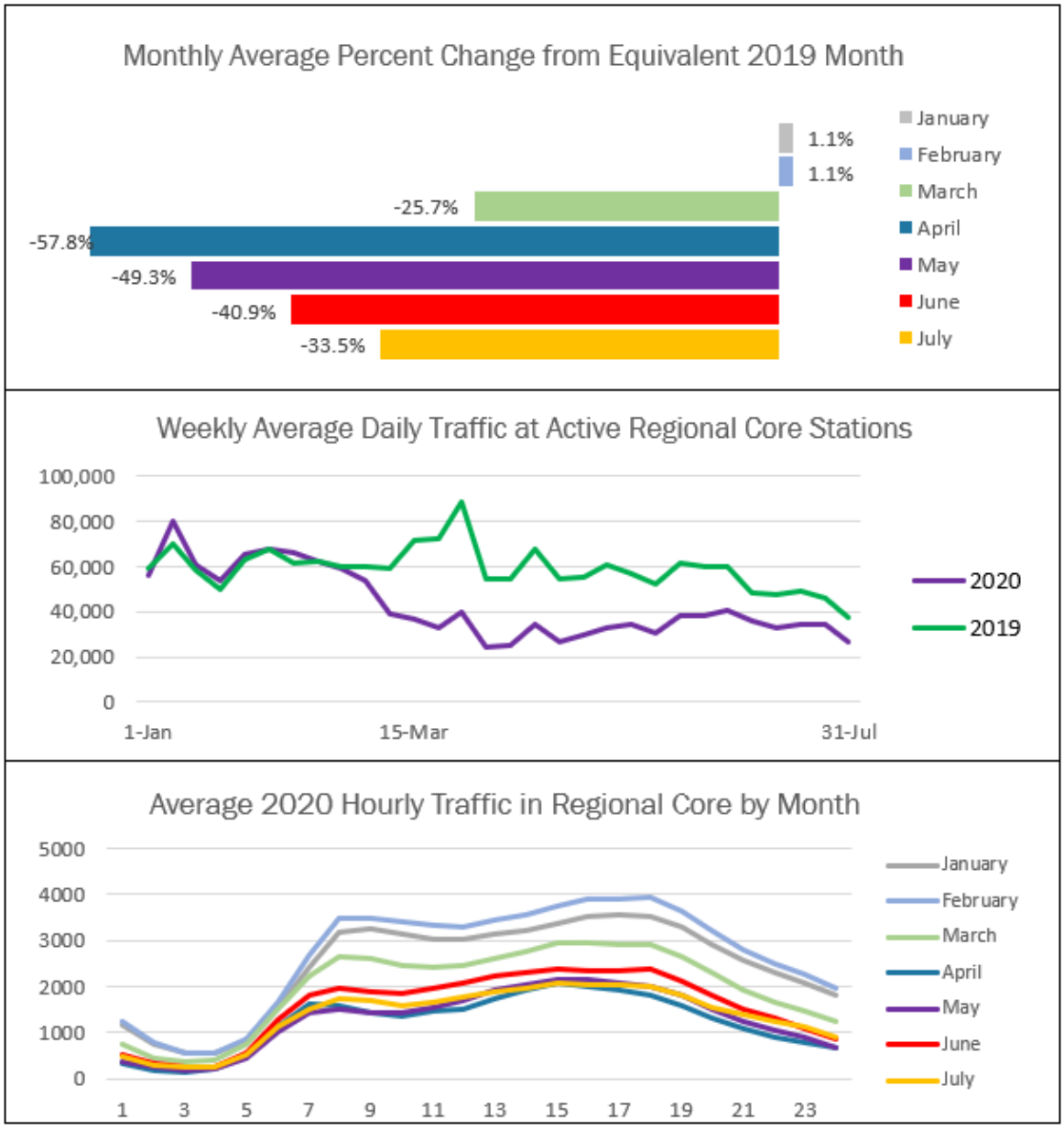
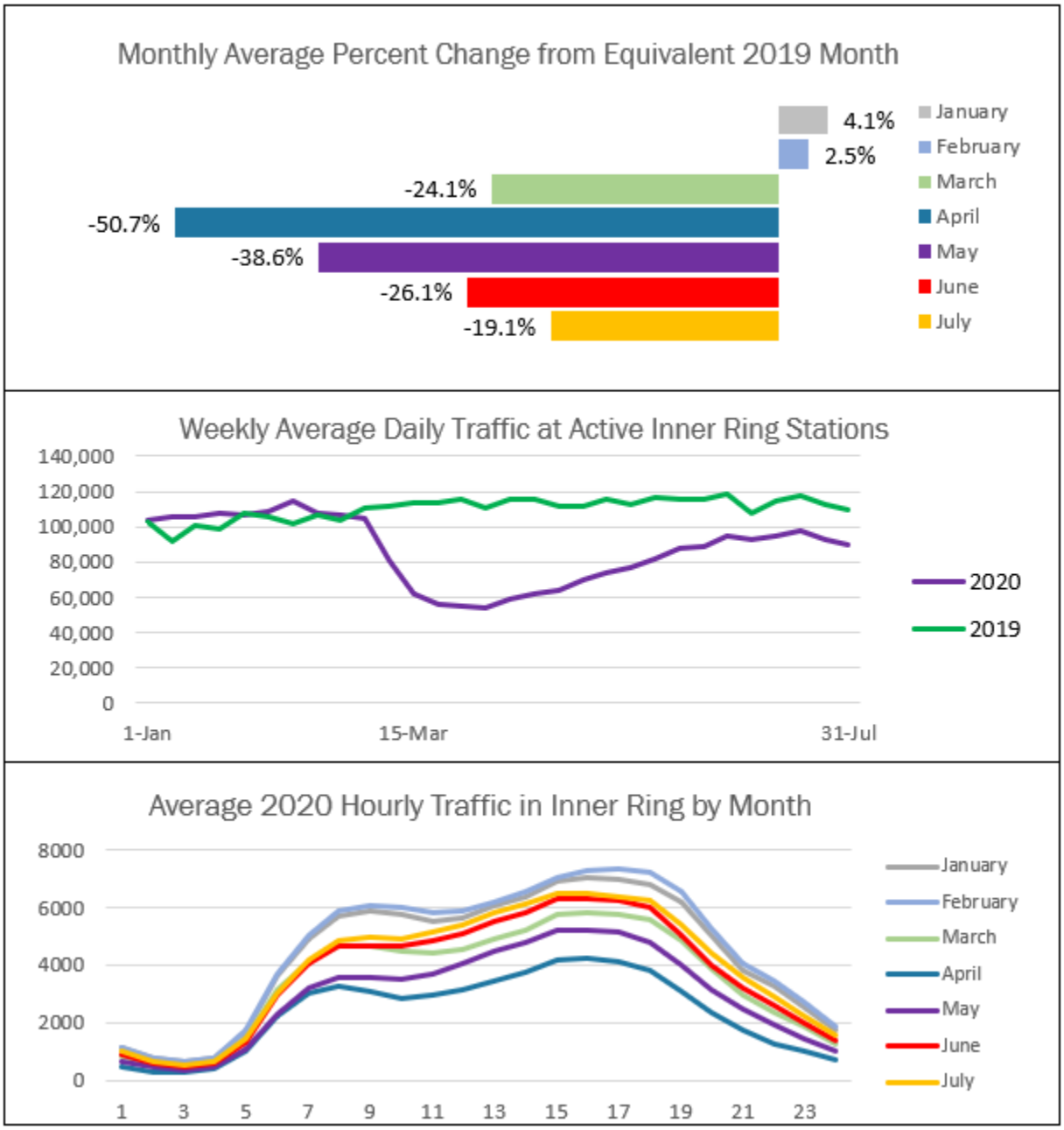


Figure 2: Traffic Counts and Percentage Changes at Permanent County Stations in the Core Jurisdictions (Source: TPB)



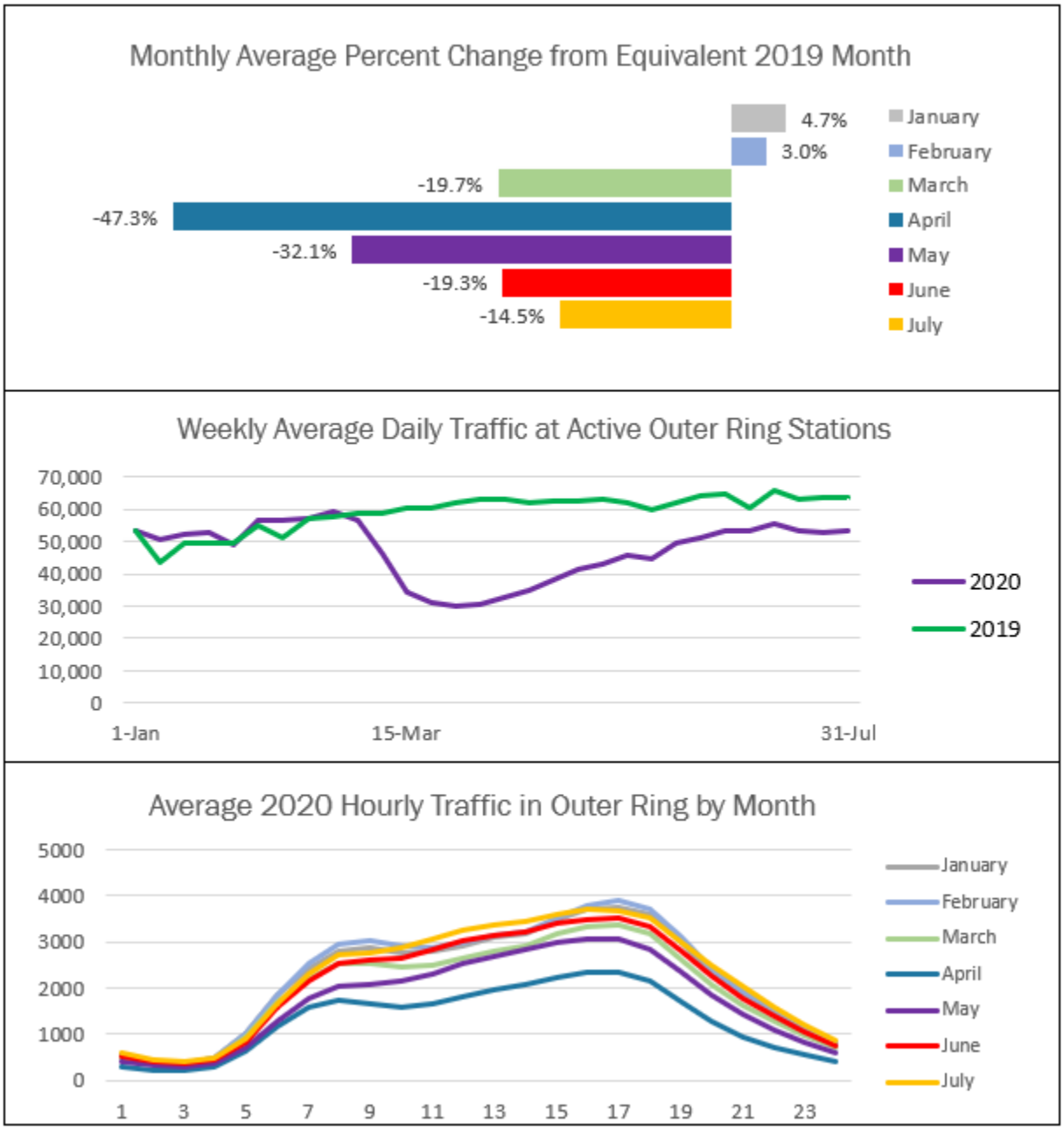
NOTE: Core jurisdictions include the District of Columbia and Arlington County and the City of Alexandria in Virginia.

Figure 3: Traffic Counts and Percentage Changes at Permanent County Stations in the Inner Jurisdictions (Source: TPB)



NOTE: Inner jurisdictions include Montgomery County, and Prince George's County in Maryland and Fairfax County (including independent cities of Falls Church and Fairfax) in Virginia.

Figure 4: Traffic Counts and Percentage Changes at Permanent County Stations in the Outer Jurisdictions (Source: TPB)



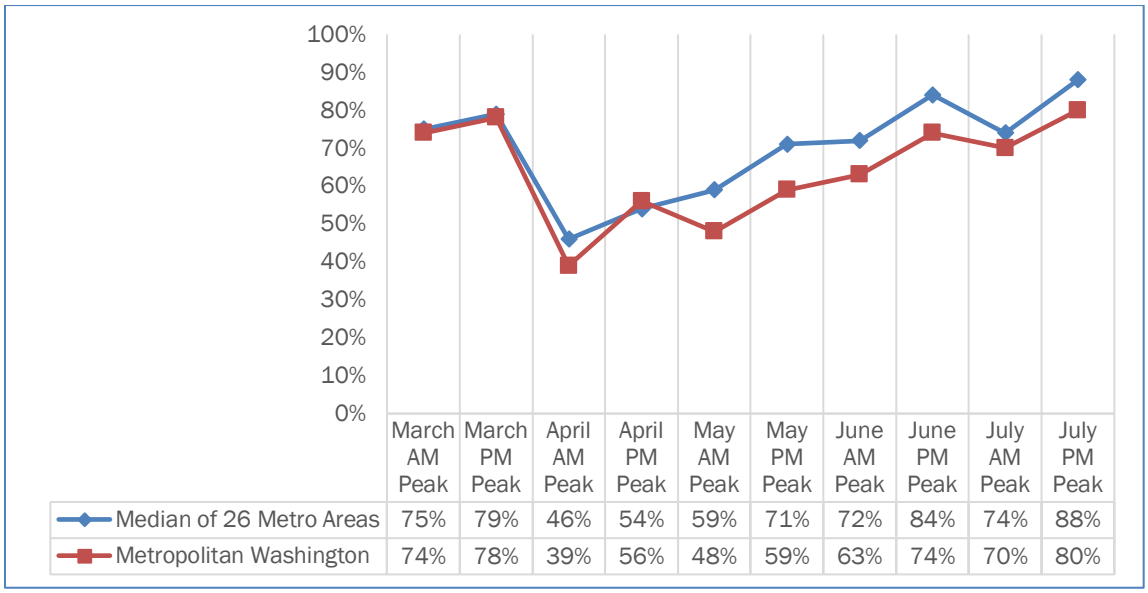
NOTE: Outer jurisdictions include Anne Arundel, Carroll, Charles, Frederick (including Frederick City), Howard, and St. Mary's counties in Maryland; Clarke, Fauquier, King George, Loudoun, Prince William (including Manassas and Manassas Park), Spotsylvania (portion), and Stafford counties in Virginia; and Jefferson County in West Virginia.

2. VEHICLE MILES OF TRAVEL

Snapshot: Regional vehicle miles of travel dipped most dramatically in April, but by July had recovered significantly, according to a post on the blog of big data provider INRIX[1].

Trends in vehicle miles of travel (VMT) in the region are informative, but not always readily available. Private sector big data provider INRIX[2], in an August 11, 2020 blog post, described morning and evening peak VMT trends for 26 major metropolitan areas[3] around the country, including metropolitan Washington[4]. Figure 5 shows reported VMT for metropolitan Washington versus the median values for the full 26 metropolitan areas described in the blog post[5]. Monthly VMT was lowest in April both regionally and nationally, and has recovered somewhat since then through July; metropolitan Washington's VMT has generally tracked a bit lower than the national median.

Figure 5: Vehicle Miles of Travel Trends (Percentage of Pre-pandemic VMT) Reported by INRIX, March through July 2020 (Source: INRIX https://inrix.com/blog/2020/08/vmt-commute-us/, August 11, 2020)



	March AM Peak	March PM Peak	April AM Peak	April PM Peak	May AM Peak	May PM Peak	June AM Peak	June PM Peak	July AM Peak	July PM Peak
Median of 26 Metro Areas	75%	79%	46%	54%	59%	71%	72%	84%	74%	88%
Metropolitan Washington	74%	78%	39%	56%	48%	59%	63%	74%	70%	80%

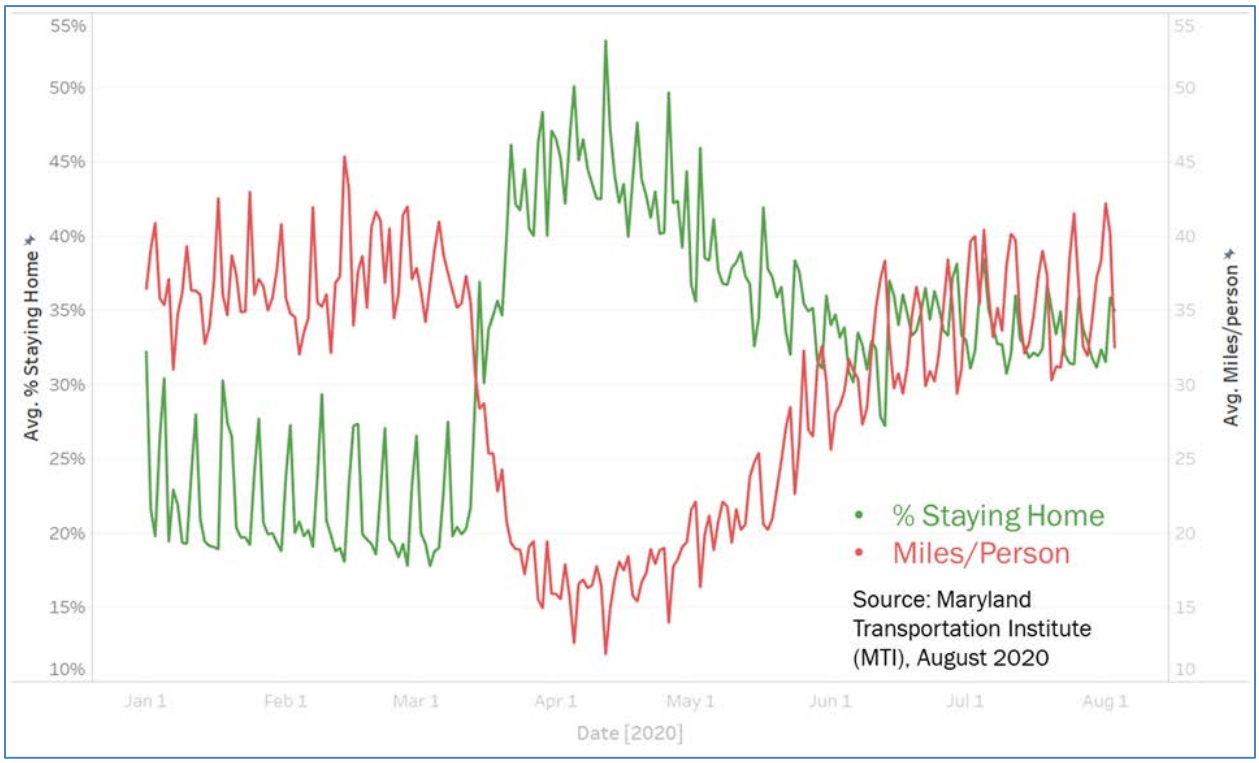
[1] https://inrix.com/blog/2020/08/vmt-commute-us/.
[2] At this time, TPB only has gratis access to some, not all, data sets vended by INRIX.
[3] The metropolitan areas reported (as listed by INRIX) were: Atlanta, Austin, Baltimore, Boston, Charlotte, Chicago, Dallas, Denver, Detroit, Houston, Los Angeles, Miami, Minneapolis, New York, Orlando, Philadelphia, Phoenix, Portland, Sacramento, San Antonio, San Diego, San Francisco, Seattle, St. Louis, Tampa, and Washington, D.C.
[4] Note that INRIX's geographical definition of metropolitan Washington, D.C. is understood to be somewhat different from (is more expansive than) the TPB membership area.
[5] Medians for the 26 metropolitan areas were calculated by TPB staff based on the blog post, and were not provided by INRIX; there may be rounding error. All values should be considered approximate.

3. PERSON TRAVEL

Snapshot: Though miles of travel per person have returned to near pre-pandemic levels, people are still much more likely to be staying at home than pre-pandemic.

The University of Maryland's COVID-19 Impact Analysis Platform[6] contains a wealth of information nationally about COVID-19 impacts and travel. Figure 6 illustrates the dramatic decline in person travel in the late March and early April time frame of the pandemic, and the recovery in person travel since then, by the metrics of percentage of persons staying home and miles of travel per person. People are still "staying home" at higher rates than before the pandemic, though miles of travel are close to pre-pandemic levels, perhaps reflecting a preponderance of non-work (non-commute) travel and considerable increases in delivery trips (food, grocery, online shopping).

Figure 6: National Capital Region Percentage Staying at Home and Miles of Travel Per Person (Source: TPB staff analysis of information from COVID-19 Impact Analysis Platform, Maryland Transportation Institute, University of Maryland, August 2020)



[6] https://data.covid.umd.edu/. The site does not provide details on source data or methodology.

4. TRUCK TRAVEL

Snapshot: Truck travel never declined as much as passenger travel did.

According to big data provider INRIX, travel nationally has continued to recover from reductions in the April 2020 time frame. Notable in Figure 7 below is that truck travel, especially long-distance truck travel, never declined to the extent that passenger travel did. Figure 8 on the next page shows a National Capital Region example on an I-95 continuous count station at Dumfries, Virginia, where truck travel remained at similar levels or actually increased, as general volumes declined, during the March/April peak of COVID-19 impacts.

Figure 7: Nationwide Trends in Tripmaking and Confirmed COVID-19 Cases (Source: INRIX Blog https://inrix.com/covid-19-transportation-trends/, retrieved August 27, 2020)

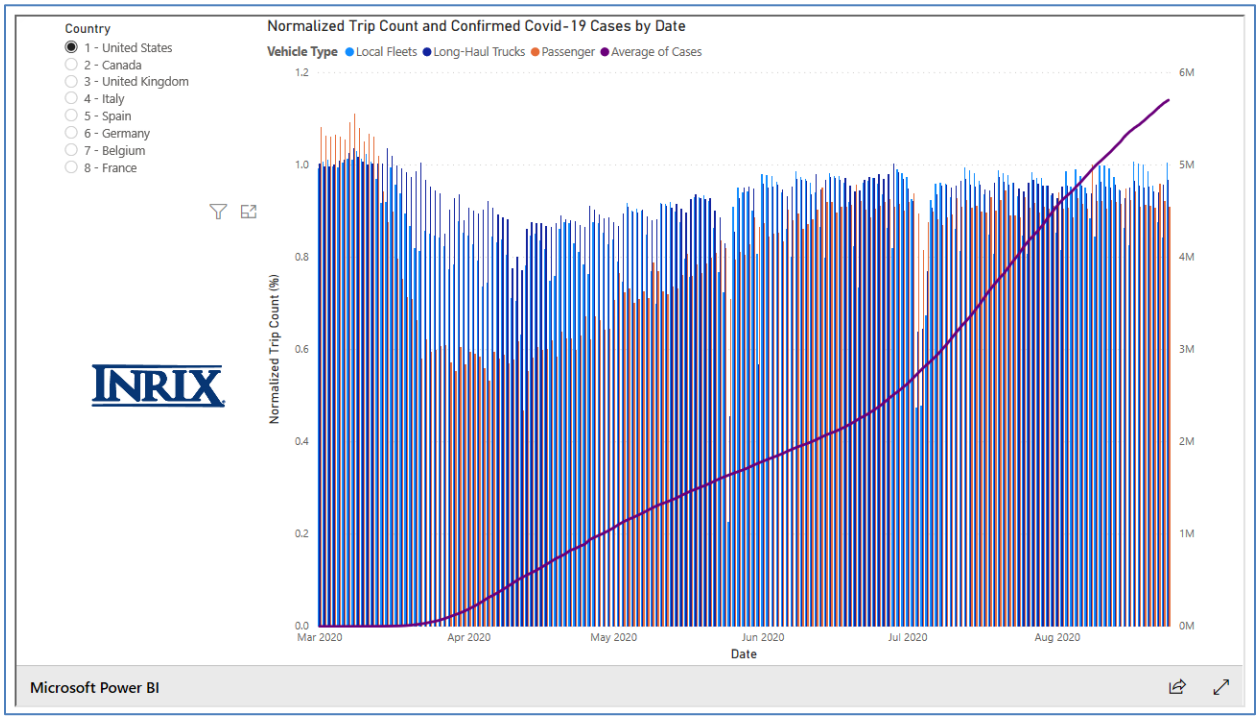
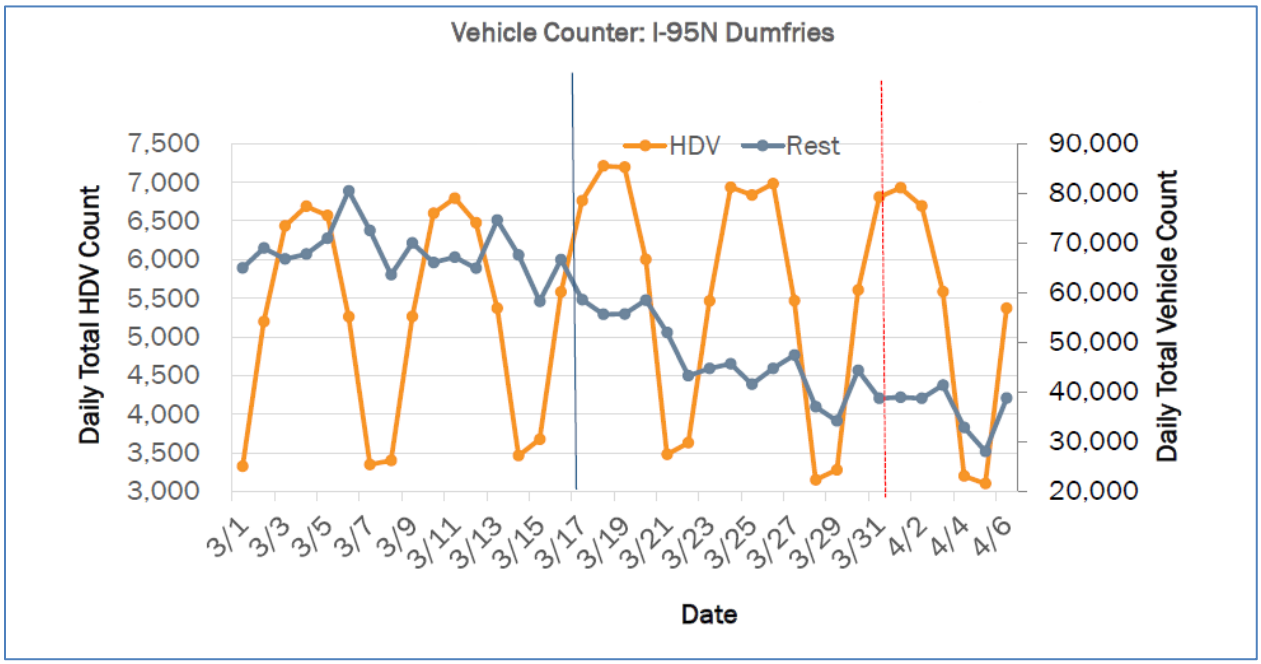


Figure 8: Heavy-Duty Vehicle (HDV) Volumes Compared to Non-HDV Volumes, I-95 Northbound at Dumfries, Virginia, March-April 2020 (Source: COG [Sunil Kumar] Analysis of Virginia Department of Transportation Data)



TRANSIT AND WALKING

5. TRANSIT RIDERSHIP: LOCAL TRANSIT AND COMMUTER SERVICES

Snapshot: Impacts to transit ridership have varied across the region, with longer-distance commuter services experiencing the biggest ridership declines, and local bus transit services experiencing declines of lesser magnitudes. While the ridership numbers reflect changes in usage, these reductions have to be viewed in relation to the reduction in service levels (capacity) due to pandemic-related challenges in operating transit. Preliminary data demonstrate that usage of available capacity has been significant, particularly on the bus system, which remains a lifeline for critical workers.

The region's local transit agencies and commuter services have experienced differing impacts to ridership. Figure 9 shows approximate ridership reductions for WMATA rail and bus[7], and Figure 10 for a selected group of the region's transit providers as reported by an August 5, 2020 questionnaire of these agencies by TPB. As may be observed from Figure 9, WMATA's Metrobus system continued to carry a substantial portion of riders through this period, even with considerable reductions in service and limits on passenger capacity within the buses due to social distancing. The regional nature of Metrobus routes, and the destinations and population served, highlight how critical bus service has been especially to the workers essential in many aspects of the economy. While longer distance services such as MARC and Loudoun Commuter Bus services had the largest reported declines in ridership (likely result of greater share of patrons being able to work from home), as did services popular with visitors and tourists such as DC Circulator, local and WMATA bus transit services generally reported ridership declines of lesser magnitudes (given the nature of destinations served and greater dependence of the patrons on public transportation).

TPB staff plans to work with transit agencies on further analysis of the supply and usage of public transportation in general and WMATA in particular given that about 84% of the region's public transportation trips are made on the WMATA system.

[7] Data obtained from WMATA Ridership Portal, https://wmata.com/initiatives/ridership-portal/.

Figure 9: Metrorail and Metrobus Year-to-Year Ridership Percentage Change, June/July/August 2020 Versus 2019 (Source: WMATA Data Portal)

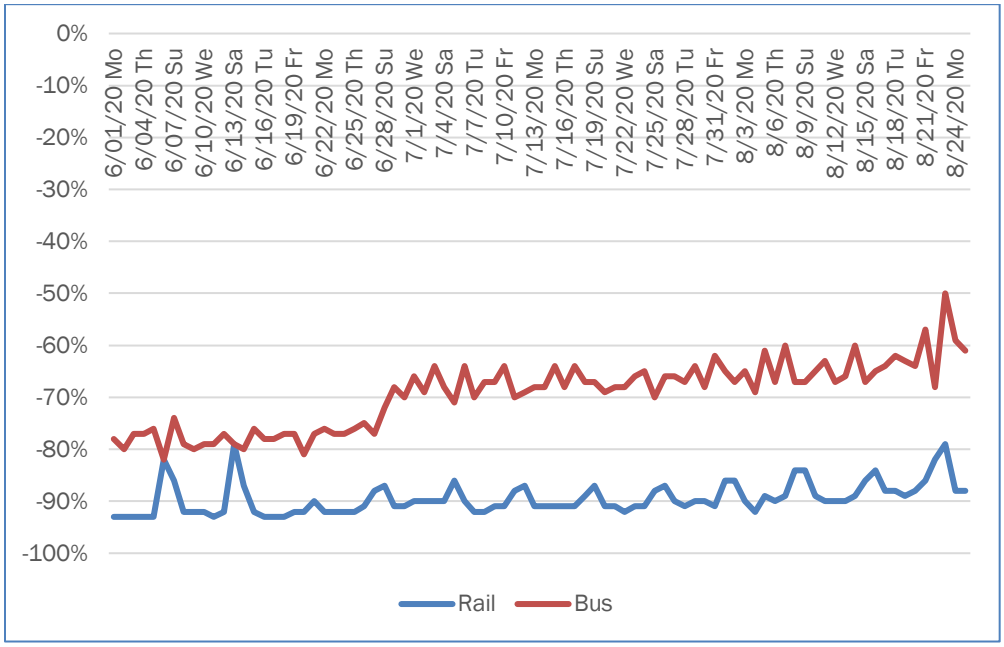
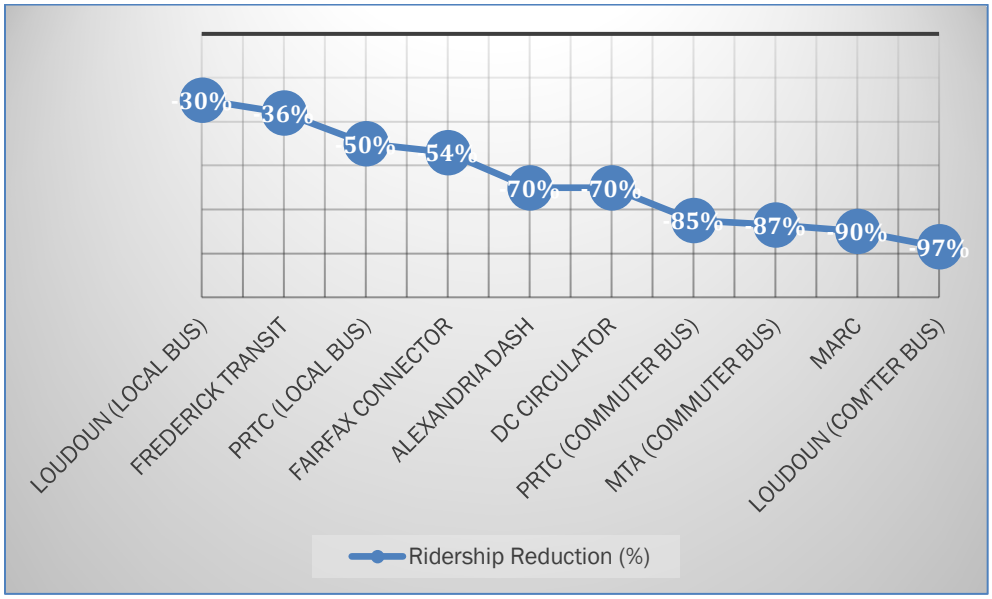


Figure 10: Transit Ridership Reductions on Selected Local Transit and Commuter Services (as reported in an August 5, 2020 TPB questionnaire to these agencies; all figures are approximate; Source: COG/TPB)

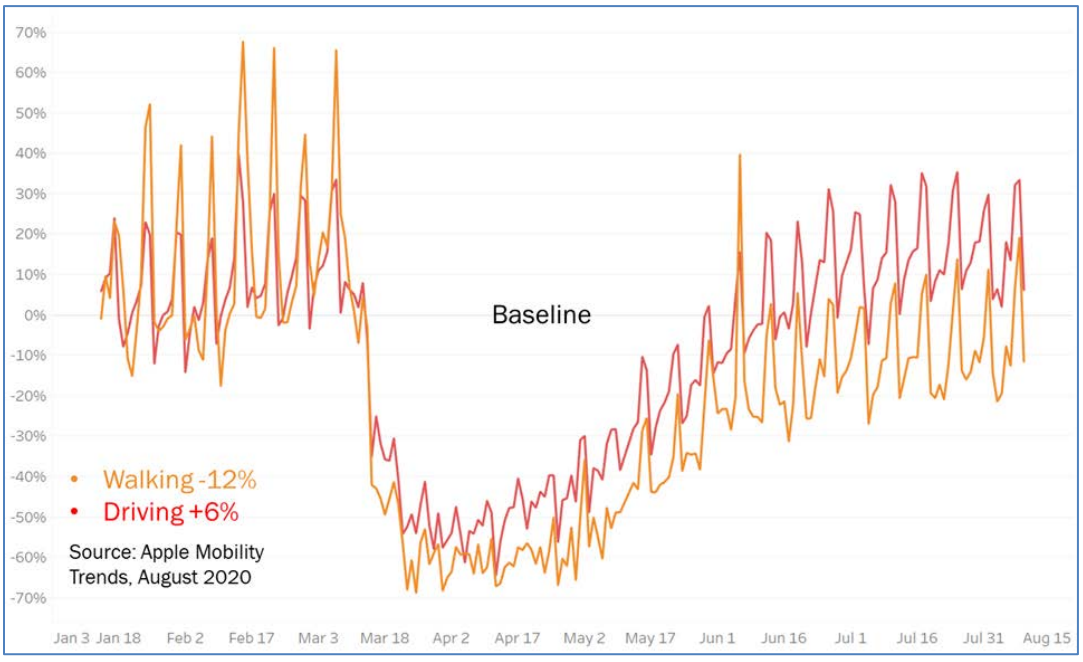


6. WALKING

Snapshot: App-based data provide an interesting but perhaps unproven insight into walking trends during the pandemic.

Data regarding walking in the region are of interest, but not always readily available. Apple Mobility made such data available for the District of Columbia[8]. These proprietary data compare mobile device usage associated with map direction requests on specific modes of travel[9], and may not be consistent with other data sources; their inclusion here is illustrative. Figure 11 shows trends over time comparing driving and walking to a January 13, 2020 baseline. Both modes showed significant declines in the late March and early April time frame, and have recovered since then. Driving is even being reported to exceed the January 13 baseline, with walking still down somewhat. It must be noted that this dataset comes from a limited segment of probe data (only Apple devices) and further from a smaller segment of such probe users (only those using the Apple Maps app on those Apple devices). The representativeness of these data is unclear compared to the overall population's walking, and may be biased toward trips to destinations unfamiliar to the user. Nevertheless, the comparative trend line is of interest.

Figure 11: Apple Mobility Data for Walking Versus Driving, District of Columbia Only (Compared to a January 13, 2020 Baseline) Source: Apple Mobility Trends, August 2020



[8] Apple Mobility data sets do not appear to be made available or summarized at the level of the National Capital Region geography, thus data for the District of Columbia only were used as illustrative.
[9] The information is generated by counting the number of requests made to Apple Maps for directions. The data sets are then compared to reflect a change in volume of people driving, walking or taking public transit around the world. Data availability in a particular city, country, or region is subject to a number of factors, including minimum thresholds for direction requests made per day. See https://www.apple.com/newsroom/2020/04/apple-makes-mobility-data-available-to-aid-covid-19-efforts/.

SAFETY, SPEEDS, AND OTHER IMPACTS

7. ROADWAY SPEEDS

Snapshot: Roadway speeds in the National Capital Region generally remain at or near free-flow speeds, with slight declines since May.

Reductions of peak period delays have been a noted impact of COVID-19, with free-flow conditions even at "rush hour" in most of the region in the April time frame. By July, peak period speeds have shown some slowing, but still much higher than pre-pandemic levels. Figure 12 provides an example showing the 5:00 P.M. to 6:00 P.M. time period on Interstate highways in the National Capital Region for the January to July 2020 time frame, separately for passenger vehicles and trucks.

As may be seen from the compiled data, speed increases have been of a greater magnitude than the magnitude of traffic volumes. While traffic volumes regionally recently have been about 20% below pre-pandemic levels, peak period speed data remain near free-flow. Traffic flow theory and longstanding empirical data have established that when demand exceeds capacity and traffic operations are in unstable or saturated conditions, a small reduction in demand results in a disproportionate improvement in speeds. As such, strategies to marginally reduce single occupant vehicle (SOV) demand during peak demand via flexible work schedules, pricing or ridesharing (including express bus service) are effective ways to address peak period congestion, conserve energy and reduce emissions.

Figure 12: Interstate System Car and Truck Mean Speeds by Week, Weekdays 5:00 P.M. to 6:00 P.M., National Capital Region (Source: TPB analysis of National Performance Management Research Data Set [NPMRDS])

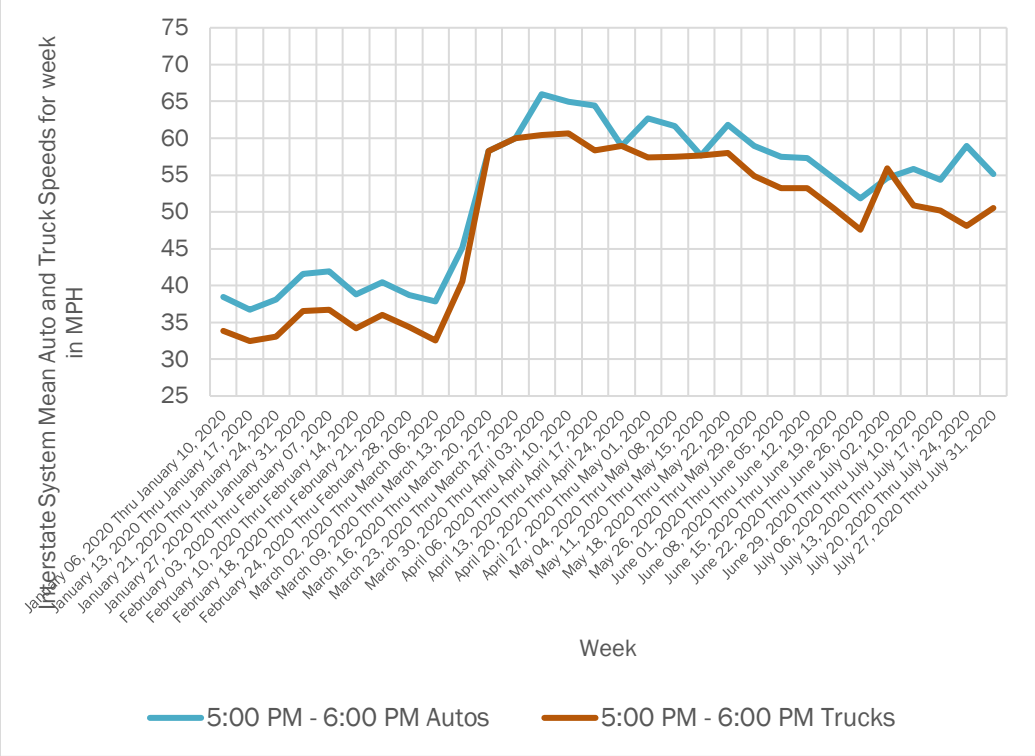
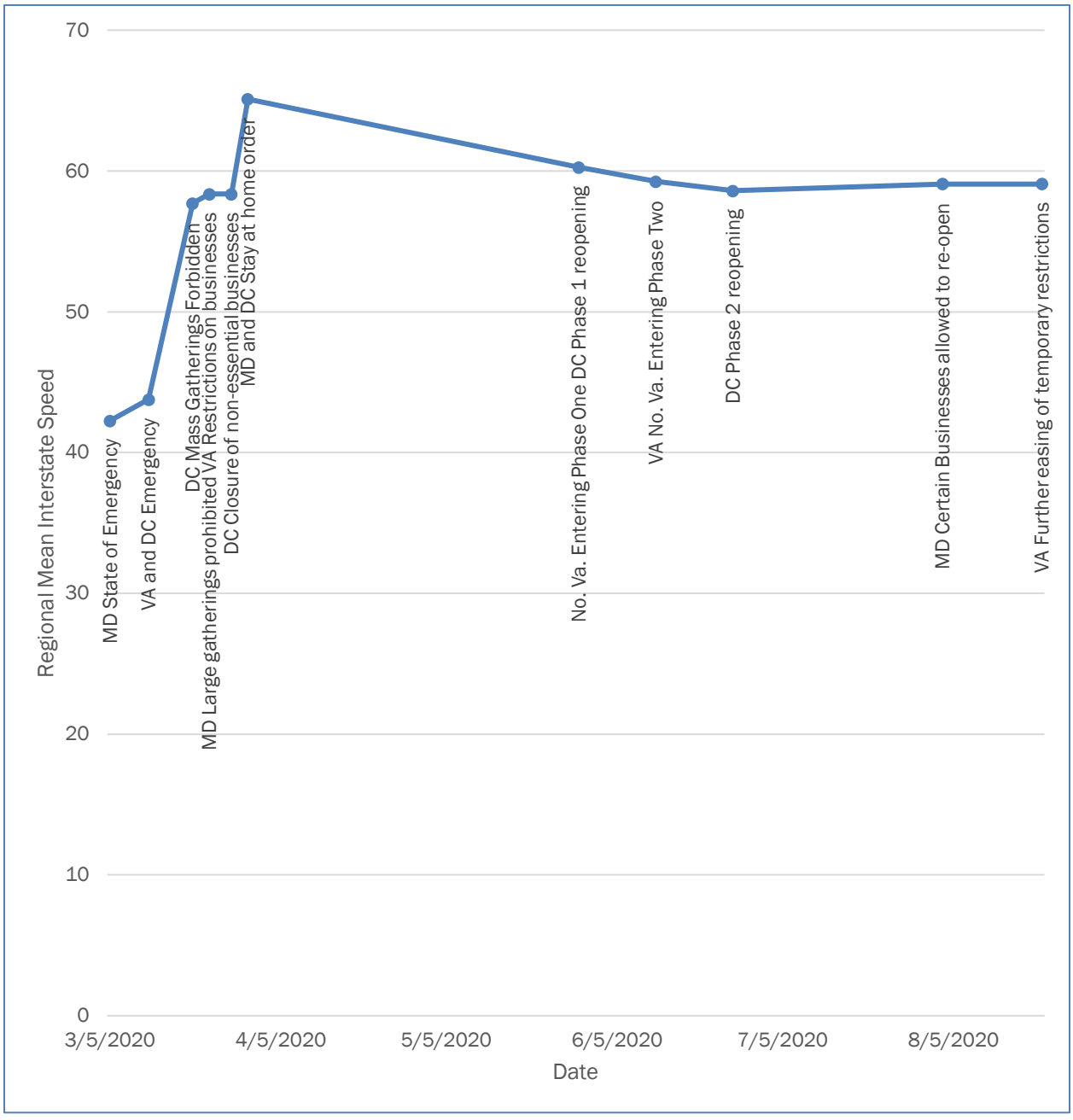


Figure 13 shows the chronology of COVID-related District of Columbia, Maryland, and Virginia emergency declarations since March, with the amalgamated mean speed trend of the region's Interstate highways shown in the same chronology. Regional Interstate Highway speed increases were dramatic in March, with modest reductions since then.

Figure 13: Chronology of Emergency Declarations and Regional Interstate Highways Mean Speed (Sources: COG regional COVID-19 resources web page (https://www.mwcog.org/about-us/covid-19/; National Performance Management Research Data Set)

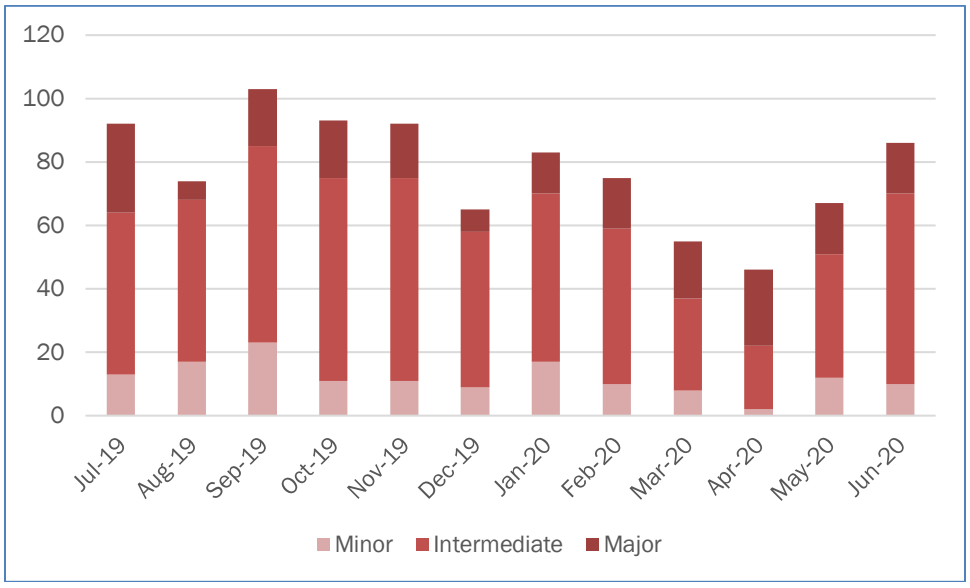


8. SAFETY

Snapshot: Though the overall number of crashes and incidents went down during the pandemic, the numbers of major incidents and fatal crashes have remained near pre-pandemic levels, despite reduced travel demand.

The Metropolitan Area Transportation Operations Coordination (MATOC) Program provides regional monitoring and situational awareness regarding incidents that have major impacts on traffic. MATOC's monthly records[10] provide an indication of overall incident trends, summarized in Figure 14. Notable in this data set was the relatively high number of incidents classified by MATOC as major during the month of April, even as the number of minor incidents had declined significantly, and intermediate incidents had declined somewhat. However, by June, incident patterns were already returning to historical norms.

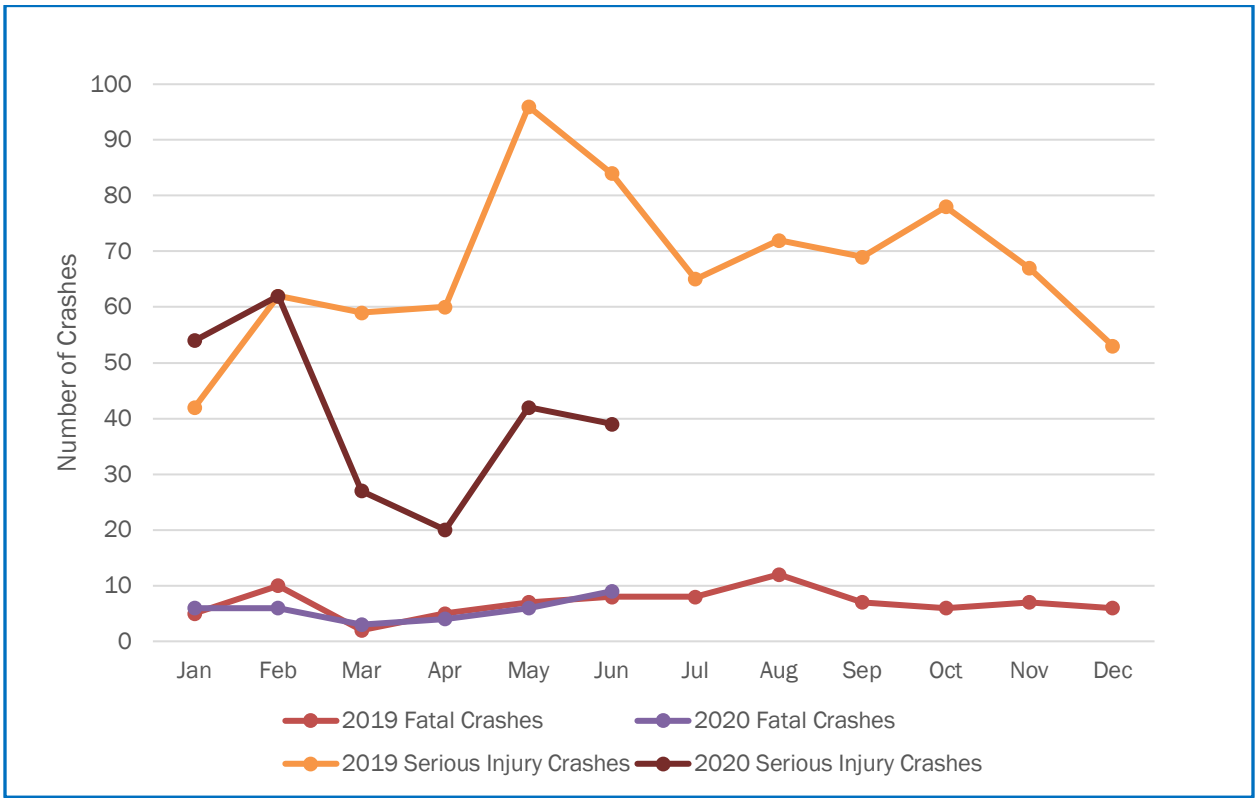
Figure 14: MATOC Roadway Incidents Summary, July 2019 to June 2020 (Source: MATOC)



[10] Summary provided to TPB staff by MATOC staff August 2020. Note that MATOC documents incidents only during its official operating hours, generally Mondays through Fridays from 4:30 A.M. to 8:00 P.M., and for a specific set of major roadways defined in MATOC's standard operating procedures (SOPs). Any incidents outside those hours and/or not on roadways designated in MATOC's SOPs are not included in these data.

Although comprehensive, regionwide fatal and serious injury crash data will not be available until later dates (published annually after thorough reviews), preliminary data have been made available for the Northern Virginia portion of the region[11]. Figure 15 shows fatal and serious injury crashes for all of 2019, and for 2020 through June. Post-COVID serious crash numbers have been significantly lower than their 2019 counterparts, but fatal crashes have remained at about the same level as 2019, even during months such as April with reduced traffic volumes.

Figure 15: Northern Virginia Fatal and Serious Injury Crashes: Preliminary 2019 and 2020 Data (Source: TPB staff analysis of Virginia Department of Motor Vehicles/Virginia Department of Transportation)



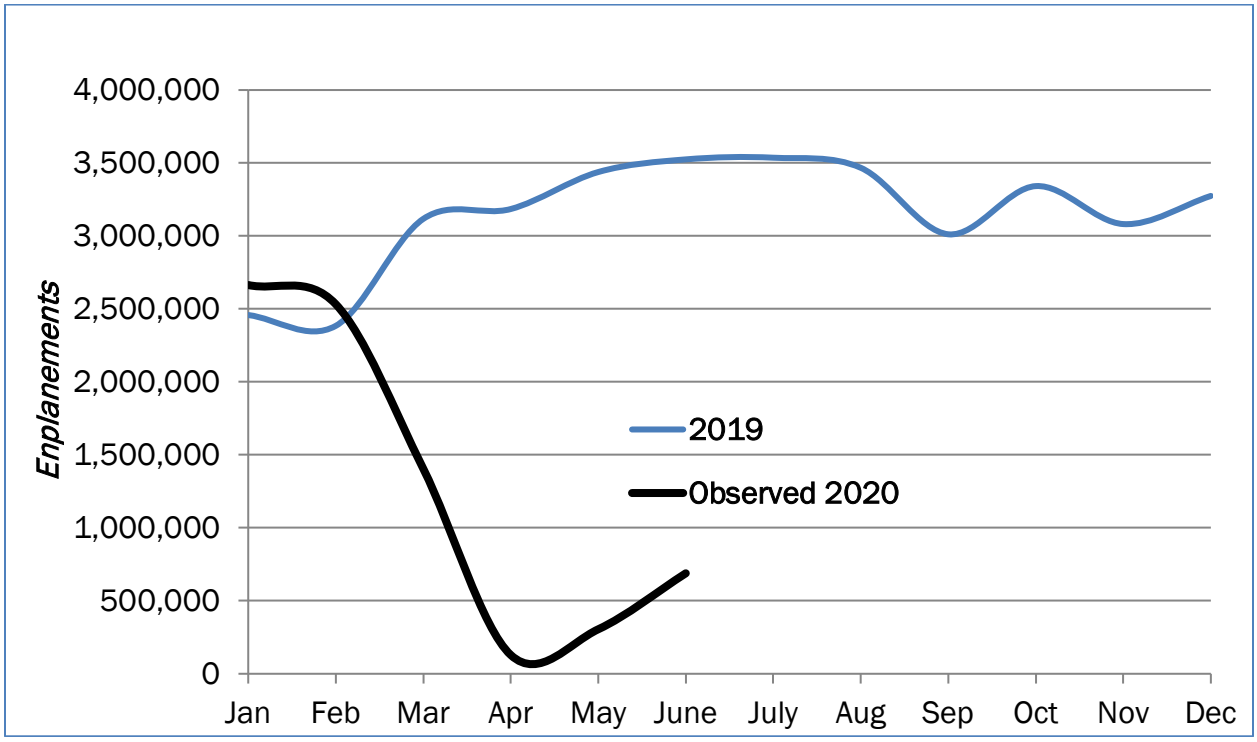
[11] Virginia Department of Motor Vehicles data accessed through the Virginia Department of Transportation Crash Analysis Tool website: https://app.powerbigov.us/view?r=eyJrIjoiMjhlZjFhZDAtNTIjMC00MDA1LWEyOTMtYWYwM2NiMmRiMmRkIiwidCI6IjYyMGFlNWE5LTRlYzEtNGZhMC04NjQxLTVkOWYzODZjNzMwOSJ9.

9. AIR TRAVEL

Snapshot: Air travel has recovered somewhat at the region's three major airports since April, but remains much lower than 2019.

Figure 16 shows enplanements data for the area's three airports (Ronald Reagan Washington National Airport, Washington Dulles International Airport, and Baltimore-Washington Thurgood Marshall International Airport).

Figure 16: Washington/Baltimore Monthly Enplanements through June 2020 (Source: COG)



10. COVID-19 CASES

Figure 17, taken from the U.S. Centers for Disease Control, shows the number of newly reported COVID-19 cases nationally. Figure 18 shows cumulative cases of COVID-19 in the National Capital Region as reported by Johns Hopkins University.

Figure 17: Nationwide New Reported COVID-19 Cases By Day (Source: https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/cases-in-us.html, retrieved August 25, 2020)

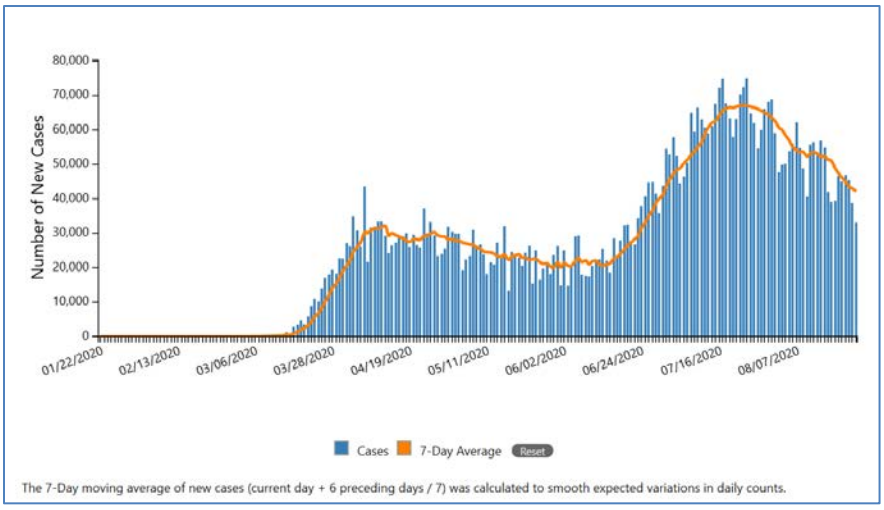
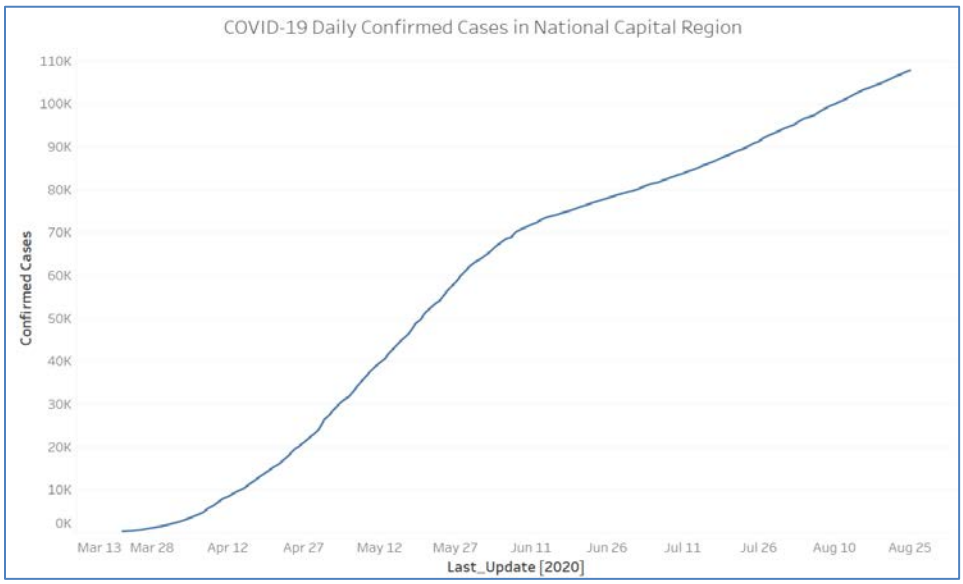


Figure 18: COVID-19 Cumulative Daily Confirmed Cases in the National Capital Region (Source: COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University, https://coronavirus.jhu.edu/map.html)

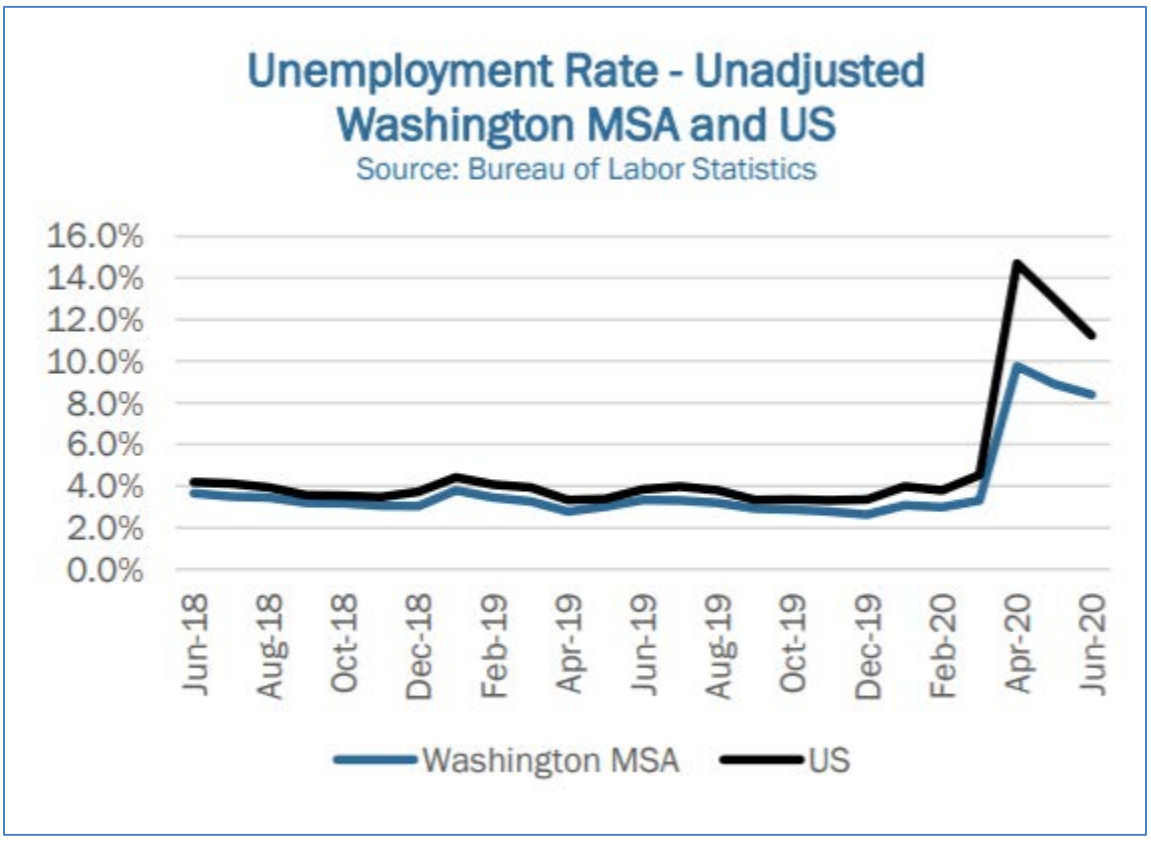


11. ECONOMIC IMPACTS

Figure 19, taken from COG's Regional Economic Monitoring System Report[12] for June 2020, shows the region's unemployment rate trend over time, compared to the national rate, as a comparator to travel demand.

Also according to the report, over-the-year employment decreased by 270,900 jobs or 8.0 percent in the Washington Metropolitan Statistical Area (MSA), while the national over-the-year employment decreased by about 13 million jobs or 8.7 percent. The Leisure & Hospitality Sector lost 131,700 jobs and the Trade Transportation, & Utilities Sector lost 35,400 jobs during the last year. (Most jobs were lost between March and April 2020) The number of unemployment insurance claims rose to a high of 96,406 for the week of April 4 and with a steady decline down to 20,679 for the week of June 27.The region's inflation decreased in May to -0.1 percent from a rate of 0.4 percent in March 2020. During June, the region's unemployment rate decreased to 8.4 percent, while the national rate decreased to 11.2 percent. The 2,432 new housing units authorized during June 2020 represent a 25.0 percent increase from June 2019, when 1,945 new units were started. For a list of jurisdictions in the MSA, visit www.mwcog.org/REMS.

Figure 19: Regional and National Unemployment Rate, June 2018 through June 2020 (Source: COG Regional Economic Monitoring System (REMS) Report, July 2020 REPORT – JULY 2020)



[12] https://www.mwcog.org/documents/2020/07/01/regional-economic-monitoring-system-rems-report-economy/.

SUMMARY

The COVID-19 pandemic has had a significant, quickly-changing, and still-evolving impact on travel and transportation in the National Capital Region and nationally. Notable among the snapshots of data examined by TPB staff include:

- Traffic volumes in the National Capital Region, which in April 2020 had dipped below 50% of 2019 volumes, by July had recovered to over 80% of 2019 volumes.
- Regional vehicle miles of travel dipped most dramatically in April to approximately 40% of January 2020 levels, but by July had recovered significantly.
- Though miles of travel per person have returned to near pre-pandemic levels, people are still much more likely to be staying at home than pre-pandemic.
- Truck travel never declined as much as passenger travel did.
- Impacts to transit ridership have varied across the region, with longer-distance commuter services experiencing the biggest ridership declines, and local bus transit services experiencing declines of lesser magnitudes. While the ridership numbers reflect changes in usage, these reductions have to be viewed in relation to the reduction in service levels (capacity) due to pandemic-related challenges in operating transit. Preliminary data demonstrates that usage of available capacity has been significant, particularly on the bus system, which remains a lifeline for critical workers.
- Though the overall number of crashes and incidents went down during the pandemic, the numbers of major incidents and fatal crashes remained near pre-pandemic levels, even during periods of reduced travel demand.
- Air travel has recovered somewhat at the region's three major airport since April, but remains much lower than 2019.

ACKNOWLEDGEMENTS

Thanks to additional COG and TPB staff who contributed to this memorandum or analyses herein: Timothy Canan, Paul DesJardin, Martha Kile, Sunil Kumar, James Li, Abdul Mohammed, Eric Randall, Jon Schermann, Kanti Srikanth, and C. Patrick Zilliacus.

Attachment E

Presentation: Commuter Connections 2020 Employer Telework Survey – Coronavirus Pandemic Survey Results by the National Capital Region Transportation Planning Board Technical Committee, 9/16/2020

COMMUTER CONNECTIONS 2020 EMPLOYER TELEWORK SURVEY

Coronavirus Pandemic Survey Results

Nicholas Ramfos
Director, Transportation Operations Programs

National Capital Region Transportation Planning Board
September 16, 2020

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Survey Objectives and Methodology

- Employer telework survey is conducted every three years by Commuter Connections to define the portion of teleworking influenced by assistance provided.
- For FY2020, the survey was expanded to include questions on the Coronavirus Pandemic's influence on Telework.

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Survey Objectives and Methodology (con't)

- Examined telework changes made by employers during coronavirus pandemic
- Interviewed employers that were in either the Employer Outreach database or federal Employee Transportation Coordinators/Telework coordinator database
- Sent email/postal mail invitations for an Internet-based survey and followed up by telephone.

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Survey Objectives and Methodology (con't)

The questionnaire addressed the following broad topics:

- Change in worksite operation due to coronavirus pandemic
- Number of employees teleworking at the time of the survey and before the pandemic
- Changes in telework programs or policies in response to the pandemic
- Likelihood to continue telework after the pandemic ends
- Assistance received with telework planning or implementation
- Significant telework issues encountered during the pandemic
- Employee and manager benefits received by teleworking
- Employer characteristics (size, location, major industry)

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Survey Objectives and Methodology

- 4,539 Employers were contacted in May and June 2020 and 180 responded for a 4% response rate.
- Due to office closures, employee furloughs and other impediments to reaching employer representatives to respond to the survey, a survey confidence level was not calculated.
    - Essentially, the survey results can be categorized as a “very large focus group”
- Companion briefing report is also available with in-depth survey response details.

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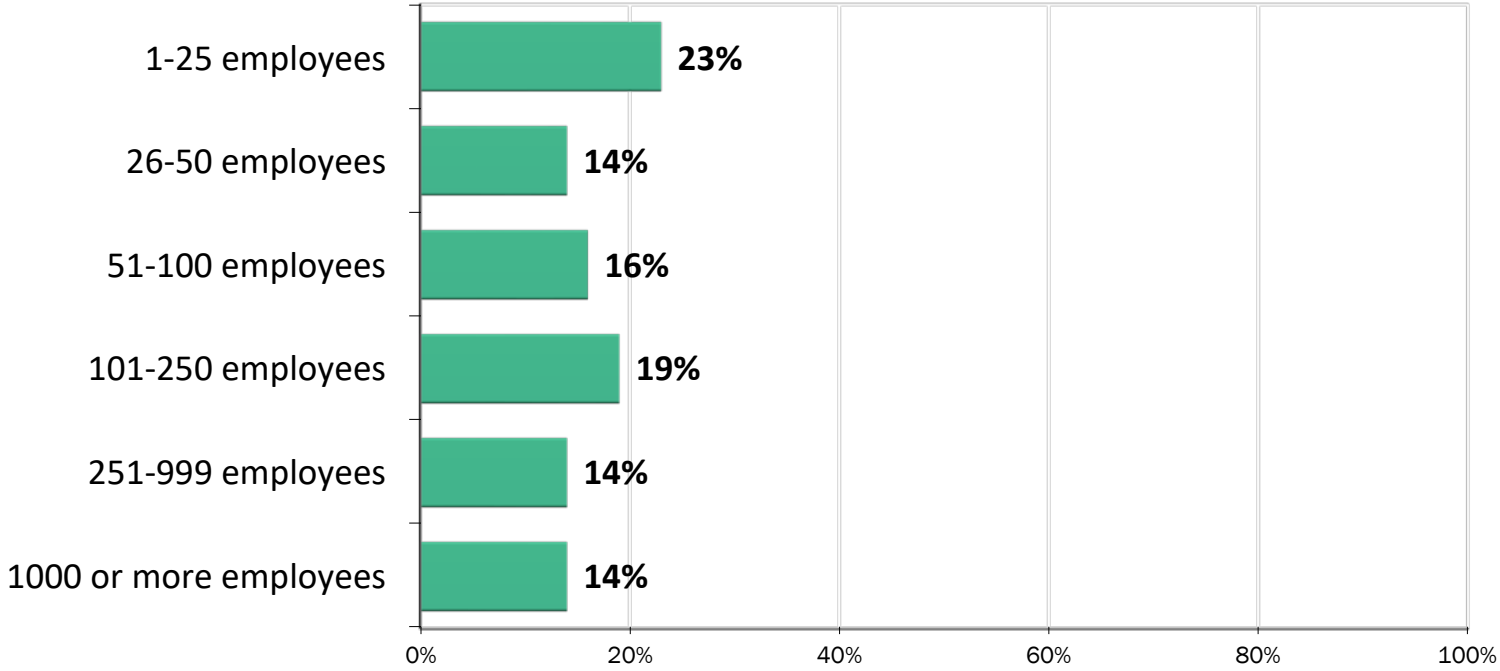
Employer Profile – Diverse Sample

- Worksite state: **12%** DC**, 43%** MD, **45%** VA
- Employer type: **49%** private, **33%** NFP, **13%** Federal, **5%** State/Local government
  - Industry: Government, medical, trade association, business support, education, real estate/property management, technology, hospitality, legal/professional, banking/finance
  - Size – number of employees in Washington metro region



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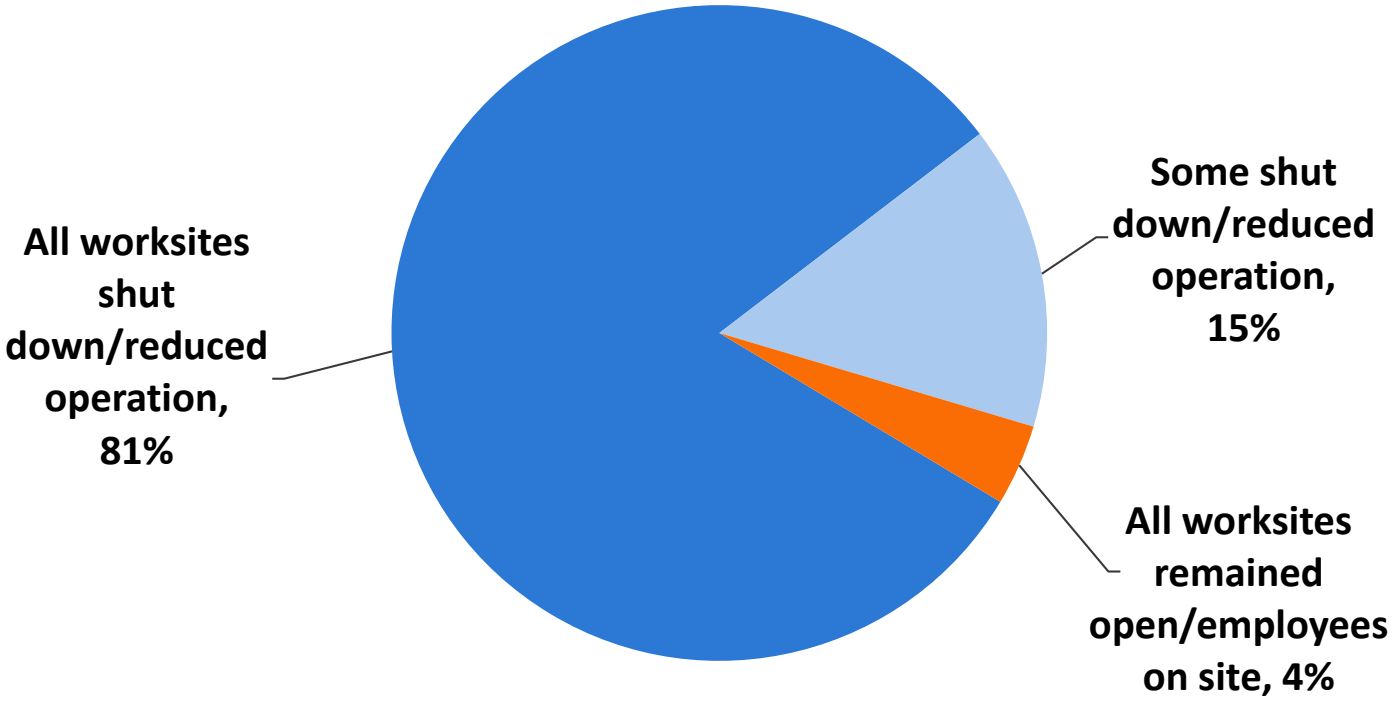
96% of Worksites Shut Down or Reduced On-site Operation Either Completely (81%) or Partially (15%) Since Coronavirus Pandemic Began

At the time of the survey, 95% of sites with reduced operation were still closed/limited on-site operation



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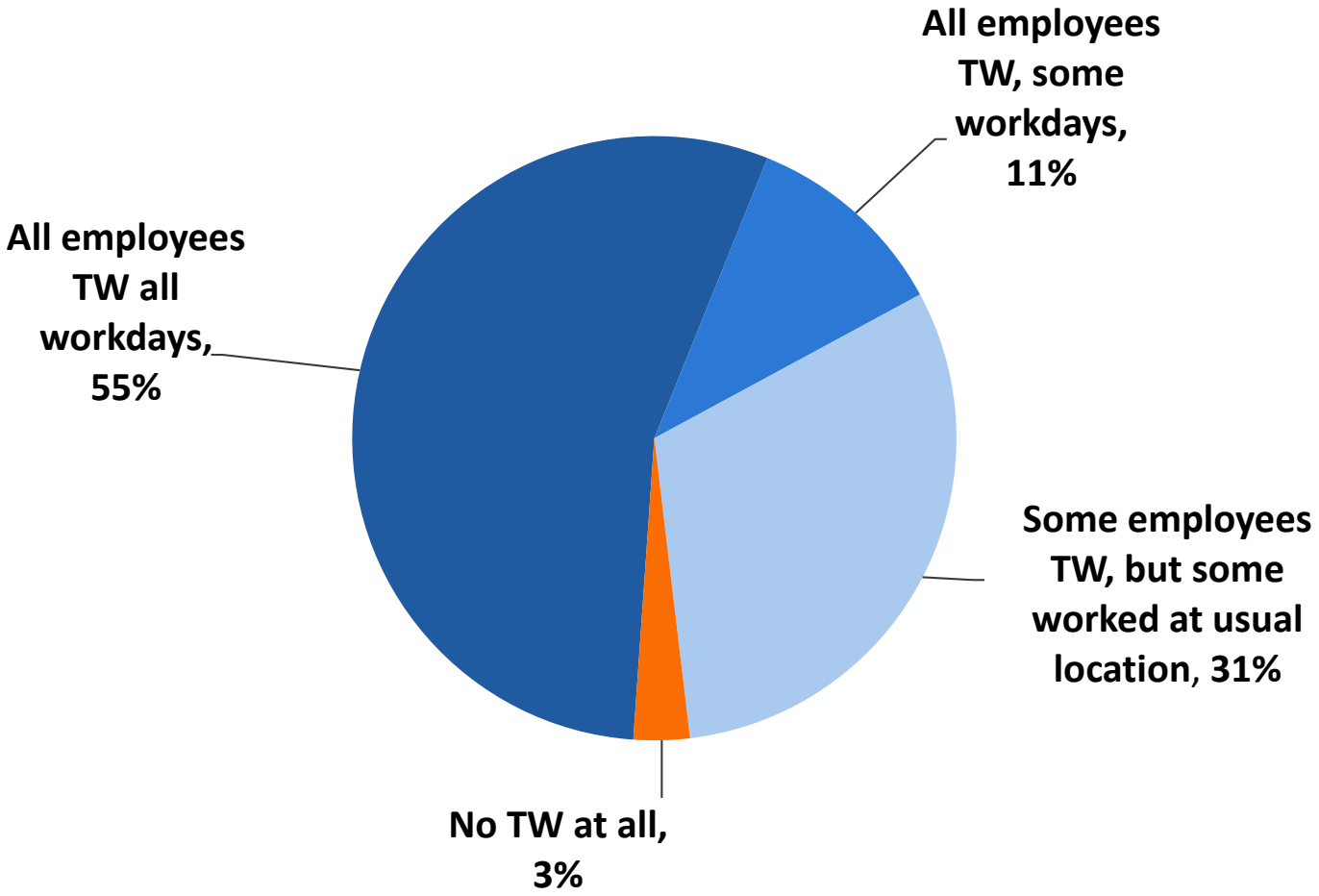
97% of Worksites Had At Least Some Telework Since Pandemic Began – For 55%, It was Full-time for All Employees



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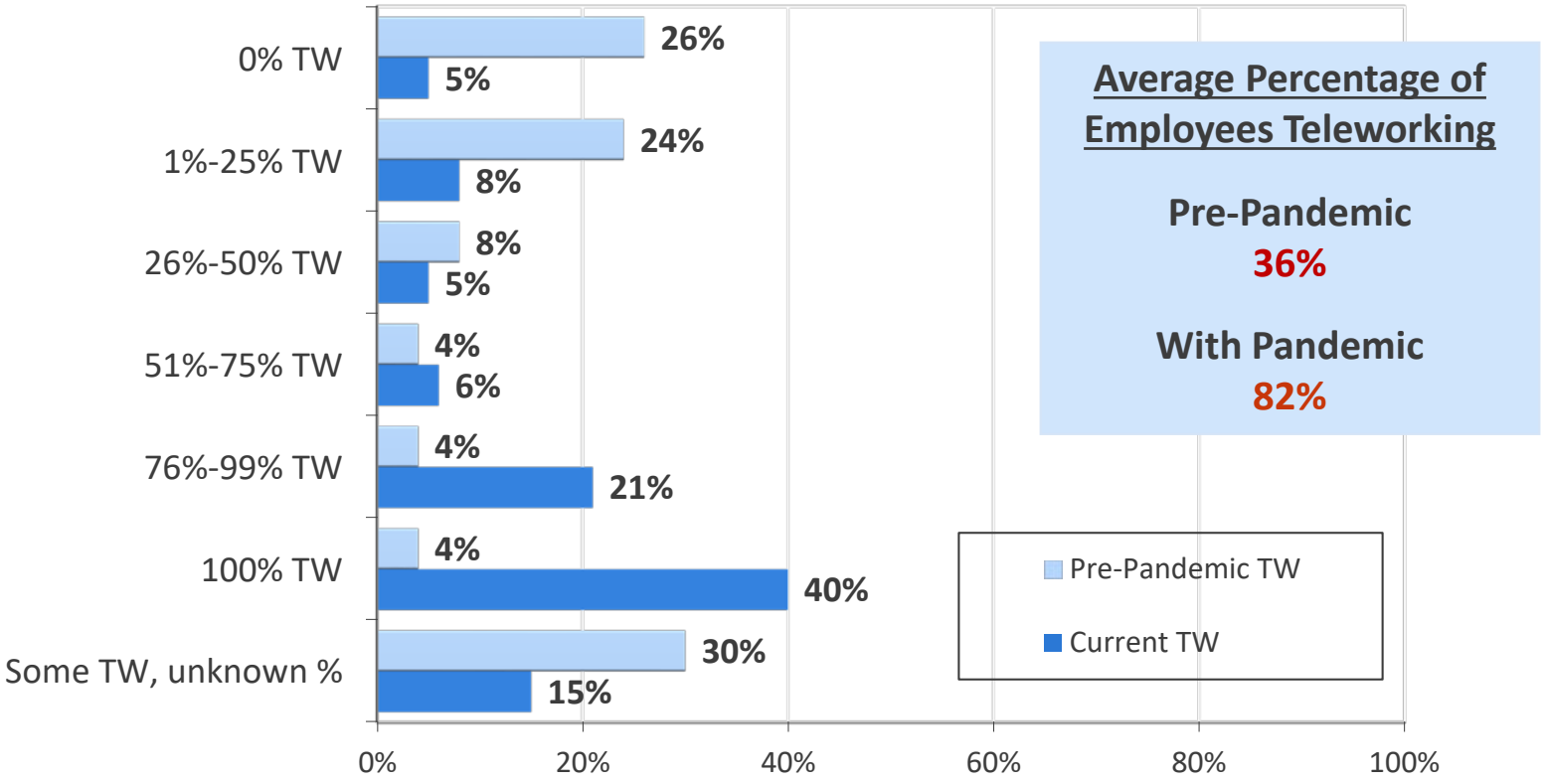
At the Time of the Survey, 95% of Worksites Had Telework; Telework Was Common Pre-Pandemic Also - 76% Had At Least Some Telework Before

But during the pandemic, the average share of employees who teleworked grew from 36% to 82% at sites with telework



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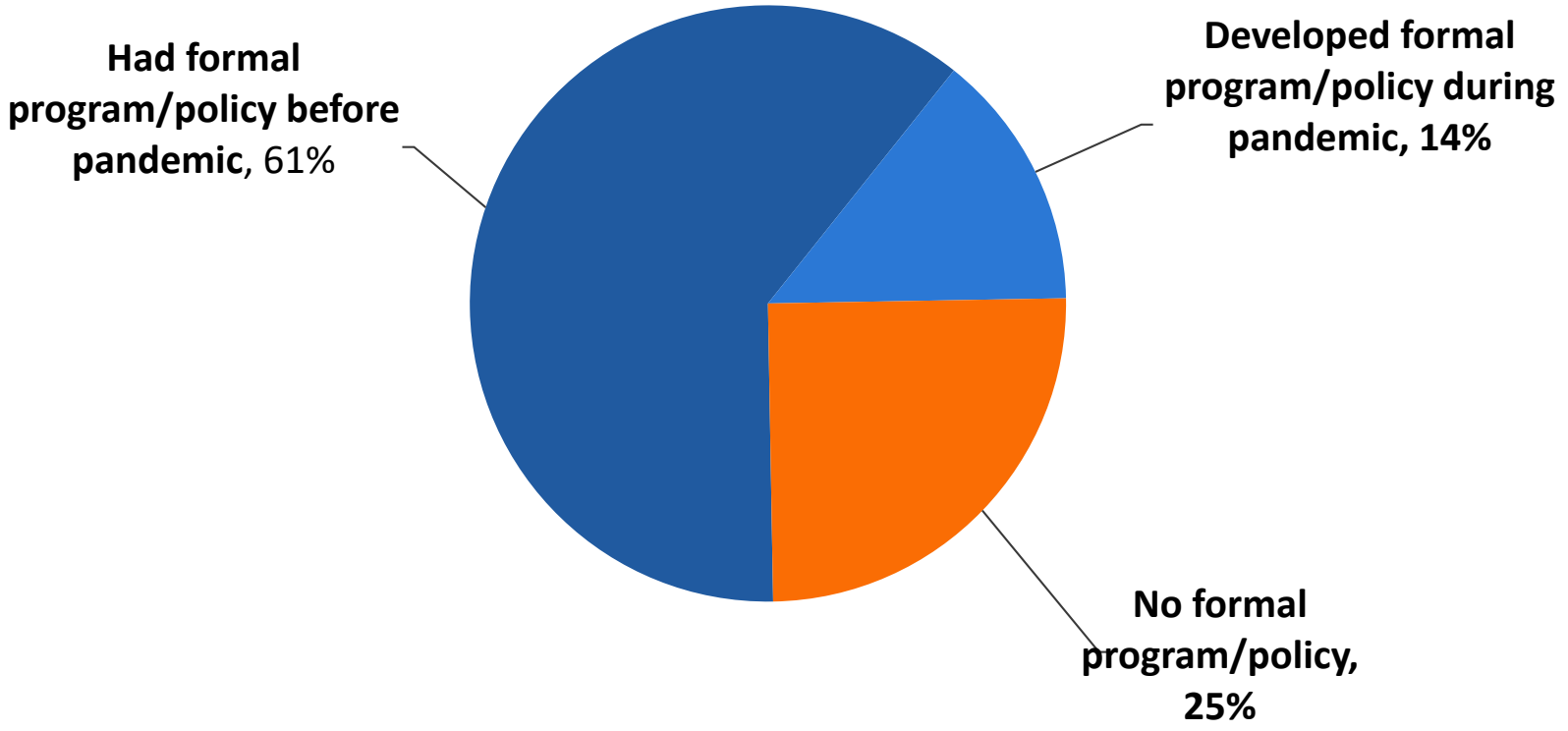
During the Pandemic, 14% of Worksites Developed a Formal Telework Program/Policy; 61% of Worksites Already Had a Formal Program/Policy before the Pandemic



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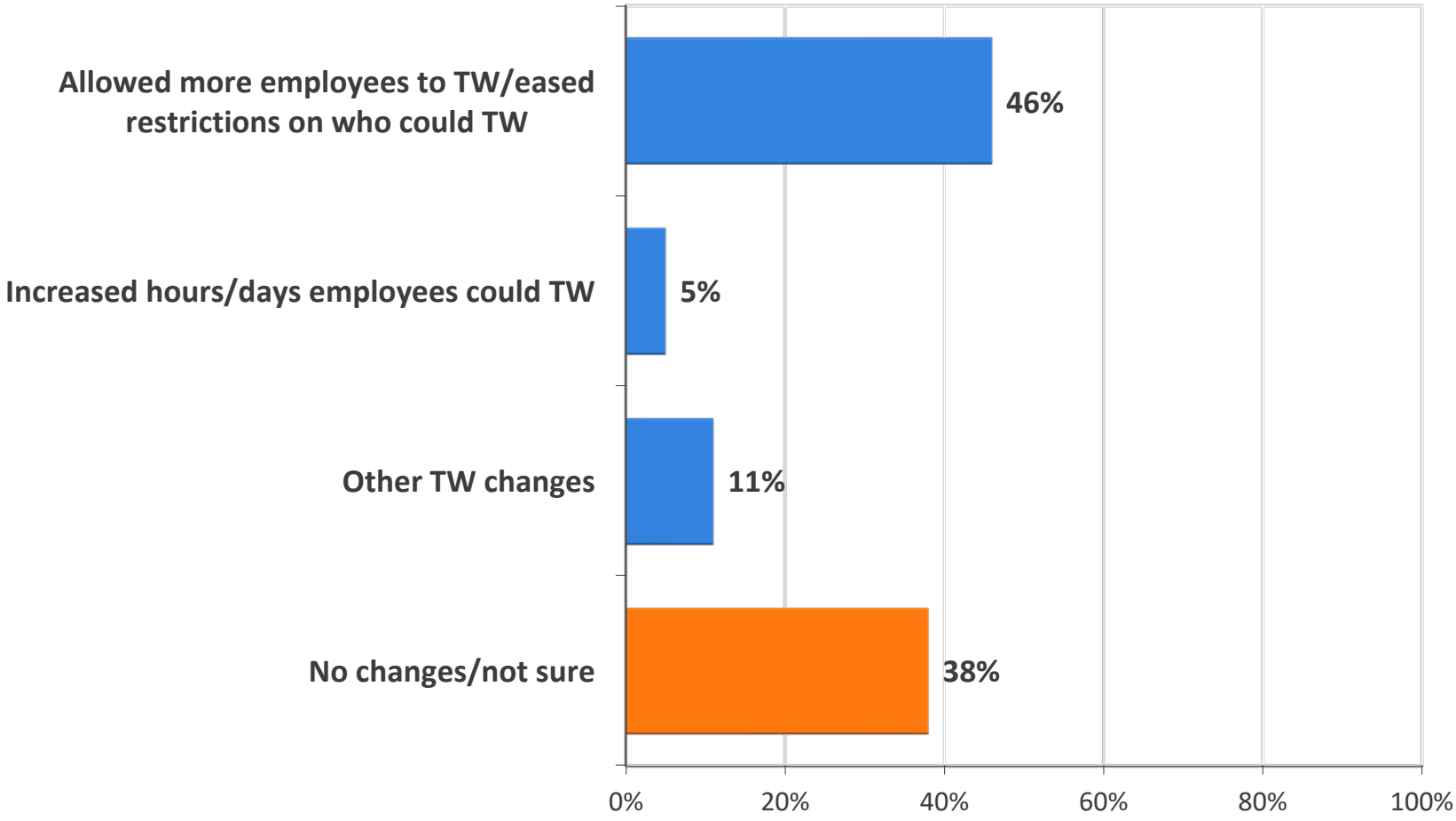
62% of Worksites With a Telework Program/Policy Made Changes to Accommodate the Pandemic – Most Made a Change to Expand Telework Eligibility



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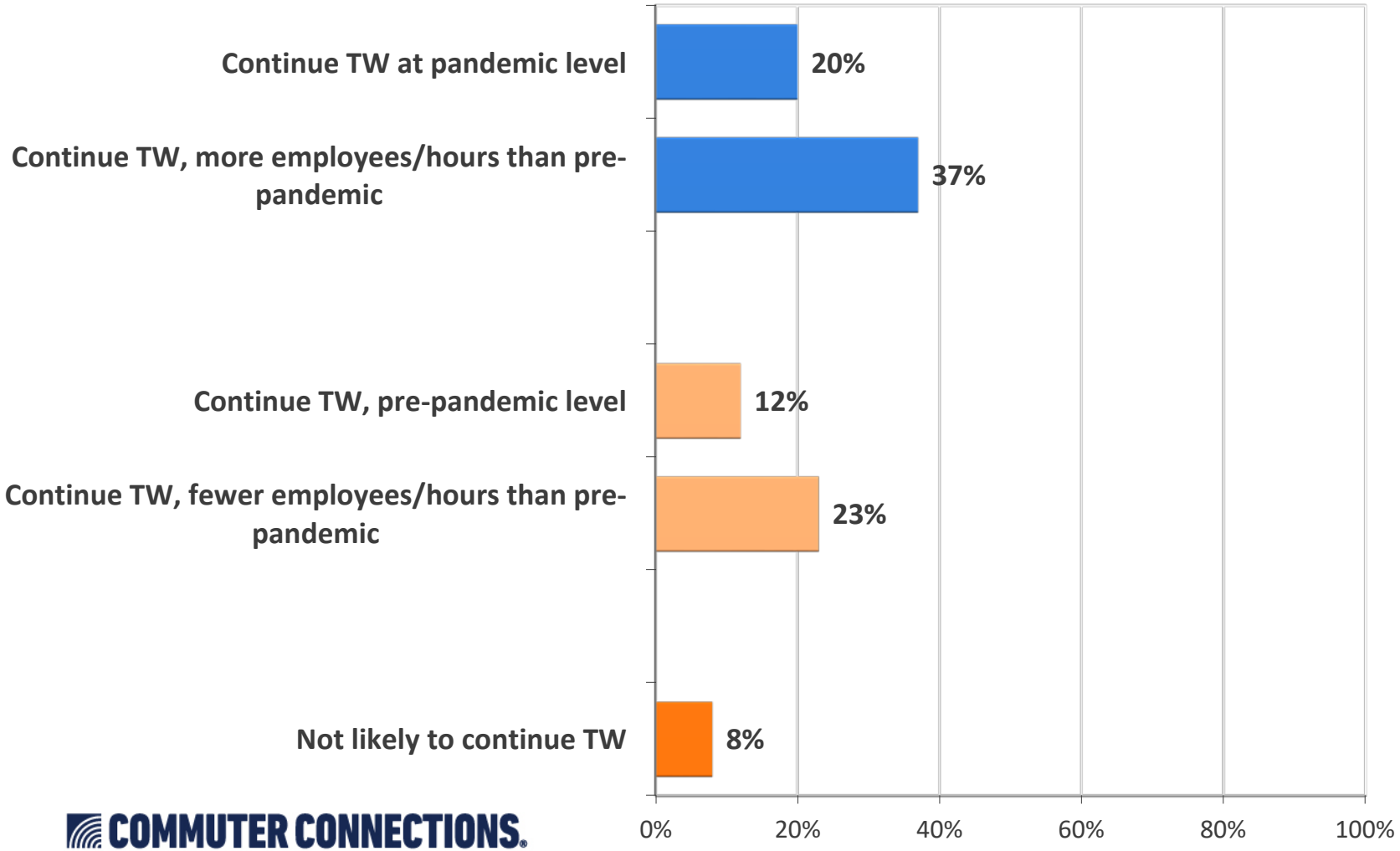
More than Half of Worksites Anticipate A Post-Pandemic Telework Level that is Higher Than the Pre-Pandemic Level



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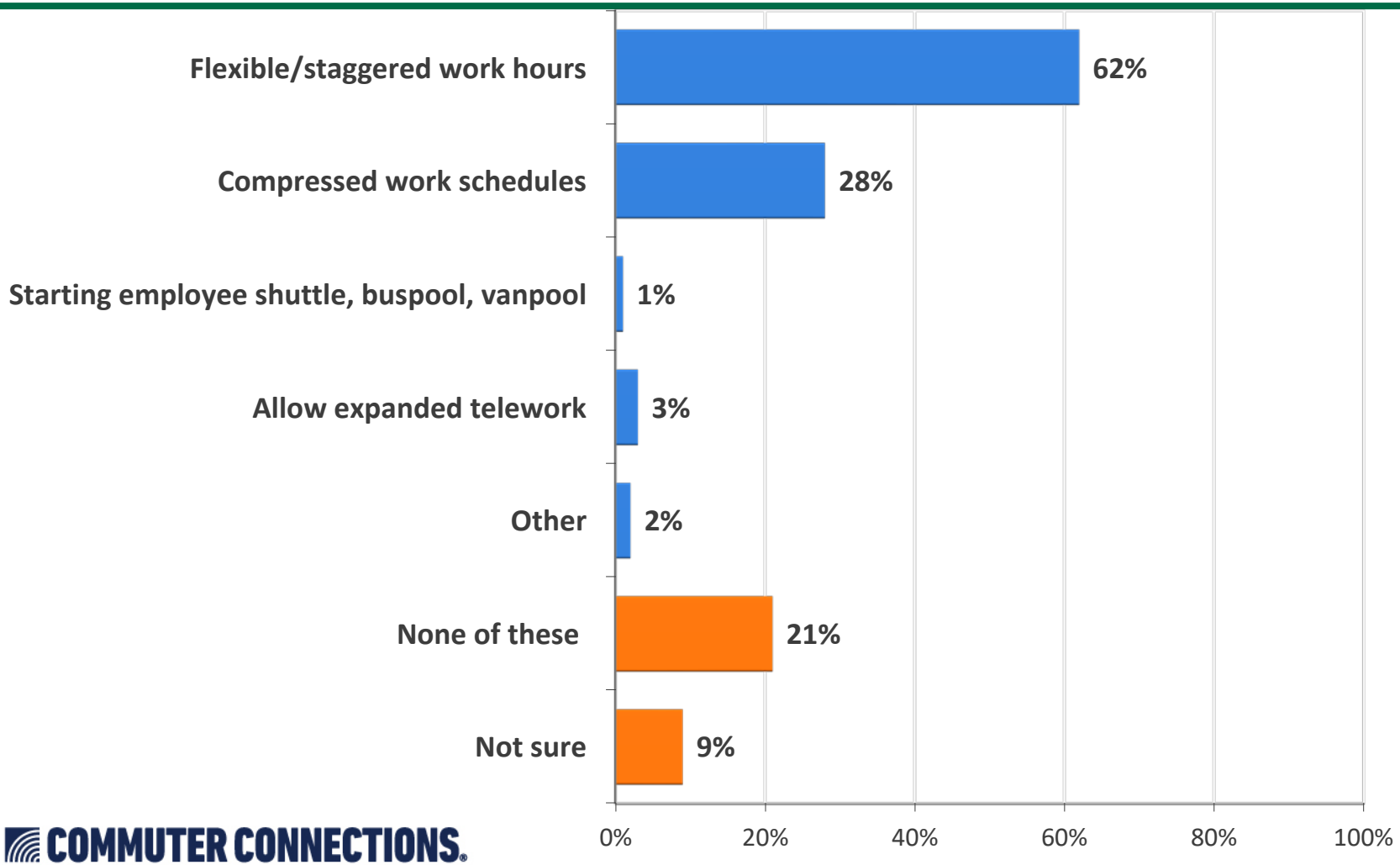
Seven in Ten Worksites Have Considered Implementing Work Hours or Commute Strategies After the Stay at Home Restrictions are Lifted to Reduce Future Virus Outbreaks



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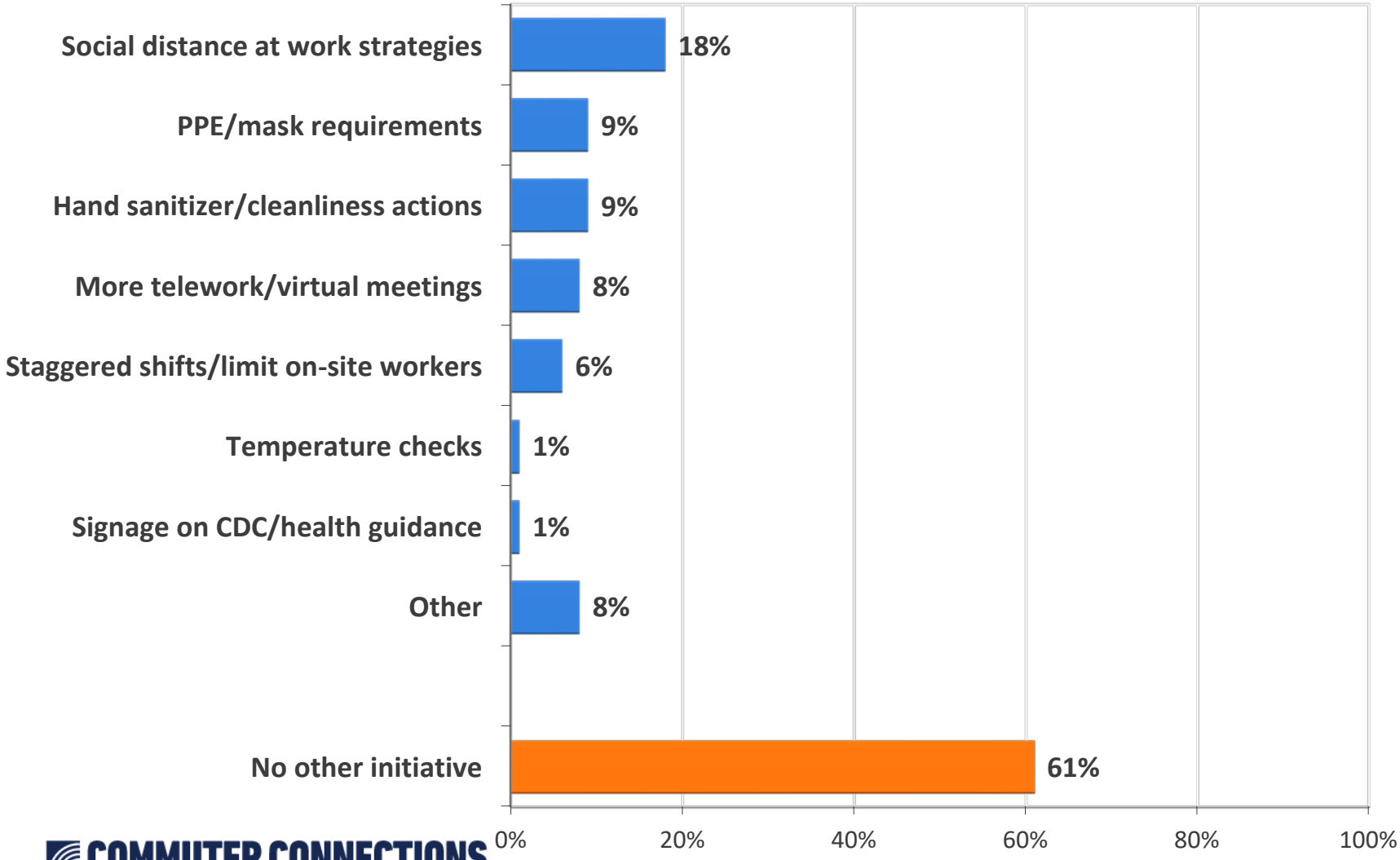
Employers Also Have Considered Implementing Other Virus-Prevention Strategies at the Worksite



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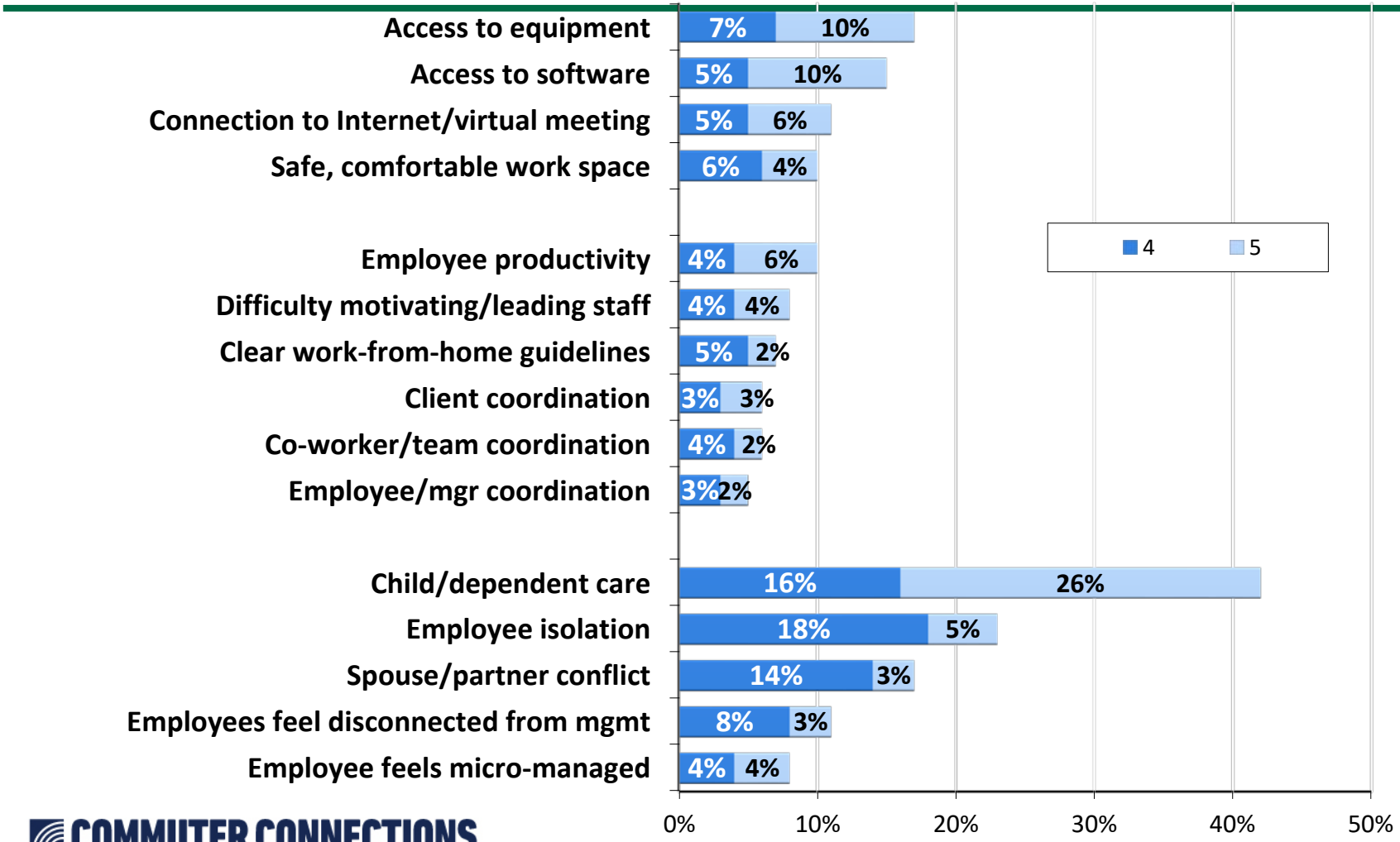
50% of Employers Noted A "Significant" TW Issue

Few Reported Technical and Coordination Issues; They Reported Greater Issues with Employees' Experience with Telework



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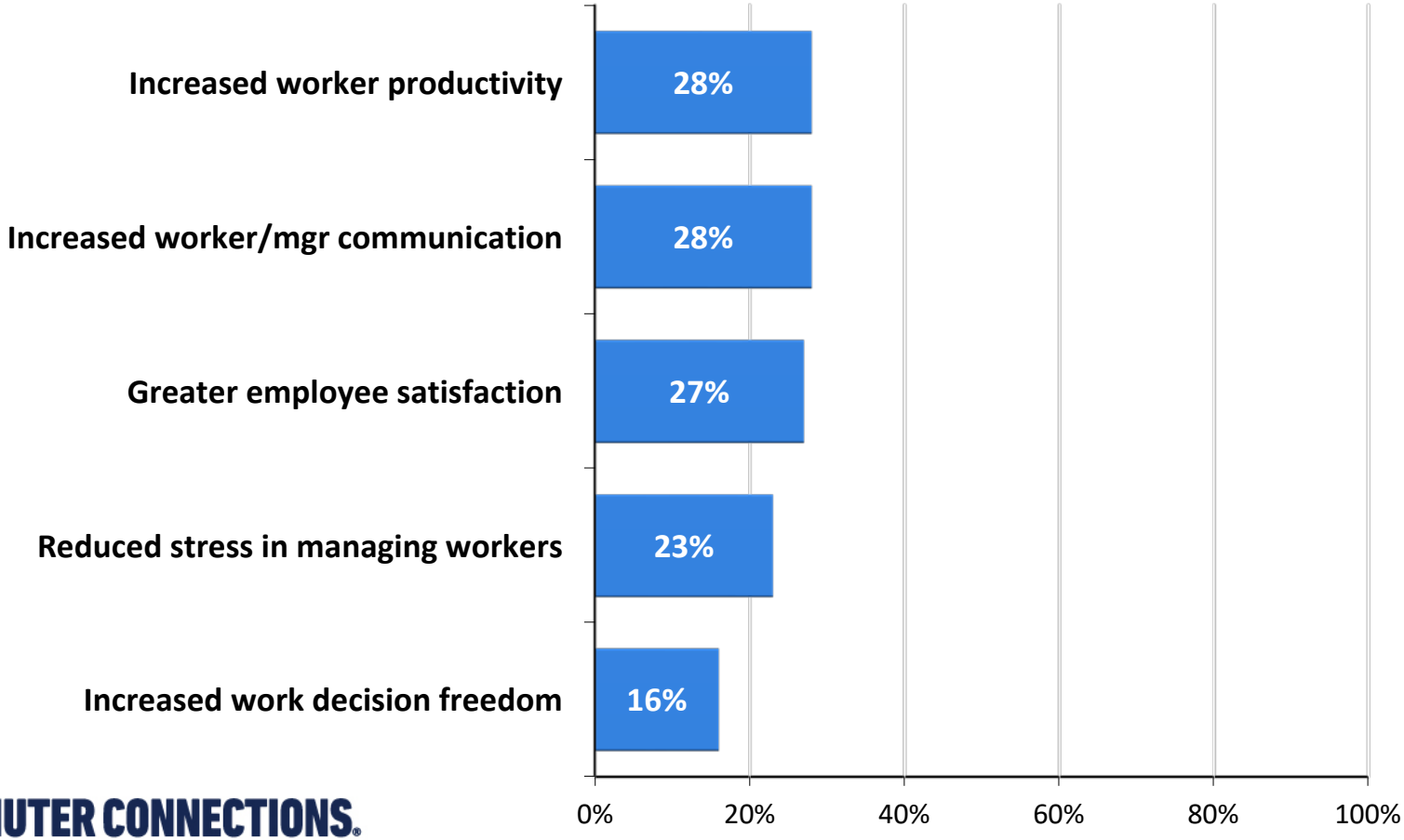
80% of Employers Said Managers Reported Benefits of Managing Remotely

Nearly three in ten said managers noted greater worker productivity and increased communication with workers



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92% of Employers Said Employees Reported Benefits of Working From Home

The greatest employee benefits were on not commuting, comfortable work environment, and personal cost savings

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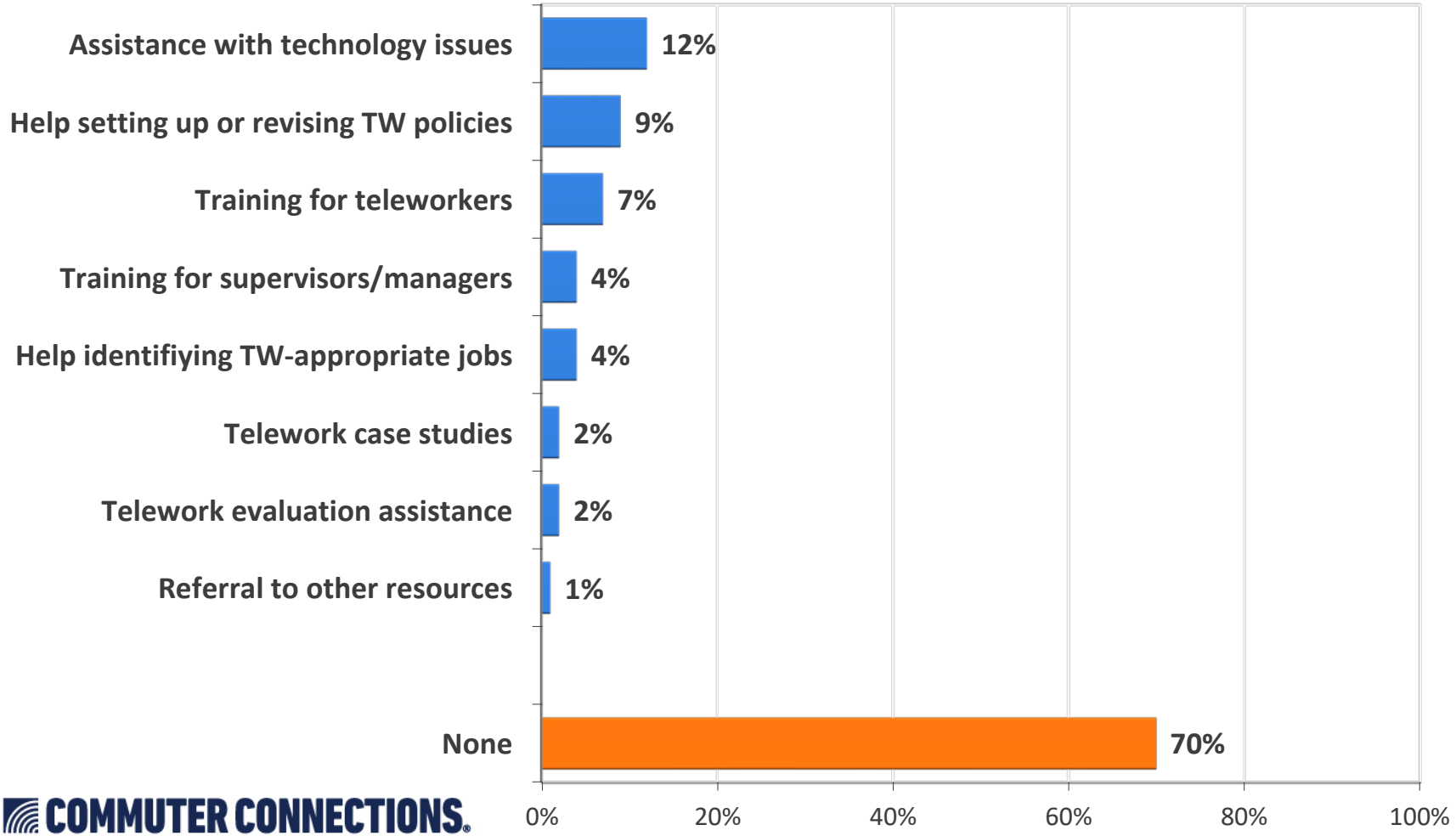
Three in Ten Organizations Had Received Some Telework Information or Assistance

Half Who Received Assistance Named an Internal or Corporate Source



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FY2020 Commuter Connections Regional Employer Telework Survey Key Highlights

- Good cross-section of employers that responded with regards to location, size and type of industry.
- During the pandemic, the average share of employees who teleworked grew from 36% to 82% at sites with telework already in place.
- Telework was a widely applied strategy to maintain business operations during the pandemic. Nearly all (97%) respondents said at least some employees were teleworking since the start of the pandemic. More than half (55%) said all employees teleworked all of their workdays.

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FY2020 Commuter Connections Regional Employer Telework Survey Key Highlights (con't)

- More than six in ten (61%) respondents said their organizations had a formal telework policy or program in place before the pandemic began.
- 62% of Worksites With a Telework Program/Policy Made Changes to Accommodate the Pandemic – Most Made a Change to Expand Telework Eligibility.

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FY2020 Commuter Connections Regional Employer Telework Survey Key Highlights (con't)

- Ninety-two percent of respondents said their organizations anticipated continuing telework after the Stay-at-Home restrictions were lifted and employees could return to their usual work locations. Two in ten (20%) said they would most likely continue telework at the level during the pandemic.
- Seven in ten respondents said their organizations had considered at least one work hours or commute travel action. 64% considered actions for flexible or staggered work hours to minimize employee contact when arriving and leaving work. Three in ten (29%) considered compressed work schedules.

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FY2020 Commuter Connections Regional Employer Telework Survey Key Highlights (con't)

- More than four in ten (42%) said employees had encountered issues with child or dependent care, 23% said employees had experienced isolation and missed going to the workplace, and 17% had experienced conflict with a spouse or partner while teleworking during the pandemic.
- Nearly nine in ten (89%) respondents cited benefits they had heard employees express about their telework experience during the pandemic.
- About half (52%) of respondents noted benefits they heard managers express about their experience managing remotely during the pandemic.

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Attachment F

Report: Capital COVID-19 Snapshot: Safe Return to Work by the Greater Washington Partnership, summarizing results from a survey conducted in August 2020.

Capital COVID-19 Snapshot: Safe Return to Work

The Greater Washington Partnership is about solutions and unity.

GREATER WASHINGTON PARTNERSHIP
FROM BALTIMORE TO RICHMOND.
FOSTERING UNITY. ADVANCING GROWTH.

Contents

Introduction

The Greater Washington Partnership is about solutions and unity, bringing people, organizations, and jurisdictions together to make the Capital Region of Baltimore, Washington, and Richmond, the world's best place to live, work, raise a family, and build a business. **The Capital COVID Snapshot: Safe Return to Work,** conducted in partnership with public agencies and business organizations throughout the region, is designed to increase regional information and data sharing, so employers, both large and small, can make more informed decisions about reopening and public agencies can better understand when employees are expected to return to their offices and worksites.

In March 2020, the Capital Region issued stay-at-home orders due to the rapid spread of COVID-19. Employers quickly prepared to have a majority of their workforce work from home full-time if possible, while many in the region continued to serve on the front lines as healthcare workers, essential service providers, and researchers working on a vaccine. Six months later, many employers in our region are still unsure when and how to safely return their employees to worksites, limiting the public sector's ability to efficiently and confidently meet the demand for many services, including public transportation. Furthermore, it is clear that low-income and minority communities are bearing a disproportionate health and economic burden due to the pandemic. A successful recovery must go beyond reopening and seek ways to address the inequities in our systems and foster opportunity for all the Capital Region's residents.

The Capital COVID-19 Survey was conducted between August 10-28, 2020, with more than 430 unique employers participating from the Washington, Baltimore, and Richmond metro areas that employ 275,000 residents. Along with an analysis of employer reopening plans, this report includes public sector information, including a Transit Tracker that provides ridership trends and the social distancing carrying capacity of the region's public transportation systems. The findings contained in this report will help employers and public agencies collaboratively reopen the Capital Region's economy safely, gradually and sustainably in the months ahead. The Partnership intends to update this product regularly as the region continues to reopen, so that all public and private decision-makers and residents have access to regular, timely and actionable information. As we work together to reopen the region safely, the Partnership encourages all employers and residents to do their part to help slow the spread of COVID-19 by following public health officials' guidance, wearing masks and observing social distancing guidelines.

Capital COVID Snapshot

Regional Partners

The Greater Washington Partnership is a first-of-its-kind civic alliance of CEOs in the region, drawing from the leading employers and entrepreneurs committed to making the Capital Region— from Baltimore to Richmond—one of the world's best places to live, work and build a business. The Partnership is about unity and solutions and we are stronger and more successful when aligned with our many exceptional partners throughout the Capital Region. This is especially true for the Capital COVID Snapshot: Safe Return to Work report. Thank you to the following partners for collaborating on this effort to ensure the Capital Region has a strong, safe recovery.

Metropolitan Washington Council of Governments

metro

MDOT Maryland Department of Transportation

Northern Virginia Transportation Authority

Federal City Council
A Catalyst For Progress In The Nation's Capital

Northern Virginia Chamber of Commerce
The Voice of Business in Northern Virginia

Tysons

Greater Washington Board of Trade

Arlington Chamber of Commerce

Chamber of Commerce Montgomery County

Prince George's Chamber of Commerce Est. 1924

Connected DMV

The Chamber ALX
Supporting Businesses & Cultivating Community

DCST
DC Sustainable Transportation

ULI Urban Land Institute Washington

NVTC
Northern Virginia Transportation Commission

Employer Comment #1

"Our COVID-19 Task Force is continuously monitoring and reviewing guidance from the CDC and local jurisdictions so that we can update our approach as needed."

Employer Survey

Key Findings

1. Employers are adopting a phased approach to reopening, but many remain uncertain. This fall, about one-third of the region's workforce are projected to physically return to worksites.

2. Of employers who had long-term reopening plans, on average, those employers expect to have 72% of their employees return to the office by Summer 2021. However, a third of responding employers are still unsure of their summer 2021 plans

3. Most employers want to test their employees for COVID-19 but will not if the test costs more than $50.

4. Nearly 50 percent of employers indicated a high level of concern about public transit safety and a low level of confidence that public agencies can control crowding and enforce the wearing of masks.

Reopening Worksites

The return to worksites will be gradual.

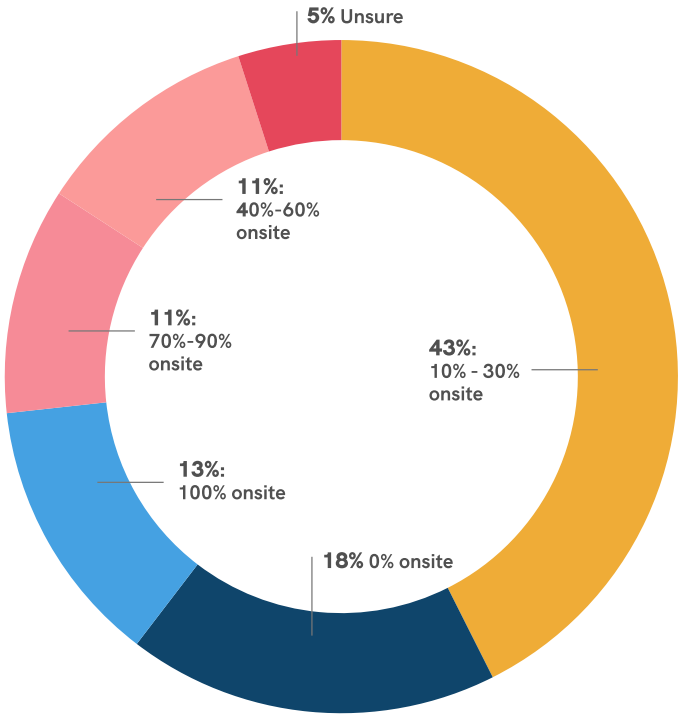
The health and safety of our regional workforce comes first.

Based on responses as of August 2020, employers with plans for next summer expect, on average, **72 percent of their employees to return to the office by summer 2021**. However, a third of responding employers are still unsure of their summer 2021 plans.

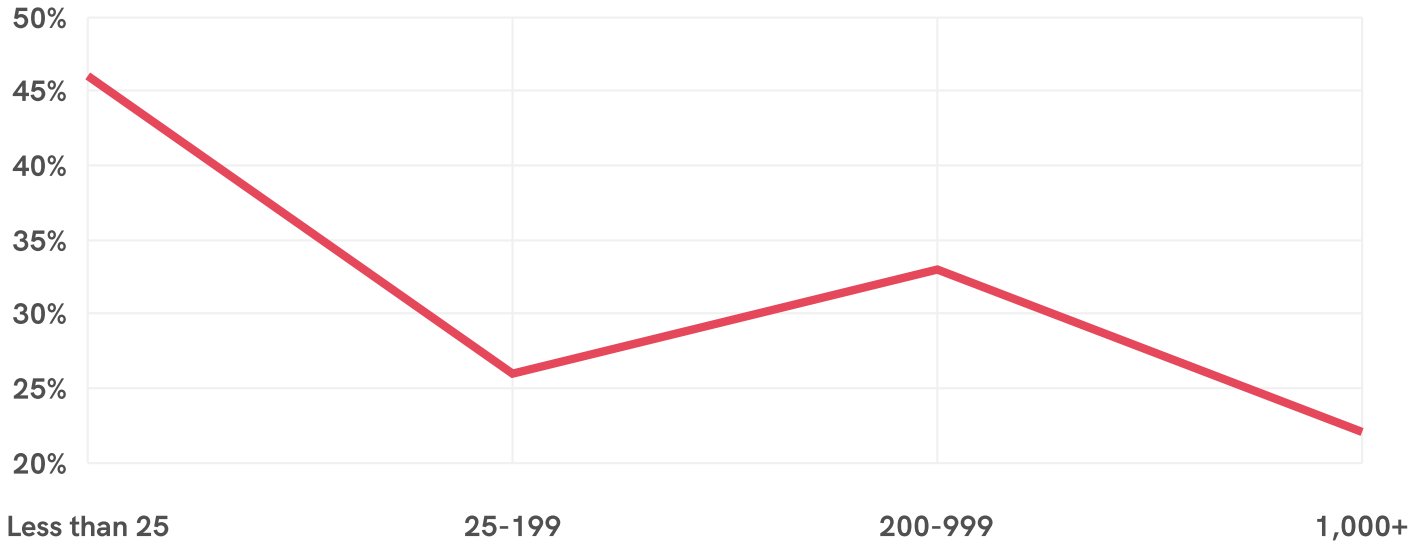
Decision-makers must continue to prioritize the health and safety of workers, and their families. By collecting and widely disseminating this information, leaders across organizations will be able to learn from each other and apply best practices to their operations.

According to responding employers, on average, less than a third of their workforce are expected to be physically at their worksites after Labor Day. Limiting the number of people in the office and teleworking will continue for most employers. Employers are adopting a phased approach to their return, with modified work schedules to limit the number of employees in the office.

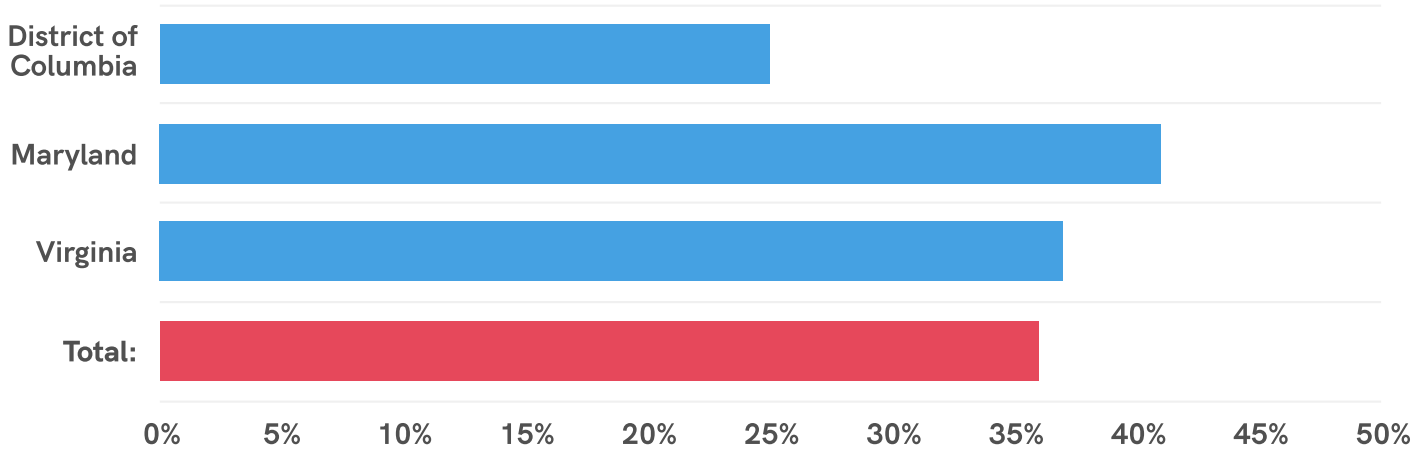
Share of Workforce Expected Onsite post Labor Day



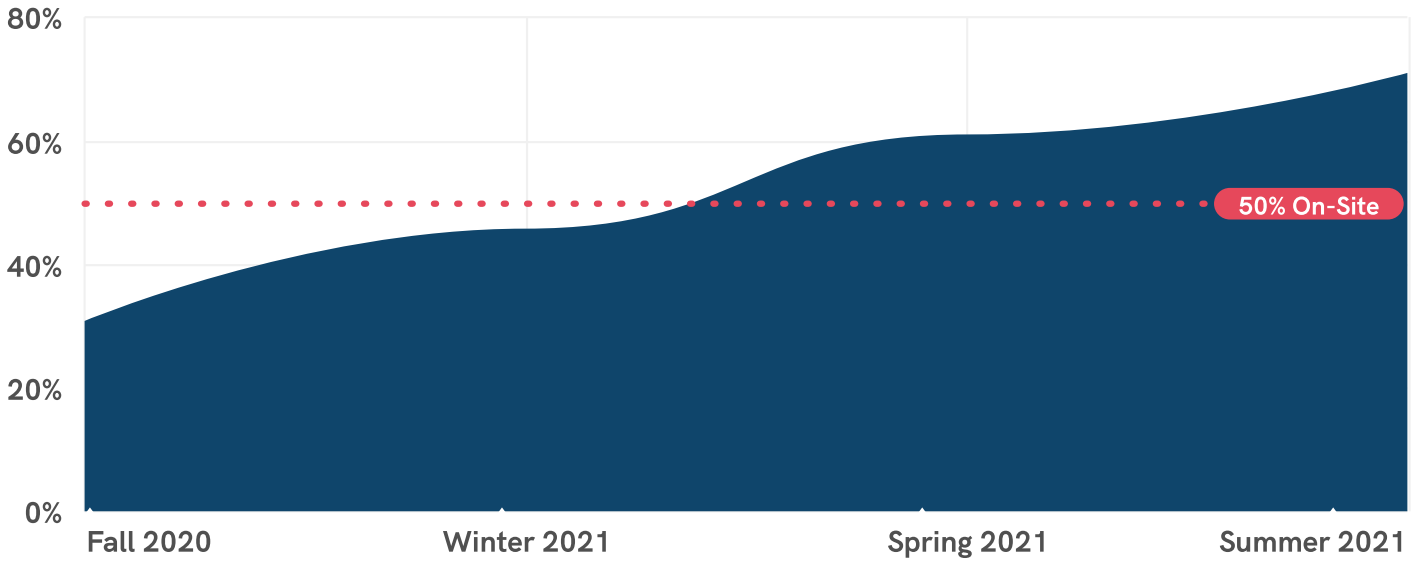
Share of Workforce Expected Onsite post Labor Day by Worksite Size



Share of Workforce Expected Onsite post Labor Day by State



Share of Workforce Expected Onsite Over the Next Year



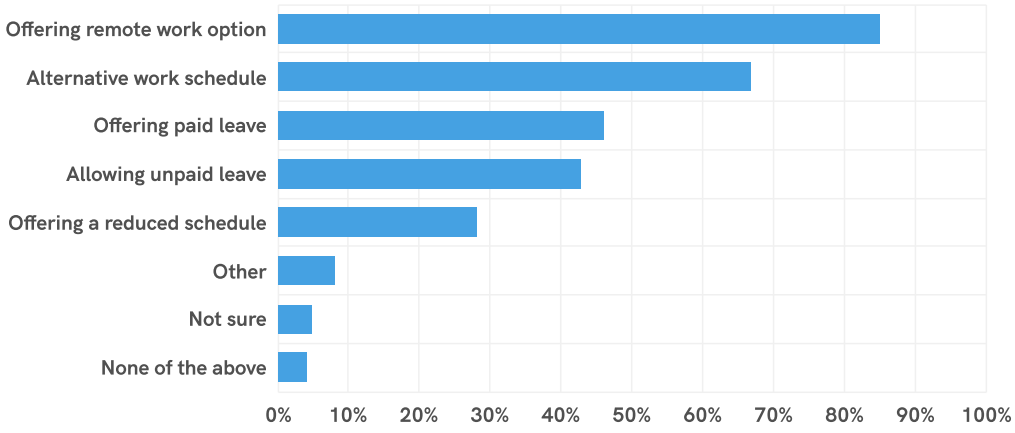
Some employers say they are benchmarking and monitoring the situation to adhere to the local/ state government mandates. Although the general theme in the comments provided by employers was continual "monitoring and re-evaluating,", those who were able to provide a long-term estimate on the return of their employees, believe a majority of their workforce will be back by spring 2021. Breaking down responses by larger employers are generally more cautious about bringing their workforce back.

Worksite Safety & Flexibility for Employees

Nearly 7 in 10 employers are currently offering alternate work schedules to support employees.

Employers are implementing revised policies and procedures to promote the safety and well-being of employees and their families during this pandemic, with more than two-thirds of respondents offering flexible and remote work options, and nearly 50 percent providing paid and/or unpaid leave. Comments from employers indicated the new accommodations are heavily influenced by employee childcare and education needs.

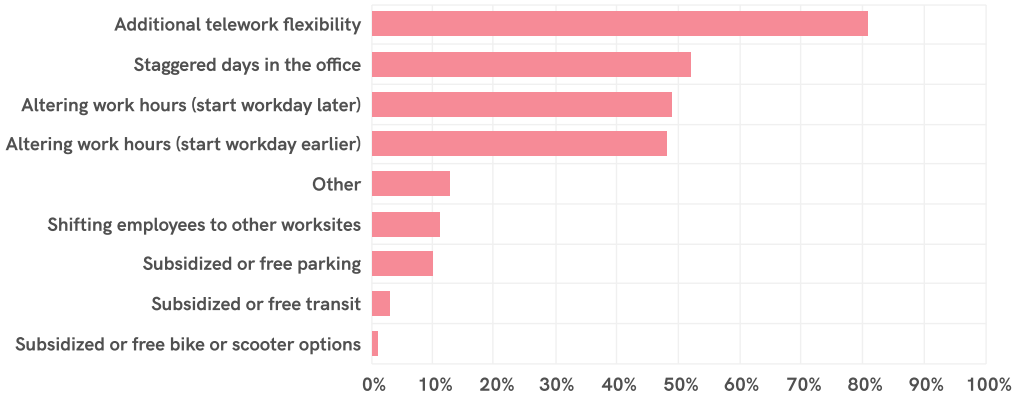
Accommodations for COVID-Related Personal Challenges (e.g. lack of childcare, caring for family member)



A majority of employers are providing new flexible options for employees.

In addition to allowing more telework, over half of employers responding to the survey are changing existing schedules to accommodate employee needs and ensure safety protocols. In addition to the listed options, employers noted that they are also providing expanded employee assistance programs, access to additional resources for working parents, and providing childcare at their worksites.

Post-COVID Flexible Work Policies



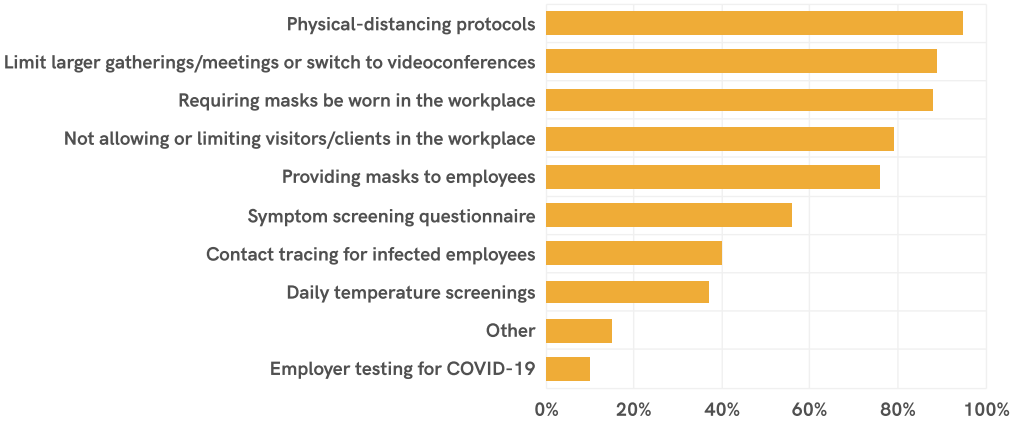
Employer Comment #2

"We are planning a 50% decrease in the density of our office as a maximum, based on a 9' planning module."

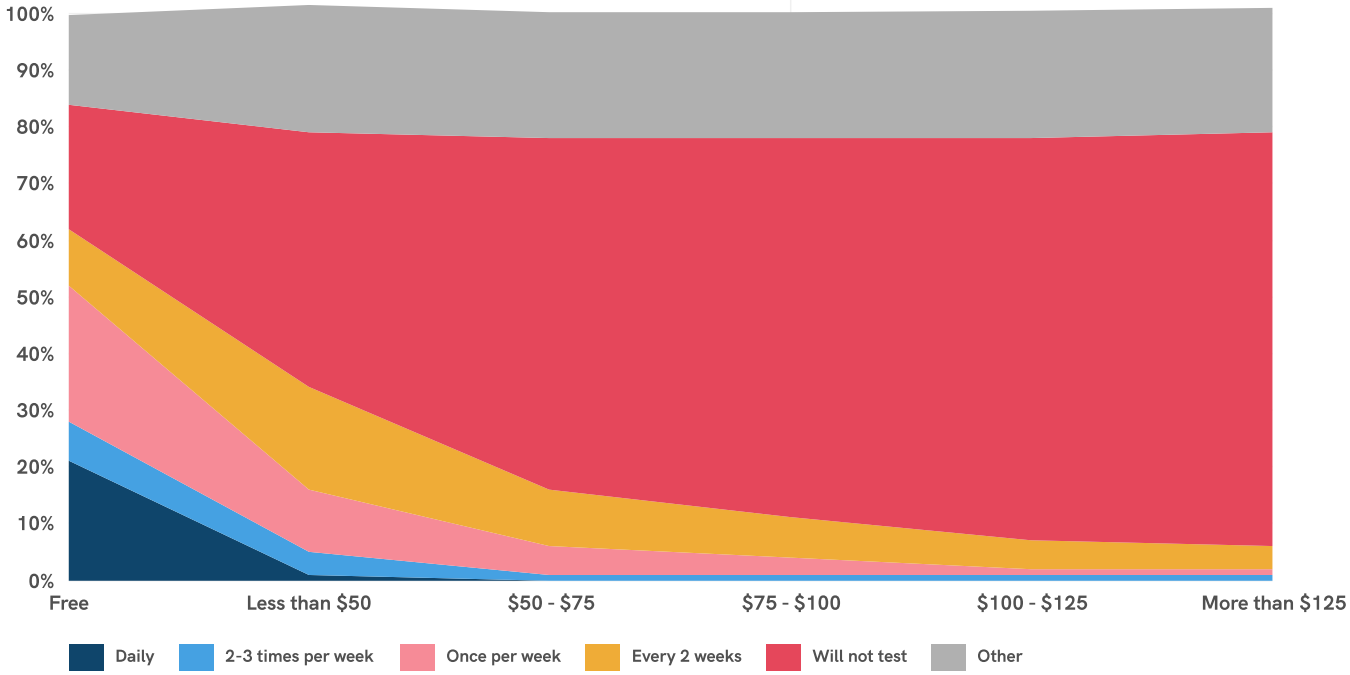
Most employers are working to ensure physical distancing, requiring masks and limiting the number of people in the workplace.

Employers are actively working to mitigate the risk of viral spread by adjusting their procedures for those employees that do return to worksites. Nearly 90 percent of employers are requiring employees to wear masks at the workplace, and four-in-ten employers plan to conduct contact tracing for infected employees.

Safety Measures at Worksites



Employer Attitudes on Frequency and Cost of Testing



Only 10-percent of respondents indicated that their organization plans to require testing to enter a worksite.

Most employers do not plan to regularly test employees.

A robust regionwide testing strategy that is timely, accessible, and affordable is needed to achieve our shared goal of reopening safely and sustainably. In addition to a robust testing strategy, there is a suite of actions employers are adopting to lower the transmission risk further. These include social distancing, contact tracing and requiring masks.

Half of employers will not test their employees if the cost per test were above $50.

While the Capital Region has been ramping up testing, there is no coordinated strategy or best practices for employers. **A robust regionwide testing strategy that is timely, accessible, and affordable is needed to achieve our shared goal of reopening safely and sustainably.** In addition to a robust testing strategy, there is a suite of actions employers are adopting to lower the transmission risk further. These include social distancing, contact tracing and requiring masks.

We asked respondents to indicate how often their organization would want to test employees for COVID, assuming rapid and accurate results, at varying price levels. When it comes to mandatory testing, employers' feelings are mixed with less than 10 percent indicating they are implementing mandatory testing. Larger organizations (500+) are more likely to require testing now or in the future (23 percent vs. 8 percent at smaller organizations). When asked about likelihood of testing if quick, accurate and free tests were available, less than quarter of the respondents (22 percent) said they would not test. However, 7 out 10 say they would not test if tests cost more than $75. Attitudes towards testing frequency vary greatly with few employers saying they would test daily (21 percent), once a week (24 percent), or every two weeks (10 percent) if tests were free. In their open-ended feedback, some employers shared that they plan to test as needed (i.e., testing required to return to work after exposure/infection). Regardless of frequency, some employers stressed the need for affordable and readily available testing with quick results in their comments.

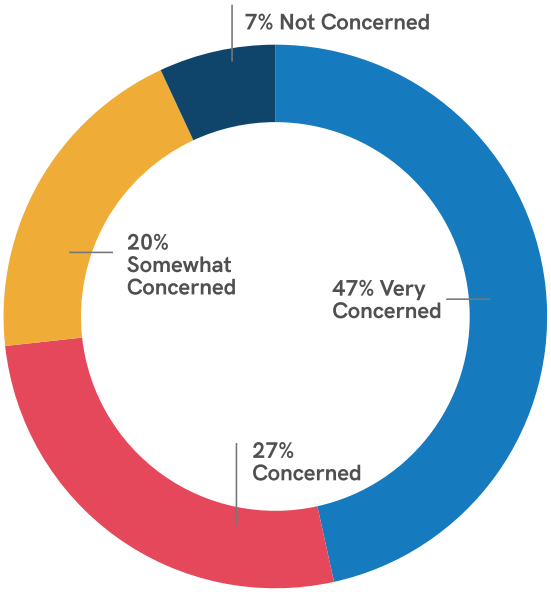
Commuting to Worksites

Employers do not expect many employees to use transit for commutes.

Today, most employees are teleworking or driving

We know that the **plan to reopen the Capital Region's economy safely must be phased and gradual**, including employee commutes. Prior to March 2020, more than 60 percent of employees at respondent worksites commuted by private vehicle, 25 percent by transit, and less than 10 percent teleworked daily. To maintain operations and safety during the pandemic, employee commutes have changed with teleworking growing by 7x since February and transit use shrinking by 4x.

Level of Concern About Employees Using Public Transit



Employer Comment #3

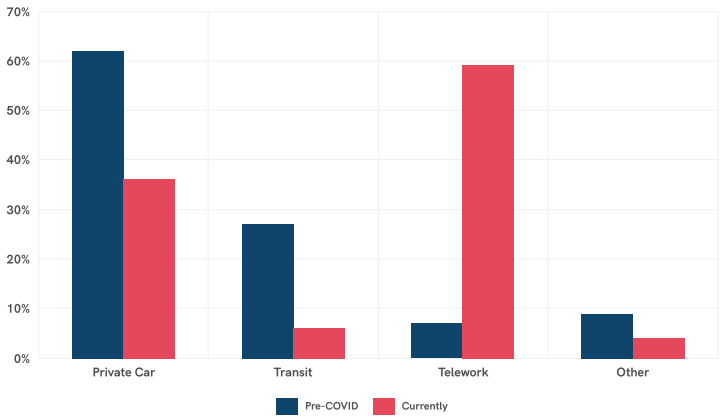
"People REALLY miss seeing each other and collaborating/interacting. The longer this continues, the more challenged our culture will be, let alone the economic challenges."

Now, more than ever, decision-makers need access to timely and relevant data to make crucial decisions and this includes real-time data on public transportation usage. The pandemic is likely to have long-lasting impacts on how employees commute to their worksites.

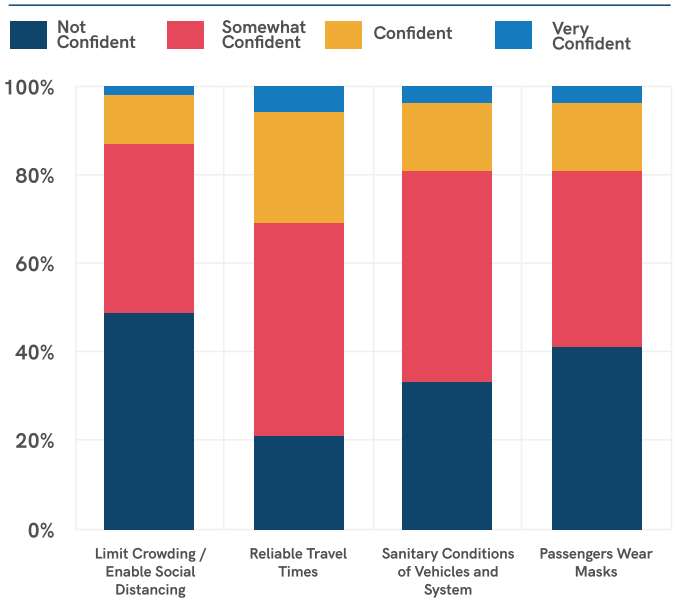
Employers lack confidence in the safety of public transportation.

Almost half of employers are very concerned about the safety of using public transit and generally do not feel confident about public agencies' ability to promote social distancing and enforce the use of masks. Employees' fears about using public transit also seems to be driving remote work policies – evidenced by some of the comments provided by employers.

COVID Impact on Commuting



Confidence in Public Transit Performance



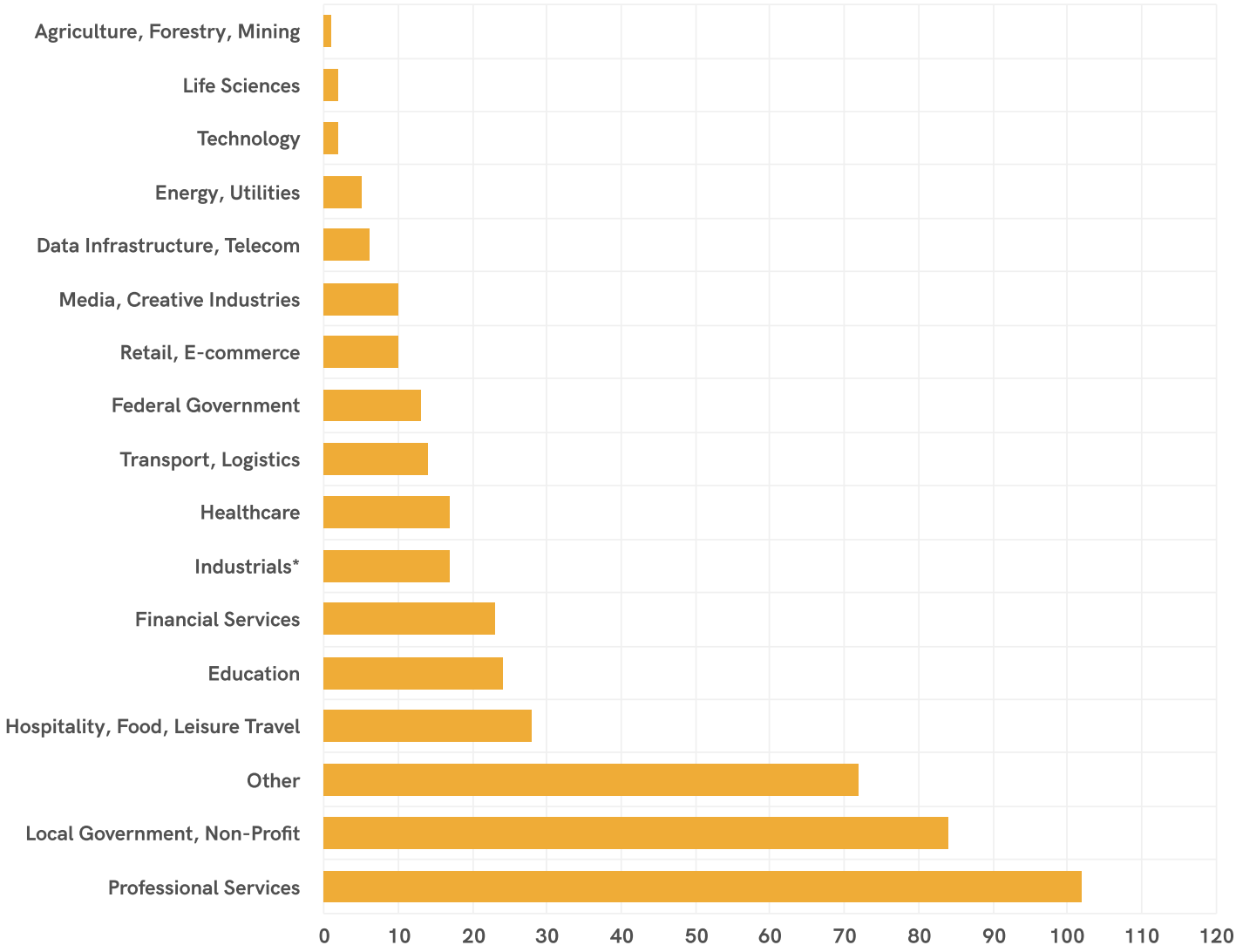
Employer Comment #4

"We are fundamentally re-assessing our workplace expectations. Our employees are very worried about public transportation. This is a big deal because our office location was secured to be very near metro and bus lines. "

Capital COVID Survey Sample Information

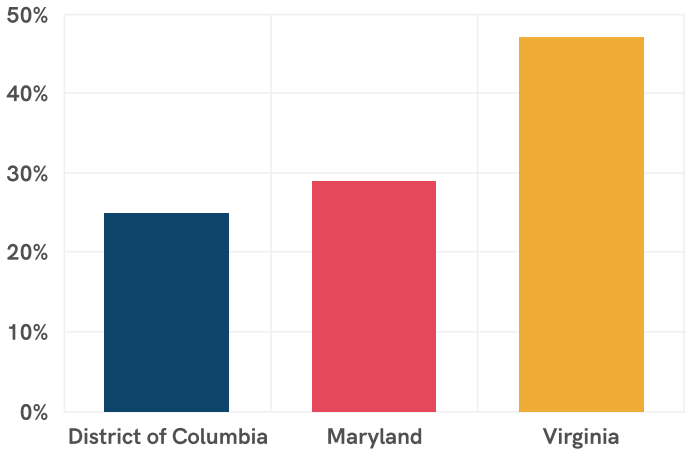
430 employers (562 worksites) from various industries are represented in the survey. Together these organizations employ around 275K people in the Capital Region (full time, part-time and contracted workforce). The results from the Employer Survey reflect the opinions and assumptions of employers who responded to the survey and should not be used to generalize to the entire Capital Region.

Organization/Industry Type

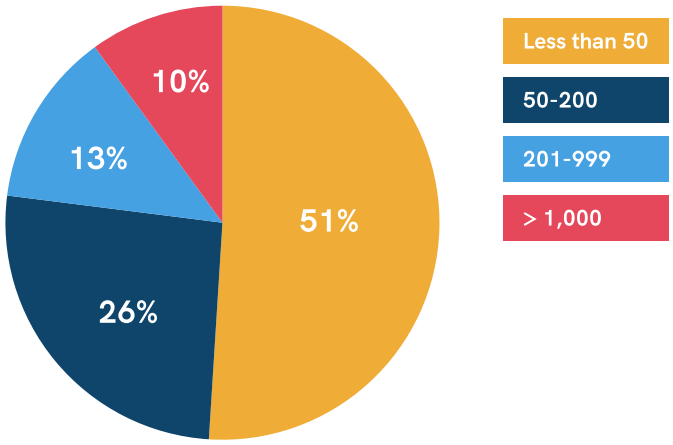


*Manufacturing, Construction, etc.

Location



Organization (Number of Employees)



Capital COVID-19 Transit Tracker

Key Findings from the Capital Transit Tracker

1. Metrorail ridership remains well below historic levels (85 percent below last year) while service, hours of operation, and frequencies are close to pre-pandemic levels. After service increased in August, on average there are no trains exceeding social distance standards, including during peak periods.

2. Local and WMATA bus transit services generally reported smaller ridership declines compared to commuter rail and bus, but no transit agencies have reported widespread crowding issues as of August.

3. Some historically high-ridership bus routes are experiencing crowding above social distancing capacity at certain times of day; a standard 40ft bus seats about 40 passengers, but the CDC guidance on social distancing capacity limits capacity to only 10 passengers per bus.

4. While crowding on the transit system is not common today, budget challenges resulting from COVID-19 will exacerbate crowding concerns should Congress be unable to provide additional aid to our region's transit network which is expected to lead to service reductions.

Working in partnership with the region's transit operators through the Metropolitan Washington Council of Governments (MWCOG), WMATA's public datasets and with expert guidance from Metro Hero, the Greater Washington Partnership and EY have created the Capital COVID-19 Transit Tracker. The tracker is intended to help employers and employees make decisions about whether and how to safely use transit. The tool allows the region to better understand the ridership and capacity limitations of the WMATA Metrorail System and provide summaries of service from commuter rail and bus transit providers around the region.

As of August 2020, nearly all transit agencies around the Capital Region are requiring masks to be worn on transit and are not reporting significant capacity issues that exceed social distancing capacity (except on limited bus routes and times outlined in the report). Data included in the report pertains to August 2020 and is subject to change based on the state of the health crisis and its impact on public budgets and transit agency service levels.

While snapshots from the Capital COVID Transit Tracker are included in this report,the interactive tool can be accessed online at: **greaterwashingtonpartnership.com/covid-transit-tracker**

Ridership remains 40-95% below normal depending on the system.

Transit service is close to pre-pandemic levels.

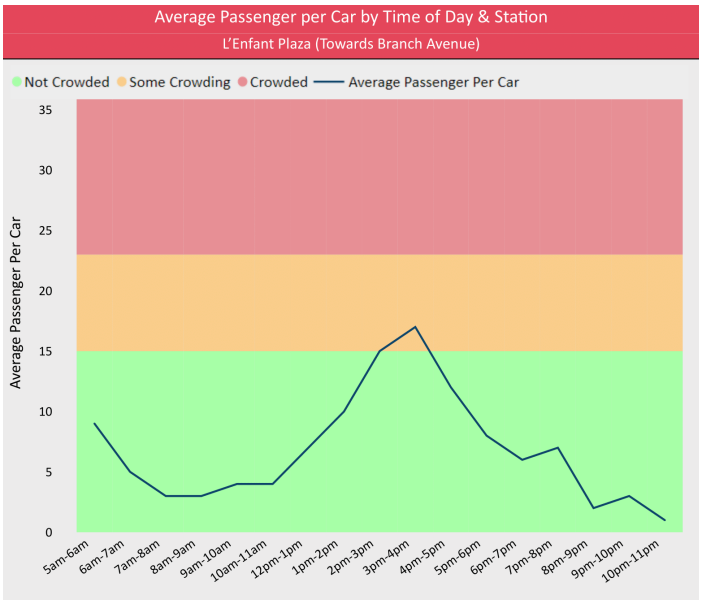
In March 2020, as COVID-related restrictions were implemented across the Capital Region and hundreds of thousands of workers transitioned to telework, transit ridership plummeted. Before the pandemic, WMATA Metrorail carried more than 600,000 trips each weekday. By the end of March, WMATA reported Metrorail ridership was around 30,000, a drop of 95%. Commuter rail systems experienced similar drops in ridership while buses, used heavily by essential workers, experienced smaller yet substantial declines in ridership between 40-80%. Daily Metrorail ridership at the end of August exceeded 70,000 riders for the first time since March, still 88% below pre-COVID levels.

WMATA Metrorail

The Metrorail system has not experienced significant capacity issues; however, some stations have approached the social distancing capacity during peak periods

Metrorail can only carry 23 passengers per car, on average, to allow six feet between passengers before they are considered crowded by social distance carrying capacity standards. During the coronavirus pandemic, the traditional peak periods have shifted. For example, the AM peak period has shifted earlier while the midday and early afternoon periods see higher relative levels of ridership.

The chart below shows the average passengers per car (PPC) by time of day on the Blue, Orange, and Silver lines passing through



L'Enfant Plaza station between August 1 and August 31, 2020.

L'Enfant Plaza is one of the busiest stations in the Metrorail system. During August, L'Enfant Plaza's average PPC did not exceed social distancing capacity, however it did approach the crowding threshold between 3-4pm heading towards Branch Avenue. *Use the Capital COVID Transit Tracker to observe ridership and crowding trends at any station on the Metrorail system.*

The chart below shows the average PPC for all WMATA Metrorail Red Line stations. During August, the Red line did not exceed social distancing capacity, however it did approach the crowding threshold between 1-6pm in the downtown core. *Use the Capital COVID Transit Tracker to observe ridership and crowding trends on any line on the Metrorail system.*

The maps below show the average crowding on the Metrorail system during the PM peak on the last Thursday in August in both 2019 and 2020. Pre-COVID, the Metrorail system experienced regular crowding on the system between 4-5pm, particularly downtown. Even with the current capacity restrictions to allow for social distancing, no station experienced crowding on August 27, 2020 between 4-5pm. *Use the Capital COVID Transit Tracker to observe ridership and crowding averages on the Metrorail system for any day and time period.*

Average Crowding Level by Station, Line & Time

Station	Direction		5am-6am	6am-7am	7am-8am	8am-9am	9am-10am	10am-11am	11am-12pm	12pm-1pm	1pm-2pm	2pm-3pm	3pm-4pm	4pm-5pm	5pm-6pm	6pm-7pm	7pm-8pm	8pm-9pm	9pm-10pm	10pm-11pm
Bethesda	Towards Glenmont	RD																		
Bethesda	Towards Shady Grove	RD																		
Brookland–CUA	Towards Glenmont	RD																		
Brookland–CUA	Towards Shady Grove	RD																		
Cleveland Park	Towards Glenmont	RD																		
Cleveland Park	Towards Shady Grove	RD																		
Dupont Circle	Towards Glenmont	RD																		
Dupont Circle	Towards Shady Grove	RD																		
Farragut North	Towards Glenmont	RD																		
Farragut North	Towards Shady Grove	RD																		
Forest Glen	Towards Glenmont	RD																		
Forest Glen	Towards Shady Grove	RD																		
Fort Totten (upper level)	Towards Glenmont	RD																		
Fort Totten (upper level)	Towards Shady Grove	RD																		
Friendship Heights	Towards Glenmont	RD																		
Friendship Heights	Towards Shady Grove	RD																		
Gallery Place–Chinatown (upper level)	Towards Glenmont	RD																		
Gallery Place–Chinatown (upper level)	Towards Shady Grove	RD																		
Glenmont	Towards Shady Grove	RD																		

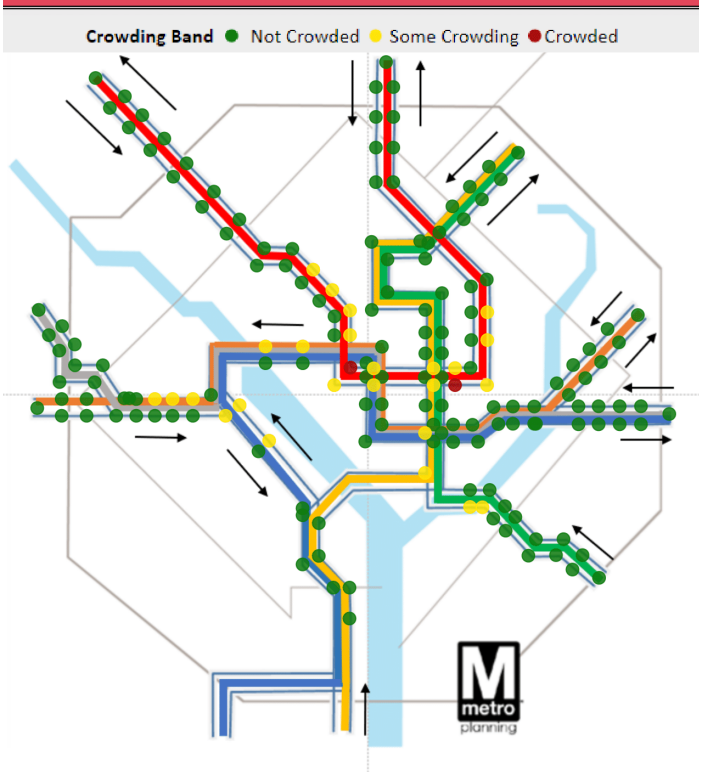
The crowding band definition is based on Avg. Passenger Per Car (PPC) and the range differs between Pre COVID Capacity and Social Distancing Capacity as explained below:
Pre COVID Capacity: Avg PPC < 60 "Not Crowded", 60 ≤ Avg PPC < 90 "Some Crowding" & Avg PPC ≥ 90 "Crowded"
Current Capacity (with social distancing): Avg PPC < 15 "Not Crowded", 15 ≤ Avg PPC < 23 "Some Crowding" & Avg PPC ≥ 23 "Crowded"

Not Crowded
Some Crowding
Crowded

Metrorail System:

Pre-COVID Capacity
Thursday, August 29, **2019** between 4-5pm

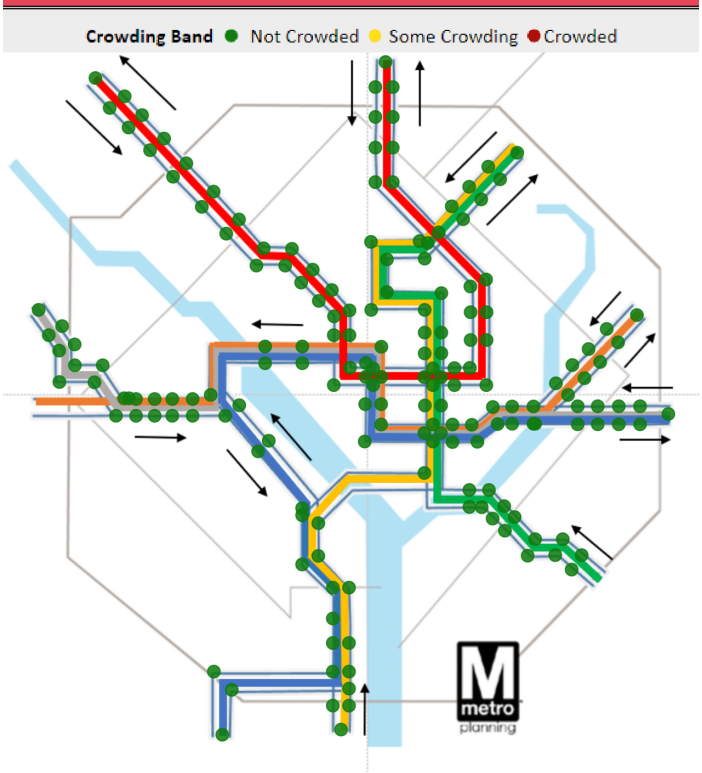
Metrorail System Crowding Map

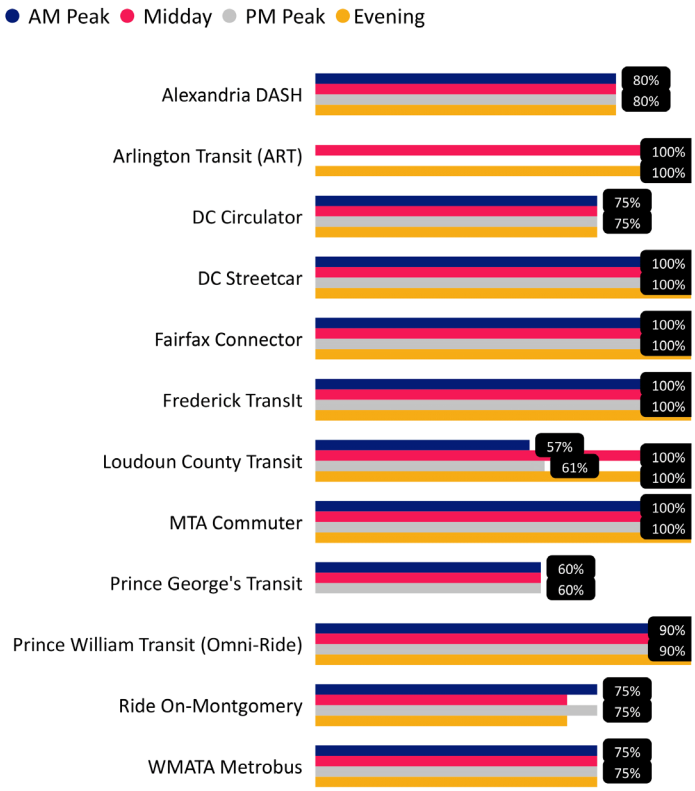


Metrorail System:

Current Capacity (with social distancing)
Thursday, August 27, **2020** between 4-5pm

Metrorail System Crowding Map





Bus Routes that were Estimated to Exceed Social Distancing Capacity in August*

WMATA Metrobus: A2, A6, A8, B2, C4, D8, F4, H8, J2, K6, P6, S2, S4, X2, Y2, Y8, Z8, 10B, 28A, 30N, 30S, 64, 70, 79, 80, 90, 92, 96, & REX

Prince George's Transit: AM Peak – Route 16, 18, 24, 33; PM Peak – Route 18, 24, 32

Montgomery Ride On: AM Peak – Route 55; PM Peak – Route 55

Alexandria DASH: AM Peak – AT8; PM Peak – AT8 & AT1 Plus

Arlington ART: AM Peak – Route 41 & 45; Late Evening – Route 41 & 45

*Estimates based on ridership and social distancing capacity. May only exceed social distance capacity along specific portions of the route at specific times of day. Subject to change as transit agencies adjust schedules and ridership levels vary.

Bus & Local Transit Service

Local bus and transit agencies are operating close to pre-pandemic levels of service.

To protect transit operators and conserve resources, transit service was significantly reduced at the outset of the pandemic. However, with new safety protocols, transit agencies began restoring service.

This chart captures service levels in September. After significant reductions during the early days of the pandemic, most local transit systems restored 75% or more of pre-COVID service. However, ridership is still historically low.

Real-time ridership and crowding data will help employers and employees feel more confident.

Most bus systems are not experiencing general crowding issues except on isolated routes at certain times of day.

A typical bus can only hold 10 passengers before exceeding CDC guidelines for social distancing capacity. However, most regional bus systems are not experiencing general crowding issues except on isolated routes at certain times of day. Route-level ridership data was not readily available for WMATA's Metrobus, but estimates indicate that approximately 20-30 of Metrobus routes in service may experience crowding conditions, especially historically heavily trafficked routes around midday.

Most local bus systems are reporting slow, steady ridership growth, while WMATA saw a nearly 20% increase from August 17 to August 24. Ridership varies among systems falling somewhere between 30%-70% of pre-COVID ridership. Commuter bus ridership remains significantly lower around 15% of pre-COVID ridership.

Every transit system in the Washington area requires masks onboard.

Every local bus and transit operation in the Washington area requires masks onboard and a majority are distributing masks upon request. Most bus systems have implemented rear door boarding and do not plan to collect fares until adequate protective barriers for drivers can be installed on buses.

Commuter Rail

Commuter rail has not reported any social distance capacity issues on rail cars.

Maryland's MARC ridership is holding steady at about 10% of pre-COVID ridership. Virginia's VRE ridership has been increasing by about 100 riders per week. However, as of August it remained well below social distancing capacity.

VRE created a Train Utilization Trends dashboard that shows the current daily ridership by train and the maximum capacity to fully support social distancing. A similar dashboard for MARC trains would help employees and employers make more informed transportation decisions.

The VRE dashboard can be accessed online at:
https://www.vre.org/service/rider/train-utilization-trends/

Transit System Overview - Policies by Operator (August 31, 2020)

Bus Type	Masks Available Onboard Buses?	Masks Required Onboard Buses?	Fare Collection	Rear Door Boarding	Ridership Trend in mid-August
Alexandria DASH	✓	✓	✗	✓	↗
Arlington Transit (ART)	✓	✓	✗	✓	→
DC Circulator	✓	✓	✗	✓	↘
DC Streetcar	✗	✓	✗	✗	↘
Fairfax Connector	✓	✓	✗	✓	↗
Frederick Transit	✓	✓	✗	✓	↗
Loudoun County Transit	✓	✓	✗	✗	↗
MTA Commuter	✗	✓	✓	✗	↗
Prince George's Transit	✗	✓	✗	✓	↗
Prince William Transit (Omni-Ride)	✓	✓	✗	✓	↗
Ride On-Montgomery	✓	✓	✗	✓	→
WMATA Metrobus	✗	✓	✗	✓	↗

Real-time data sharing can help.

Transit agencies must instill confidence for riders and employers.

Employers are concerned of transit's ability to safely transport employees to worksites due to crowding and face mask concerns. Real-time ridership numbers, reporting on social distance carrying capacity, crowding data, and information on mask compliance may help employers and employees feel more confident in using the transit network during and after the COVID pandemic.

Limiting crowding and ensuring a safe and reliable ridership may become a challenge if large organizations in the Capital Region do not coordinate their efforts and use the latest data to ensure the safety of their employees.

Find more COVID-related transit information:

- WMATA: COVID-19 Public Information
- Maryland Transit Administration: Coronavirus Updates
- Virginia Department of Rail & Public Transportation: Commuting Safely and Confidently
- Virginia Railway Express (VRE): Train Utilization Trends
- Metropolitan Washington Council of Governments: Commuter Connections Commute Guide

Conclusion

A key theme from the Capital COVID: Back to Work Report is continued uncertainty.

Many employers are uncertain when and how to reopen and whether transit is safe for their employees' commutes. While employers and transit agencies are taking unprecedented steps to make their worksites and transit trips safer, the full return to worksites is not expected until after summer 2021. The Greater Washington Partnership hopes the contents of this report, the cross-sector information sharing, and the Transit Tracker tool will help the region's leaders and public sector officials address some of the uncertainty so they can make the best plans for how to reopen their worksites and the Capital Region in a safe, gradual, and sustainable manner.

The Greater Washington Partnership would like to thank our public and private sector partners, especially the transit agencies, business organizations, and individual employers who helped to disseminate the survey and share their data. By working together, we can create the strategies, tools, and systems we need to reopen the Capital Region safely and create a stronger, more resilient and inclusive economy. We encourage everyone to do their part by wearing masks when outside of households, social distancing, and adhering to the guidance of public health officials. We look forward to continuing to work together to share more relevant and timely information so we can make the Capital Region one of the best places to live, work, and build a business during and after the COVID pandemic.

Survey & Transit Data Methodology

Survey Audience

Employers, public and private, of any size with worksites located in the Capital Region. Respondents included C-suite-level leaders and decision-makers involved in reopening plans and activities.

Survey Geography

Capital Region, which includes, Washington, Baltimore, and Richmond metro areas

Survey Data Collection

Online survey managed and hosted online by EY, under the supervision of the EY research team. Responses were collected between August 10, 2020 through August 28, 2020.

Survey Sample

Survey respondents were sought from email subscriber lists of The Greater Washington Partnership and more than 15 partner organizations, including MWCOG, WMATA, MDOT, NVTA and NVTC, and local Chambers of Commerce. Partner organizations supported this effort by promoting the survey through their network of employers and subscribers. The survey was also promoted through social media using both targeted ads and online posts on LinkedIn, Twitter, and Facebook Employer groups. Although survey results are only representative of the organizations which chose to participate in the survey, findings provide a valuable snapshot of employers' reopening plans and general sentiment related to commuting in the Capital Region. Please note, organizations in this study were not randomly sampled and so findings cannot be generalized to all employers in the region. Responses from the survey were also not statistically weighted by geography or business size. Instead, differences are highlighted based on these factors when significant.

430 employers (562 worksites) from various industries are represented in the survey. Together these organizations employ approximately 275,000 people in the Capital Region (full time, part-time and contracted workforce).

Transit Audience

Local transit agencies WMATA and Commuter Rail (Marc and VRE)

Transit Geography

Washington Metropolitan Area

Transit Data Collection

The MWCOG surveyed all transit agencies operating in the Washington metro area. EY analyzed available data from the MWCOG survey and data available from WMATA to produce the findings for this report. Data collection occurred during August 2020.

Transit Sample

Transit agencies were asked to provide data on current ridership, levels of service, projected demand, and safety precautions they are employing to limit the risk of COVID-19 transmission. MWCOG distributed a questionnaire to local transit agencies and EY worked directly with WMATA to access relevant data.

Findings provide a valuable snapshot of transit service levels and safety precautions related to commuting in the Capital Region. Data included in the report pertains to August 2020 and is subject to change as transit agencies adjust service plans and ridership levels respond to employer reopening plans and the state of the health crisis.

WMATA, MARC, VRE, ART, DASH, DC Circulator, DC Streetcar, Fairfax Connector, Frederick Transit, Loudoun County Transit, Montgomery Ride On, MTA Commuter, Prince George's Transit, and PRTC provided service level data during August 2020.

Attachment G

Presentation: Visualizing Effects of COVID-19 on Transportation: A One-Year Retrospective by the National Academies of Sciences Engineering and Medicine Transportation Research Board, 3/8/2021

Visualizing Effects of COVID-19 on Transportation: A One-Year Retrospective

ORGANIZED BY:

TRB STANDING COMMITTEE ON VISUALIZATION IN TRANSPORTATION (AED80)

March 8, 2021 – 2:00 PM ET

TRB Standing Committee on Visualization in Transportation (AED80)

Our goal: to use visualization to identify and address critical transportation issues of today, and to develop innovative visualization approaches to meet society's transportation needs of the future.

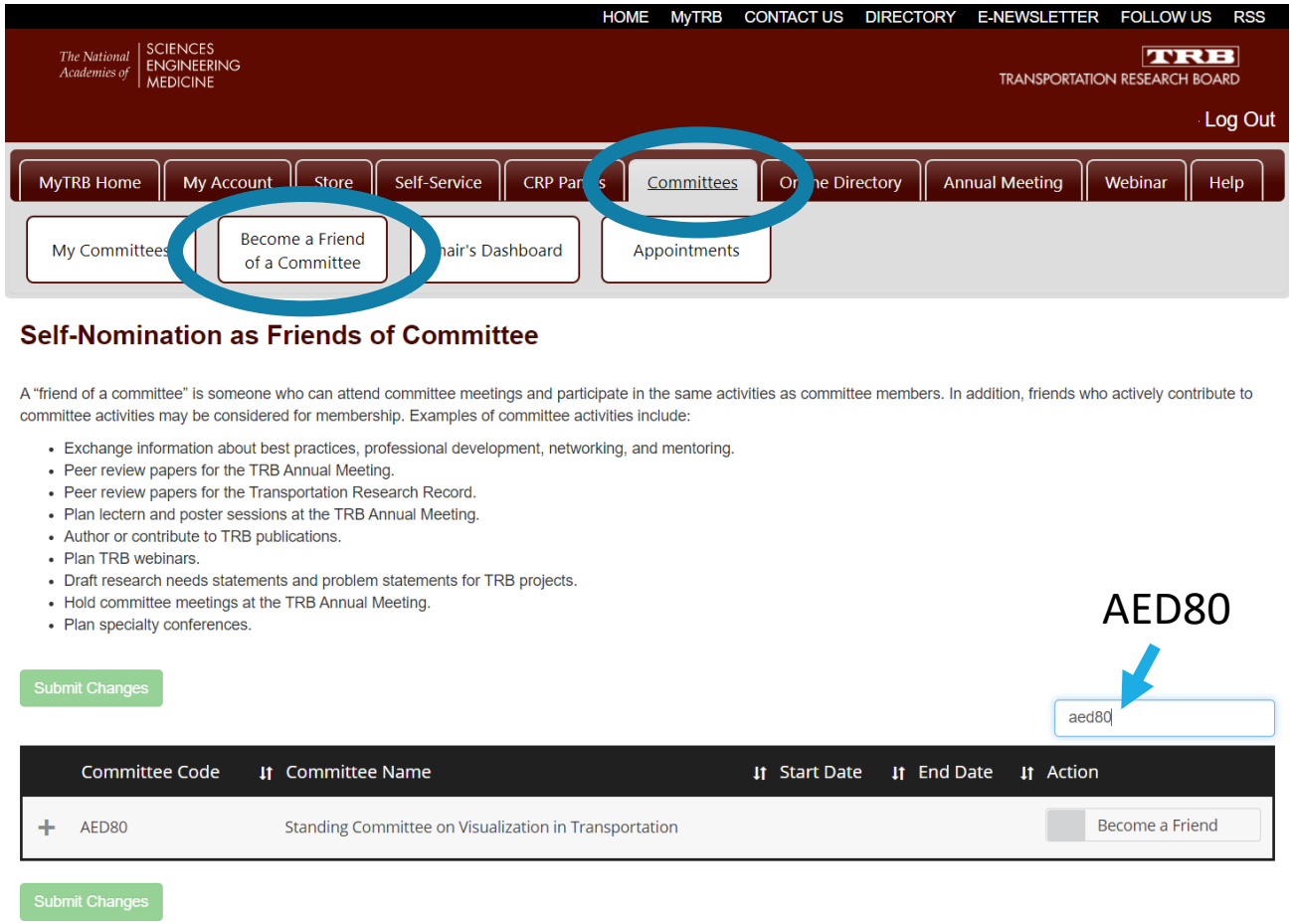
Subcommittees:

- Subcommittee on Building Information Modeling (BIM)
- Subcommittee on Performance Visualization
- Subcommittee Interactive Simulation

How to Get Involved

Become a friend of the Committee

Create an account at mytrb.org and search for AED80



Today's Webinar

Visualizing COVID-19 Impacts on Urban Mobility

Dr. Kaan Ozbay, New York University

Visualizing COVID-19 Impacts on State-Level Mobility

Michael L. Pack, University of Maryland

Visualizing COVID-19 Impacts on Air Travel

Mark Duell, FlightAware

Questions & Answers

Moderated by Charles Lattimer, University of Maryland

The National Academies of
SCIENCES · ENGINEERING · MEDICINE

TRANSPORTATION RESEARCH BOARD

Visualizing Effects of COVID-19 on Transportation: A One-Year Retrospective

March 8, 2021

@NASEMTRB
#TRBwebinar

PDH Certification Information:

- 1.5 Professional Development Hour (PDH) – see follow-up email for instructions
- You must attend the entire webinar to be eligible to receive PDH credits
- Questions? Contact Reggie Gillum at RGillum@nas.edu

The Transportation Research Board has met the standards and requirements of the Registered Continuing Education Providers Program. Credit earned on completion of this program will be reported to RCEP. A certificate of completion will be issued to participants that have registered and attended the entire session. As such, it does not include content that may be deemed or construed to be an approval or endorsement by RCEP.

RCEP

REGISTERED CONTINUING EDUCATION PROGRAM

#TRBwebinar

Learning Objectives

1. Identify COVID-19's impacts on urban and state-level mobility
2. Identify COVID-19's impacts on air travel

#TRBwebinar

VISUALIZING COVID-19 IMPACTS ON URBAN MOBILITY AND SOCIABILITY

Kaan Ozbay, Ph.D.
Director & Professor
C2SMART University Transportation Center
New York University Tandon School of Engineering

Mar 8th, 2021

c2smart.engineering.nyu.edu

DATA VISUALIZATION vs COVID vs MOBILITY

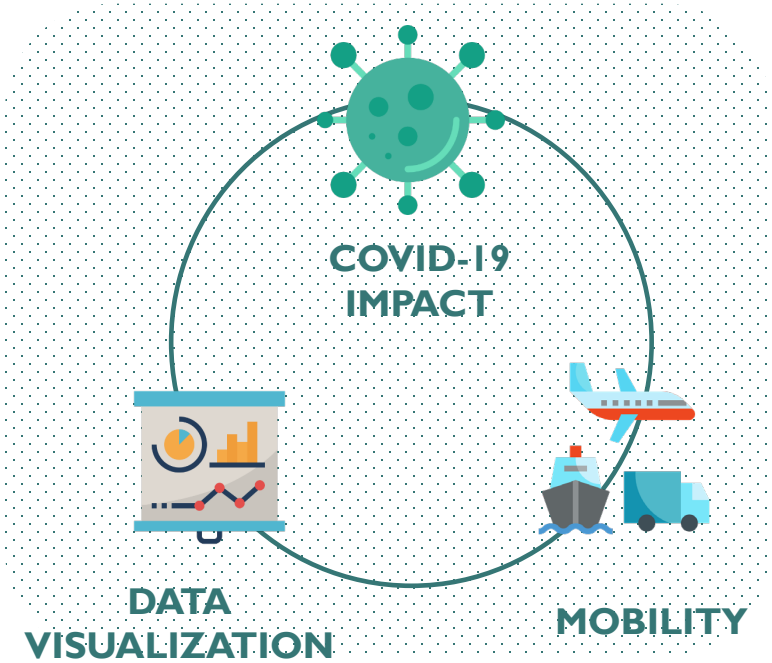
DATA is critical to understanding the impacts and needs in times of crisis. However, simply collecting data is not enough.

DATA VISUALIZATION is one of the best tools to understand the data and communicate findings in constructive ways. Data visualization during the COVID-19 pandemic helps us to fast track the changes and develop effective strategies immediately actionable in the current environment.

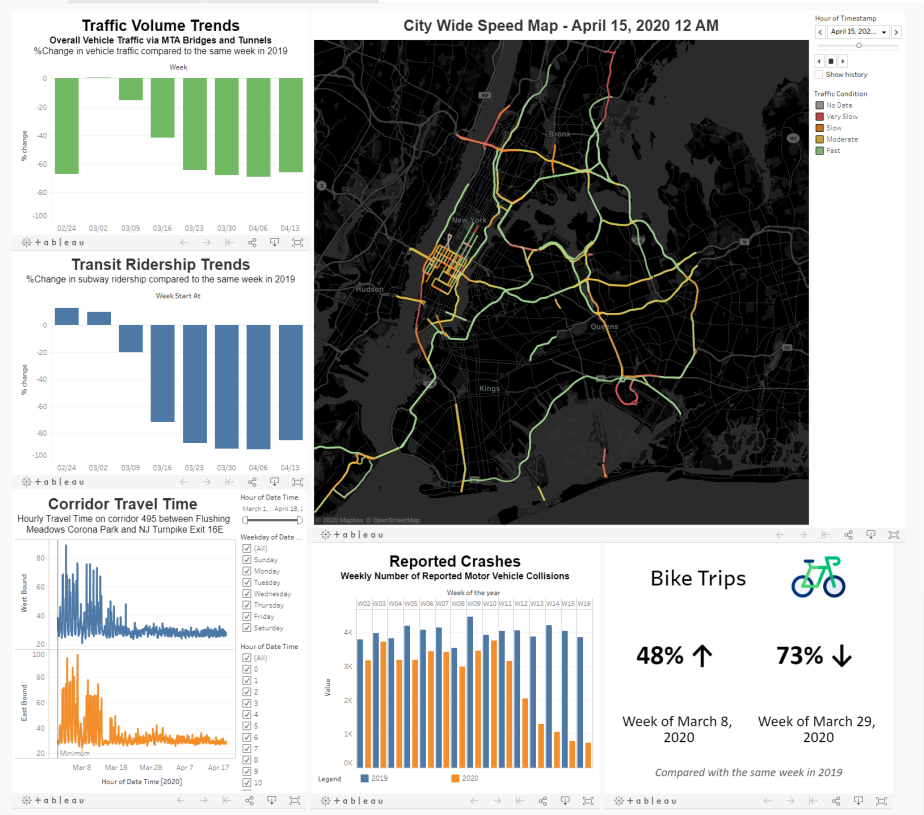
MOBILITY is one good indicator of the effectiveness of Nonpharmaceutical interventions (NPIs) such as social distancing policies during the outbreak and reveals the recovery of the cities.

OUR APPROACH:

Interactive Data Dashboard → Visualizing the Effect of Social Distancing → Infographics for Travel Survey



C2SMART COVID-19 INTERACTIVE DASHBOARD



We developed a comprehensive and publicly accessible data dashboard that integrates numerous sources of data to monitor transportation trends in the wake of COVID-19.

http://c2smart.engineering.nyu.edu/covid-19-dashboard/

Online dashboard pooling open data sources to observe trends

Travel trends and mode choice

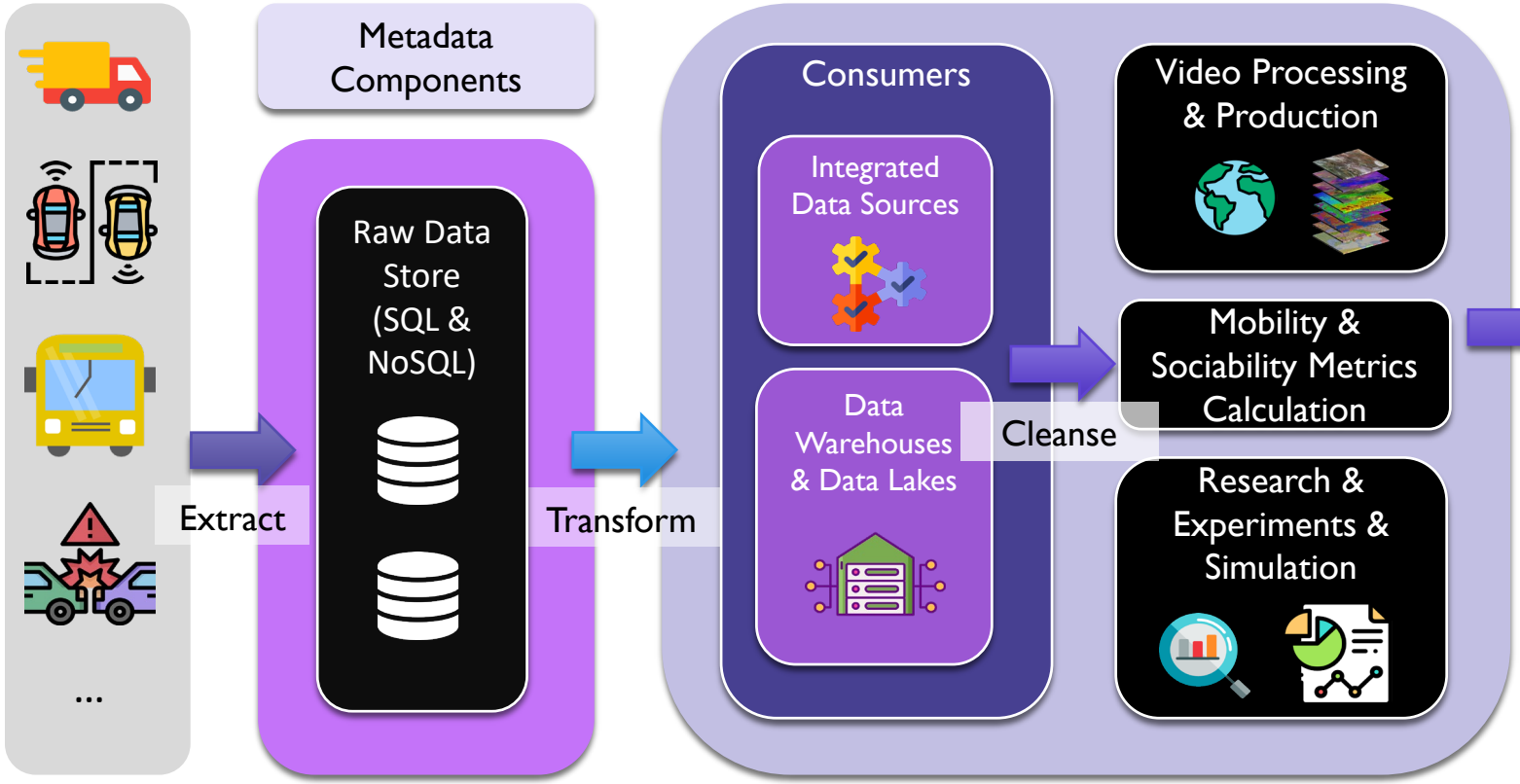
The effect of social distancing

Multi-city: New York City, Chicago, Seattle, 6 cities in China

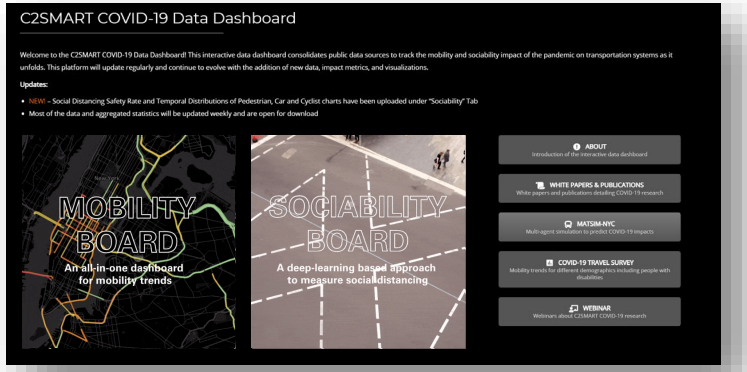
As far as we know it is the only deployed and open site that integrates all of these datasets in one place.

Fan Zuo, Jingxing Wang, Jingqin Gao, Kaan Ozbay, Xuegang Jeff Ban, Yubin Shen, Hong Yang and Shri Iyer (2020), An Interactive Data Visualization and Analytics Tool to Evaluate Mobility and Sociability Trends During COVID-19, UrbComp 2020 : The 9th SIGKDD International Workshop on Urban Computing.

C2SMART COVID-19 DATA DASHBOARD ARCHITECTURE



C2SMART COVID-19 DATA DASHBOARD & ANALYTICS



Realtime/ Offline Data Acquisition

Digital Integration & Access Layer

Data Mining & Could Computing

- Cross domain multi-data view
- Perform scenario analysis

Newly Released Version of the Public Data Dashboard

C2SMART COVID-19 Data Dashboard

Welcome to the C2SMART COVID-19 Data Dashboard! This interactive data dashboard consolidates public data sources to track the mobility and sociability impact of the pandemic on transportation systems as it unfolds. This platform will update regularly and continue to evolve with the addition of new data, impact metrics, and visualizations.

Updates:

- NEW! – Social Distancing Safety Rate and Temporal Distributions of Pedestrian, Car and Cyclist charts have been uploaded under "Sociability" Tab
- Most of the data and aggregated statistics will be updated weekly and are open for download

ABOUT
Introduction of the interactive data dashboard

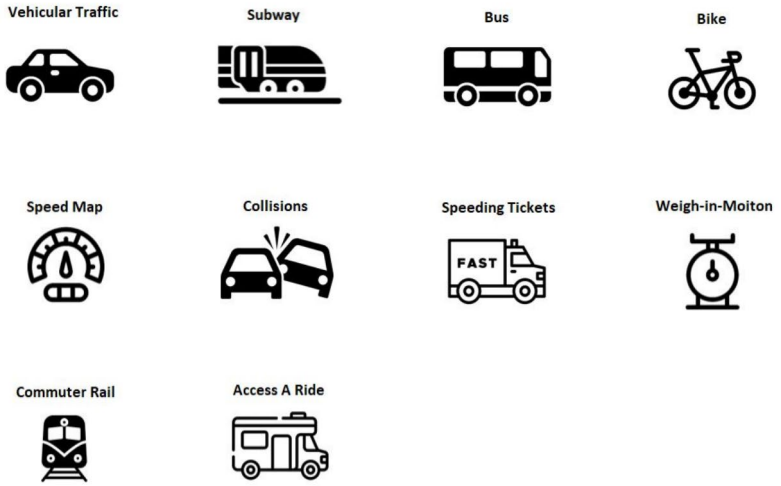
WHITE PAPERS & PUBLICATIONS
White papers and publications detailing COVID-19 research

MATSIM-NYC
Multi-agent simulation to predict COVID-19 impacts

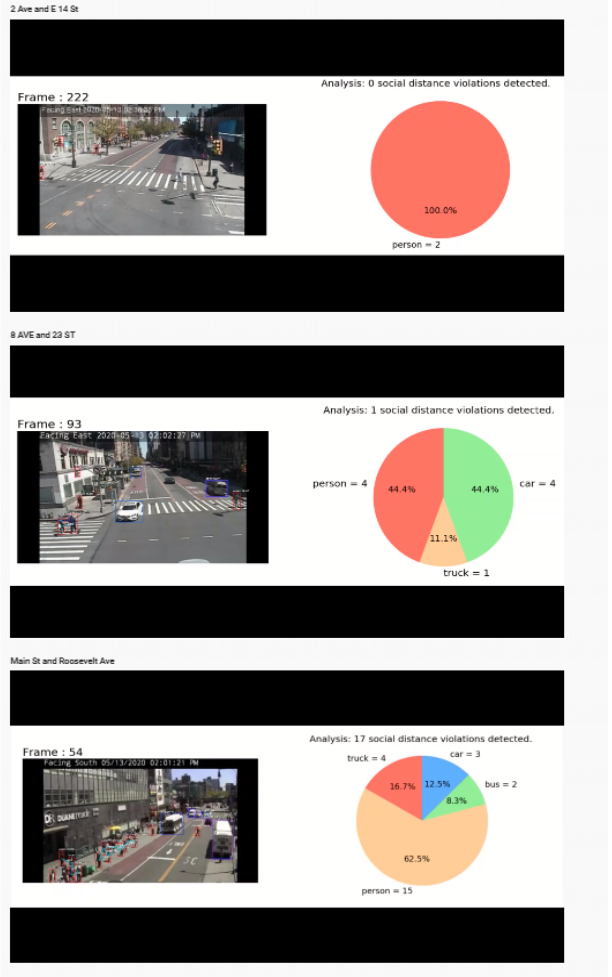
COVID-19 TRAVEL SURVEY
Mobility trends for different demographics including people with disabilities

WEBINAR
Webinars about C2SMART COVID-19 research

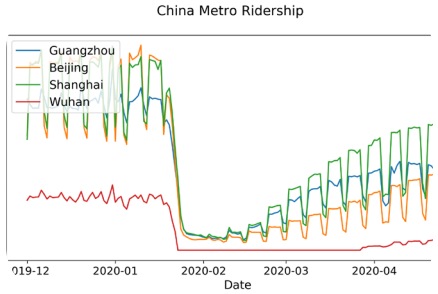
MOBILITY BOARD



SOCIABILITY BOARD

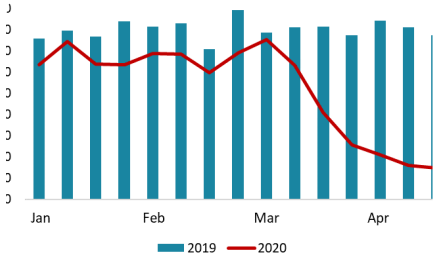


C2SMART COVID-19 Interactive Dashboard Data Collection



Transit Ridership

NYC/Seattle/Multiple cities in China



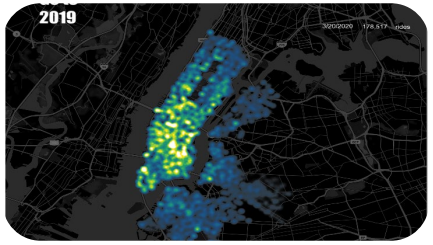
Crashes

NYPD reported crashes: peds/cyclist fatality rate

Speed & Travel Time

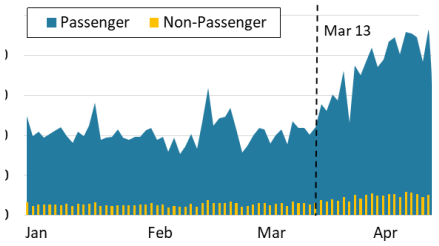
Traffic Speed Map

Corridor Travel Time



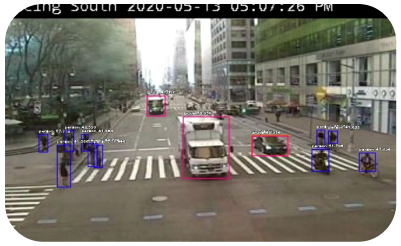
NYC CitiBike trips

Seattle Bike counts, Fremont Bridge



Camera Violations

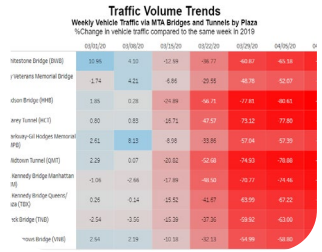
Speeding /parking tickets



Social Distancing

Pedestrian density

Social distance safety rate



Vehicular Volume

NYC inter-city traffic volume

Weigh-in-Motion

Traffic Volume/speed

by gross vehicle weight classes

A Glance Back to April (April 2020 vs. 2019)

New York City

↓**92%** Subway

↓**68%** Vehicular Traffic via MTA bridges and tunnels

↑**108%** Avenue Speeds Midtown 8AM-6PM Apr vs.

↑**44%** Average Bus Speeds

↑ **73%** School Zone Speeding Tickets

↓**30-44%** Trucks with GVW > 100kips at BQE WIM Stations

Changes in Freight Traffic

Yellow Taxi: **-96%**

Green Taxi: **-92%**

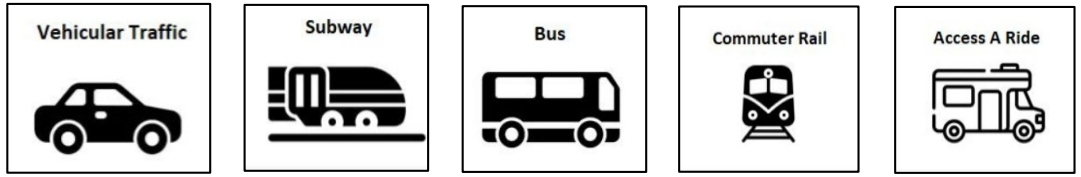
For-hire Vehicle: **-79%**

High volume for-hire services (Uber, Lyft, Via etc.): **-76%**

↓**15%** Friday & Saturday trips ↑**20%** Trip duration

Social Distancing Complaints **2nd most frequent** of all 311 complaint types

WHERE WE ARE NOW

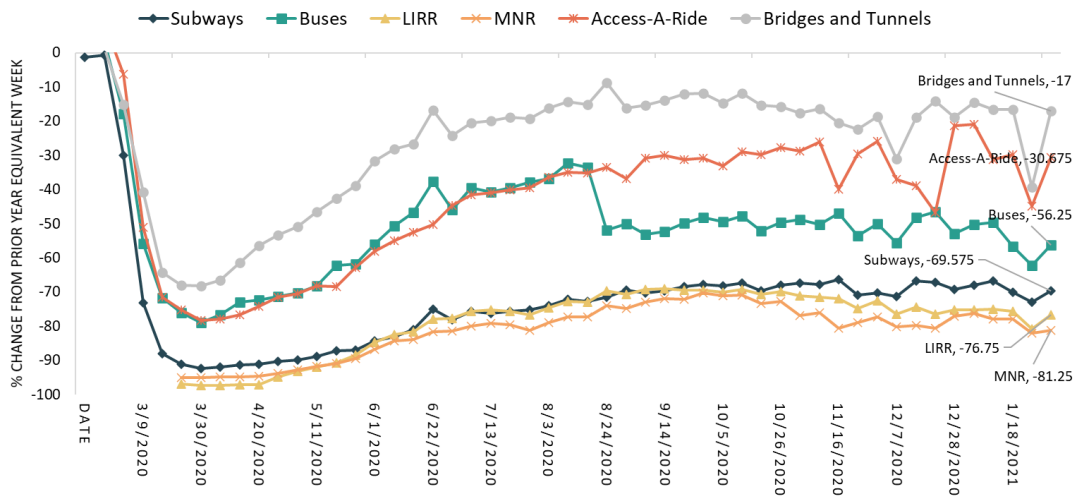


- Uneven recovery speeds - with a faster rebound of truck volume, and slower rebound of transit ridership
- Higher recovery demand for Access-a-ride

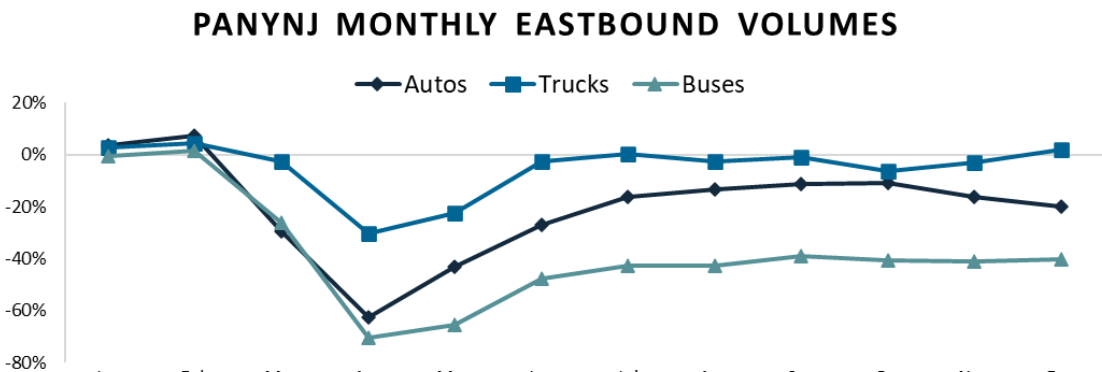
	Subway	Bus	Commuter Rail (LIRR)	Commuter Rail (MNR)	Access-a-ride
Worst week in 2020	-92%	-79%	-97%	-95%	-78%
Week of Jan 25, 2021	-70%	-56%	-76%	-78%	-30%

	Vehicular (MTA Bridge & Tunnel)	Vehicular (PANYNJ crossing - Monthly)	Vehicular (BQE WIM, Queensbound)
Worst week in 2020	-68%	-61% (-30% Truck)	-37% (-28% Truck)
Week of Jan 25, 2021	-17%	-19% (+2% Truck), Dec 2020	-4% (+1% Truck), Nov 2020

Source: MTA, PANYNJ, NYCDOT/C2SMART



Source: MTA



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Autos	4%	7%	-29%	-63%	-43%	-27%	-16%	-13%	-11%	-11%	-16%	-19.80%
Trucks	3%	4%	-2%	-30%	-23%	-3%	0%	-3%	-1%	-6%	-3%	1.90%
Buses	-1%	1%	-26%	-70%	-65%	-48%	-43%	-43%	-39%	-41%	-41%	-40.20%

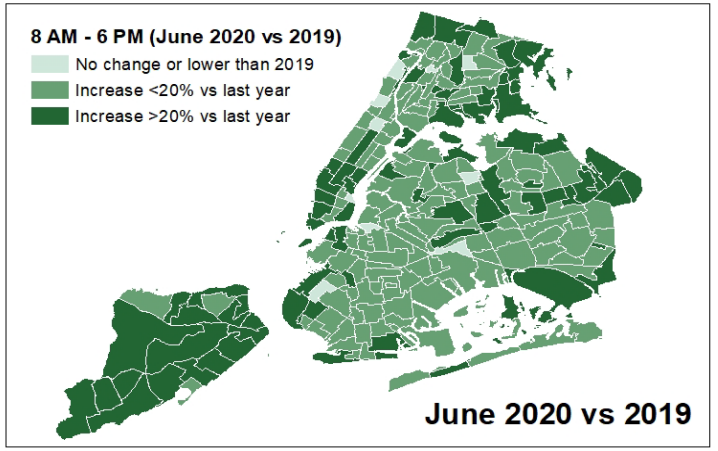
Source: PANYNJ

WHERE WE ARE NOW (Cont'd)

Bus Speed

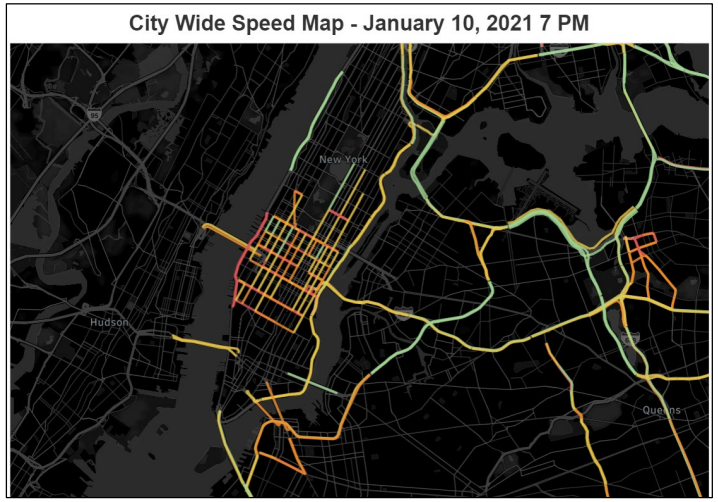
Borough	Monthly Bus Speed, mph (Feb 2020)	Monthly Bus Speed, mph (Dec 2020)	%change (Dec 2020 vs Feb 2020)	Highest %change in 2020 (Highest month vs Feb 2020)
Bronx	7.46	7.74	+4%	+10%
Brooklyn	7.17	7.55	+5%	+21%
Manhattan	5.97	6.44	+8%	+29%
Queens	8.94	9.42	+5%	+21%
Staten Island	14	14.25	+2%	+4%

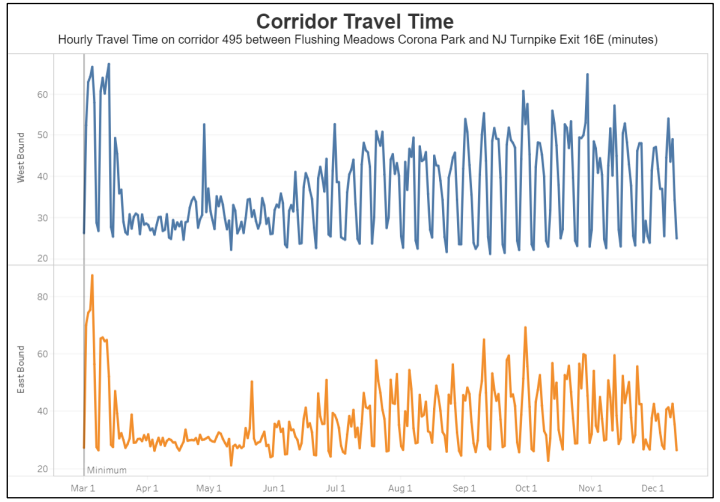
Source: MTA



Vehicular Travel Time

- Travel times on the 495 Corridor in the first week of December 2020 are still about **17% lower (EB)** and **24% lower (WB)** compared to pre-pandemic levels (Feb 2020).
- Still see **30% more school zone speeding tickets** in Jan 2021, compared to Mar 2020.





Source: C2SMART Virtual Sensors

Micromobility

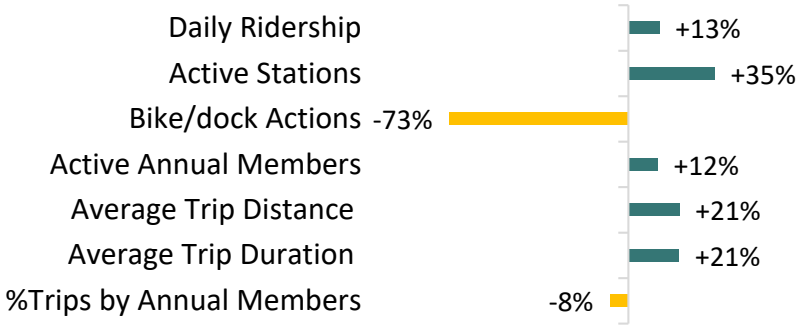
Micromobility is on the rise and have even surpasses pre-pandemic volumes in some cases. These modes are being increasingly counted on as an alternative to the subway, as economical, safer and less-crowded travel options.

Bike Share - Citi Bike

Source: Citi Bike

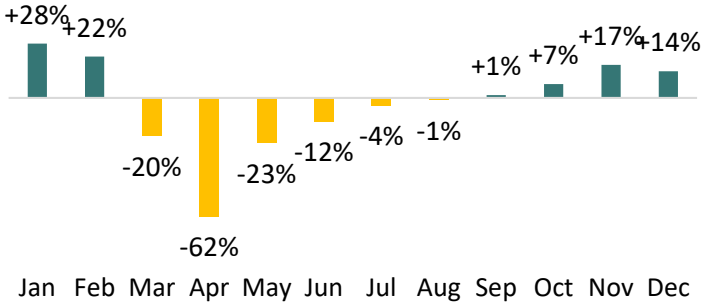
Overall Statistics

% Change (Citi Bike Dec 2020 vs Dec 2019)



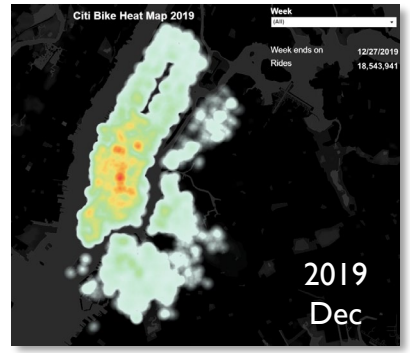
Ridership Trend

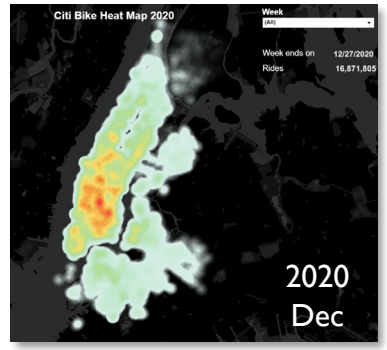
Citi Bike Monthly Ridership Change (2020 vs 2019, NYC only)



Spatial Distributions

Identify hotspots & new clusters

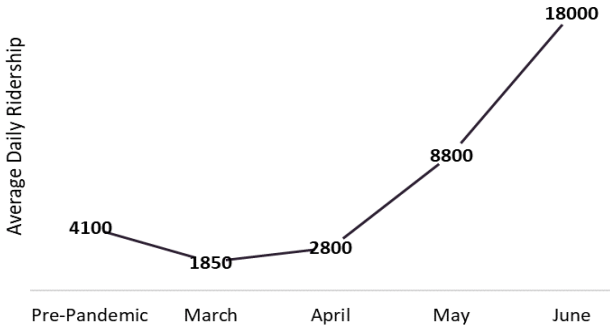




Ride-Sharing Moped - Revel

Source: Revel

Average daily ridership is 3 times higher in June 2020, compared with pre-pandemic data in 2020.



Sociability Indicators from Real-time Traffic Cameras

Pedestrian crowd at Main Street, Flushing (4/8/2020), (NYCDOT Traffic Camera)

Understanding the actual reduction in social contact and is important to measuring the effectiveness of the policy. Identifying the density of the crowd on the street can help provide informative insights.

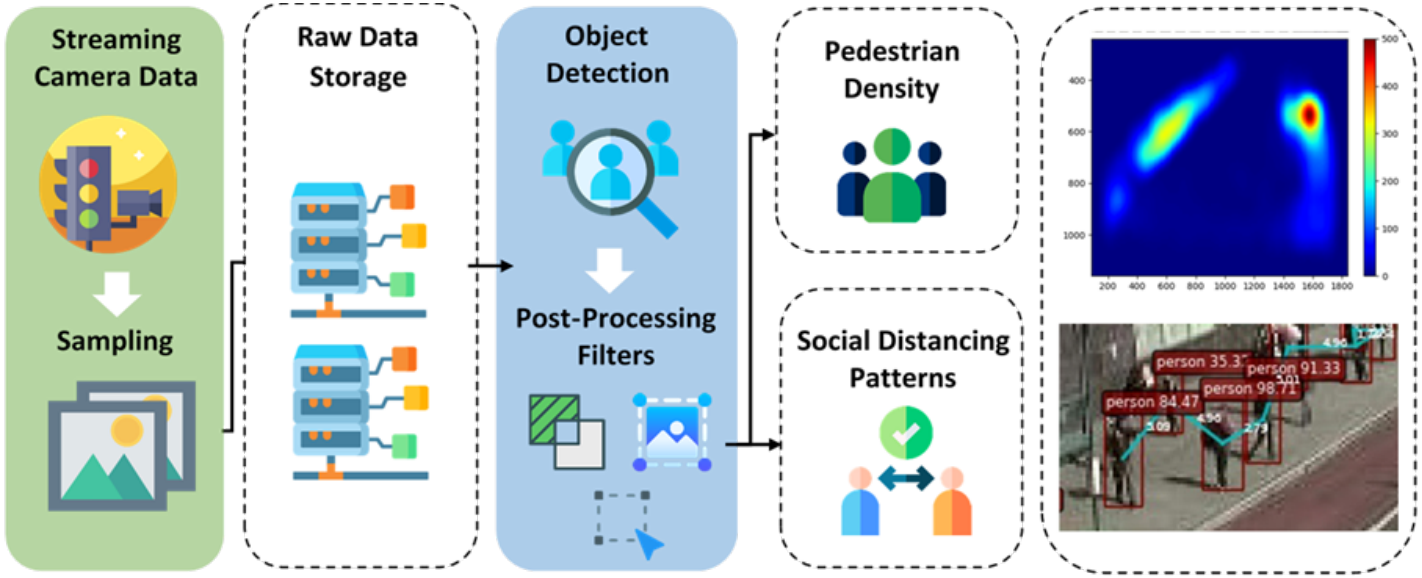
A **deep-learning based video-processing algorithm** was developed to monitor the evolution of social distancing patterns in urban areas.

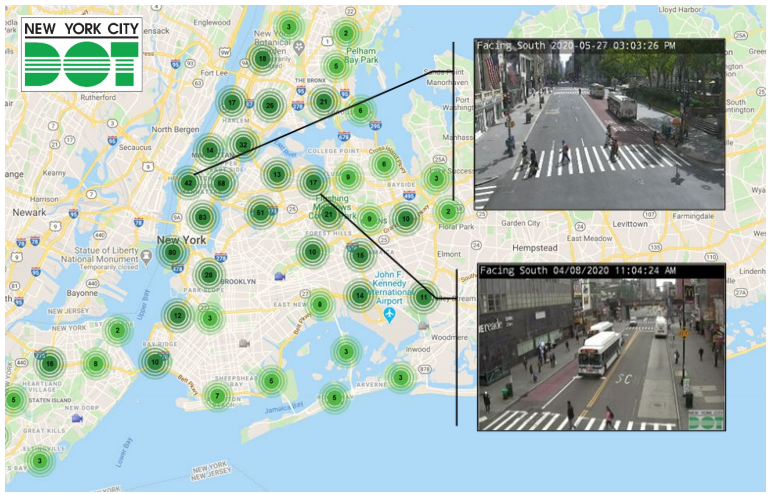
- ✓ Leverages existing public video data sources
- ✓ Real-time object detection for different classes (Pedestrians, Cars, Trucks and Cyclists)
- ✓ Distance projection and approximation
- ✓ Temporal and spatial density distribution

DATA-DRIVEN ANALYTICAL FRAMEWORK

Perishable data was collected for105 locations in NYC + 1 location in Seattle, including locations near hospitals, subway stations, and meal distribution centers.

- Reporting average and maximum pedestrian density from selected locations in NYC
- Computing social distancing safety sate (the ratio of people following social distancing guidelines)
- Currently applied in off-line mode, feasible for real-time application



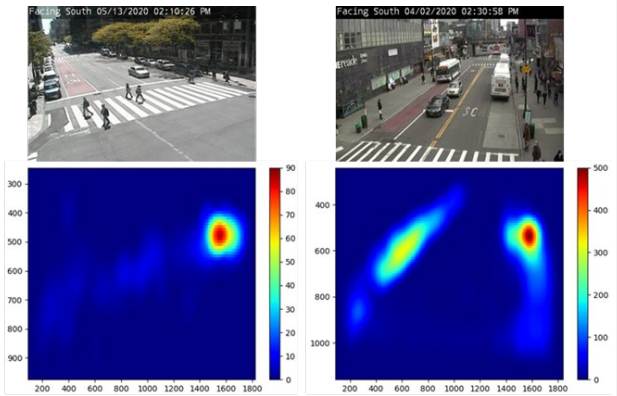


Public Traffic Cameras: https://nyctmc.org/

This study (#IRB-FY2020-4638) is reviewed by the University Committee on Activities Involving Human Subjects (UCAIHS) at New York University and is determined that it does not involve human subjects as defined by 45 CFR part 46.102.

DETECTION OUTPUT

Blue lines between pedestrian pairs indicating a social distance less than 6 feet.

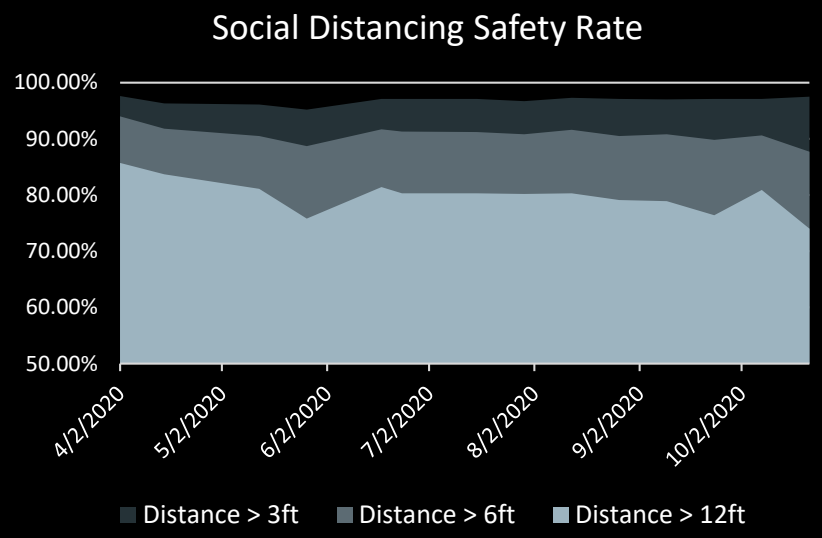


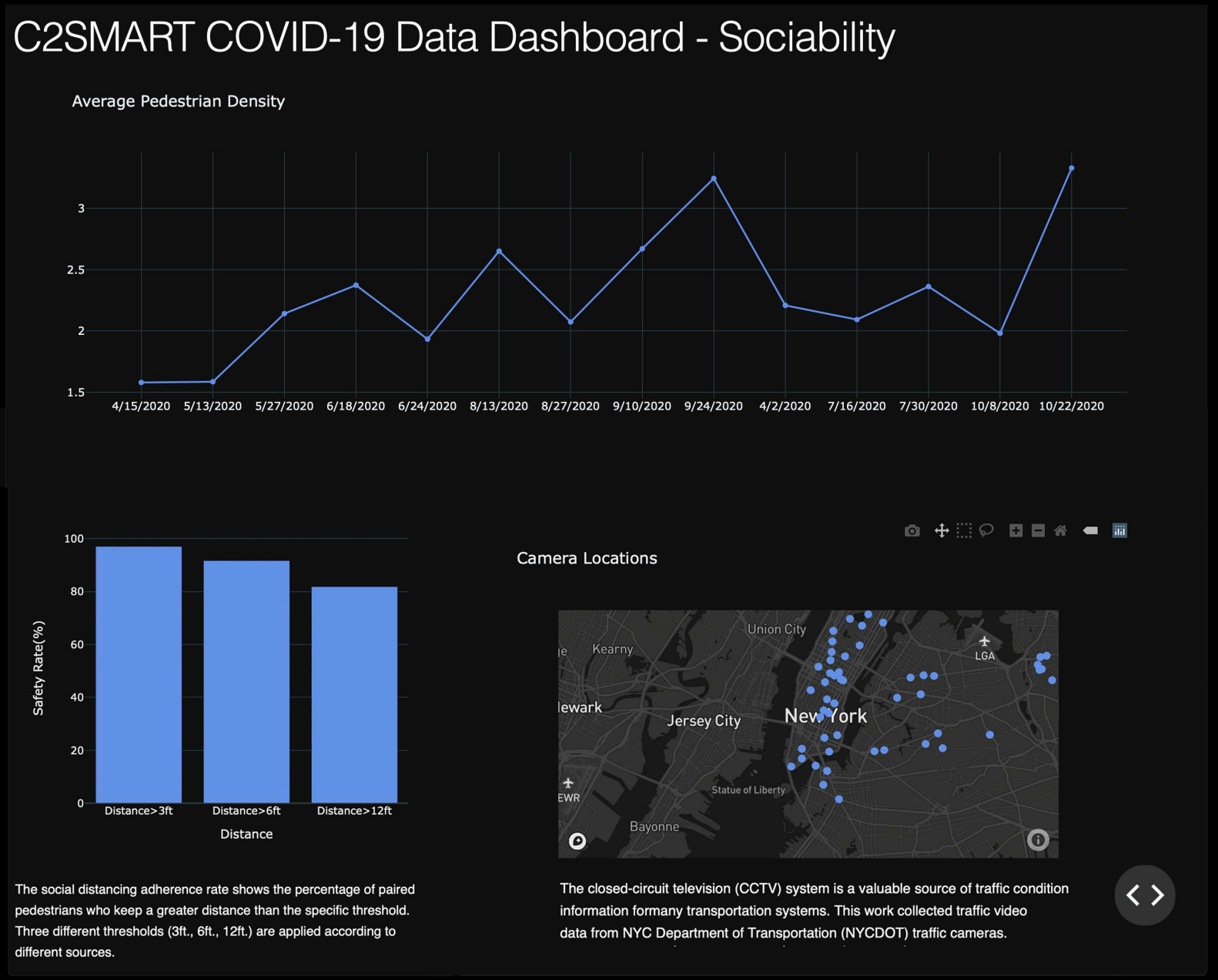
Heatmap example of clustered pedestrians who are not following social distancing guidelines during April 2020.

Zuo, F., Gao, J., Kurkcu, A., Yang, H., Ozbay, K., & Ma, Q. (2021) Reference-Free Video-to-Real Distance Approximation-Based Urban Social Distancing Analytics Amid COVID-19 Pandemic. Journal of Transport & Health.

SOCIABILITY TRENDS

Social distancing safety rate (the ratio of people following social distancing guidelines) and ***average pedestrian density*** (#peds/frame) are calculated from representative weekdays based on 60+ selected locations in NYC. The results are constantly updated with more locations.





C2SMART COVID-19 TRAVEL SURVEY

- Understand how people are adjusting their travel and essential needs as COVID19 presents new challenges and constraints
- Focus on NYC specific trends, looking at how different demographics of people were affected by the effect of COVID19
- Analyze how travel trends have changed for *people with disabilities, women, older people, low-income households*

What are the main concerns before and after the pandemic?

How the pandemic has changed travel trends?

Did people shift to other travel modes?

What is the impact on disadvantaged group's travel?

SURVEY STATISTICS

- Data collection time-frame: **July to October 2020**
- Total responses (partial and completed): **2022**
- Total completed responses: **1382**

July to September 2020

Phase I

Distributed **nation-wide** via **organic reach**

892

(partial and completed responses)
58% respondents for NYC (all five boroughs)

September to October 2020

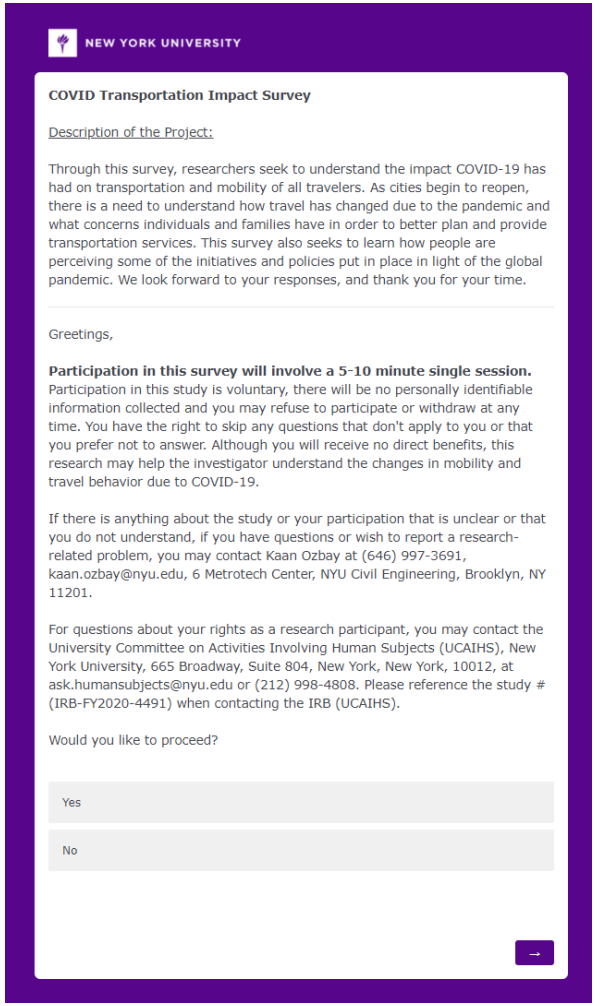
Phase II

Targeted at NYC residents who are **over 60 years old**, or identify as **having a disability**

1130

(partial and completed responses)

532 respondents identified as living with a disability


NEW YORK UNIVERSITY

COVID Transportation Impact Survey

Description of the Project:

Through this survey, researchers seek to understand the impact COVID-19 has had on transportation and mobility of all travelers. As cities begin to reopen, there is a need to understand how travel has changed due to the pandemic and what concerns individuals and families have in order to better plan and provide transportation services. This survey also seeks to learn how people are perceiving some of the initiatives and policies put in place in light of the global pandemic. We look forward to your responses, and thank you for your time.

Greetings,

Participation in this survey will involve a 5-10 minute single session. Participation in this study is voluntary, there will be no personally identifiable information collected and you may refuse to participate or withdraw at any time. You have the right to skip any questions that don't apply to you or that you prefer not to answer. Although you will receive no direct benefits, this research may help the investigator understand the changes in mobility and travel behavior due to COVID-19.

If there is anything about the study or your participation that is unclear or that you do not understand, if you have questions or wish to report a research-related problem, you may contact Kaan Ozbay at (646) 997-3691, kaan.ozbay@nyu.edu, 6 Metrotech Center, NYU Civil Engineering, Brooklyn, NY 11201.

For questions about your rights as a research participant, you may contact the University Committee on Activities Involving Human Subjects (UCAIHS), New York University, 665 Broadway, Suite 804, New York, New York, 10012, at ask.humansubjects@nyu.edu or (212) 998-4808. Please reference the study # (IRB-FY2020-4491) when contacting the IRB (UCAIHS).

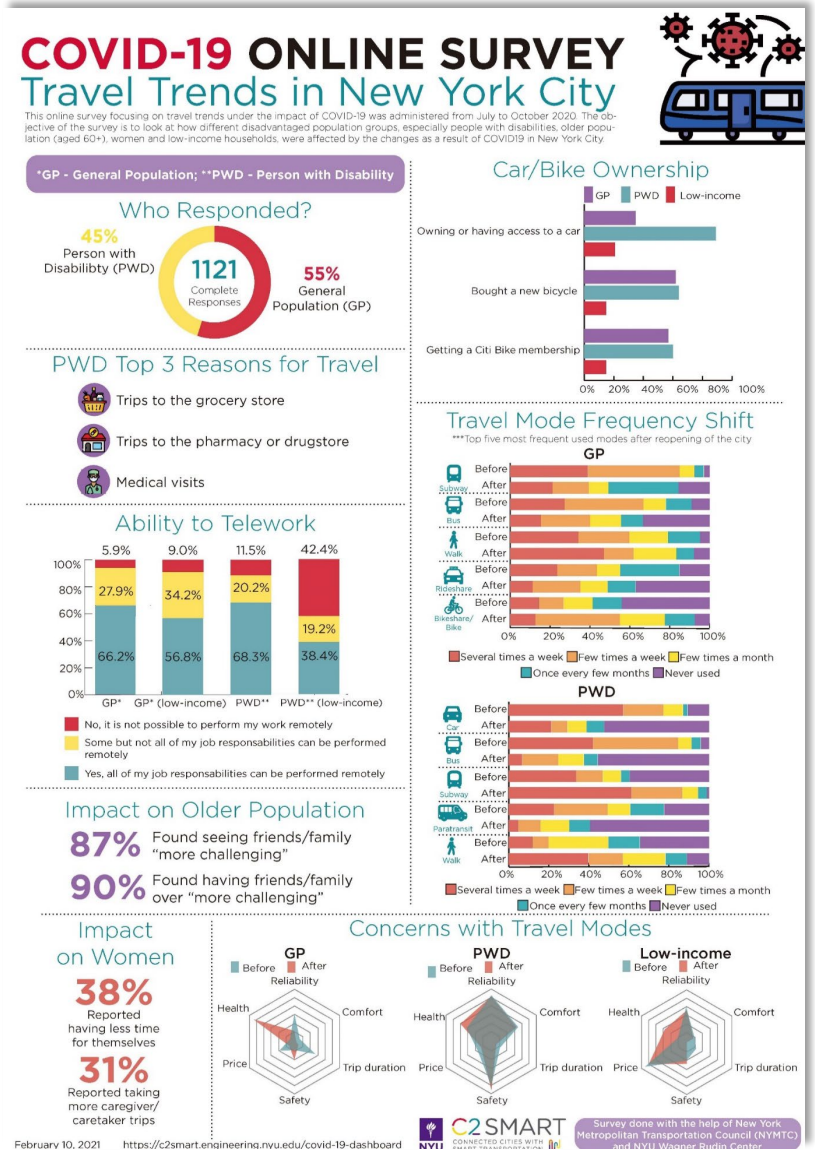
Would you like to proceed?

Yes

No

→

SURVEY RESULTS AT A GALANCE



*GP - General Population; **PWD - Person with Disability

Who Responded?

45% Person with Disabilibty (PWD)

1121 Complete Responses

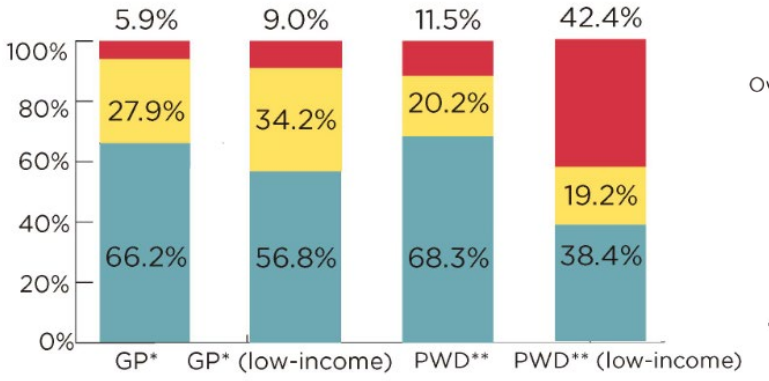
55% General Population (GP)

Impact on Women

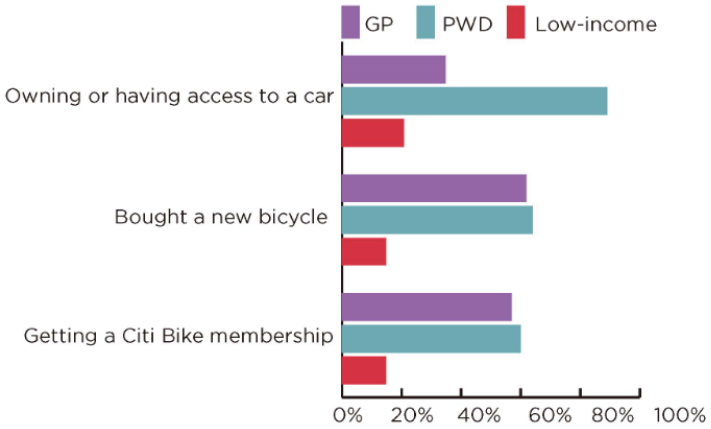
38% Reported having less time for themselves

31% Reported taking more caregiver/ caretaker trips

Ability to Telework

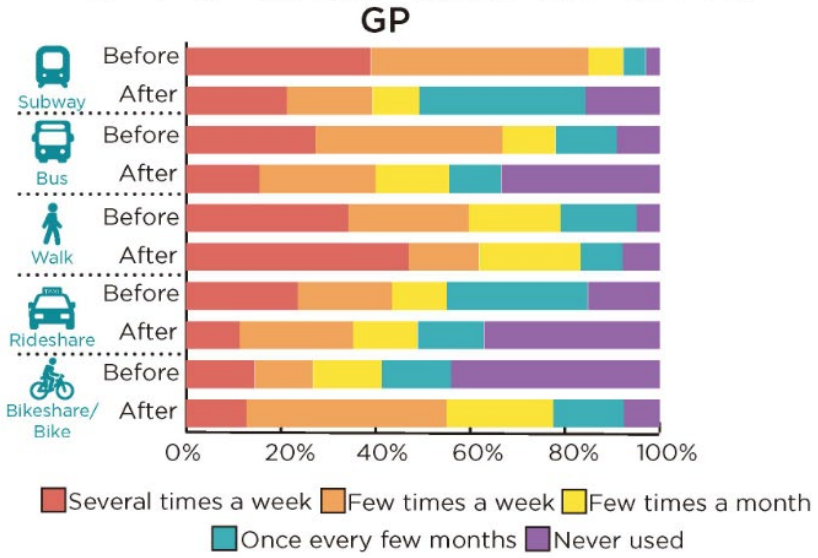


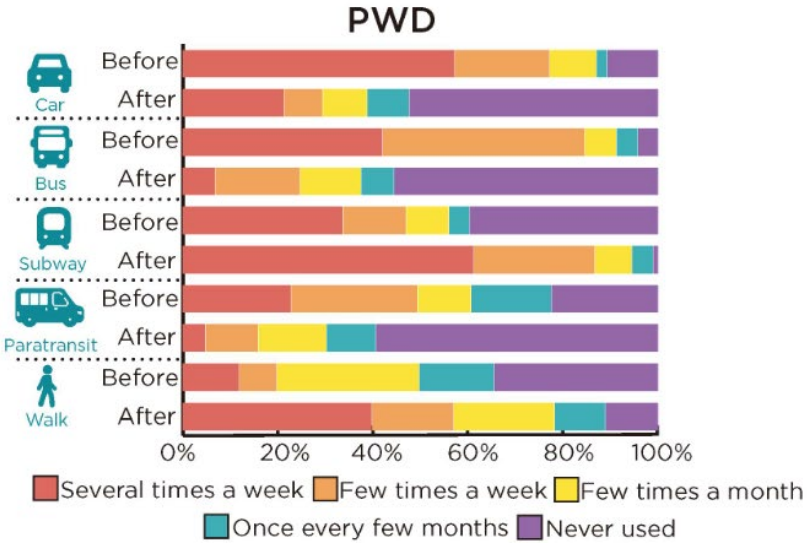
Car/Bike Ownership



Travel Mode Frequency Shift

***Top five most frequent used modes after reopening of the city





Impact on Older Population

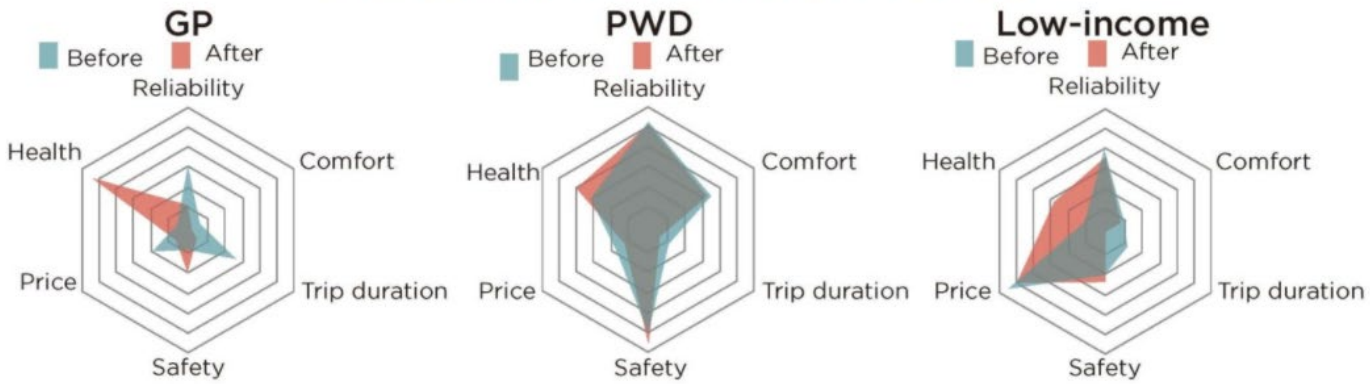
87% Found seeing friends/family "more challenging"

90% Found having friends/family over "more challenging"

PWD Top 3 Reasons for Travel

- Trips to the grocery store
- Trips to the pharmacy or drugstore
- Medical visits

Concerns with Travel Modes



https://c2smart.engineering.nyu.edu/covid-19-dashboard-covid-19-travel-survey

MATSim-nyc - A Multi-agent Simulation to Evaluate the Impact of COVID-19 on Mass Transit Ridership

The findings imply that a transit capacity restriction policy during reopening needs to be accompanied by (1) support for micromobility modes, particularly in non-Manhattan boroughs, and (2) congestion alleviation policies that focus on reducing traffic in Manhattan, such as cordon-based pricing.

Pre-COVID-19

Post-COVID-19

Wang, D., He, B. Y., Gao, J., Chow, J. Y., Ozbay, K., & Iyer, S. (2021). Impact of COVID-19 Behavioral Inertia on Reopening Strategies for New York City Transit. International Journal of Transportation Science and Technology.

C2SMART Project Team

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Brooklyn, NY 11201

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THANK YOU

Visualizing the COVID-19 Impacts Platform

Michael Pack, Director of CATT Laboratory

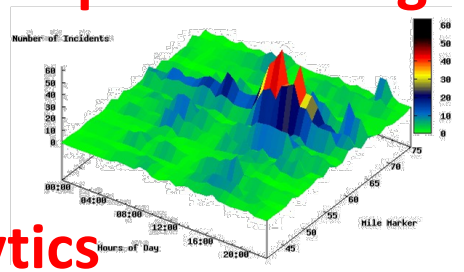
Enabling agencies through better communication, data-based decision making, advanced insights discovery, and enhanced operations and planning capabilities.

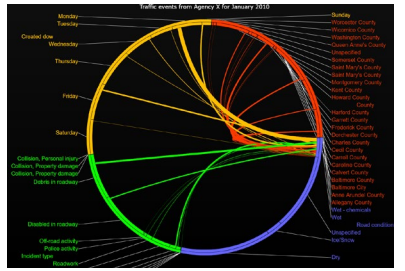
CATT Lab Visualization Team

- 75+ Professional Staff of
  - Software Developers
  - Data Scientists
  - UI/UX Designers
  - Program Managers
  - IT & Network Engineers
- 30-60 Students
  - Computer Science
  - Human Computer Interaction
  - Engineering
- 50+ affiliated researchers

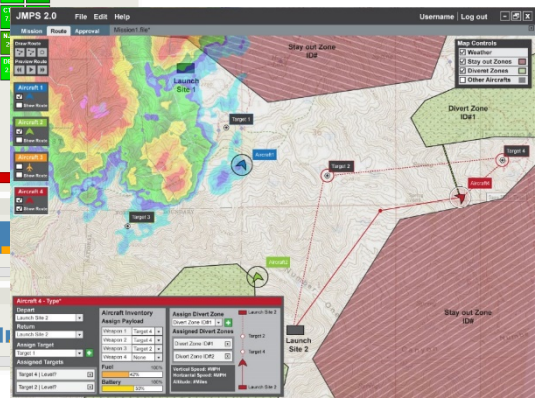
Analytics of All Flavors

Speed & Congestion

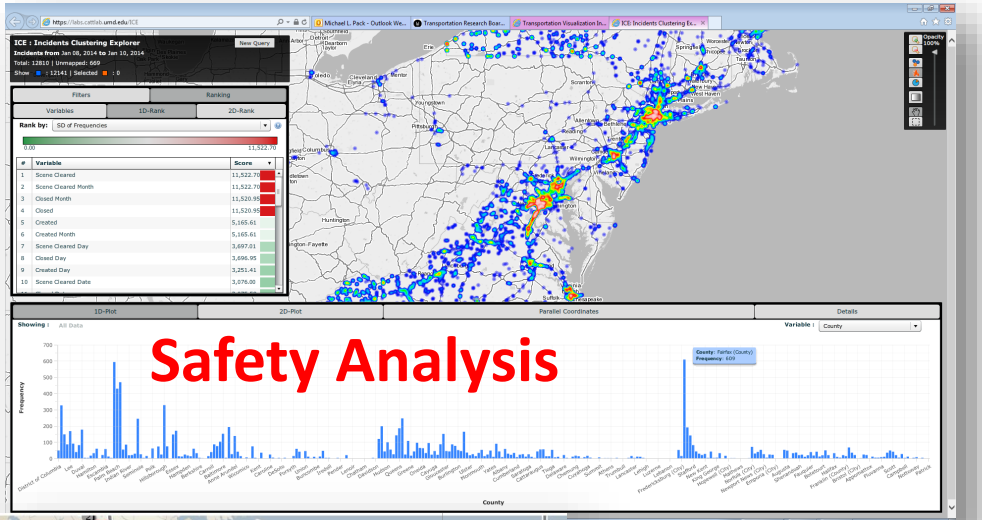




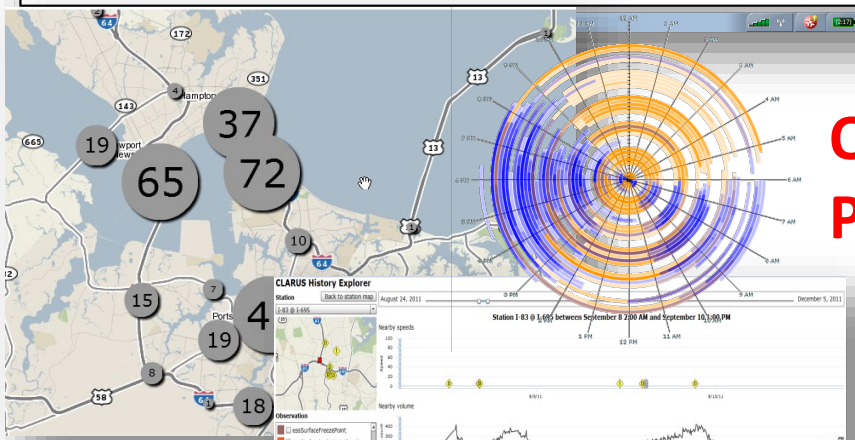
Mobility Analytics



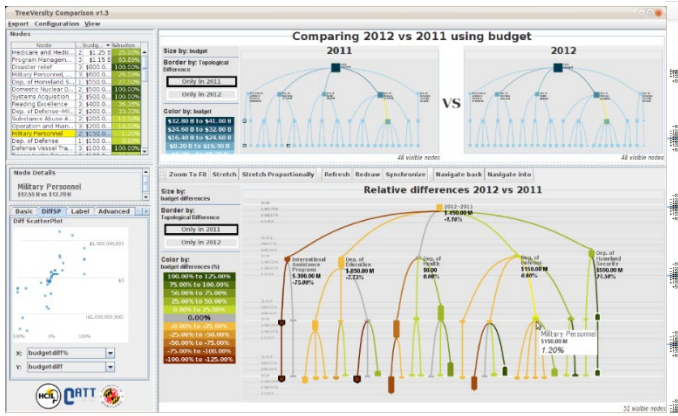
Safety Analysis

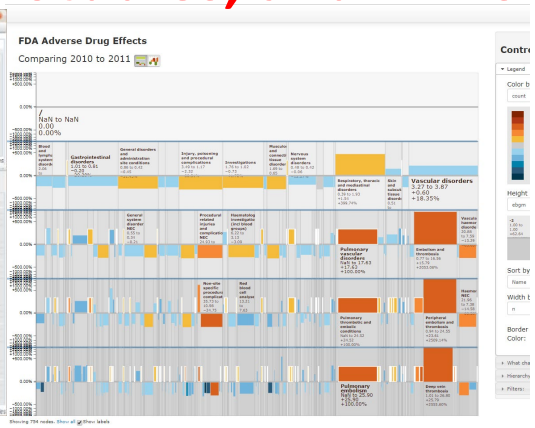


Operations and Planning Analytics

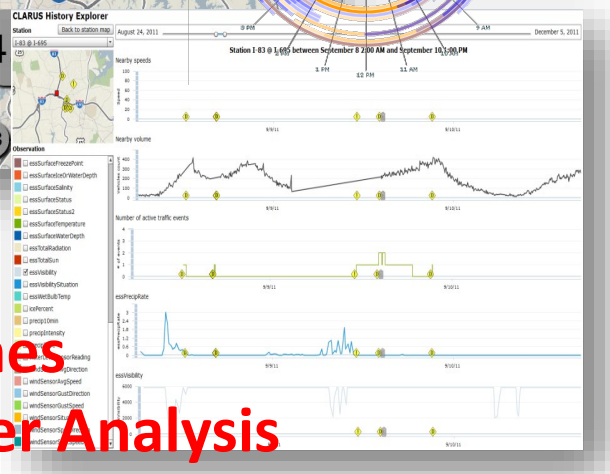


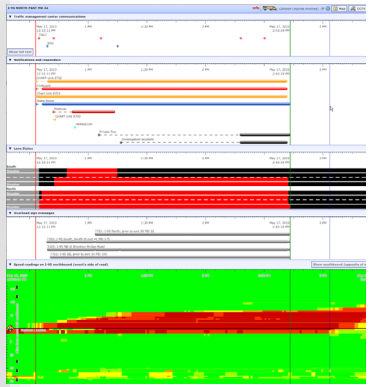
Project Prioritization, Before & After Studies, and AARs





Work Zones & Weather Analysis

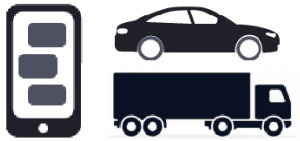




COVID-19 Travel Impacts Analysis

MARYLAND TRANSPORTATION INSTITUTE

Anonymized Location Data from Phones and Vehicles



Data Processing

- Data Quality Check
- Data Cleaning
- Data Fusion

Trip Identification

- Trip Origin, Destination, and Time Identification
- Identification of Stay-Home Devices

Imputation Algorithms

- Trip Purpose Imputation
- Travel Mode Imputation
- Socio-Demographics Imputation

Road, Rail, Bus, Airline System Datasets

Census Population Datasets

Baseline Control Totals from National Surveys

National All-Trip Roster from Observed Data Sample

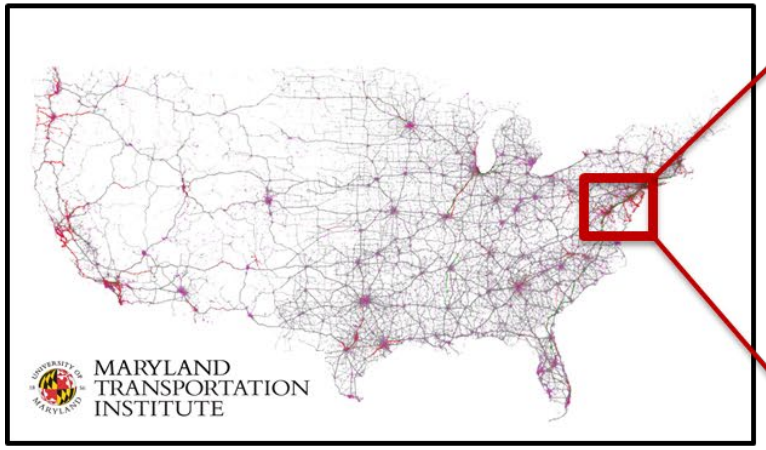
COVID-19 Cases, Business Establishment Data, and Other Data

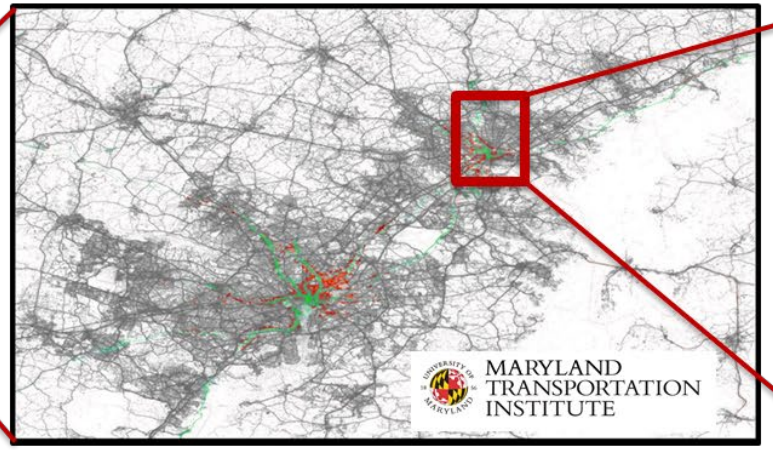
University of Maryland COVID-19 Impact Analysis Platform Metrics and Analytics

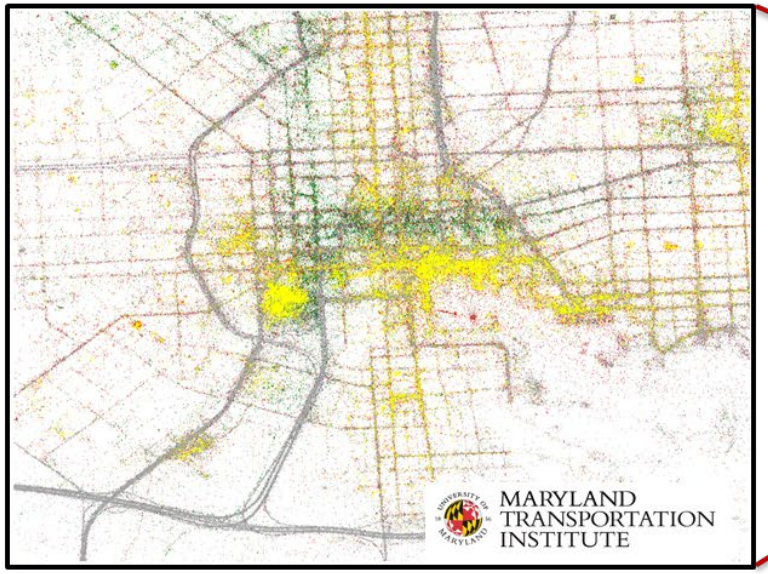
Data Integration and Aggregation

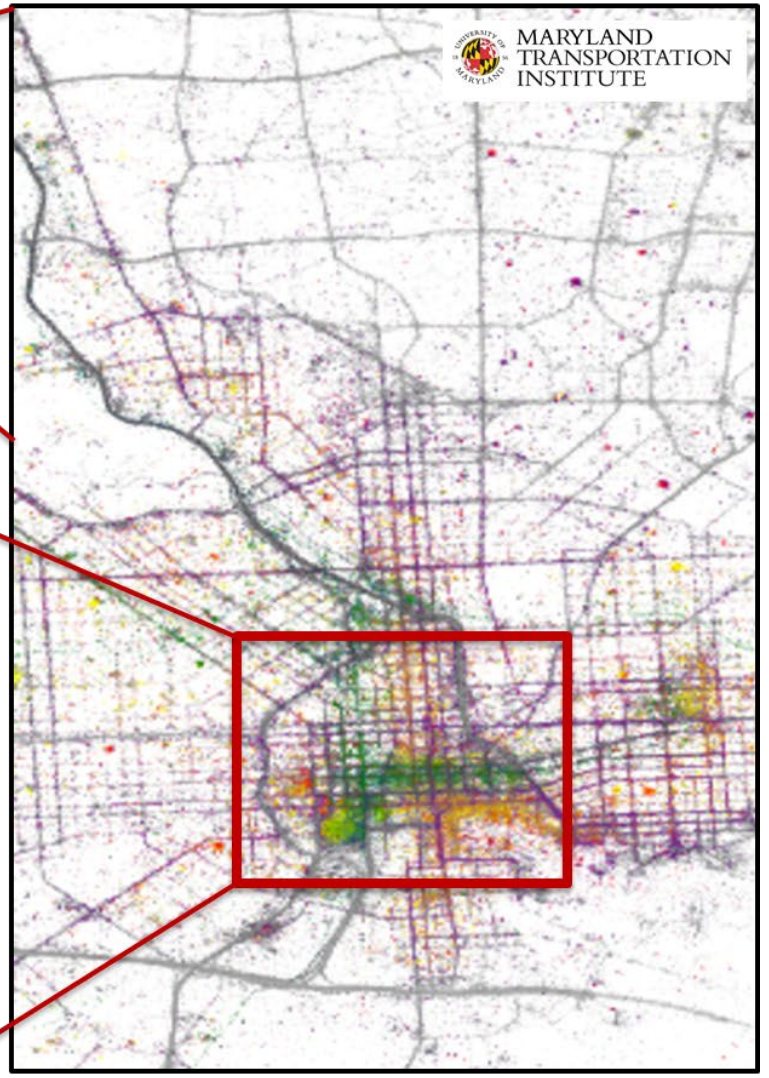
Multi-Level Weighting

Comprehensive Trip Data Validation









Gray: Driving

Purple: Air

Green: Rail

Red: Bus

Yellow: Bike/Walk

- 39 Metrics are Computed and Aggregated
- Mobility & Social Distancing (9 metrics)
  - Social distancing index
  - % Staying at hoe
  - Trips/Person
  - % out-of-county trips
  - % out-of-state trips
  - Miles/person
  - Work trips/ person
  - Non-work trips / person
  - Transit mode share
- COVID & Health (15 metrics)
- Economic Impact (5 metrics)
- Vulnerable Populations (10 metrics)

UNIVERSITY OF MARYLAND
COVID-19 Impact Analysis Platform

MARYLAND TRANSPORTATION INSTITUTE

CATT LABORATORY

States | Counties

From August 27, 2020 to August 27, 2020

Select metrics: Mobility and Social Distancing | COVID and Health | Economic Impact | Vulnerable Population

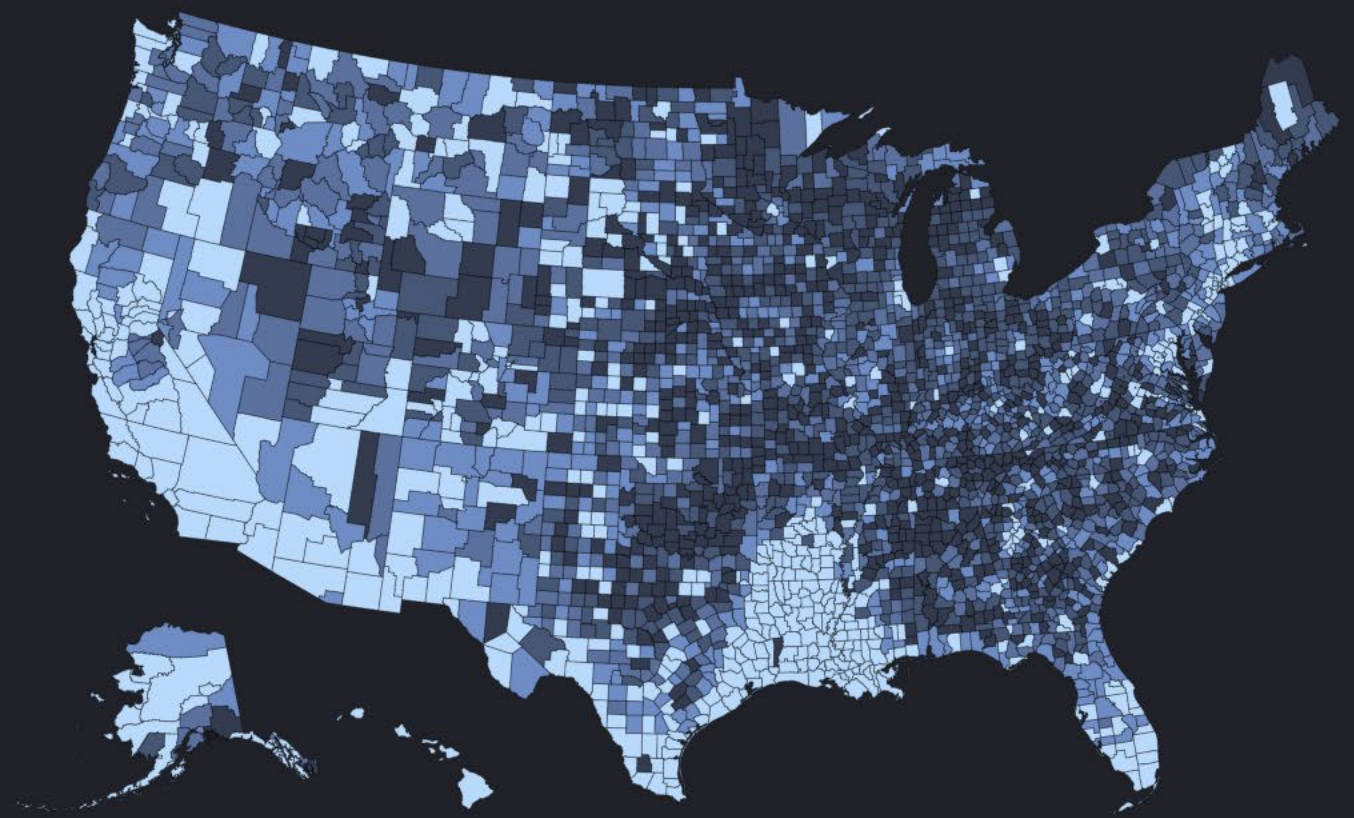
Search for a county

County ▲	Social distancing index	% staying home	Imported COVID cases	% change in consumption	COVID death rate	
Abbeville County, South Carolina	15	18%	173	13.7%	1.68%	SERA
Acadia Parish, Louisiana	44	32%	401	-20.7%	2.49%	SERA

Accomack County, Virginia 19 18% 75 0.2% 1.65% SERA

Zoom to All states | Show Social distancing index | Show National Statistics

Showing data for August 27, 2020



Social distancing index

0	18	21	24	29+

COVID-19 **Key Insights**

UMD COVID-19 Impact Analysis Platform: data.covid.umd.edu

https://data.covid.umd.edu/

Live Demo
data.covid.umd.edu

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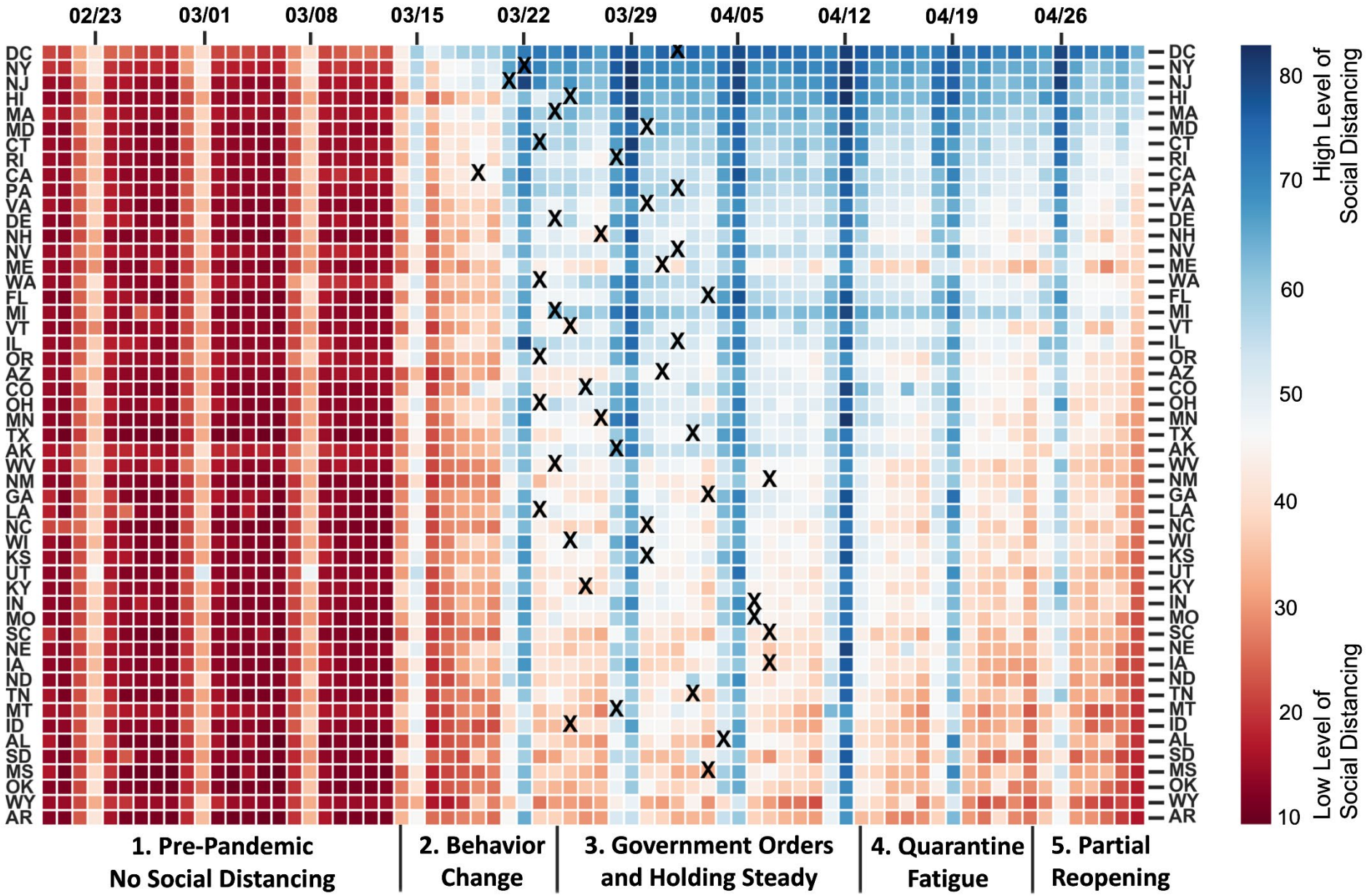
Social Distancing Index by State

February 20~May 1 data from: data.covid.umd.edu

"X" indicates statewide stay-at-home order date.



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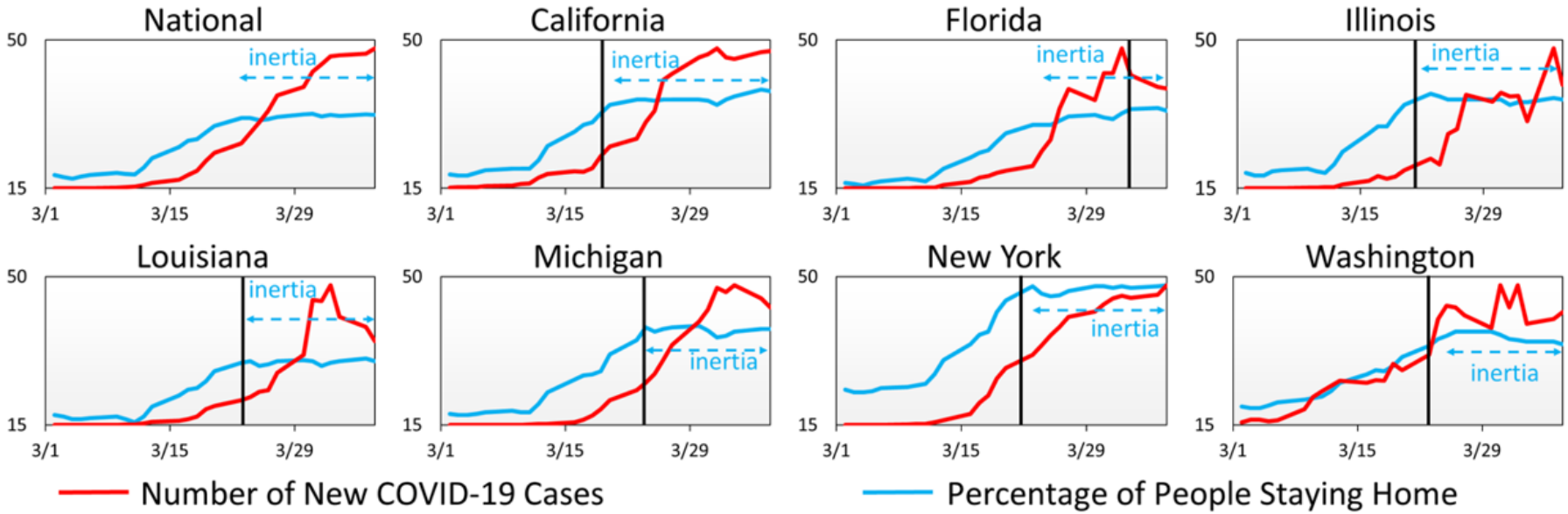
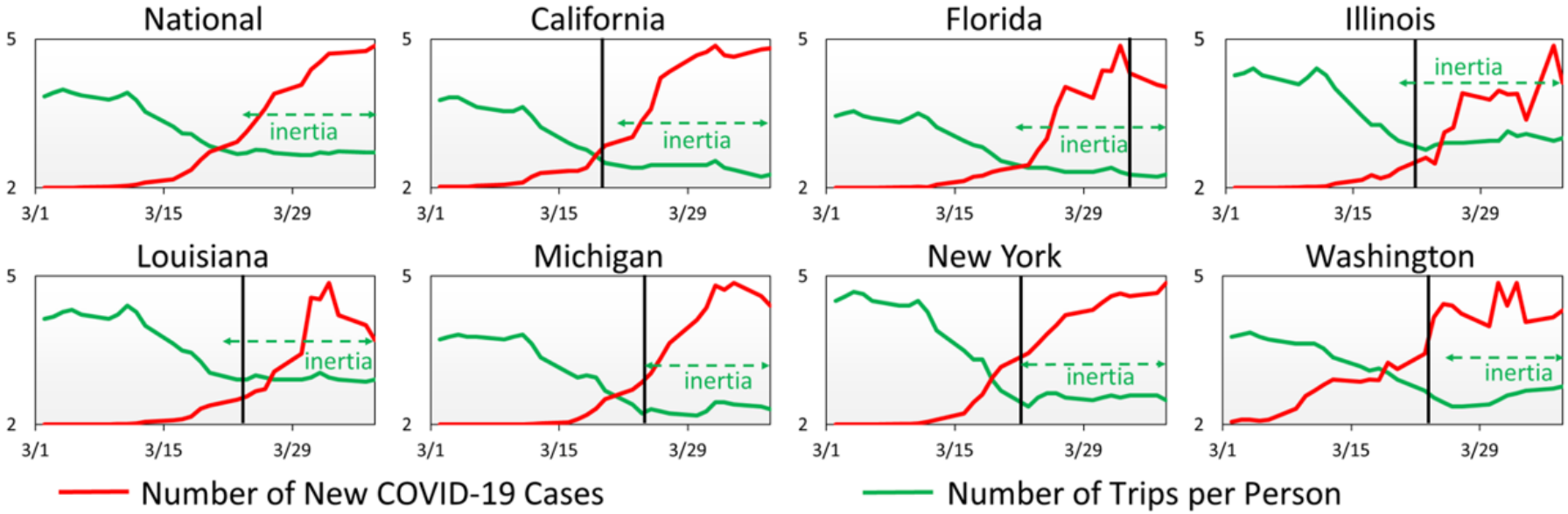
Impact of Stay-at-Home Orders on Mobility Behavior

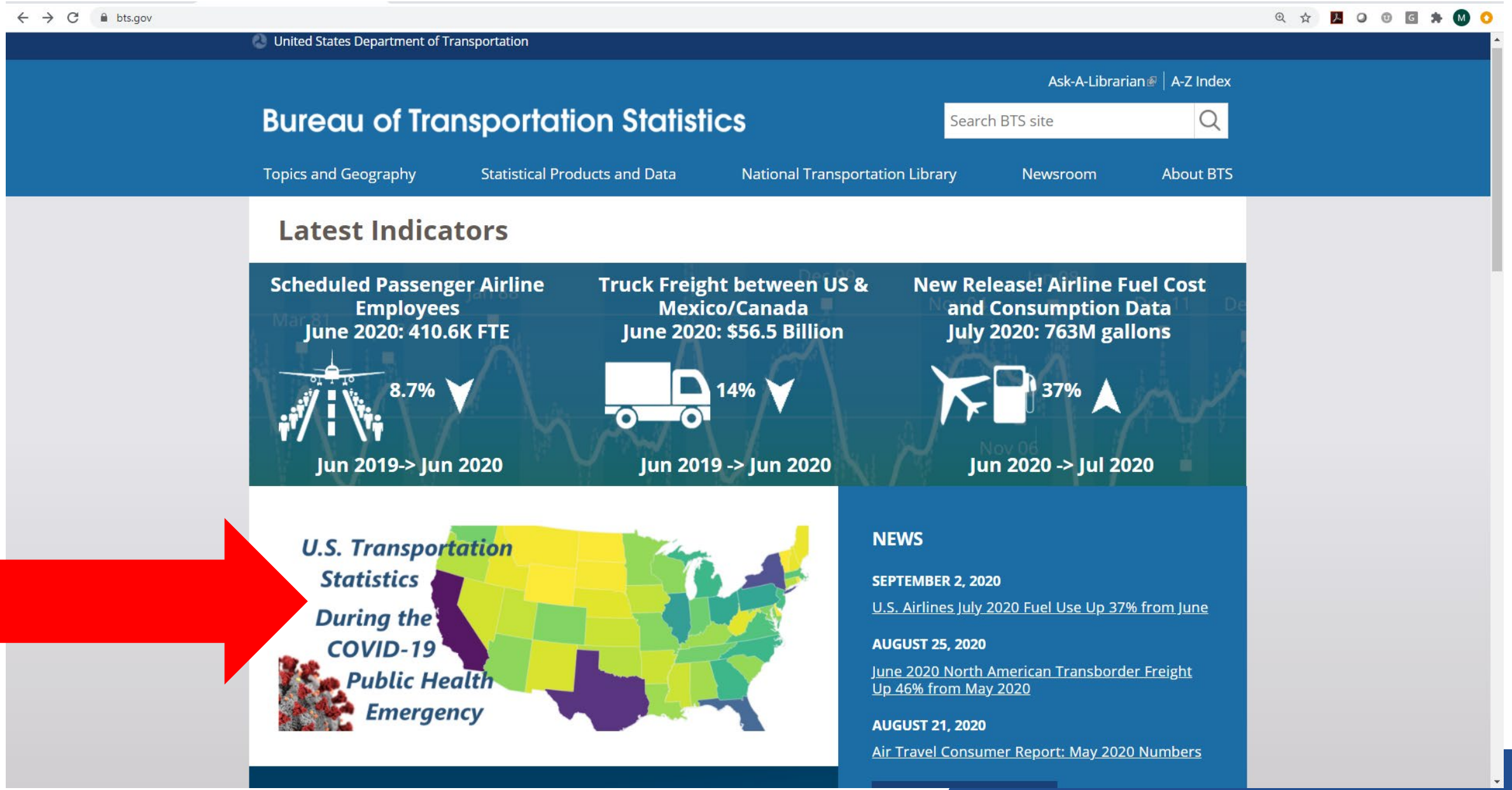
March 1~April 9 data from: data.covid.umd.edu

Black lines indicate dates of statewide stay-at-home orders. Vertical axes on the left show ranges of %staying home (15~50) and #trips/person (2~5). #COVID-19 cases across states have different ranges.

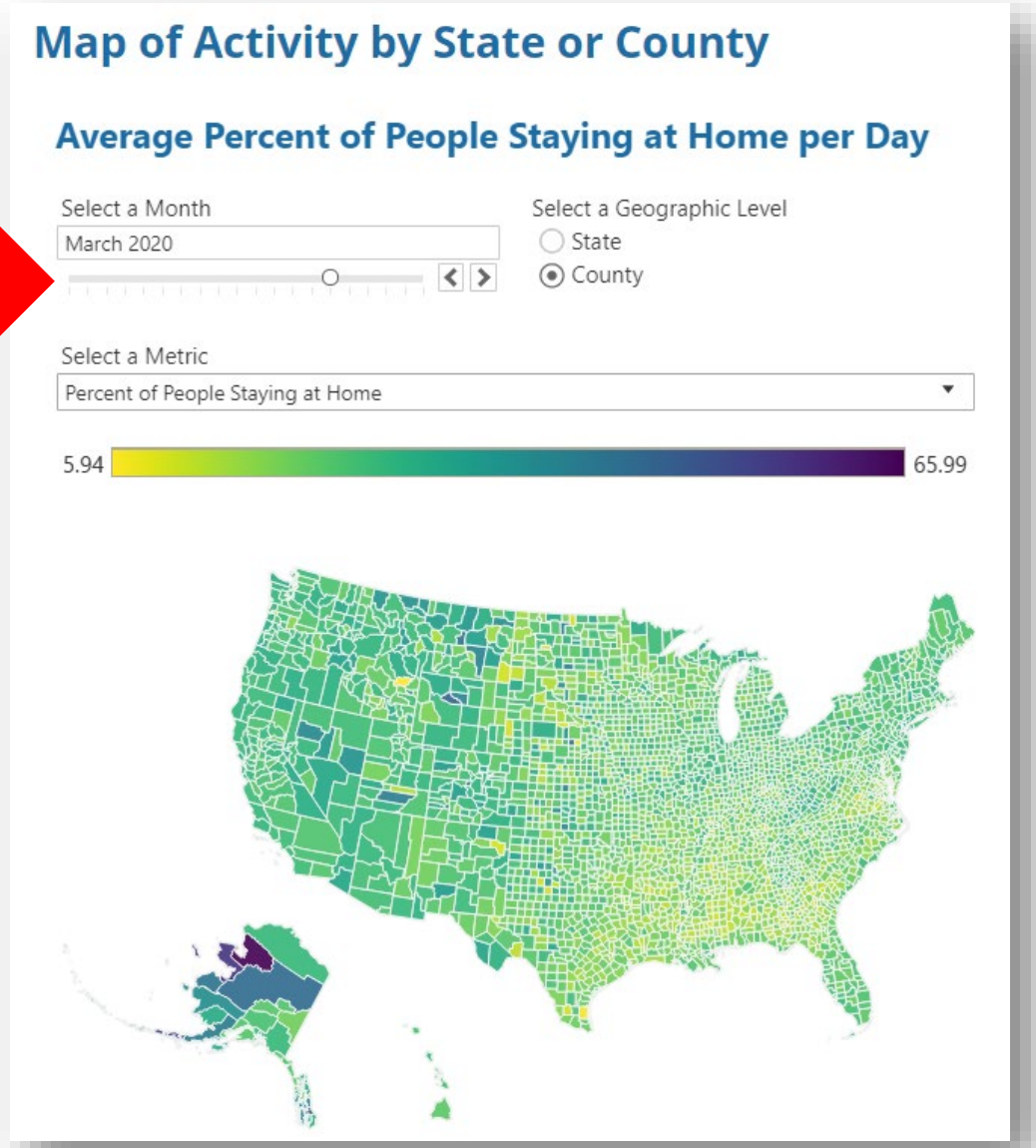


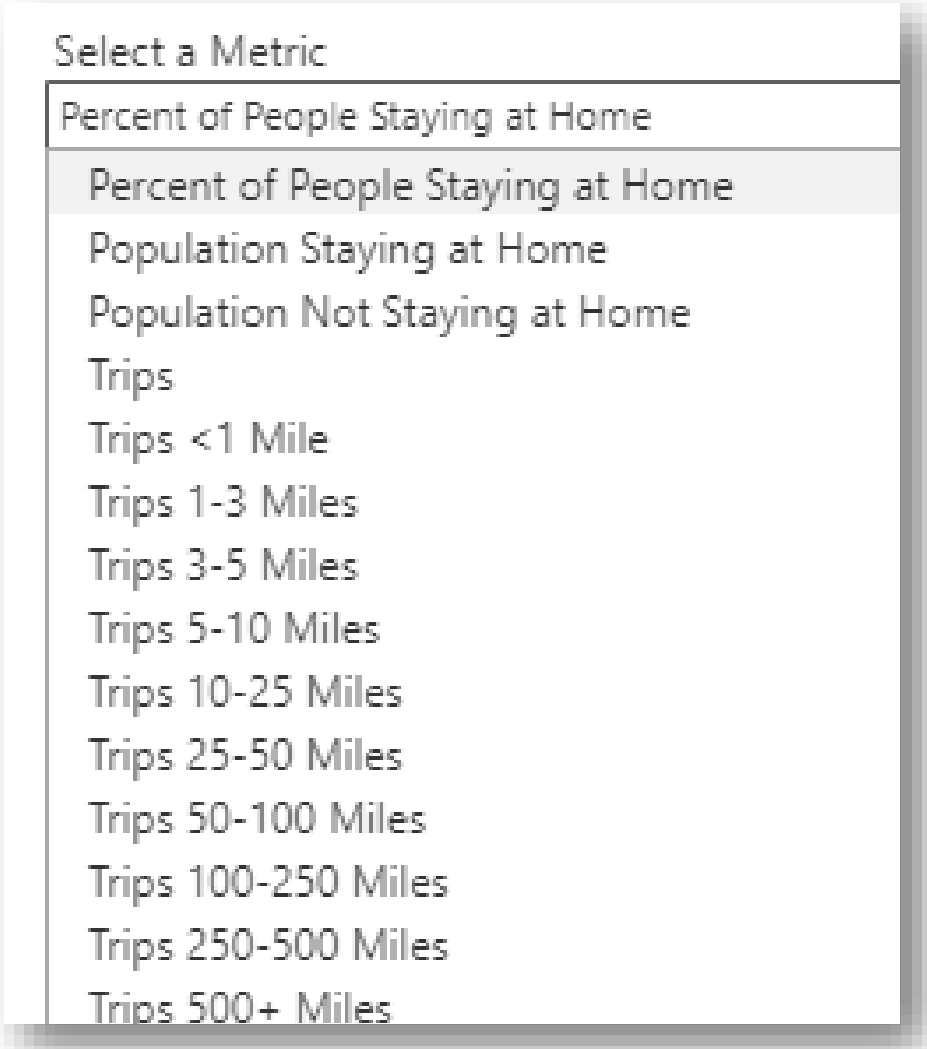


USDOT Bureau of Transportation Statistics

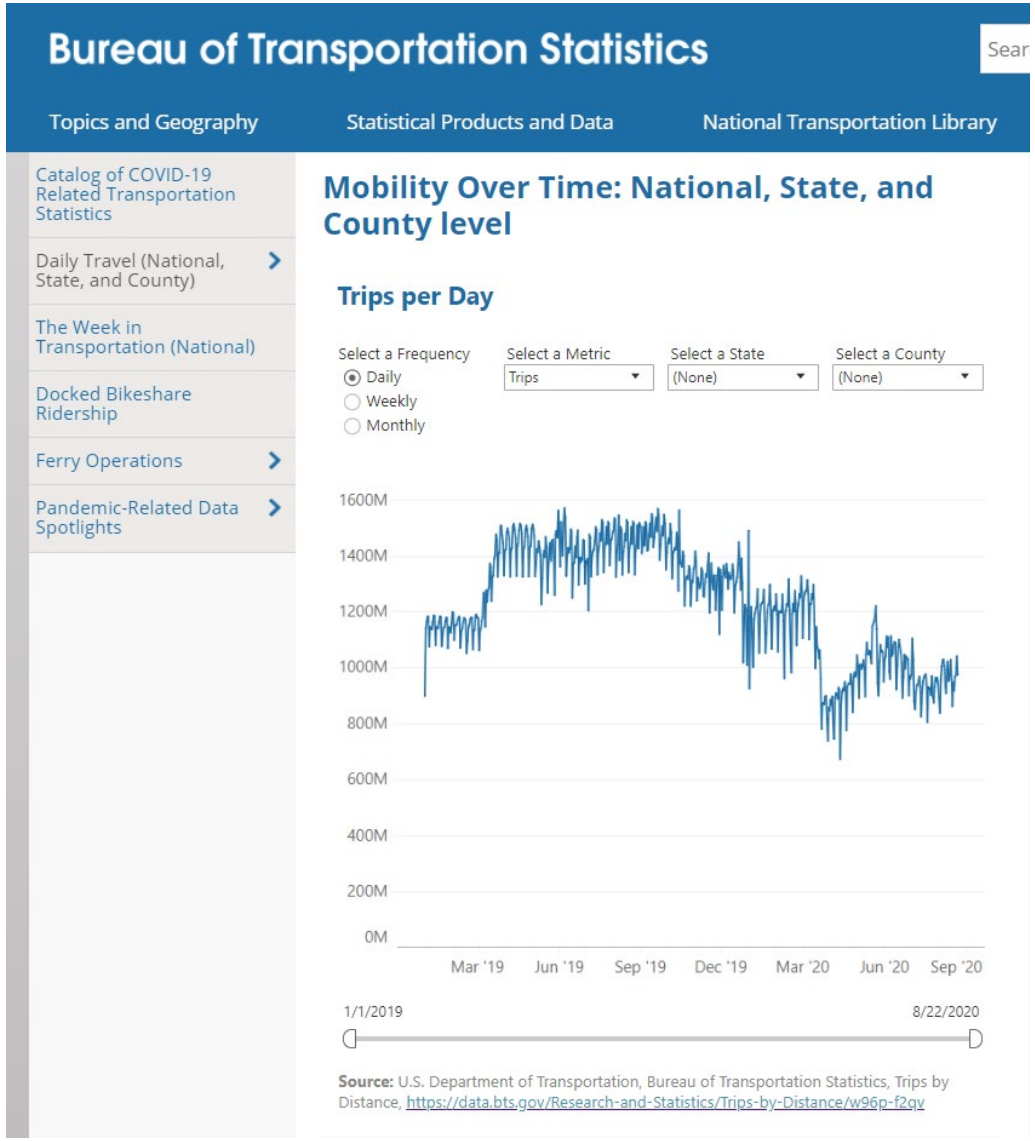


USDOT Bureau of Transportation Statistics





USDOT Bureau of Transportation Statistics

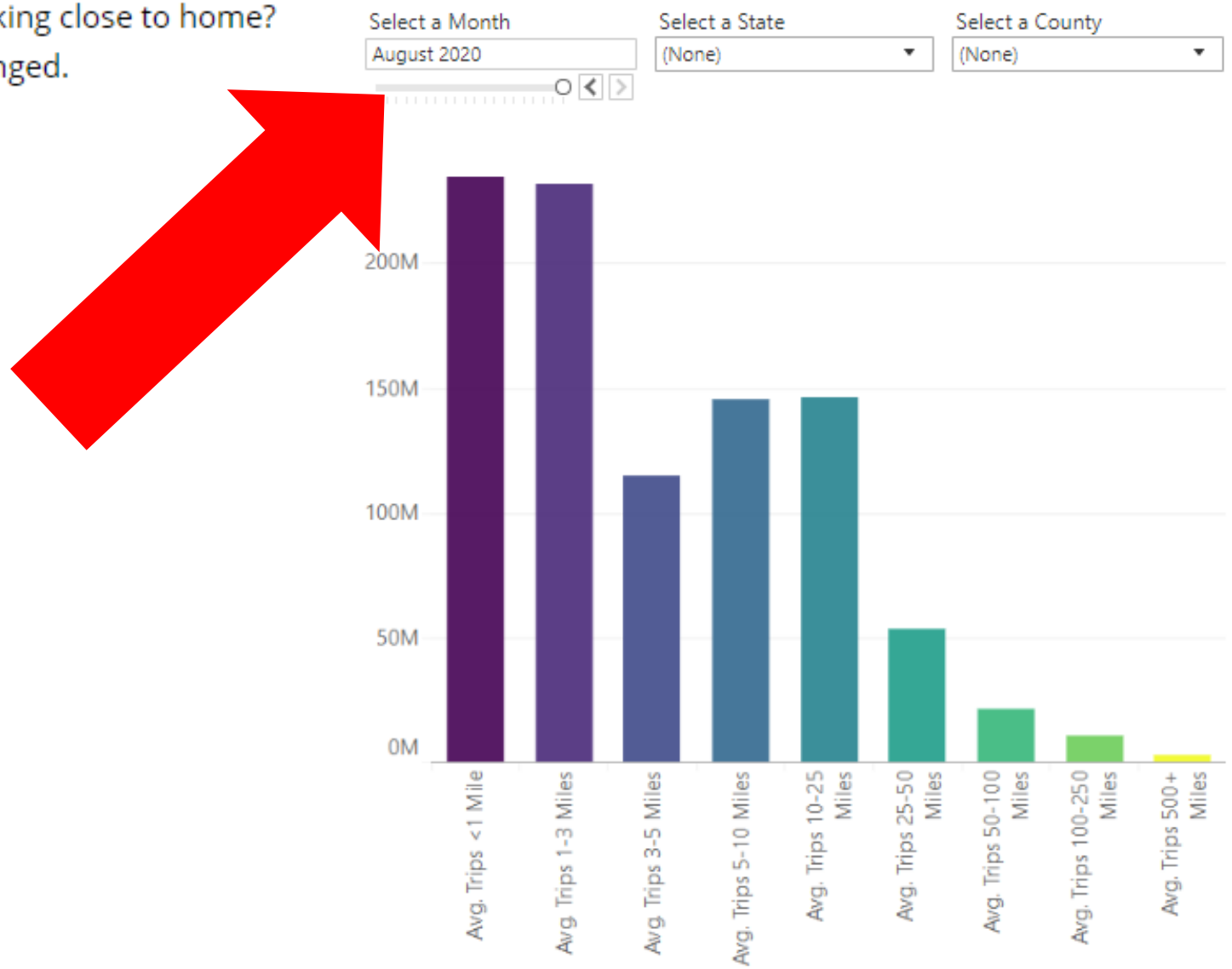


When they leave the home, how far are people traveling?

Are people going farther on each trip, or are they sticking close to home? Use the date selector to learn how patterns have changed.

Distribution of Trips by Distance: National, State, and County level

Average Trips per Day by Distance Band



Catalog of COVID-19 Related Transportation Statistics

Daily Travel (National, State, and County)

The Week in Transportation (National)

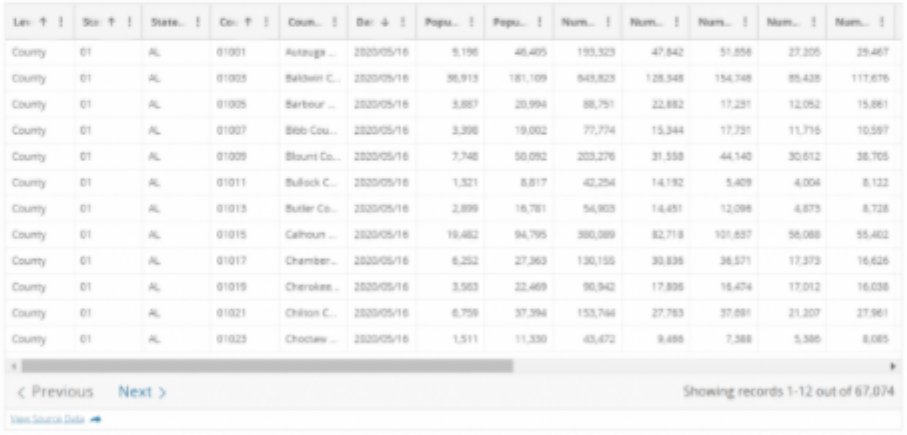
Docked Bikeshare Ridership

Ferry Operations

Pandemic-Related Data Spotlights

Explore the Trips By Distance Data on Your Own

Click on the image below to see the metadata for the Daily Travel data in our Data Inventory. There, you can download the data or use the inventory platform to create your own visualizations and share them with others.



Source

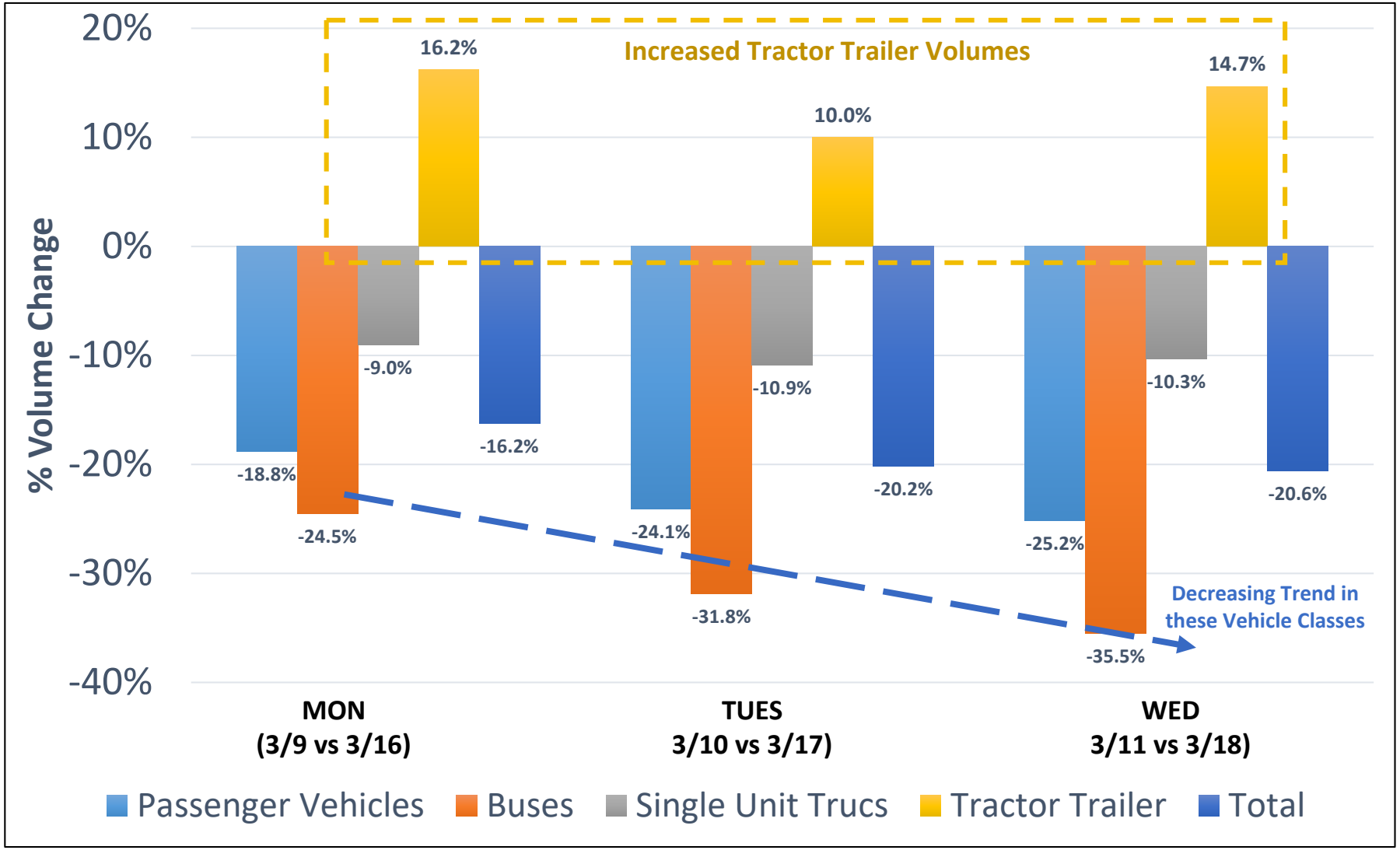
The Daily Travel data and number of people staying home and not staying home are estimated for the Bureau of Transportation Statistics by the Maryland Transportation Institute and Center for Advanced Transportation Technology Laboratory at the University of Maryland.

Additional Analysis & Tools from the RITIS Platform

COVID-19 **Key Insights**

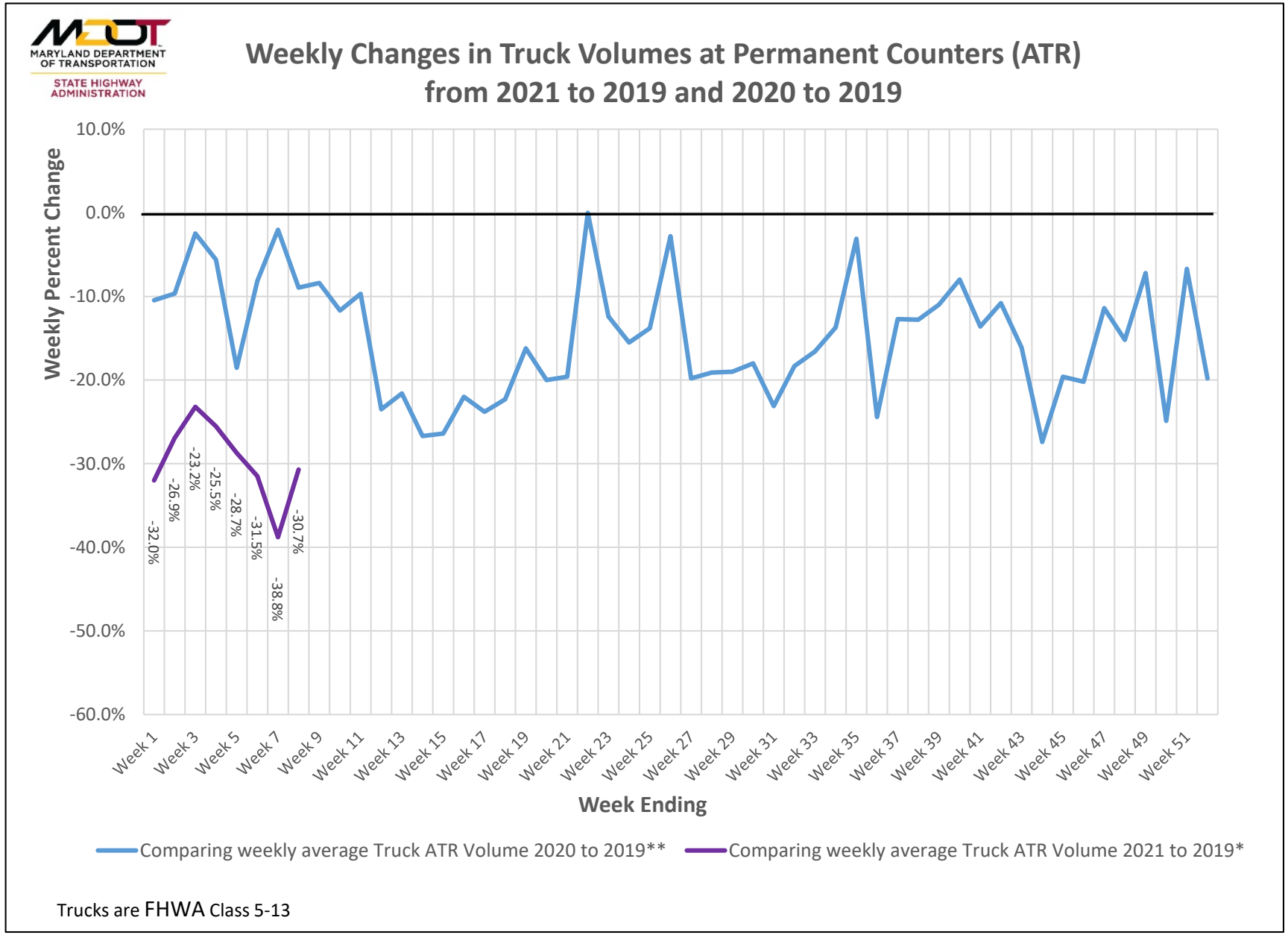
Traffic Volumes Decreased Significantly due to COVID-19

- Passenger vehicles, buses, and single unit trucks ***decreased by 9-35%***
- Tractor trailer volumes ***increased by 10-16%*** in select freight corridors



COVID-19 **Key Insights**

Traffic Volumes Decreased Significantly due to COVID-19



Trucks are FHWA Class 5-13

What's New 07/17/20

REGION EXPLORER
Explore the relationships between bottlenecks and traffic events in real-time and in the past.

Tutorial Help

MASSIVE DATA DOWNLOADER
Download raw probe data from our archive for offline analysis.

Tutorial Help History

CONGESTION SCAN
Analyze the rise and fall of congested conditions on a stretch of road.

Tutorial Help History

TREND MAP
Create animated maps of roadway conditions.

Tutorial Help History

PERFORMANCE CHARTS
Chart performance metrics over time.

Tutorial Help History

PERFORMANCE SUMMARIES
Report on Buffer Time Index, Planning Time Index, and other performance metrics.

Tutorial Help History

BOTTLENECK RANKING
Rank bottlenecks and discover which ones have the greatest impact.

Tutorial Help History

SPEED THRESHOLD BREAKDOWN
Determine how well or how poorly a road performed between two dates.

Help History

USER DELAY COST ANALYSIS
Put a dollar amount on how much a road's performance impacts its users.

Tutorial Help History

DASHBOARD
Create your own personal dashboards to monitor corridor performance in regions of interest.

Tutorial Help

NPMRDS COVERAGE MAP
Explore the coverage completeness of the NPMRDS on a month-by-month basis.

Tutorial Help

TRAVEL TIME DELTA RANKING
Rank roads based on their change in travel time performance between two time periods.

Tutorial Help History

TRAVEL TIME COMPARISON
Chart travel times to compare performance for different time periods.

Tutorial Help History

TUTORIALS
Learn how to use each of the tools in the suite.

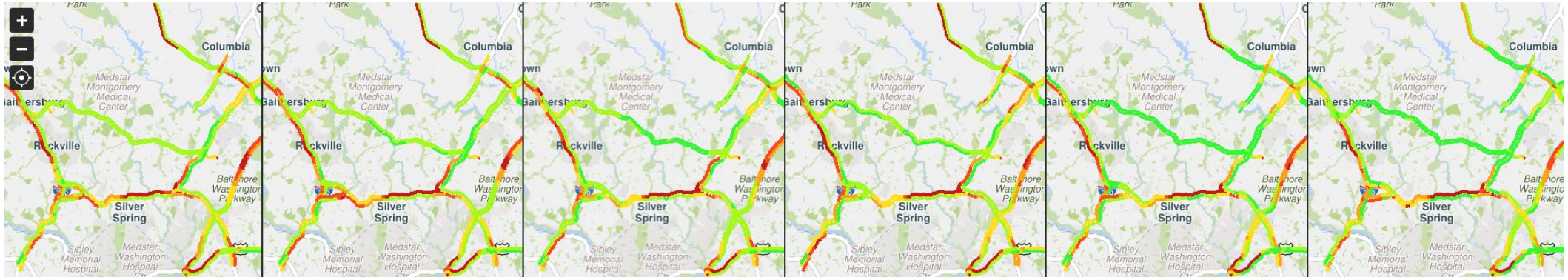
COVID-19 **Key Insights**

With Decreased Travel Demand, Traffic Congestion was also Mitigated

Average travel speeds by month at 8:00 a.m.

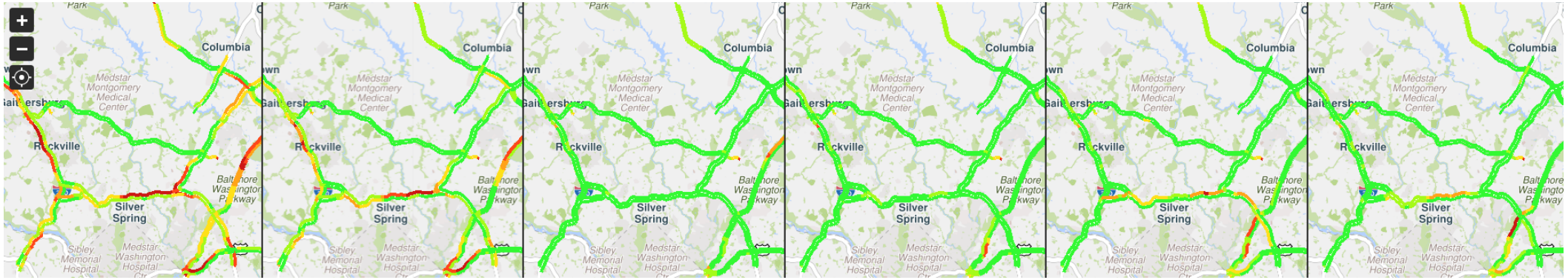
2019

20 mph
30 mph
40 mph
50 mph
60 mph



FEB MAR APR MAY JUN JUL

2020



Source: RITIS / Trend Map

FEB 2020

03.05.20
Catastrophic Health Emergency declared

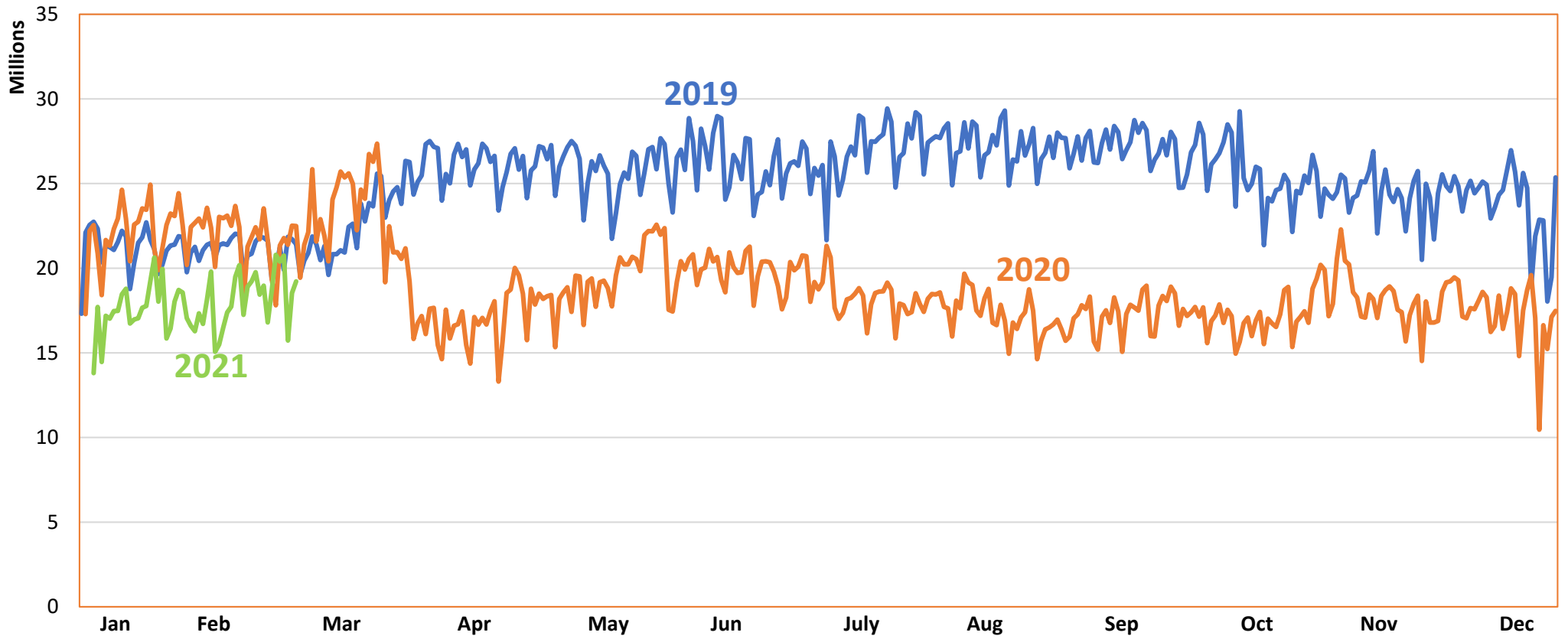
03.30.20
Stay at Home Order issued

04.15.20
Use of Face Coverings & Physical Distancing Order issued

05.15.20
Stay at Home Order replaced by Safer at Home Order

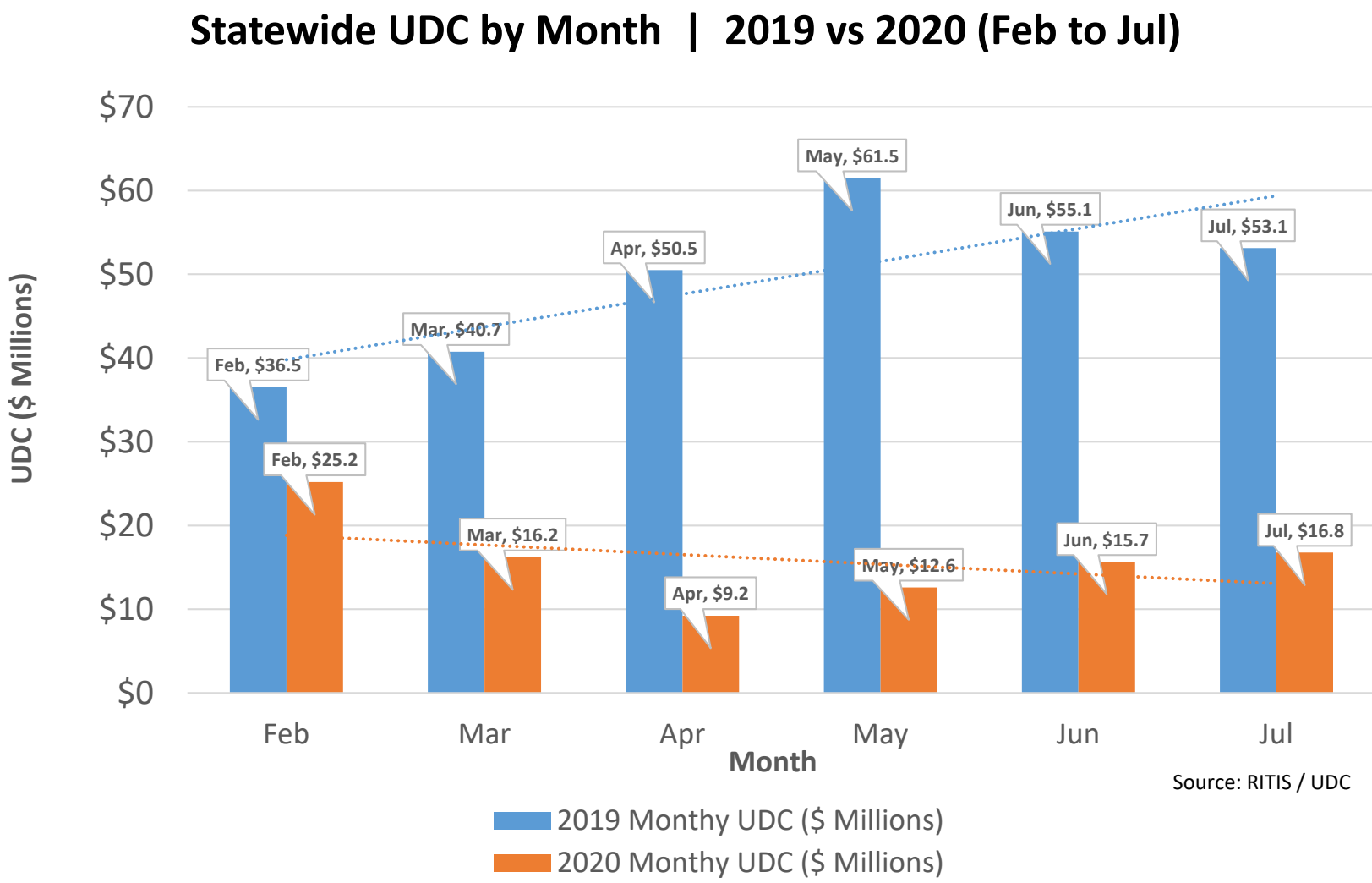
AUG 2020

Maryland Daily Trips (Jan 1, 2019 - Feb 20, 2021)



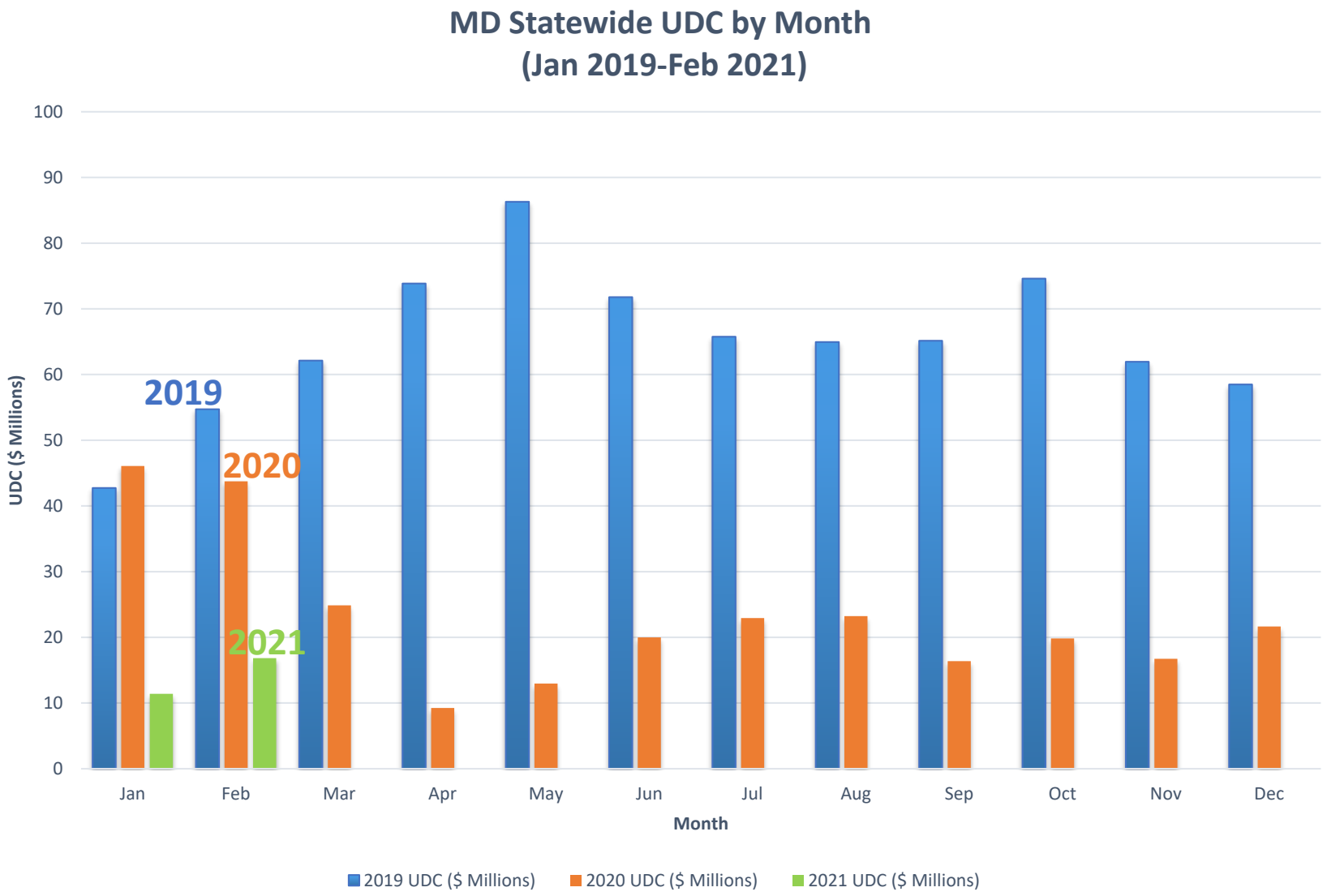
Using the UMD RITIS **User Delay Cost (UDC)** tool, comparisons were made for a six-month period between 2019 (pre-pandemic) and 2020.

Comparing month-by-month UDC results for the entire state of Maryland shows ***dramatic drops* in user delay cost – between 31% and 82%** – with an overall decrease in delay cost of **$202M** for the six-month period.



Source: RITIS / UDC

COVID-19 **Key Insights** User Delay Cost (UDC) Comparisons: Pre-pandemic vs. Pandemic



Thanks! Comments and Feedback are Welcome.

CATT Lab Point-of-Contact:

Michael Pack
Director, CATT Lab
packml@umd.edu; 240.676.4060

or

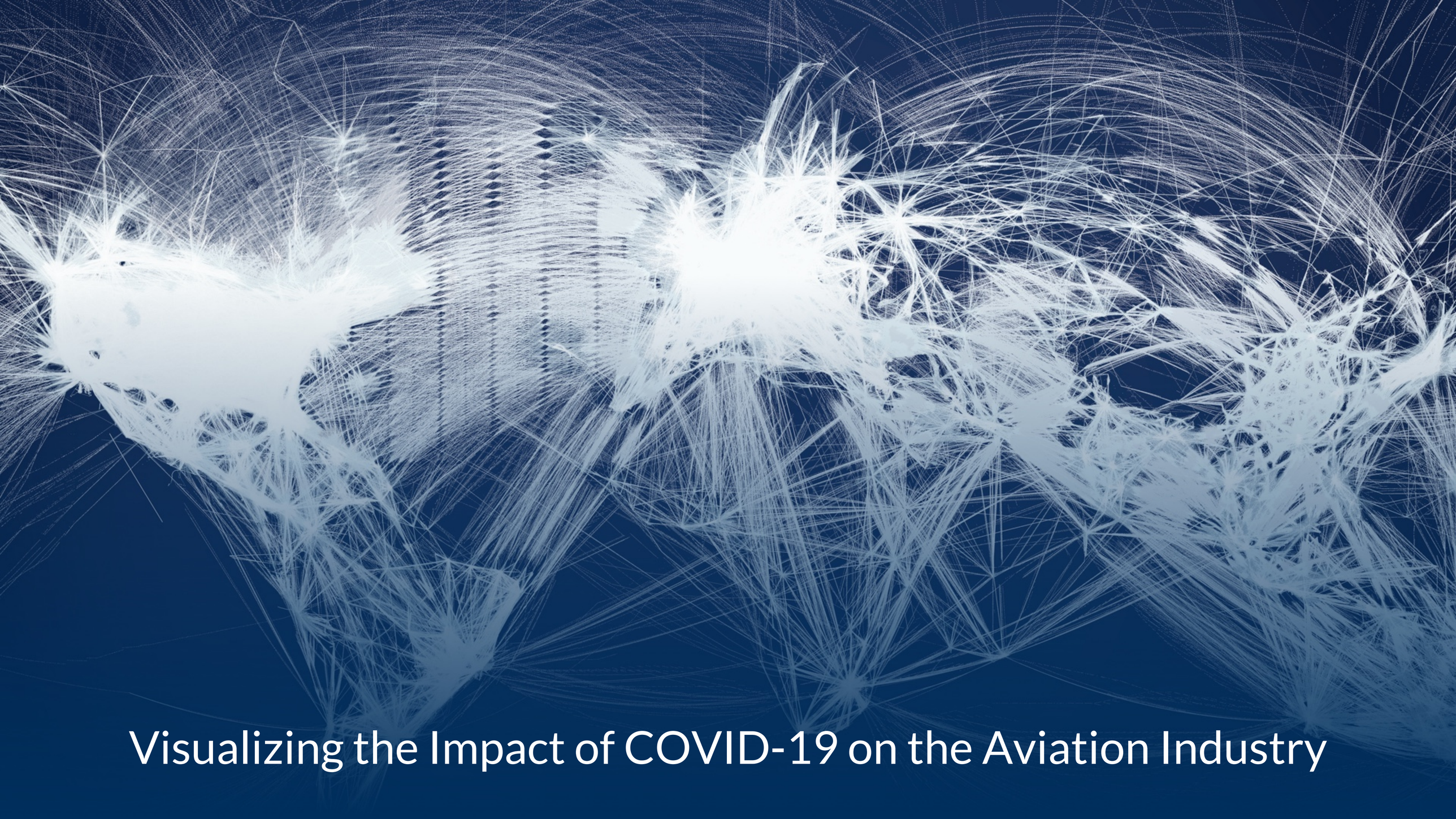
Rick Ayers
Public Agency Advocate, CATT Lab
rayers@umd.edu 703..989.3221

Or

support@ritis.org

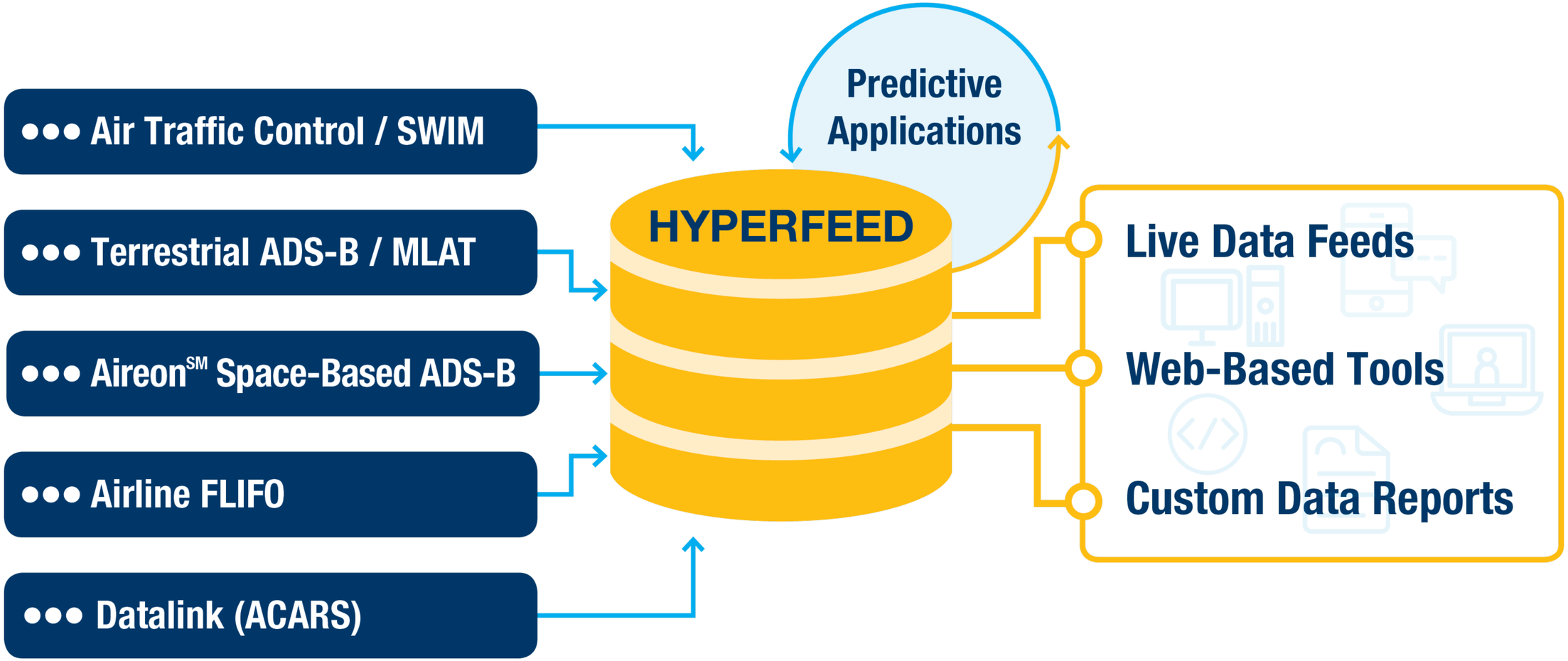
Online Training Videos available at:
https://www.ritis.org/help/tutorials/

CATT LABORATORY

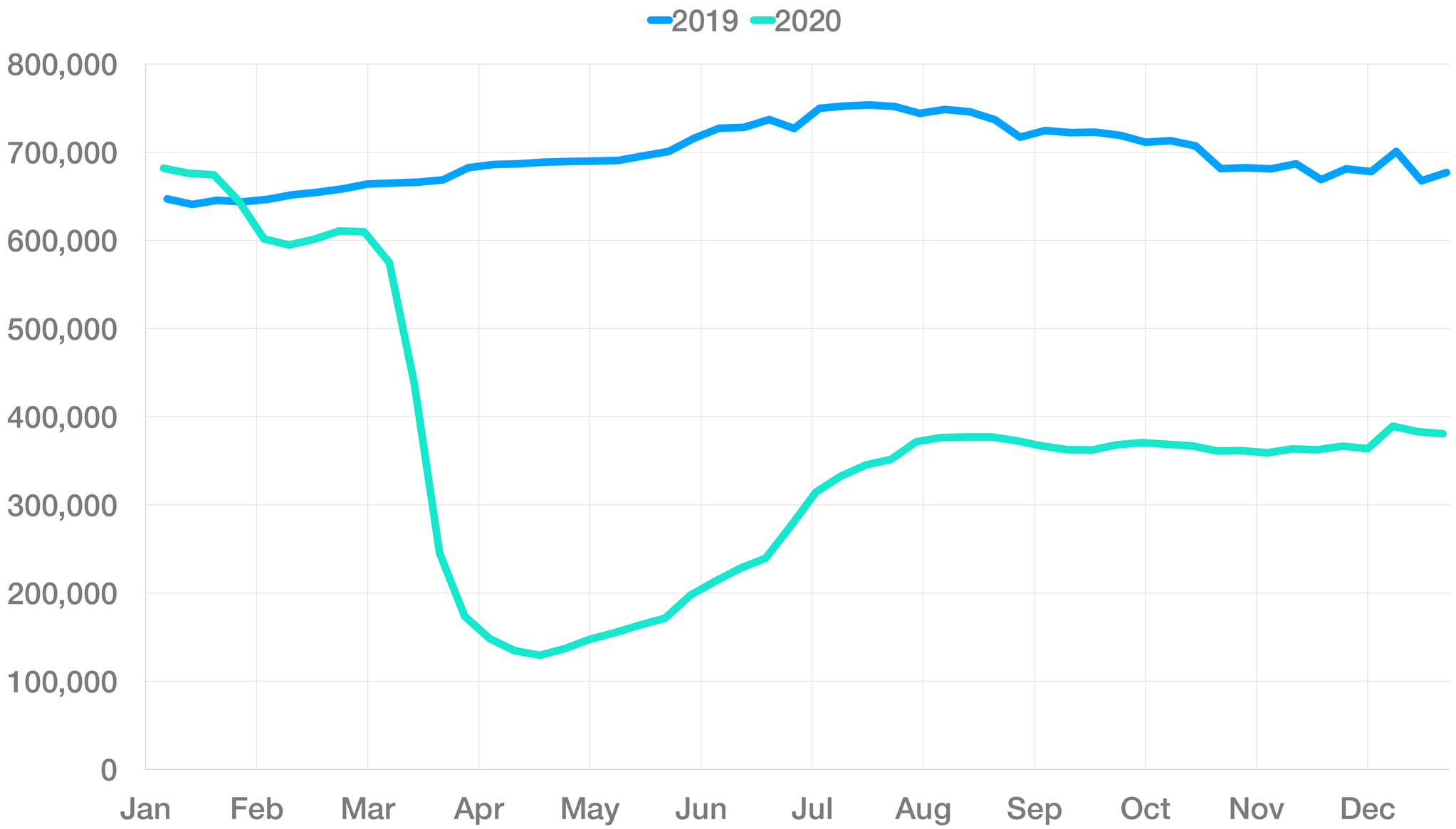


Visualizing the Impact of COVID-19 on the Aviation Industry

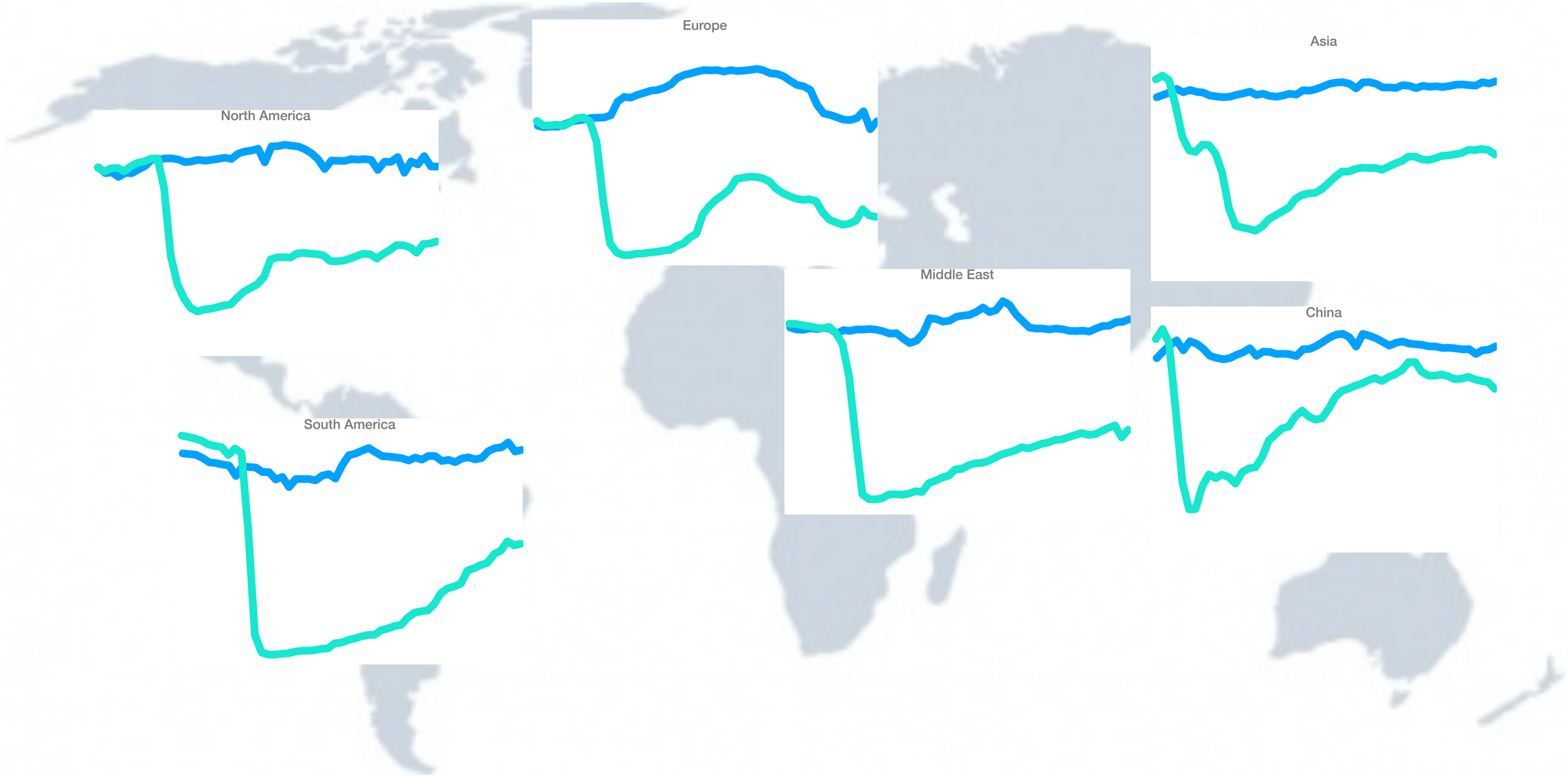
Hyperfeed


Air Traffic Control / SWIM
Terrestrial ADS-B / MLAT
Aireon℠ Space-Based ADS-B
Airline FLIFO
Datalink (ACARS)
Predictive Applications
HYPERFEED
Live Data Feeds
Web-Based Tools
Custom Data Reports

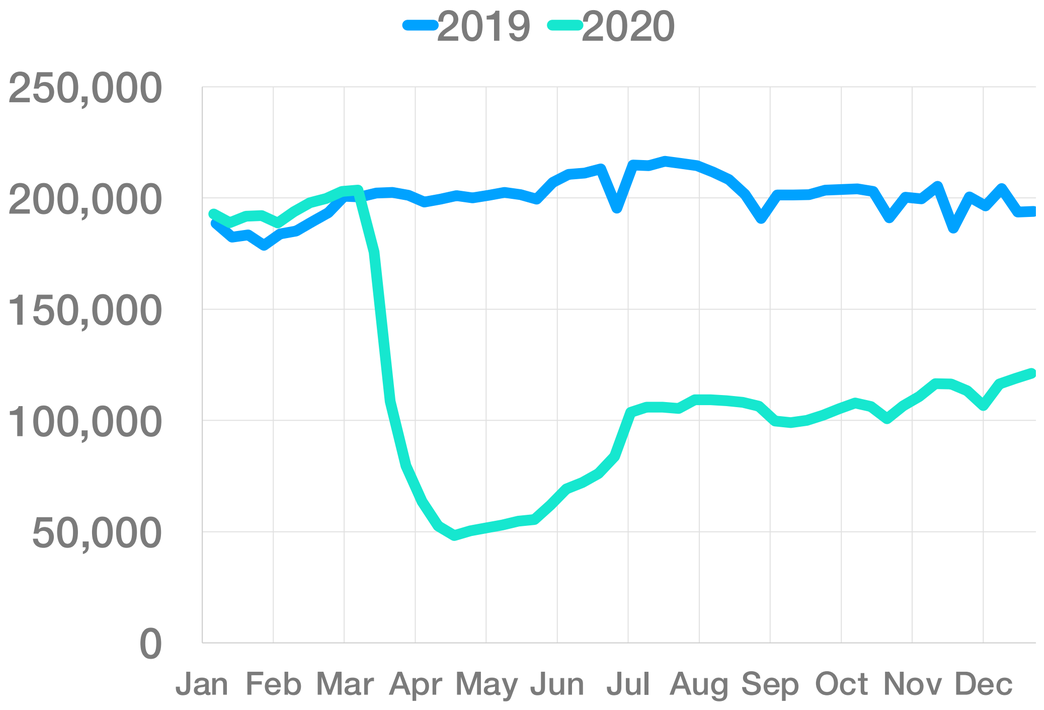
Commercial Passenger Airlines Overall



Geographic Variation

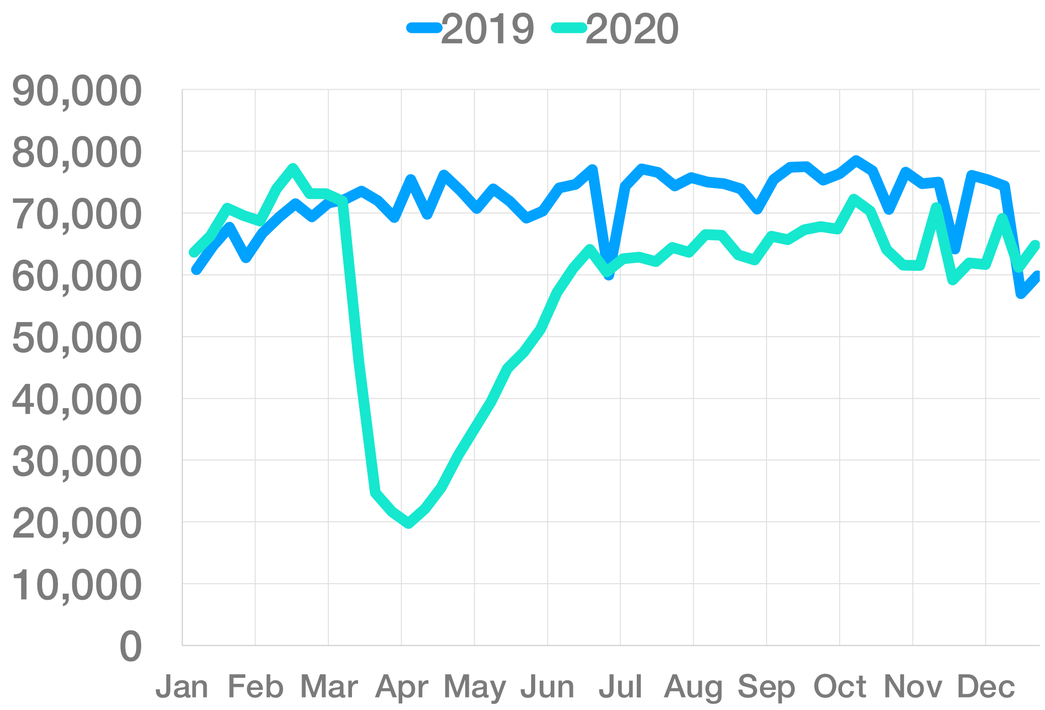


Operation Type Impact



Passenger Airlines

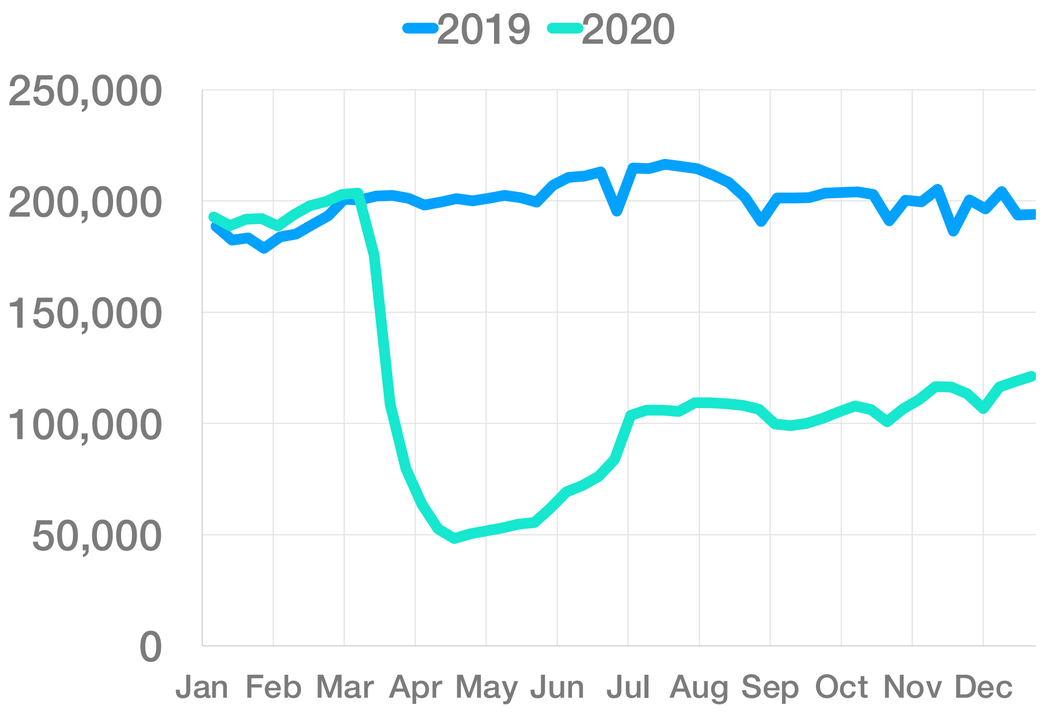
(to/from/within United States)



Business Aviation

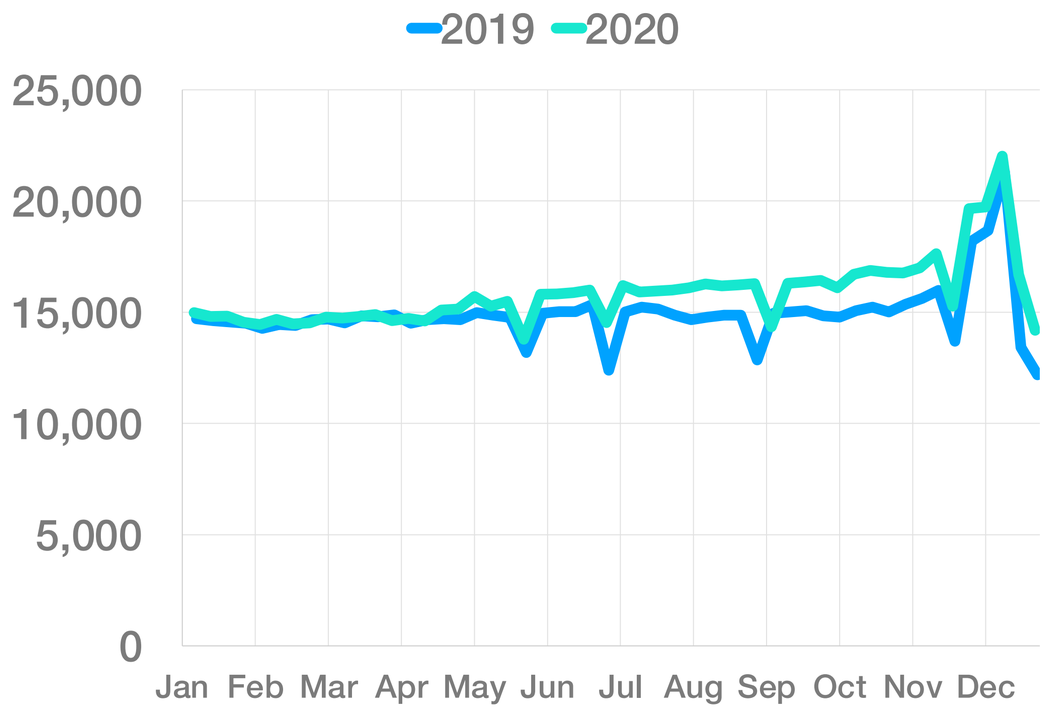
(to/from/within United States)

Operation Type Impact



Passenger Airlines

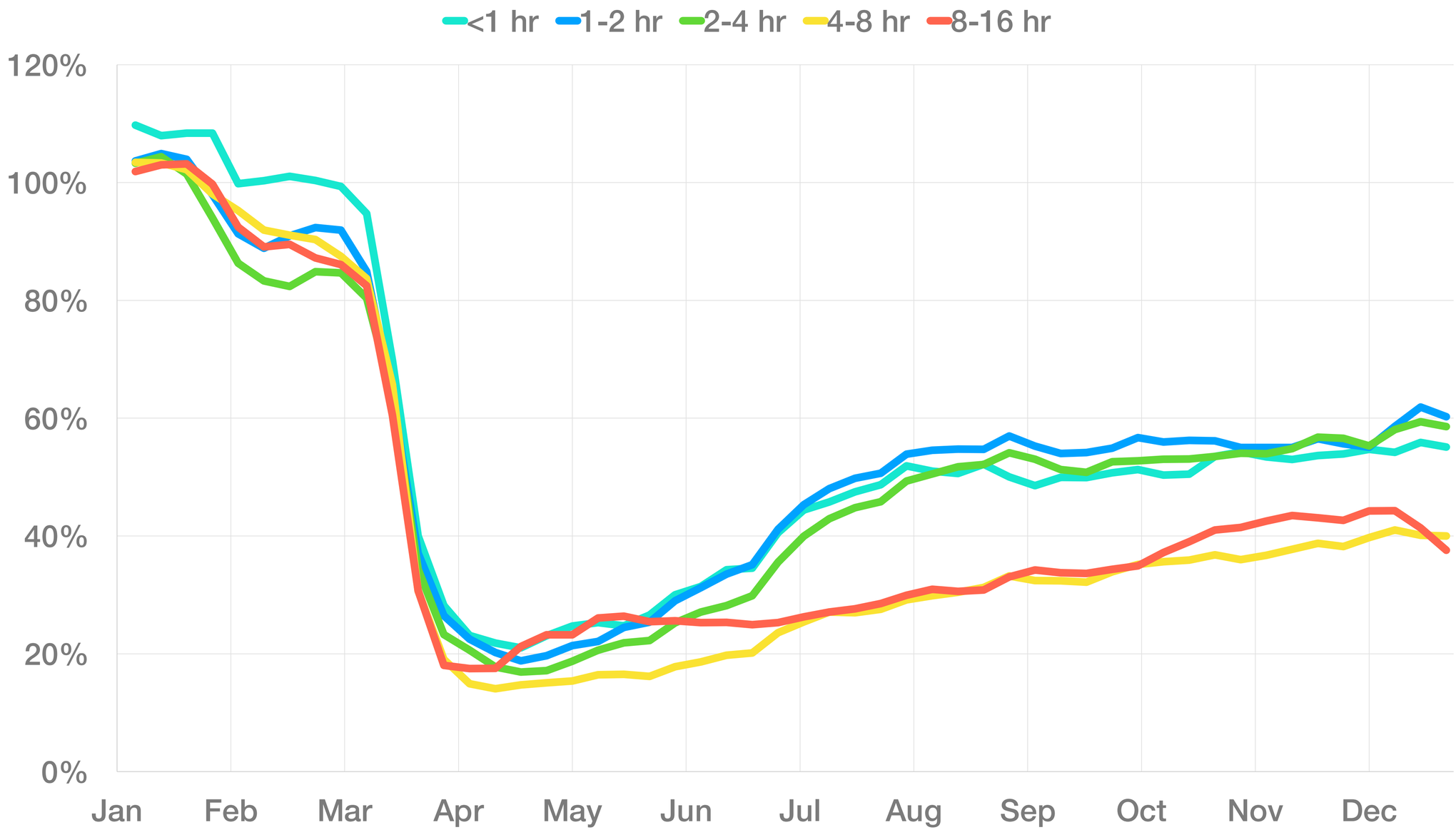
(to/from/within United States)



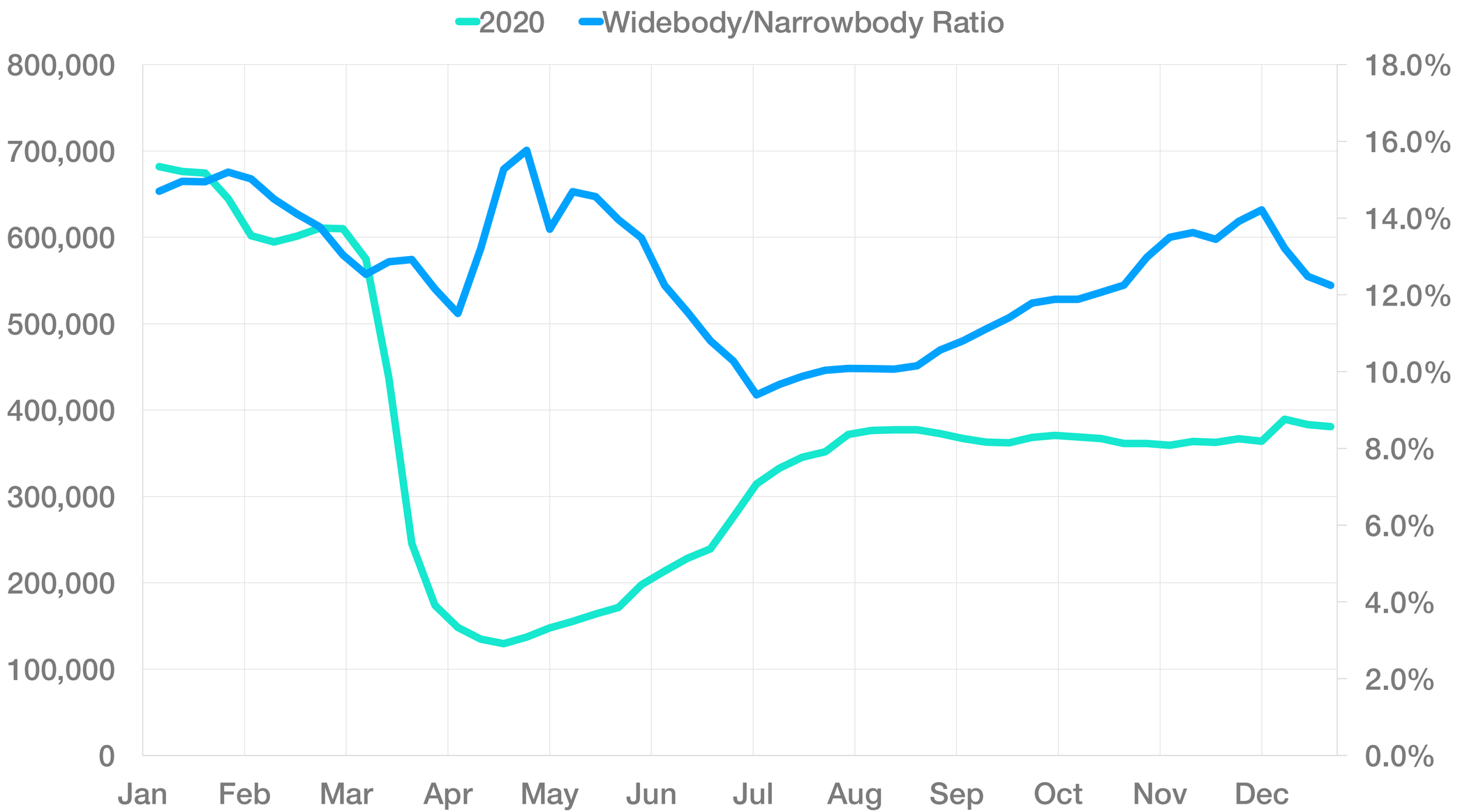
Cargo Airlines

(to/from/within United States)

Stage length impact



Airliner Size Mix



Summary

- Commercial passenger airlines have levelled off at a modest recovery of traffic levels during COVID19
  - Geographically diverse recovery profile
- Other operation types have seen more substantial recovery and even growth through COVID19
- Different recovery profiles for flights above and below 4 hours
- Multiple changes in mix of aircraft size

Today's Panelists

#TRBWebinar

Moderator:
Charles Lattimer

Michael Pack

CATT LABORATORY

Kaan Ozbay, ***New York University/ C2SMART Center***

Mark Duell

FlightAware

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