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 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.

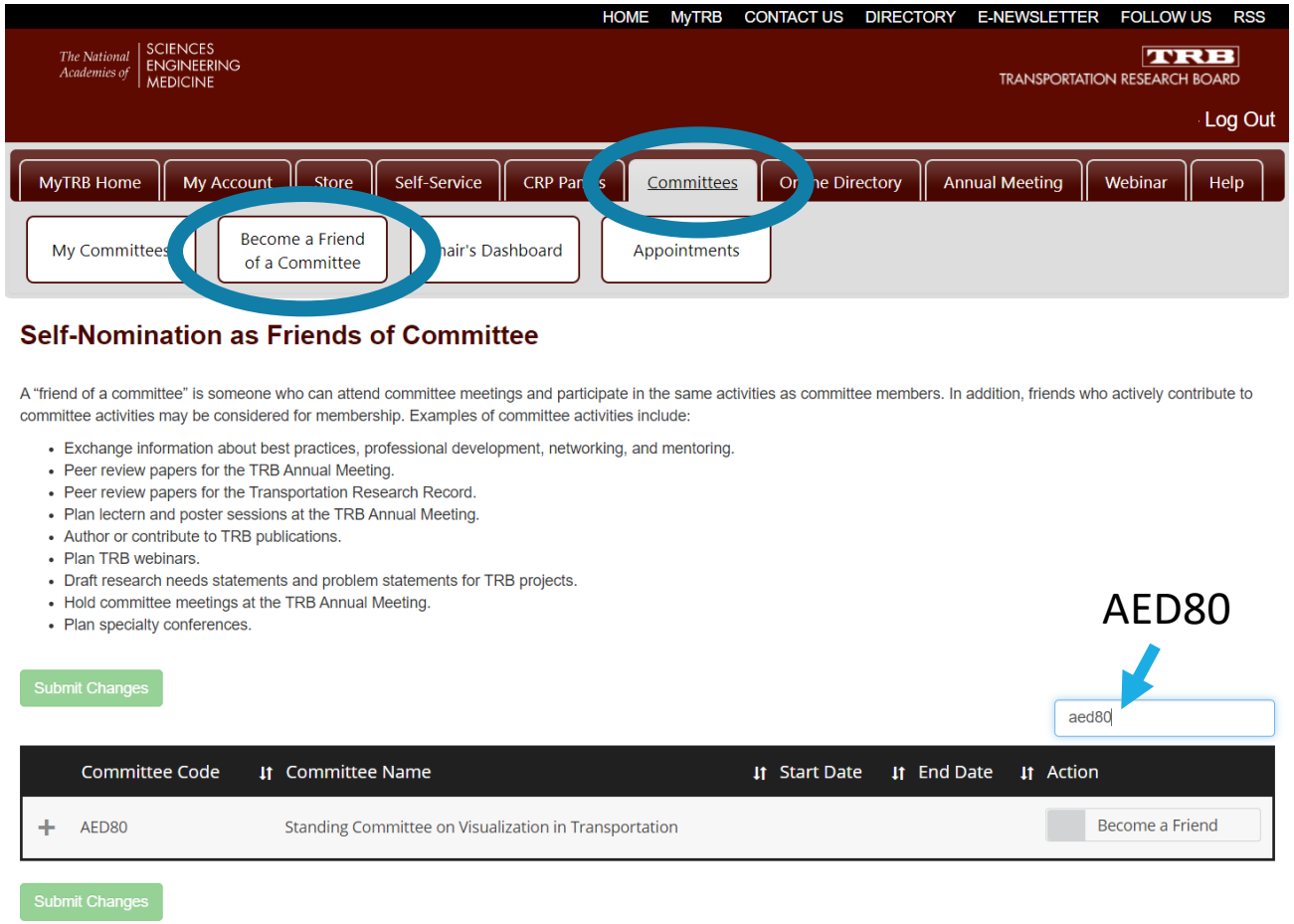
Subcommittees:

- 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

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

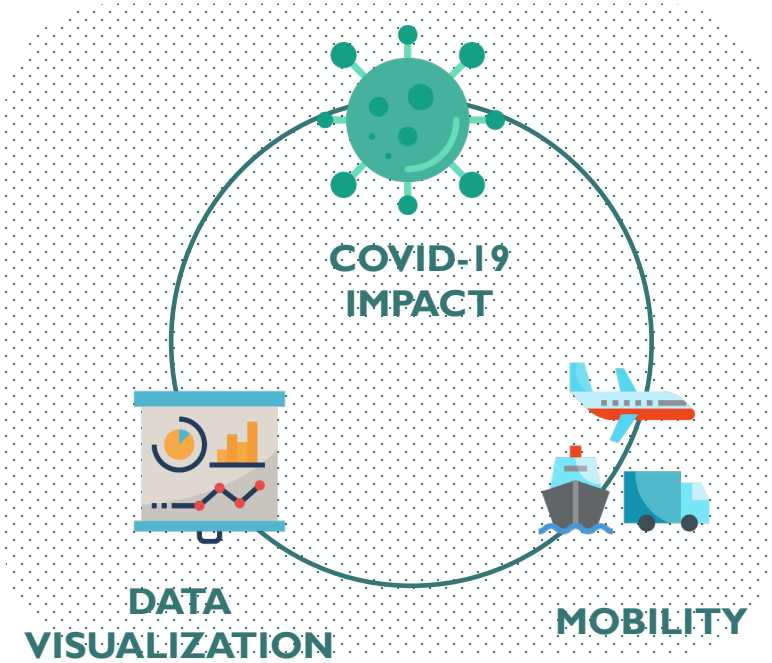
DATA is critical to understanding the impacts and needs in times of crisis. However, simply collecting data is not enough.

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.

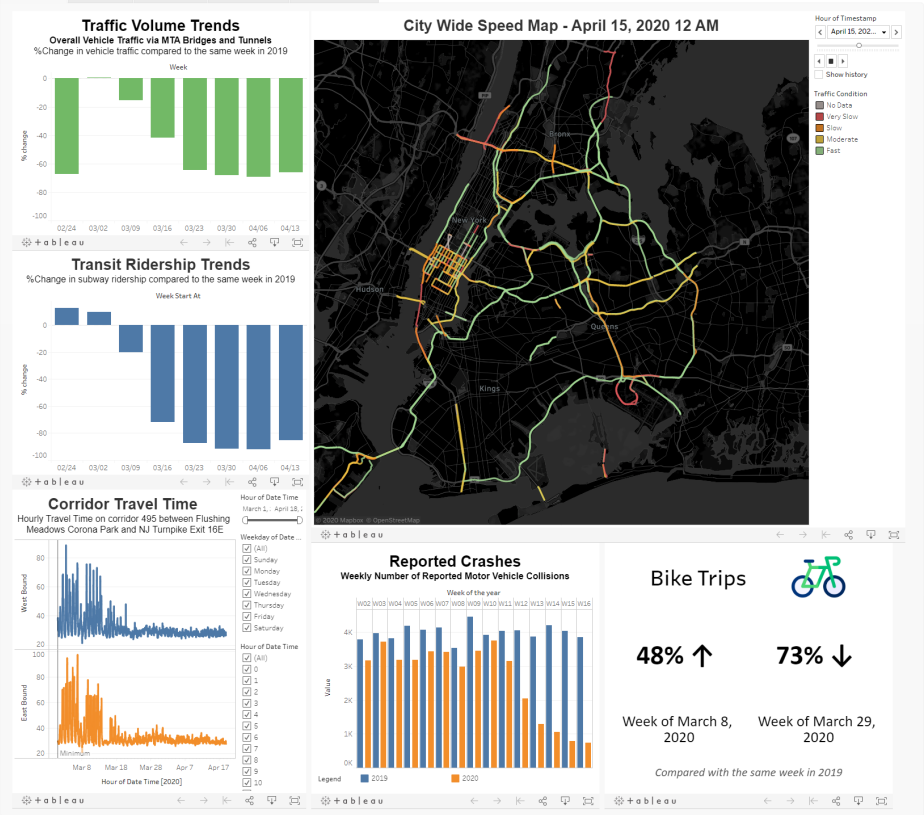
MOBILITY is one good indicator of the effectiveness of Nonpharmaceutical interventions (NPIs) such as social distancing policies during the outbreak and reveals the recovery of the cities.

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

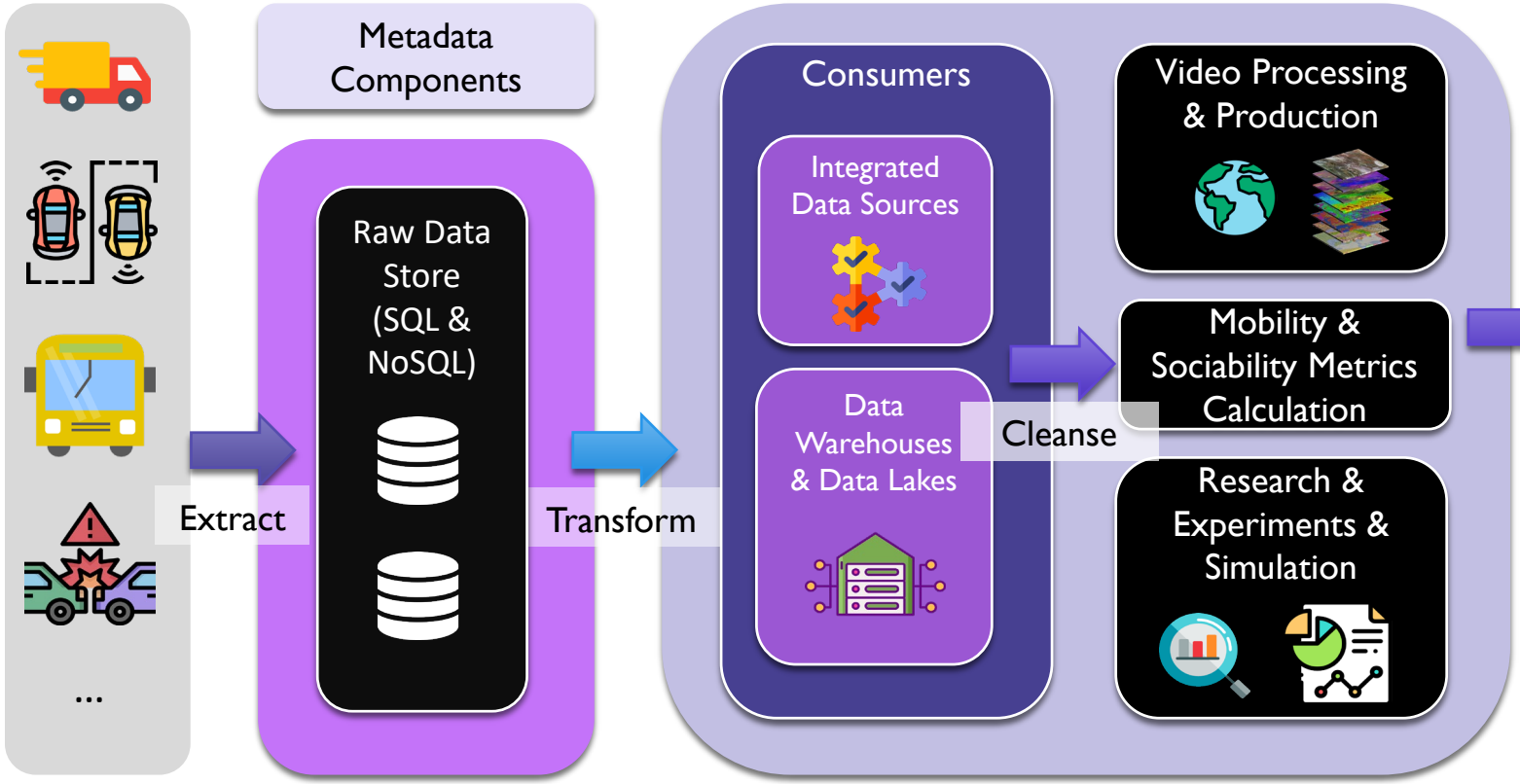
The effect of social distancing

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

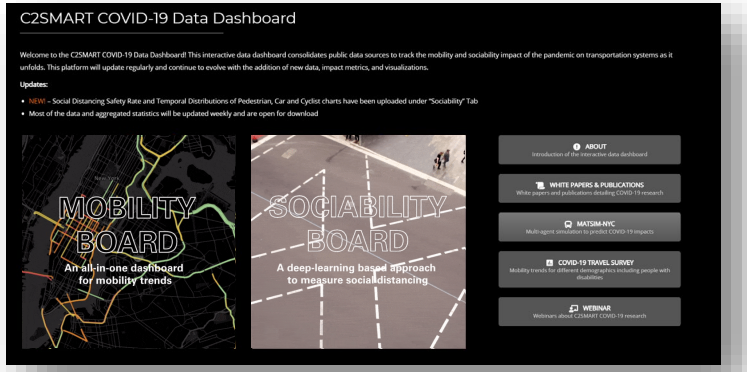
As far as we know it is the only deployed and open site that integrates all of these datasets in one place.

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

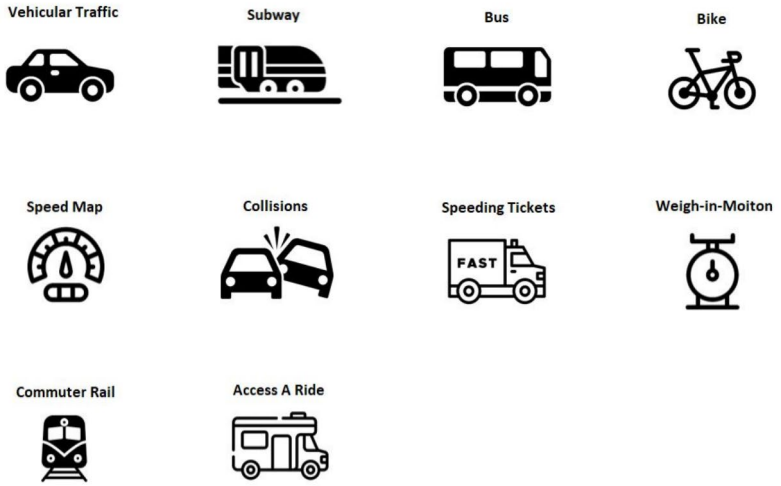
WHITE PAPERS & PUBLICATIONS
White papers and publications detailing COVID-19 research

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

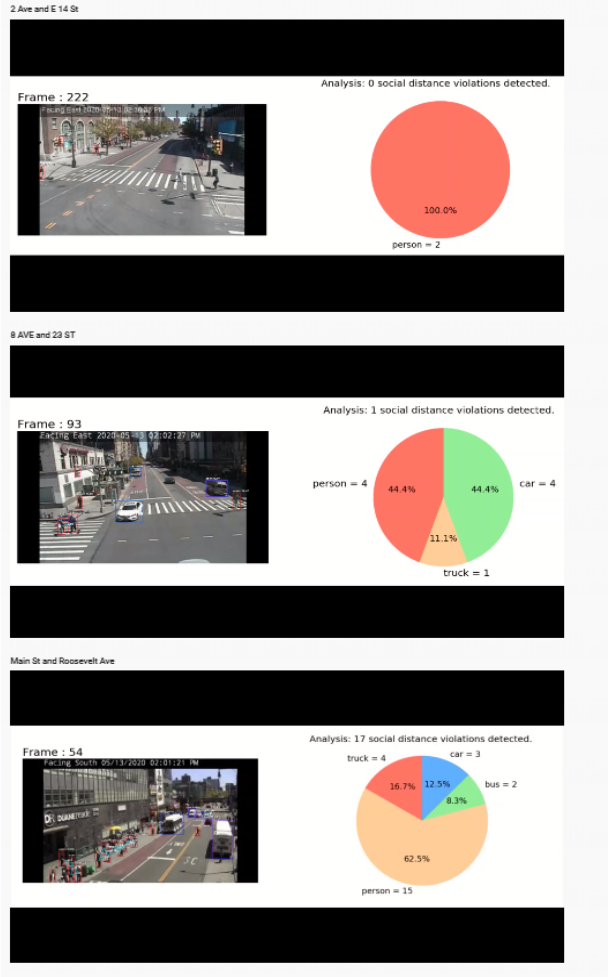
COVID-19 TRAVEL SURVEY
Mobility trends for different demographics including people with disabilities

WEBINAR
Webinars about C2SMART COVID-19 research

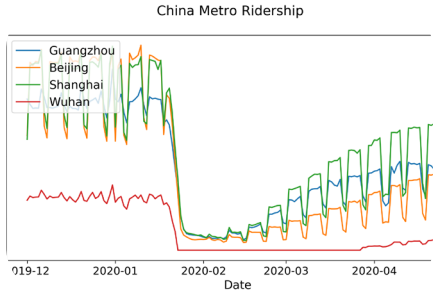
MOBILITY BOARD



SOCIABILITY BOARD

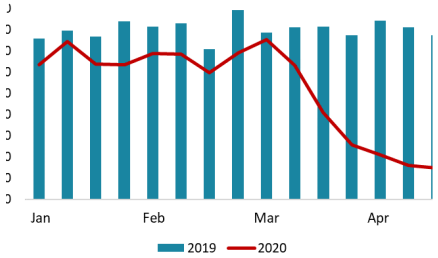


C2SMART COVID-19 Interactive Dashboard Data Collection



Transit Ridership

NYC/Seattle/Multiple cities in China



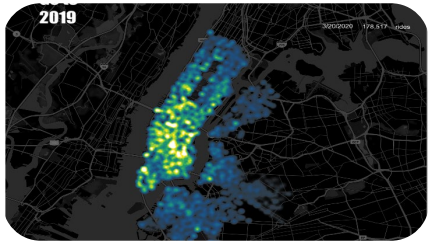
Crashes

NYPD reported crashes: peds/cyclist fatality rate

Speed & Travel Time

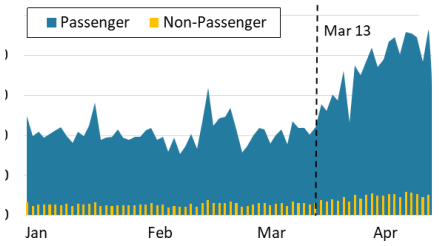
Traffic Speed Map

Corridor Travel Time



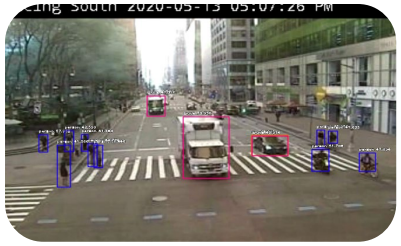
NYC CitiBike trips

Seattle Bike counts, Fremont Bridge



Camera Violations

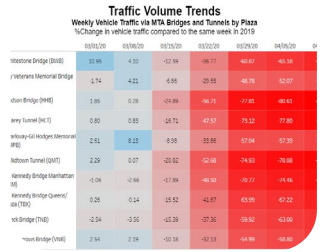
Speeding /parking tickets



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%**

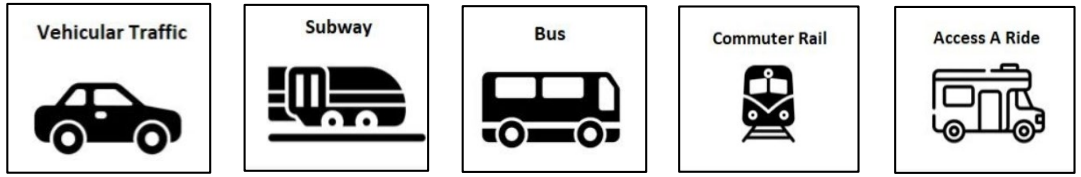
For-hire Vehicle: **-79%**

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

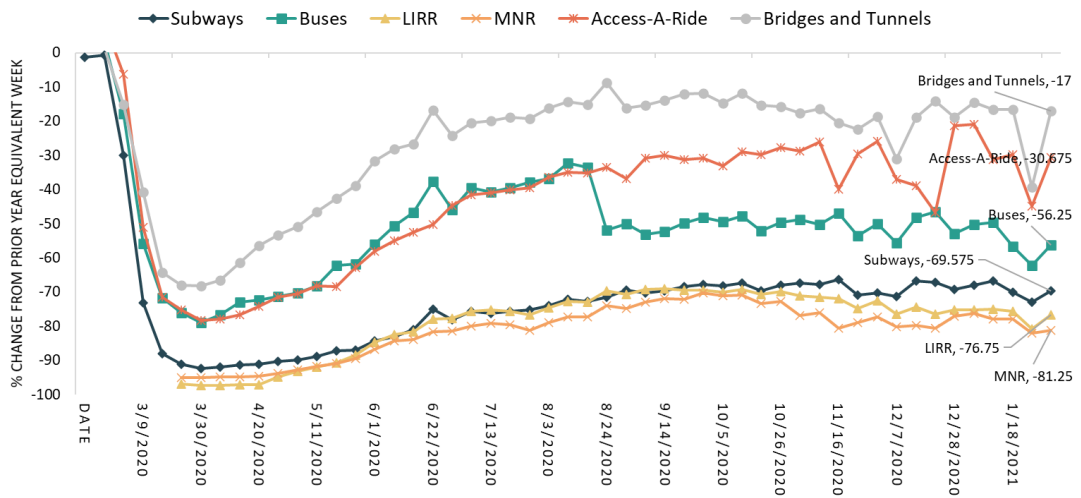


- Uneven recovery speeds - with a faster rebound of truck volume, and slower rebound of transit ridership
- Higher recovery demand for Access-a-ride

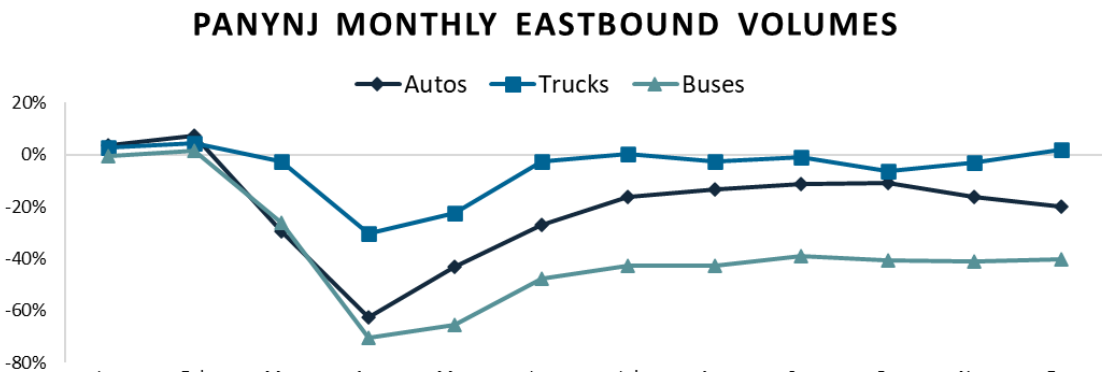
	Subway	Bus	Commuter Rail (LIRR)	Commuter Rail (MNR)	Access-a-ride
Worst week in 2020	-92%	-79%	-97%	-95%	-78%
Week of Jan 25, 2021	-70%	-56%	-76%	-78%	-30%

	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%

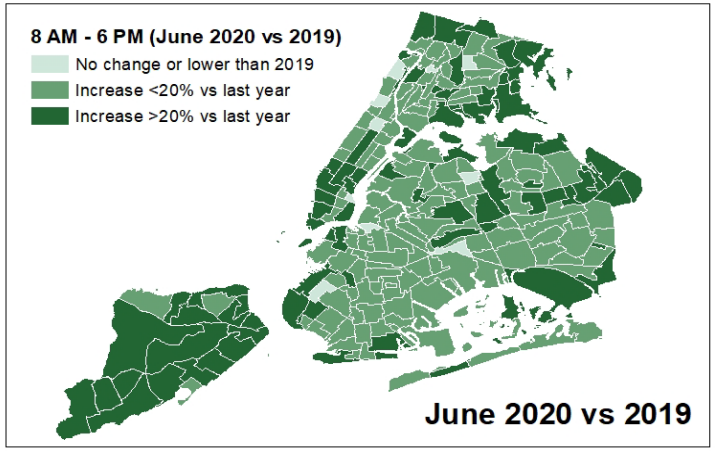
Source: PANYNJ

WHERE WE ARE NOW (Cont'd)

Bus Speed

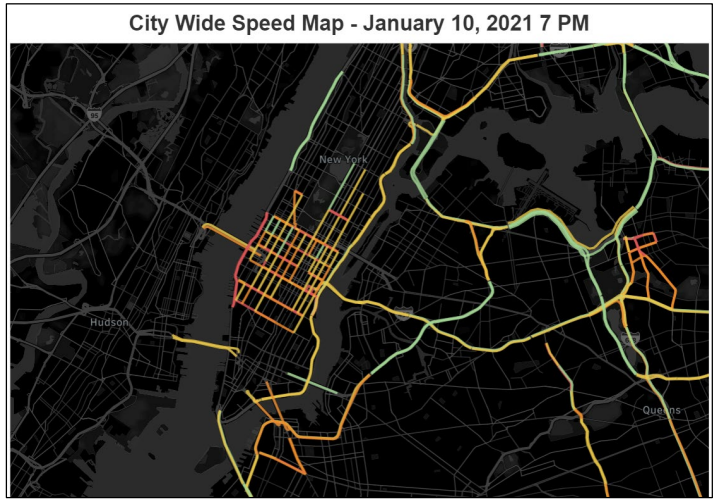
Borough	Monthly Bus Speed, mph (Feb 2020)	Monthly Bus Speed, mph (Dec 2020)	%change (Dec 2020 vs Feb 2020)	Highest %change in 2020 (Highest month vs Feb 2020)
Bronx	7.46	7.74	+4%	+10%
Brooklyn	7.17	7.55	+5%	+21%
Manhattan	5.97	6.44	+8%	+29%
Queens	8.94	9.42	+5%	+21%
Staten Island	14	14.25	+2%	+4%

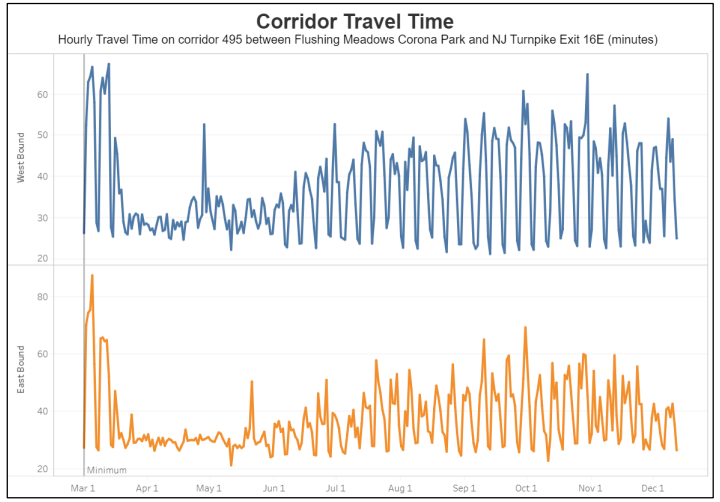
Source: MTA



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

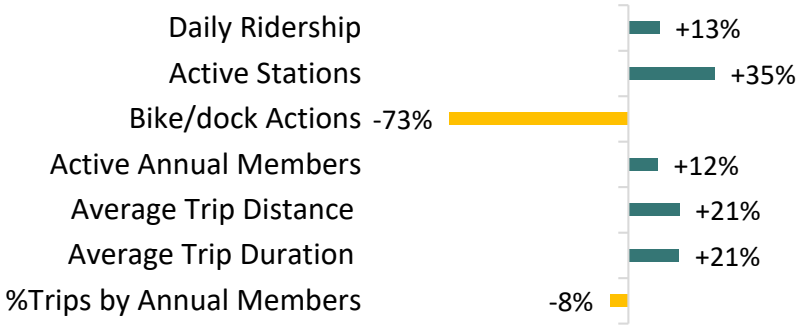
Micromobility is on the rise and have even surpasses pre-pandemic volumes in some cases. These modes are being increasingly counted on as an alternative to the subway, as economical, safer and less-crowded travel options.

Bike Share - Citi Bike

Source: Citi Bike

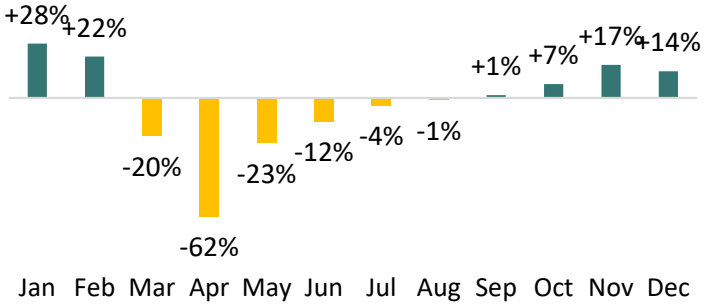
Overall Statistics

% Change (Citi Bike Dec 2020 vs Dec 2019)



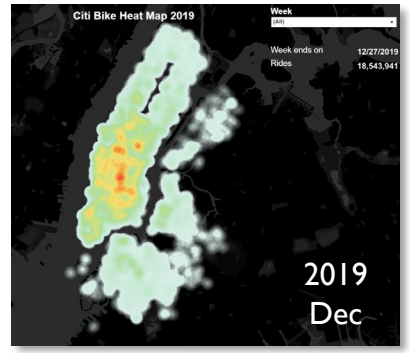
Ridership Trend

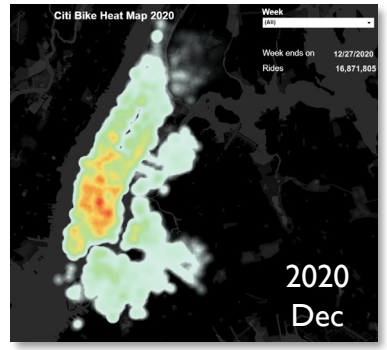
Citi Bike Monthly Ridership Change (2020 vs 2019, NYC only)



Spatial Distributions

Identify hotspots & new clusters

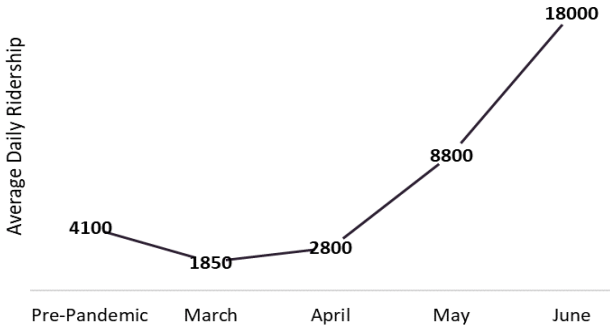




Ride-Sharing Moped - Revel

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.

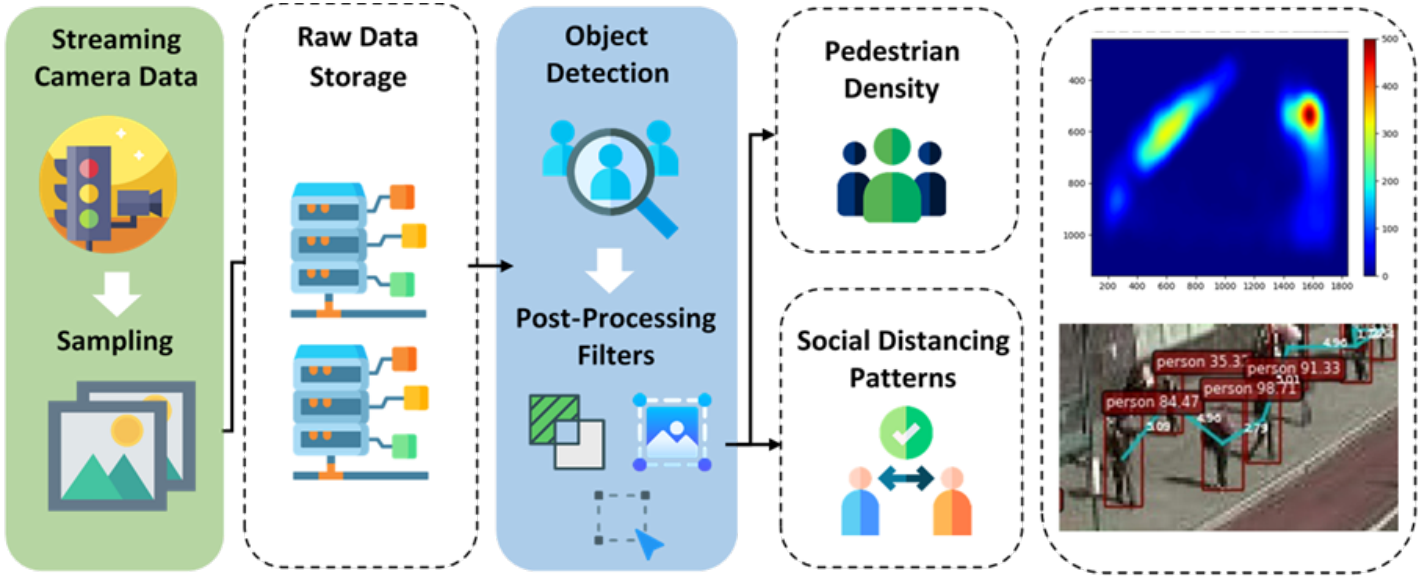
A **deep-learning based video-processing algorithm** was developed to monitor the evolution of social distancing patterns in urban areas.

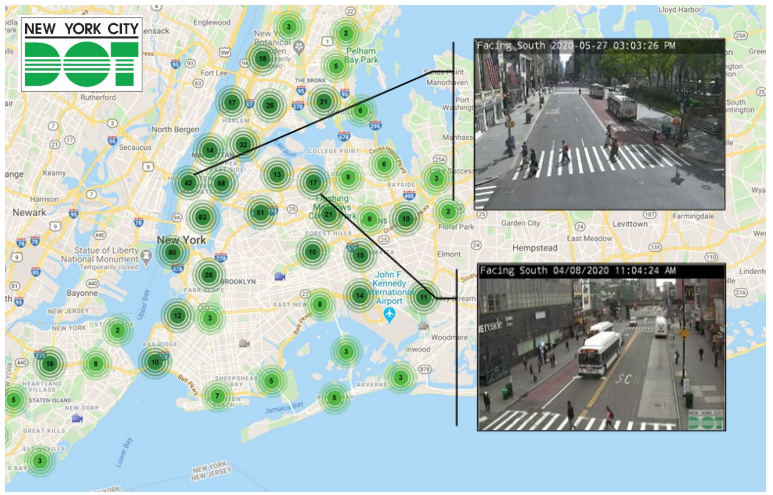
- ✓ Leverages existing public video data sources
- ✓ Real-time object detection for different classes (Pedestrians, Cars, Trucks and Cyclists)
- ✓ Distance projection and approximation
- ✓ Temporal and spatial density distribution

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



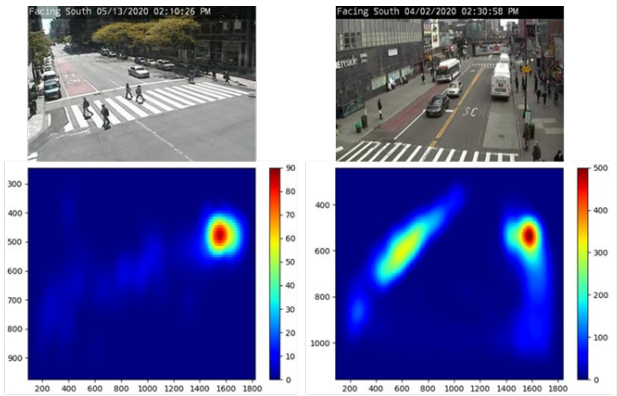


Public Traffic Cameras: https://nyctmc.org/

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.

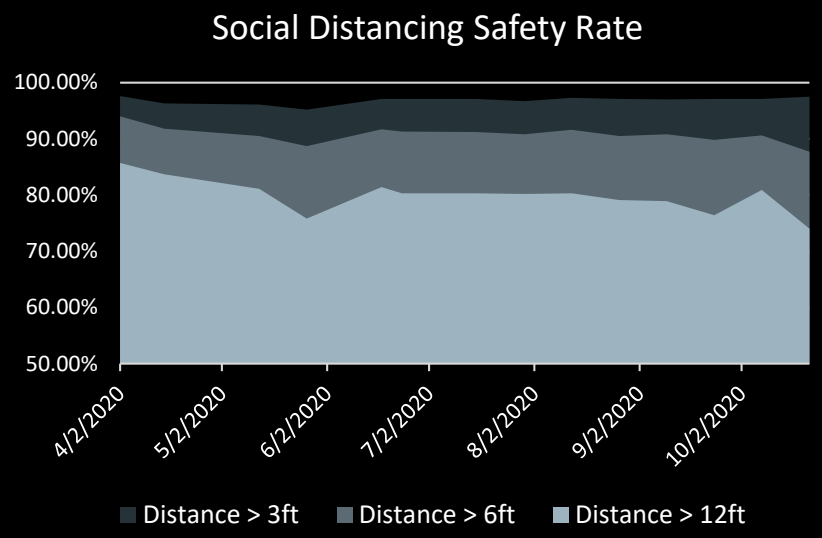


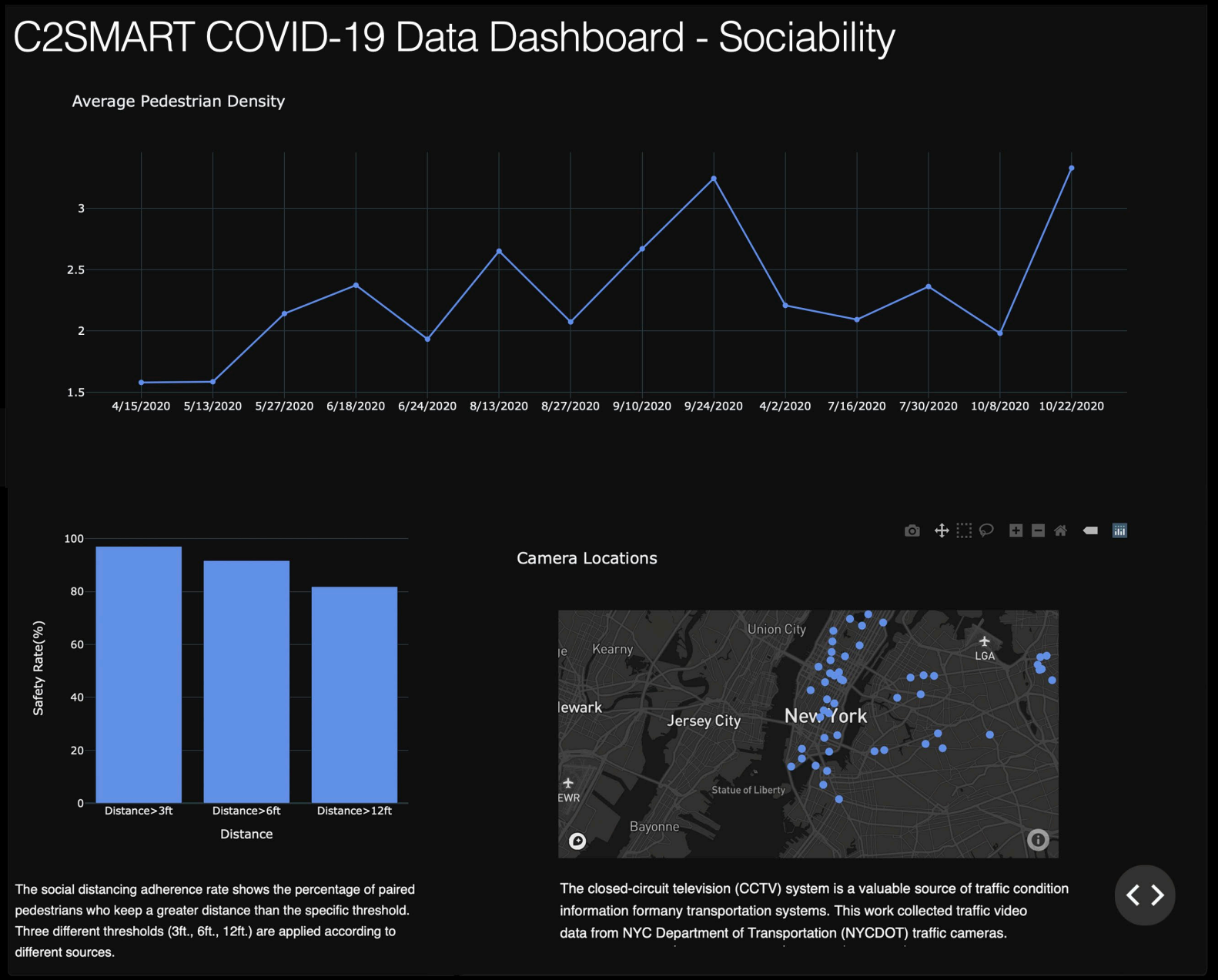
Heatmap example of clustered pedestrians who are not following social distancing guidelines during April 2020.

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

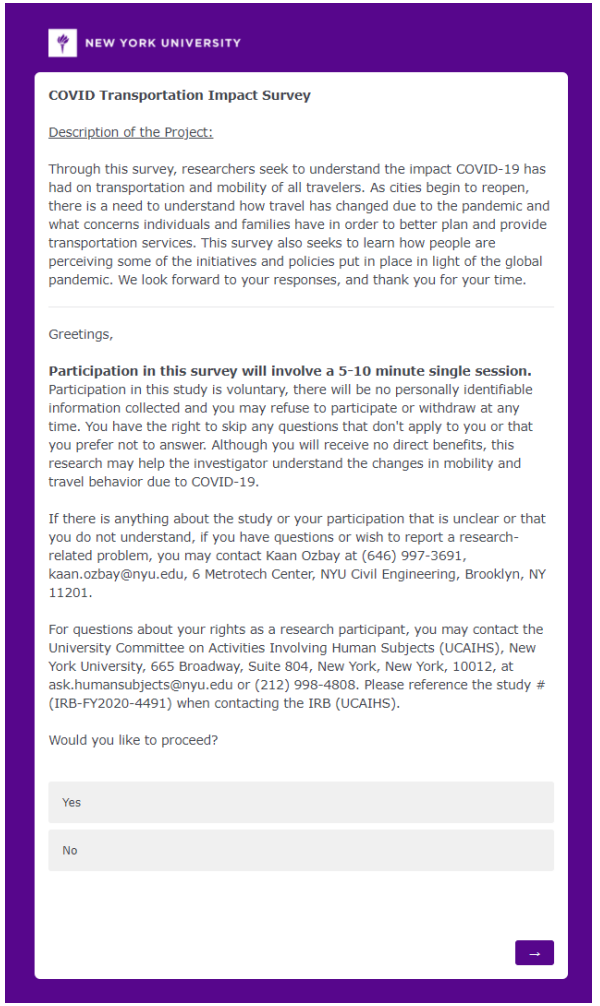
Phase II

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).

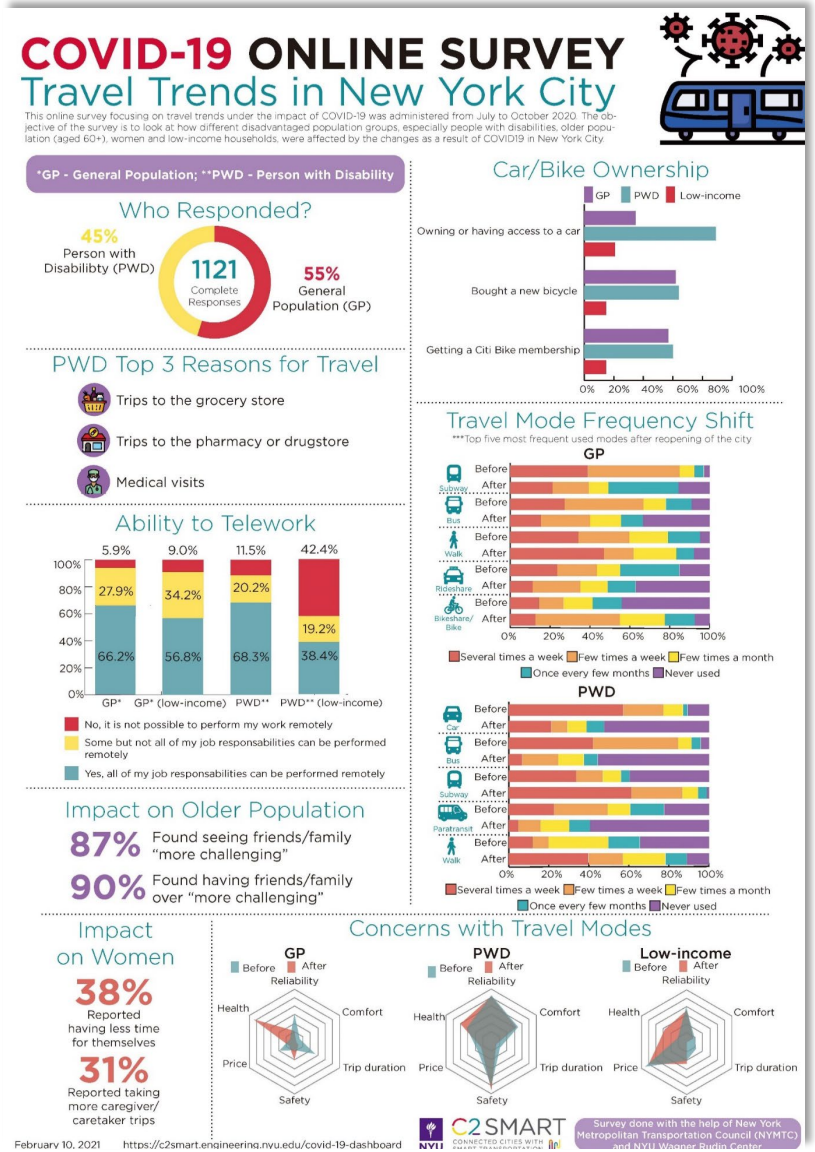
Would you like to proceed?

Yes

No

→

SURVEY RESULTS AT A GALANCE



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

Who Responded?

45% Person with Disabilibty (PWD)

1121 Complete Responses

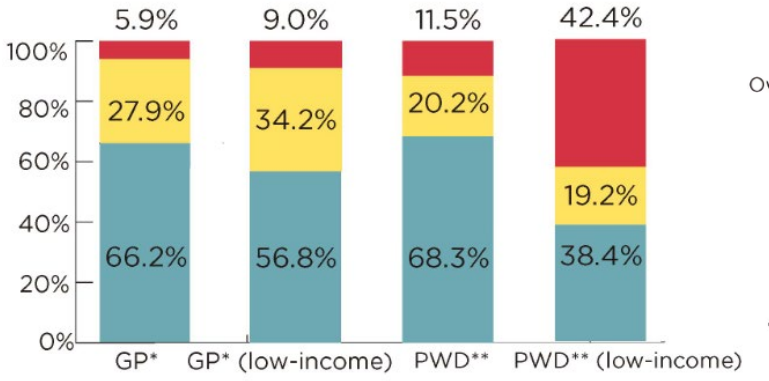
55% General Population (GP)

Impact on Women

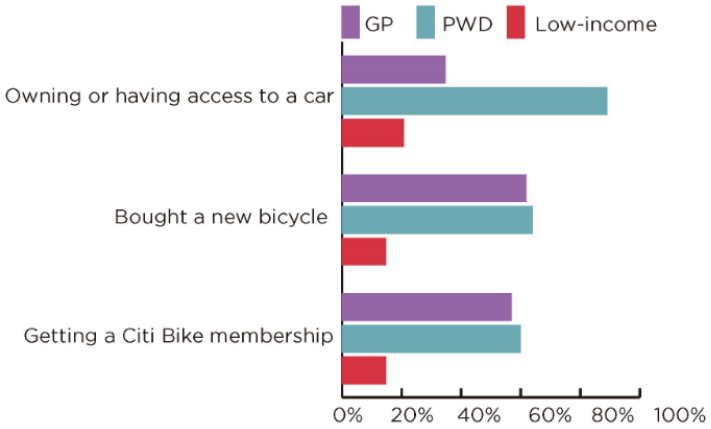
38% Reported having less time for themselves

31% Reported taking more caregiver/ caretaker trips

Ability to Telework

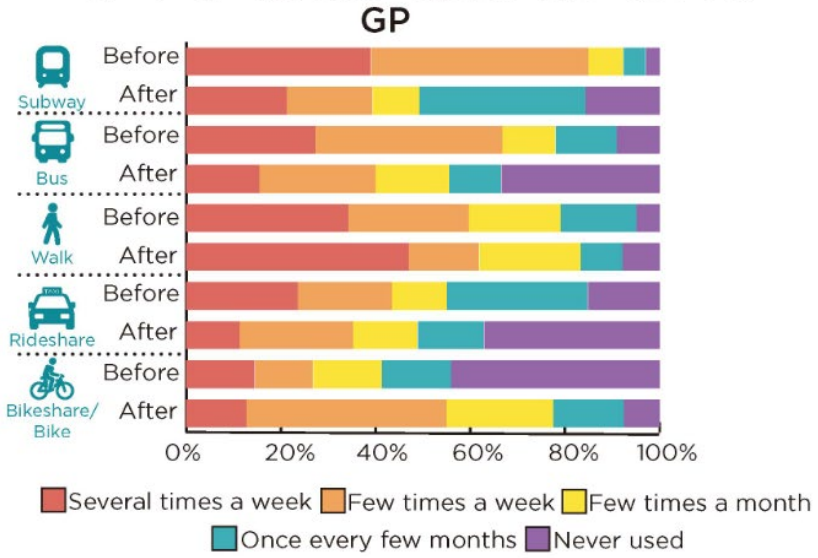


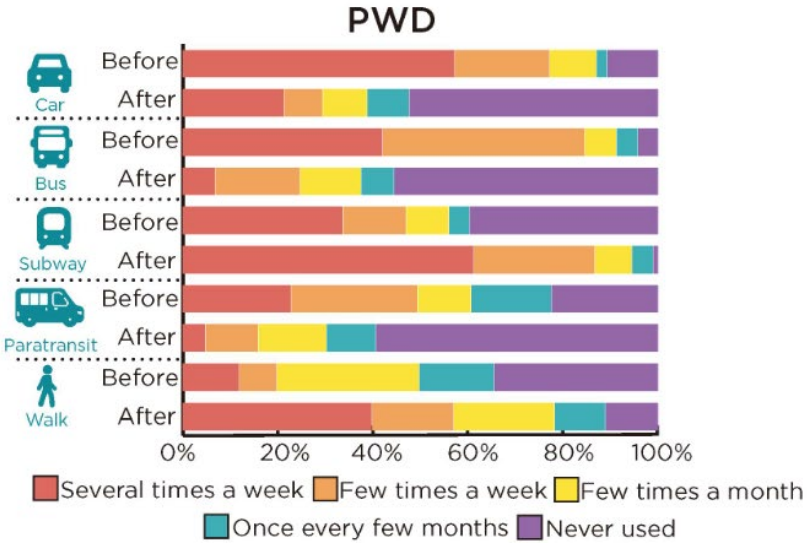
Car/Bike Ownership



Travel Mode Frequency Shift

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





Impact on Older Population

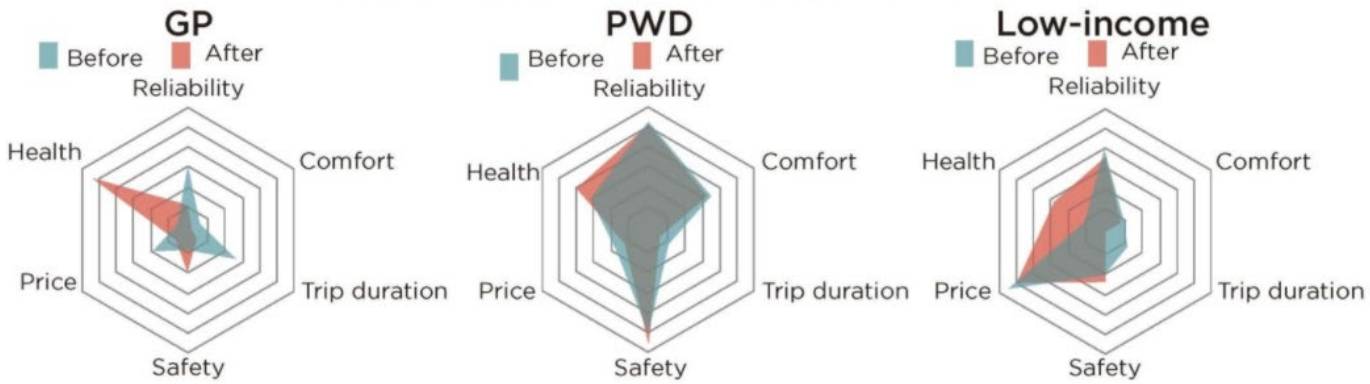
87% Found seeing friends/family "more challenging"

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

Lead: Kaan Ozbay, Joseph Y.J. Chow, Shri Iyer

NYU Team: Jingqin Gao, Yubin Shen, Zilin Bian, Suzana Duran Bernardes,

Fan Zuo, Yubin Shen, Abhinav Bhattacharyya, Yueshuai He,

Ding Wang, Siva Soorya Muruga Thambiran, Nick Hudanich, John Petinos

UW Team: Jingxing Wang, Yanyan Chen,

Sai Sarath Chandra Pavuluri Venkata

Lead: Xuegang Jeff Ban

Rutgers Team: Chaekuk Na

Lead: Hani Nassif

New York University

Tandon School of Engineering

6 MetroTech Center

Brooklyn, NY 11201

c2smart.engineering.nyu.edu

kaan.ozbay@nyu.edu

THANK YOU

Visualizing the COVID-19 Impacts Platform

Michael Pack, Director of CATT Laboratory

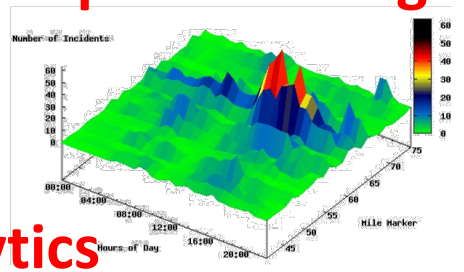
Enabling agencies through better communication, data-based decision making, advanced insights discovery, and enhanced operations and planning capabilities.

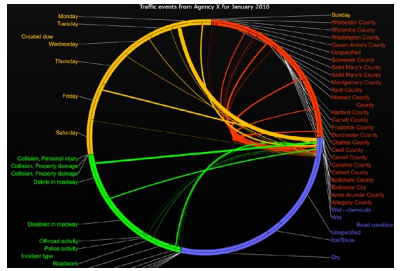
CATT Lab Visualization Team

- 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

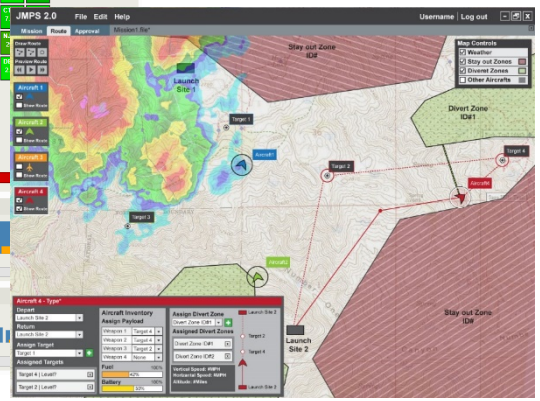
Analytics of All Flavors

Speed & Congestion

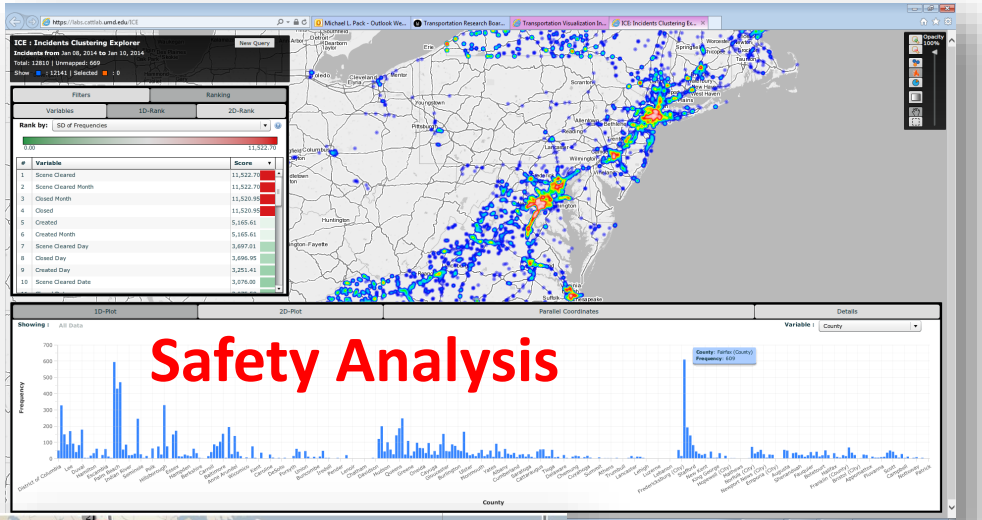




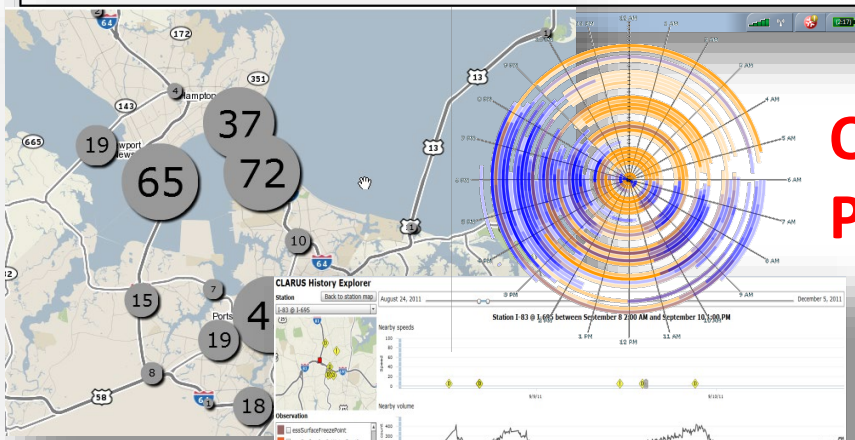
Mobility Analytics



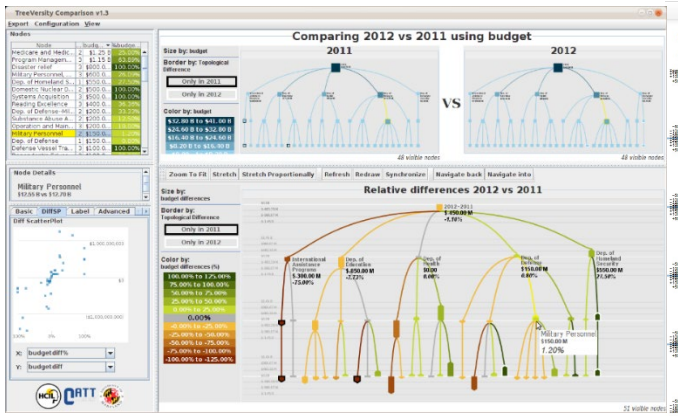
Safety Analysis

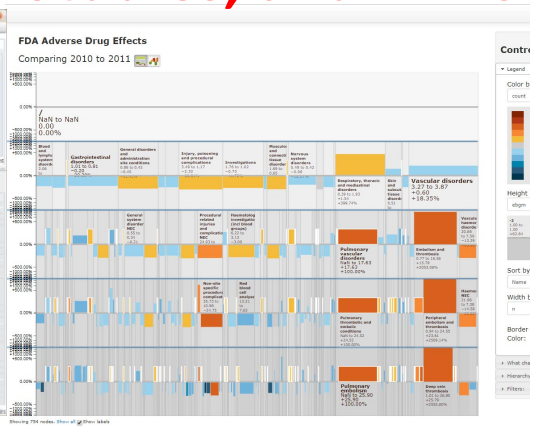


Operations and Planning Analytics

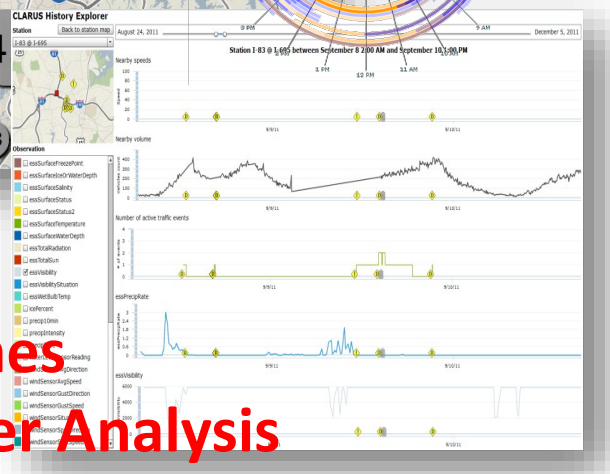


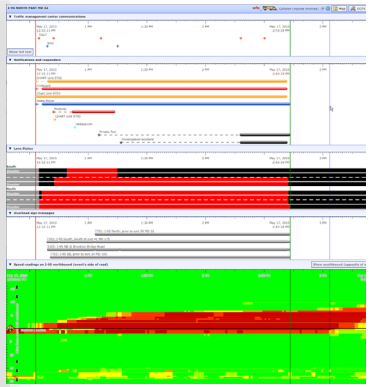
Project Prioritization, Before & After Studies, and AARs





Work Zones & Weather Analysis

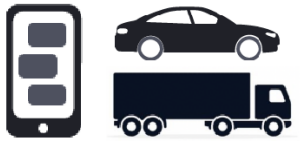




COVID-19 Travel Impacts Analysis

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

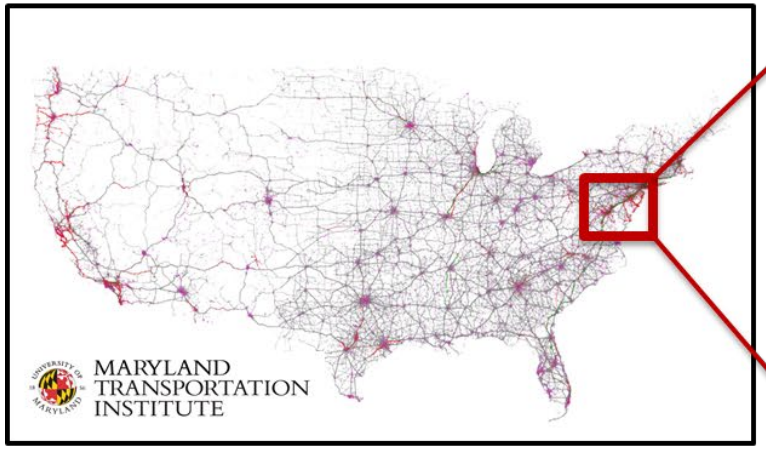
COVID-19 Cases, Business Establishment Data, and Other Data

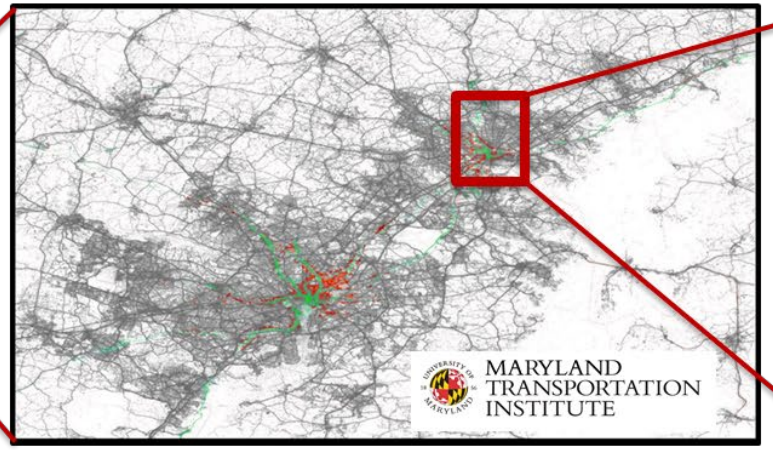
University of Maryland COVID-19 Impact Analysis Platform Metrics and Analytics

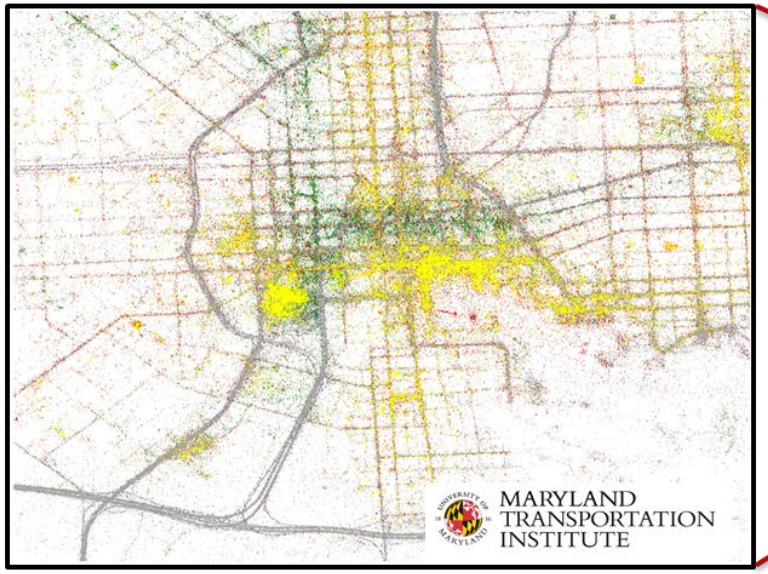
Data Integration and Aggregation

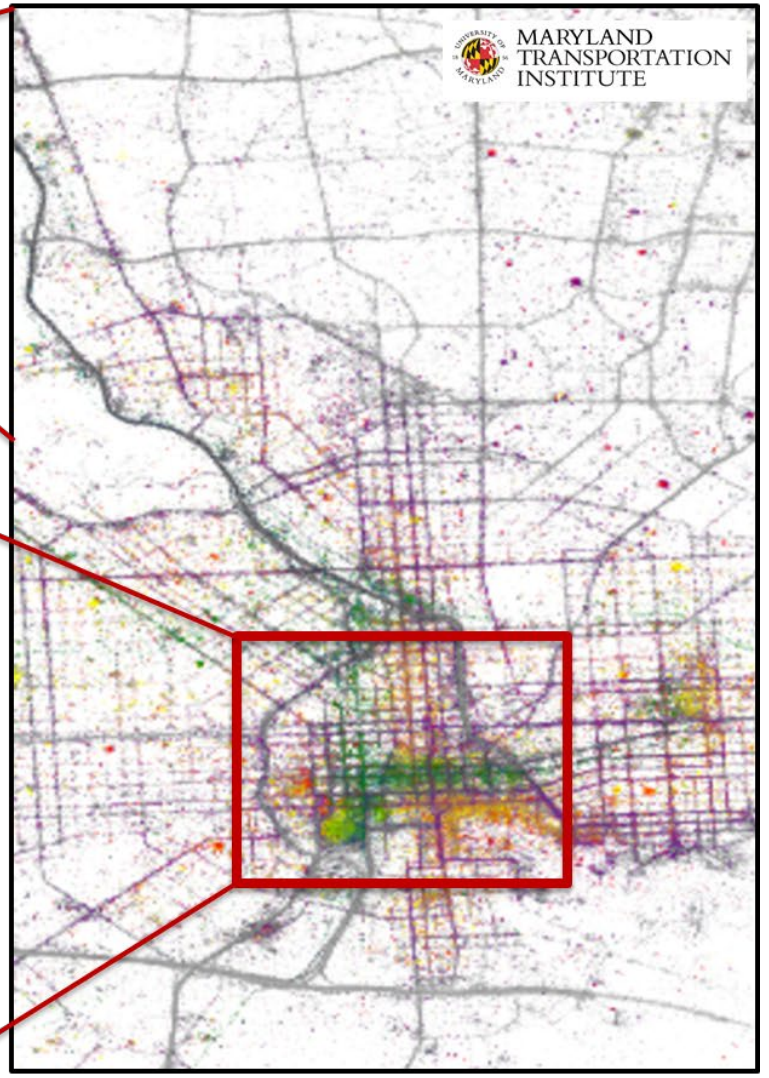
Multi-Level Weighting

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

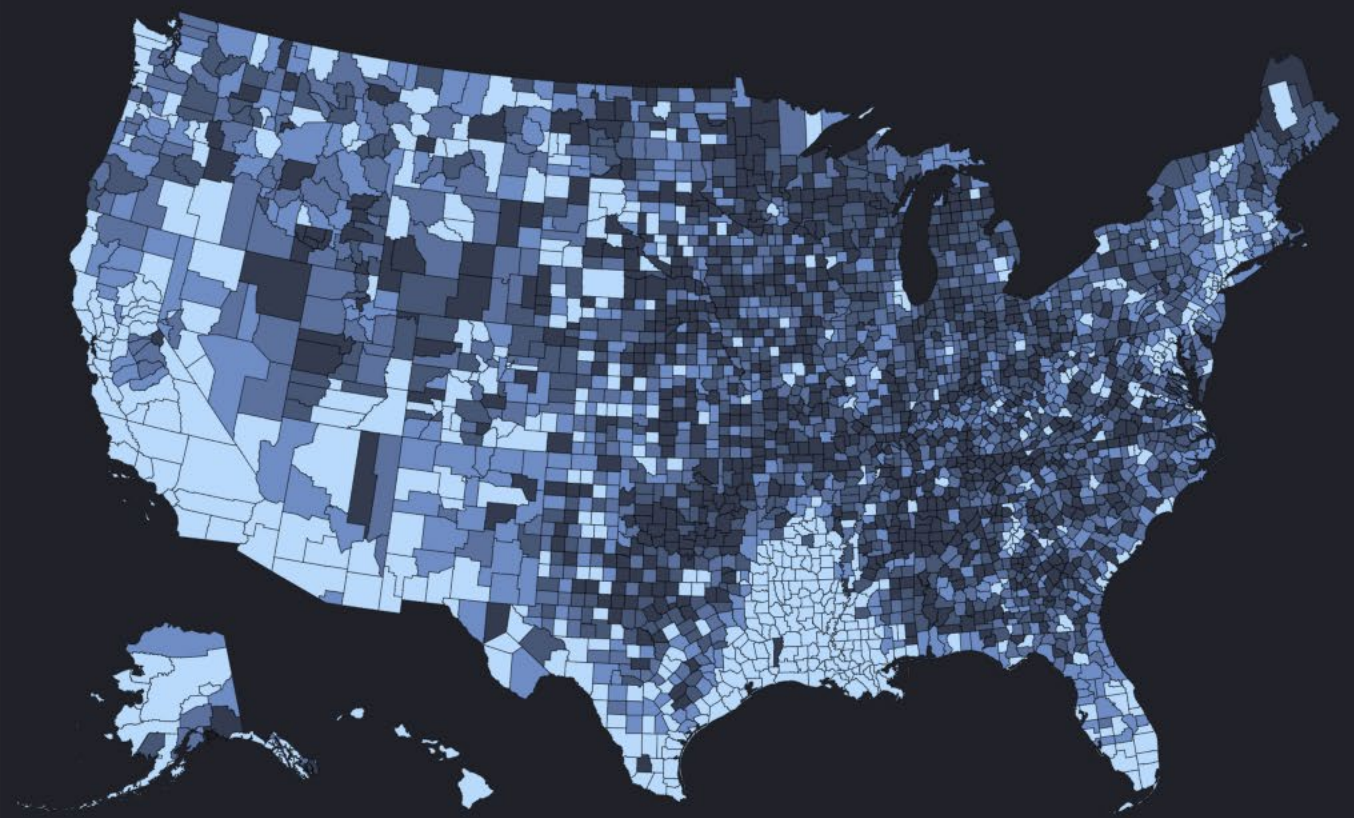
Search for a county

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/

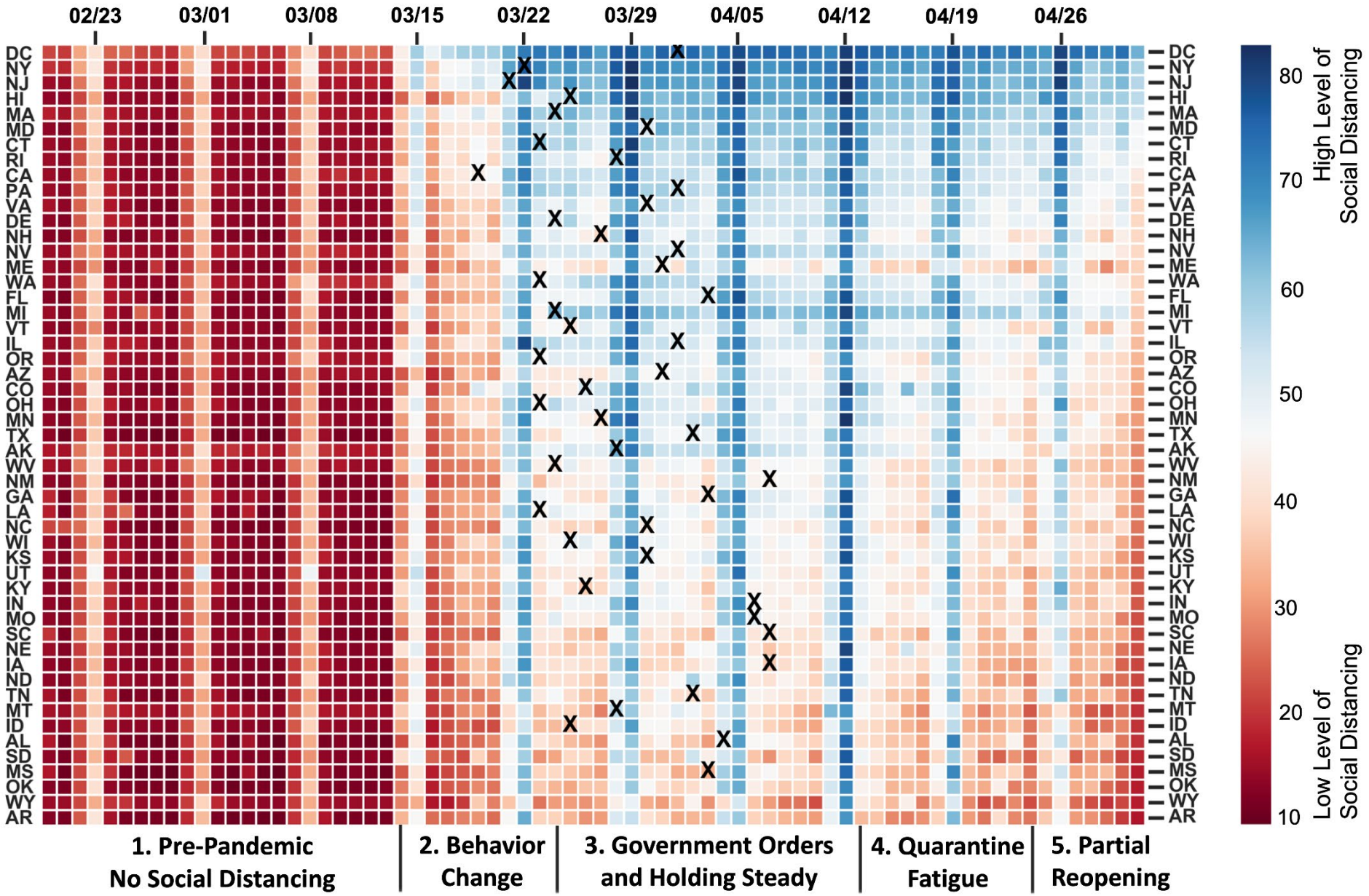
Live Demo
data.covid.umd.edu

MARYLAND TRANSPORTATION INSTITUTE

Social Distancing Index by State

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

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

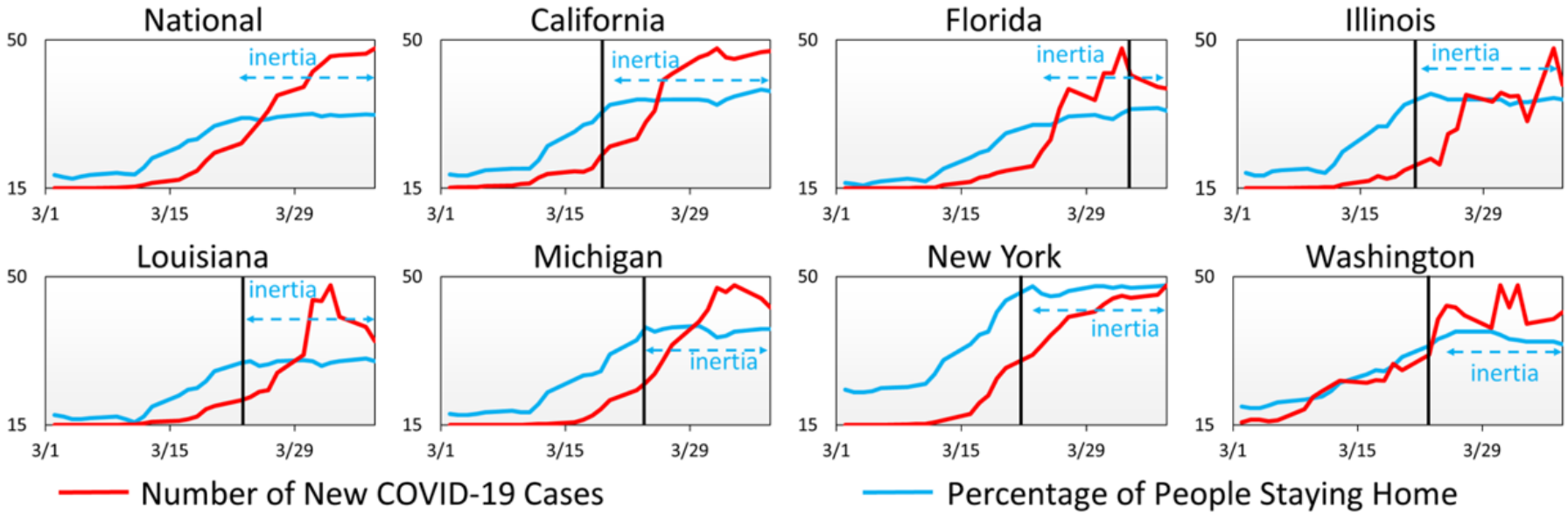


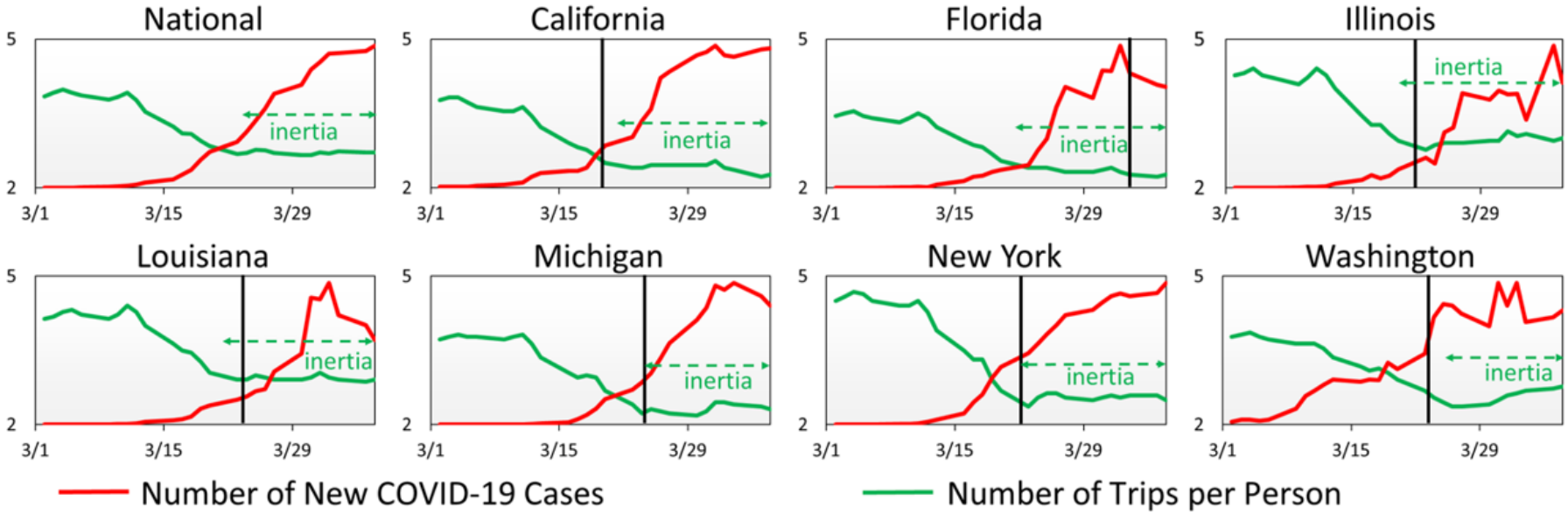
MARYLAND TRANSPORTATION INSTITUTE

Impact of Stay-at-Home Orders on Mobility Behavior

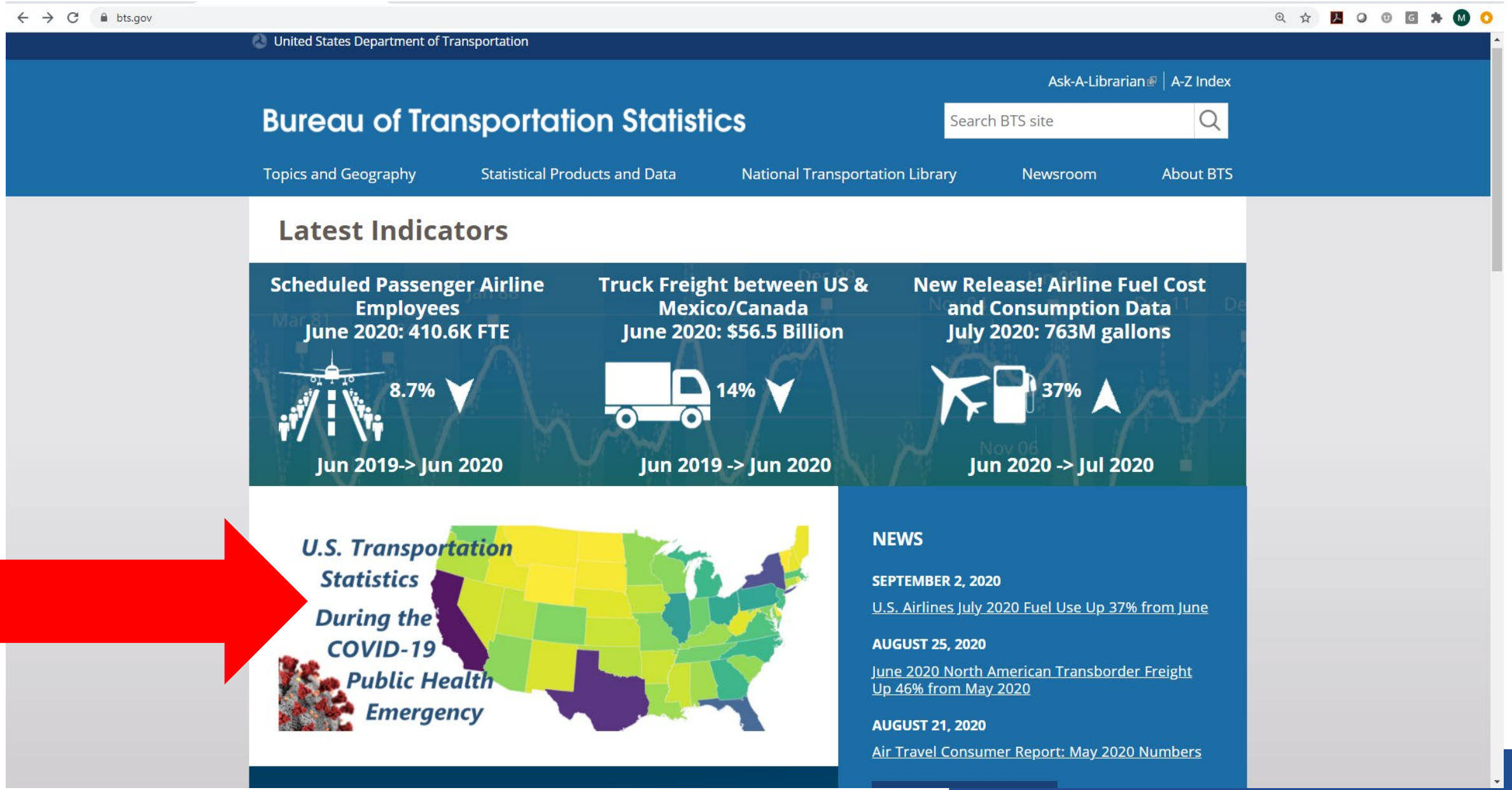
March 1~April 9 data from: data.covid.umd.edu

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.

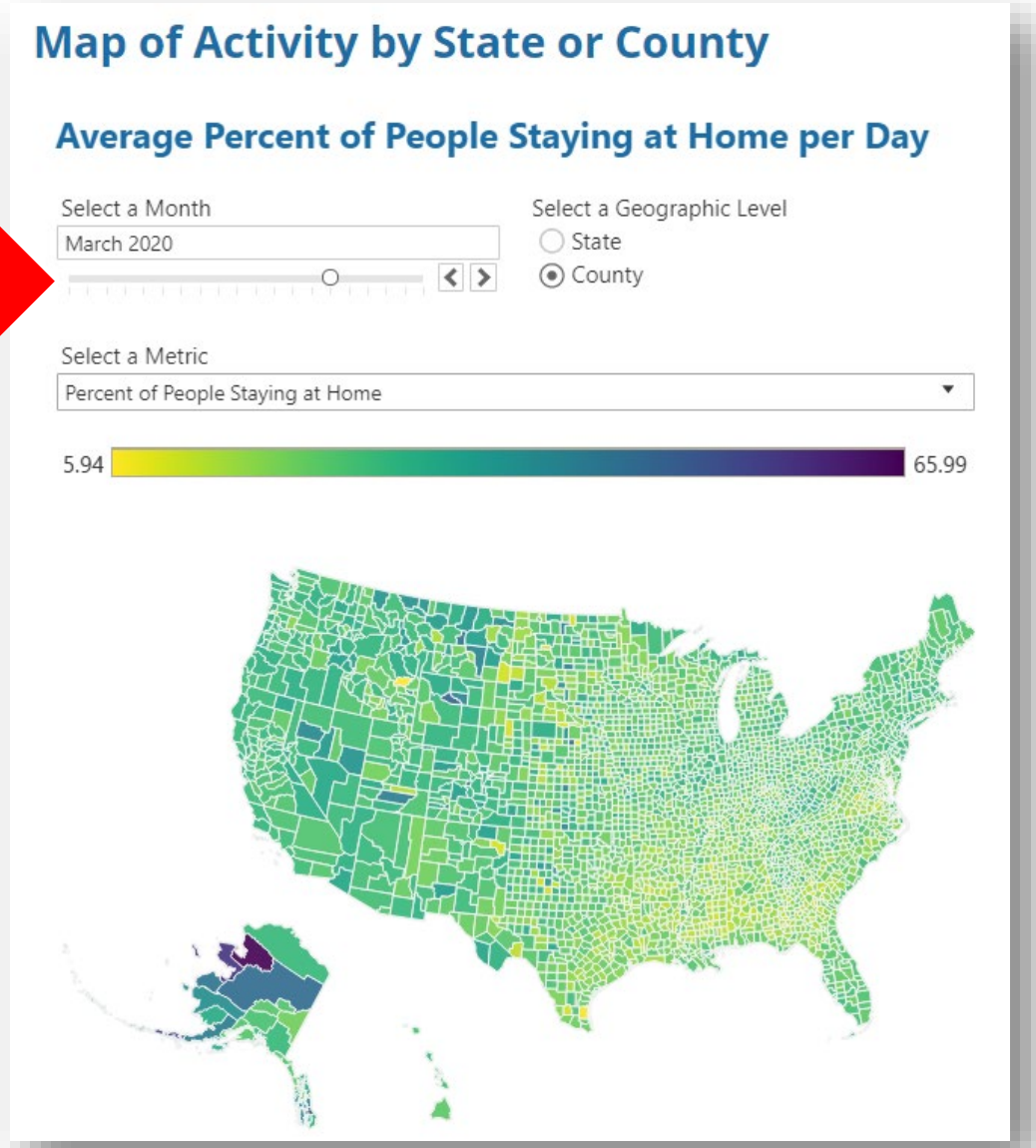


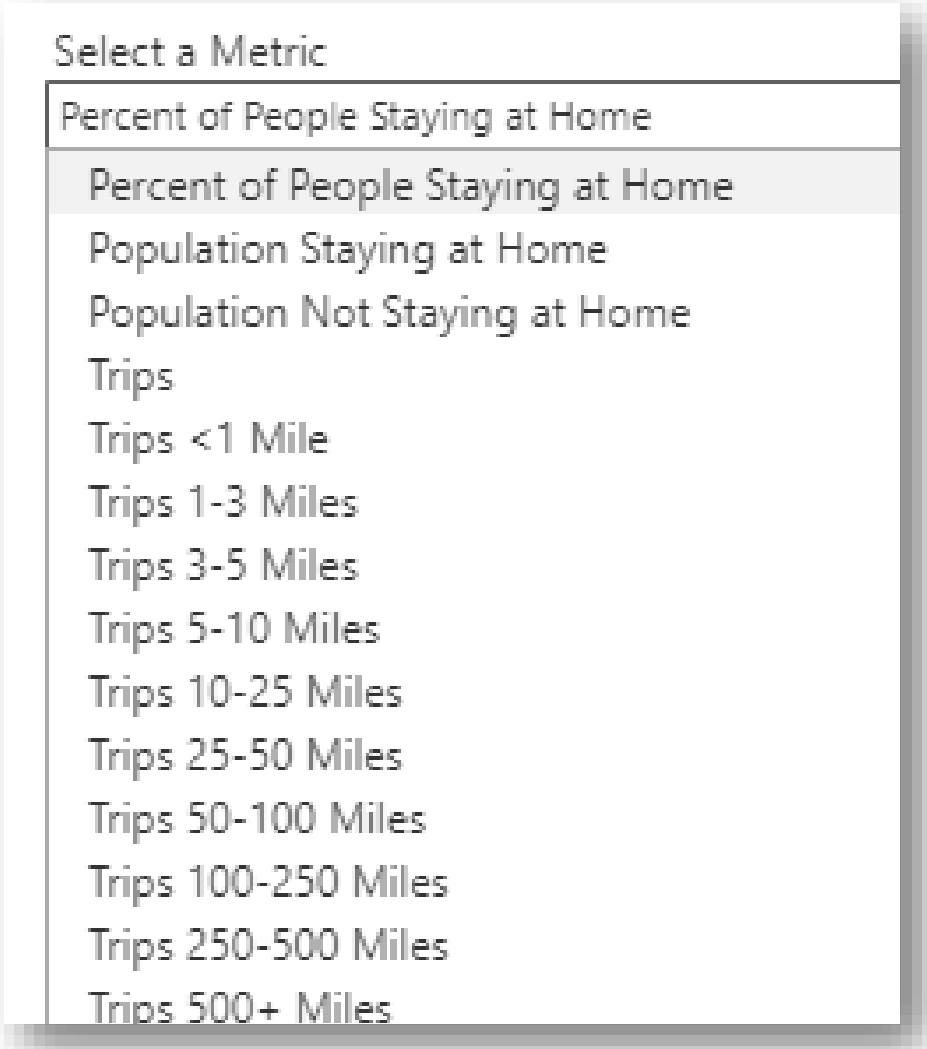


USDOT Bureau of Transportation Statistics

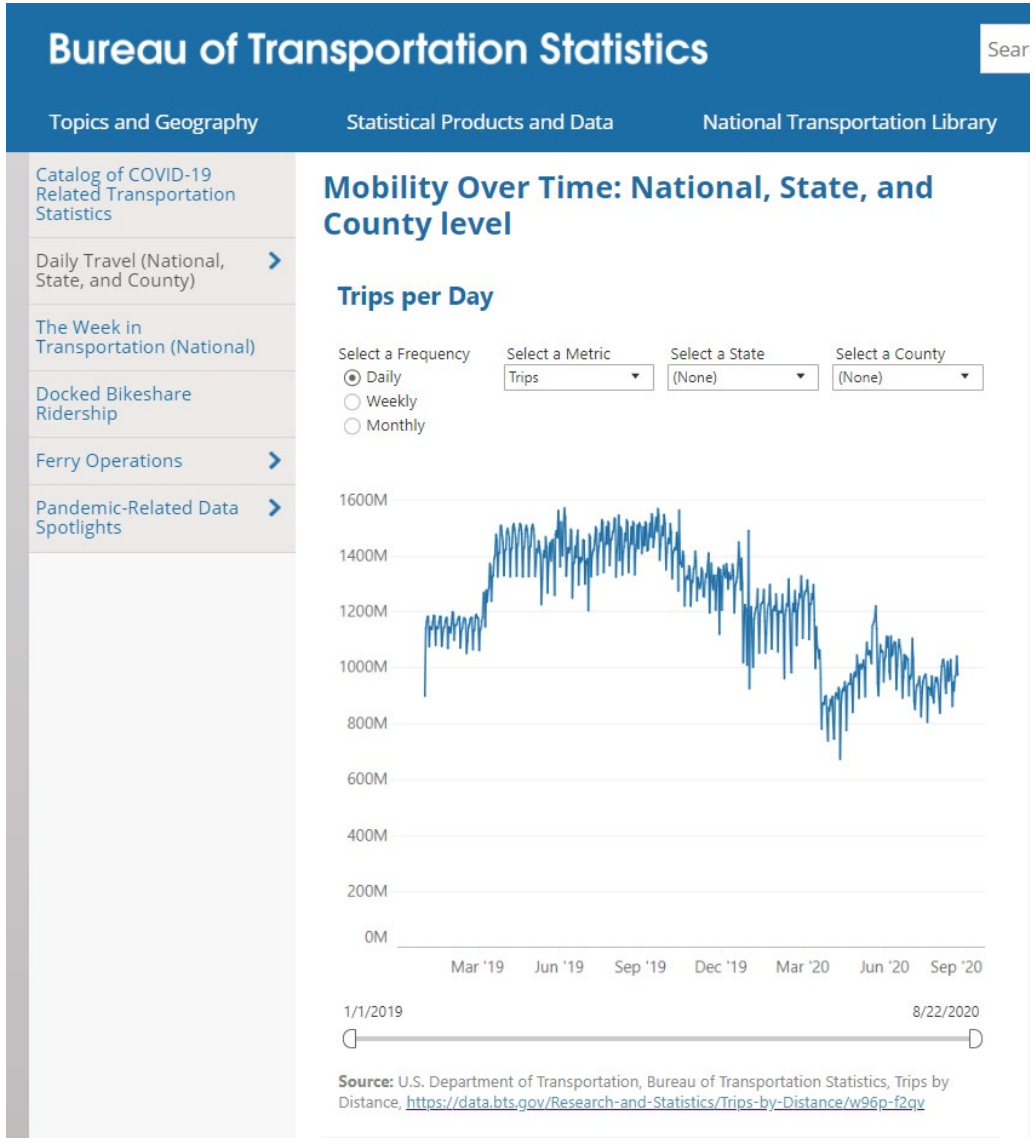


USDOT Bureau of Transportation Statistics





USDOT Bureau of Transportation Statistics

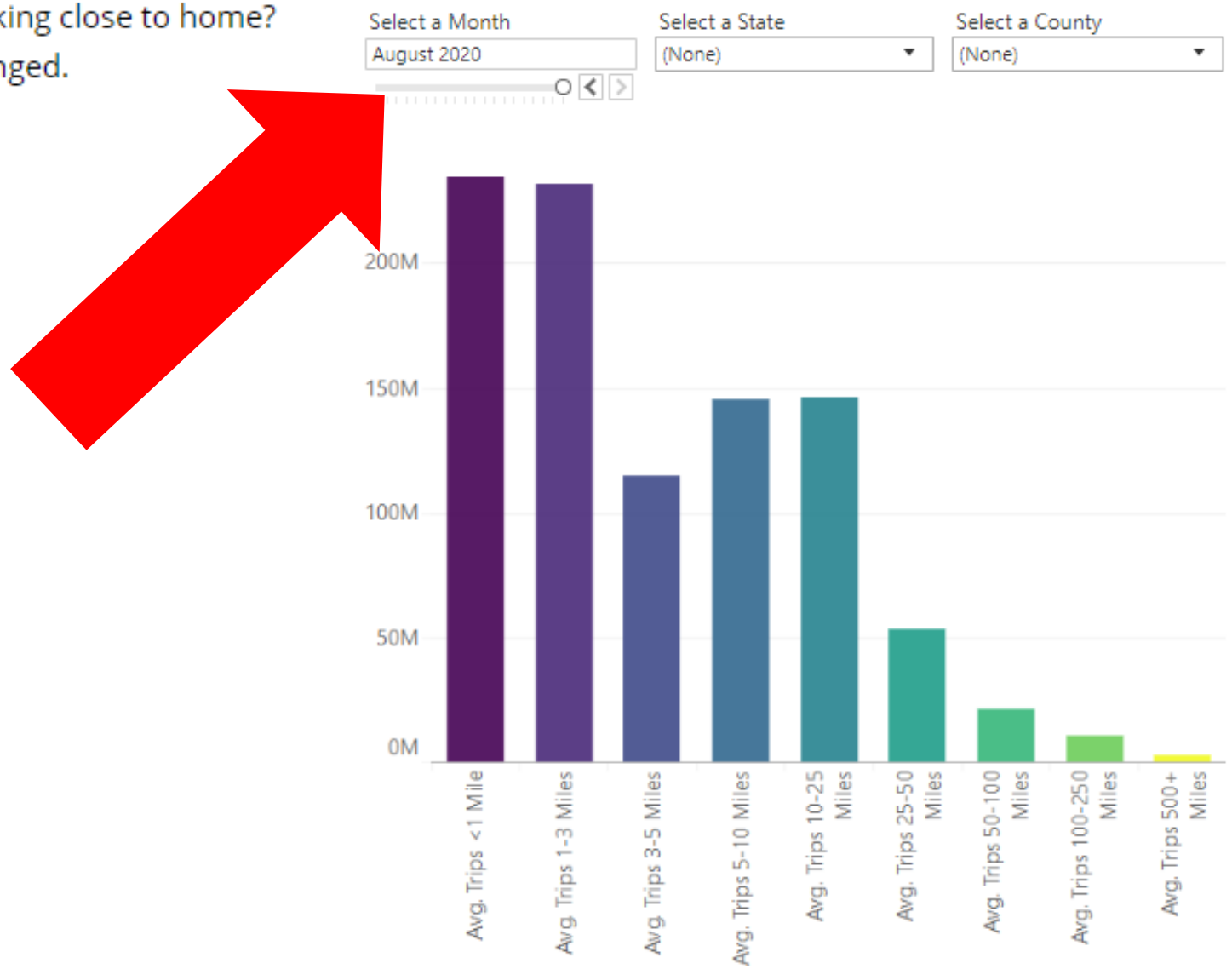


When they leave the home, how far are people traveling?

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)

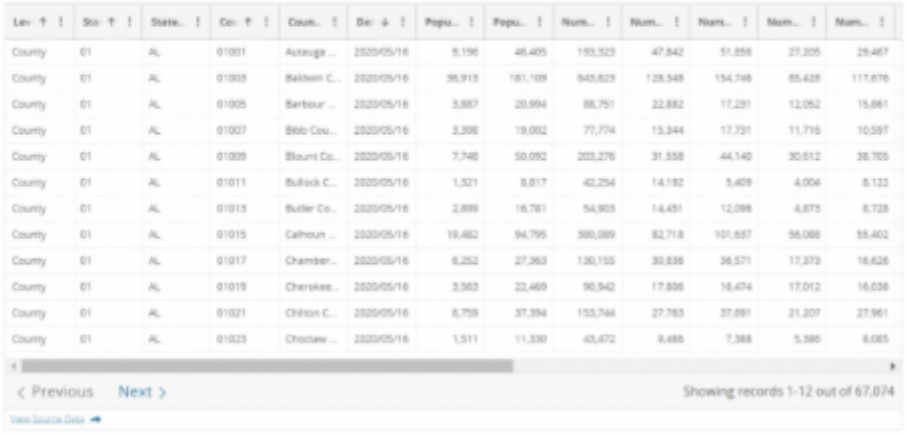
Docked Bikeshare Ridership

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

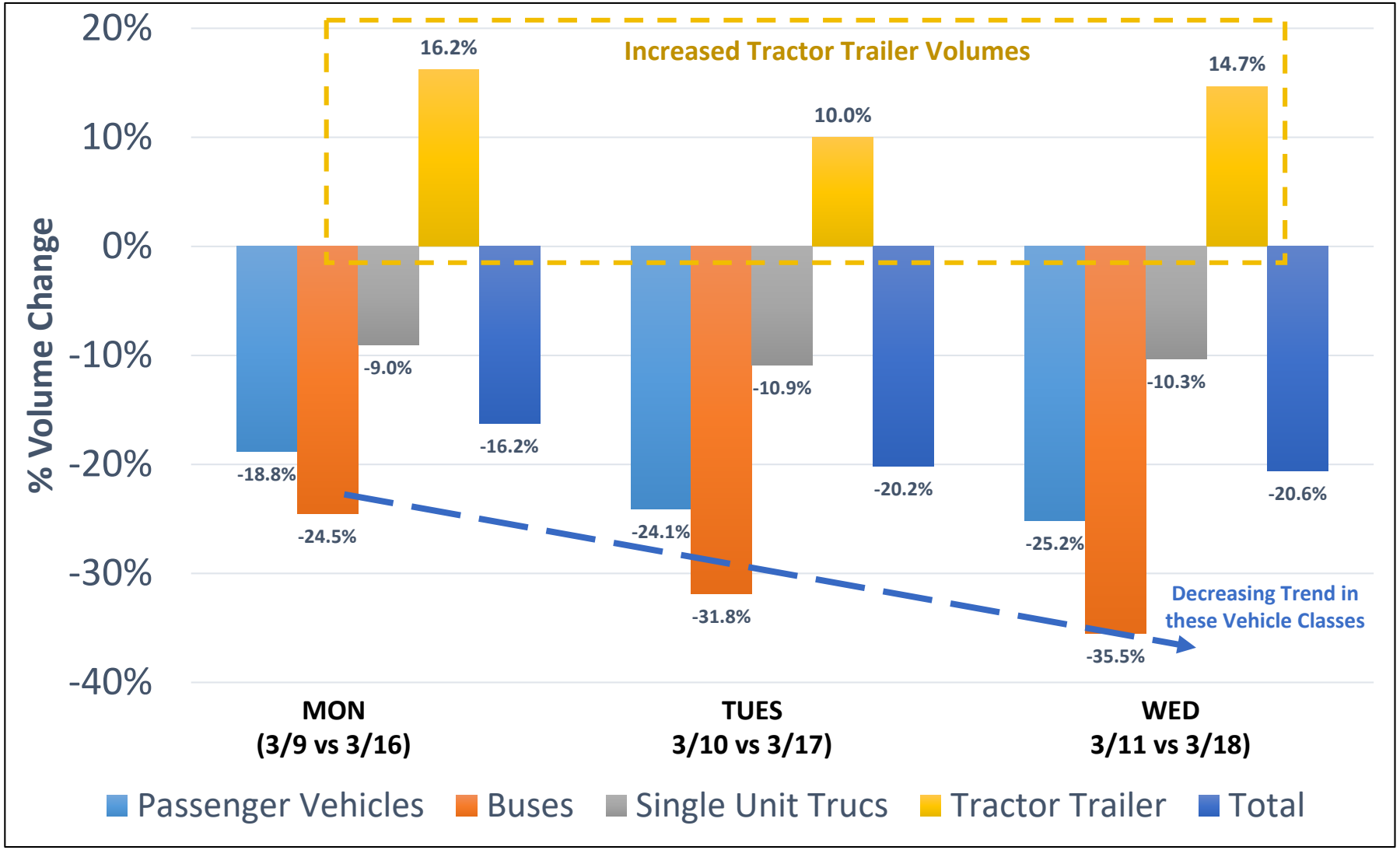
The Daily Travel data and number of people staying home and not staying home are estimated for the Bureau of Transportation Statistics by the Maryland Transportation Institute and Center for Advanced Transportation Technology Laboratory at the University of Maryland.

Additional Analysis & Tools from the RITIS Platform

COVID-19 **Key Insights**

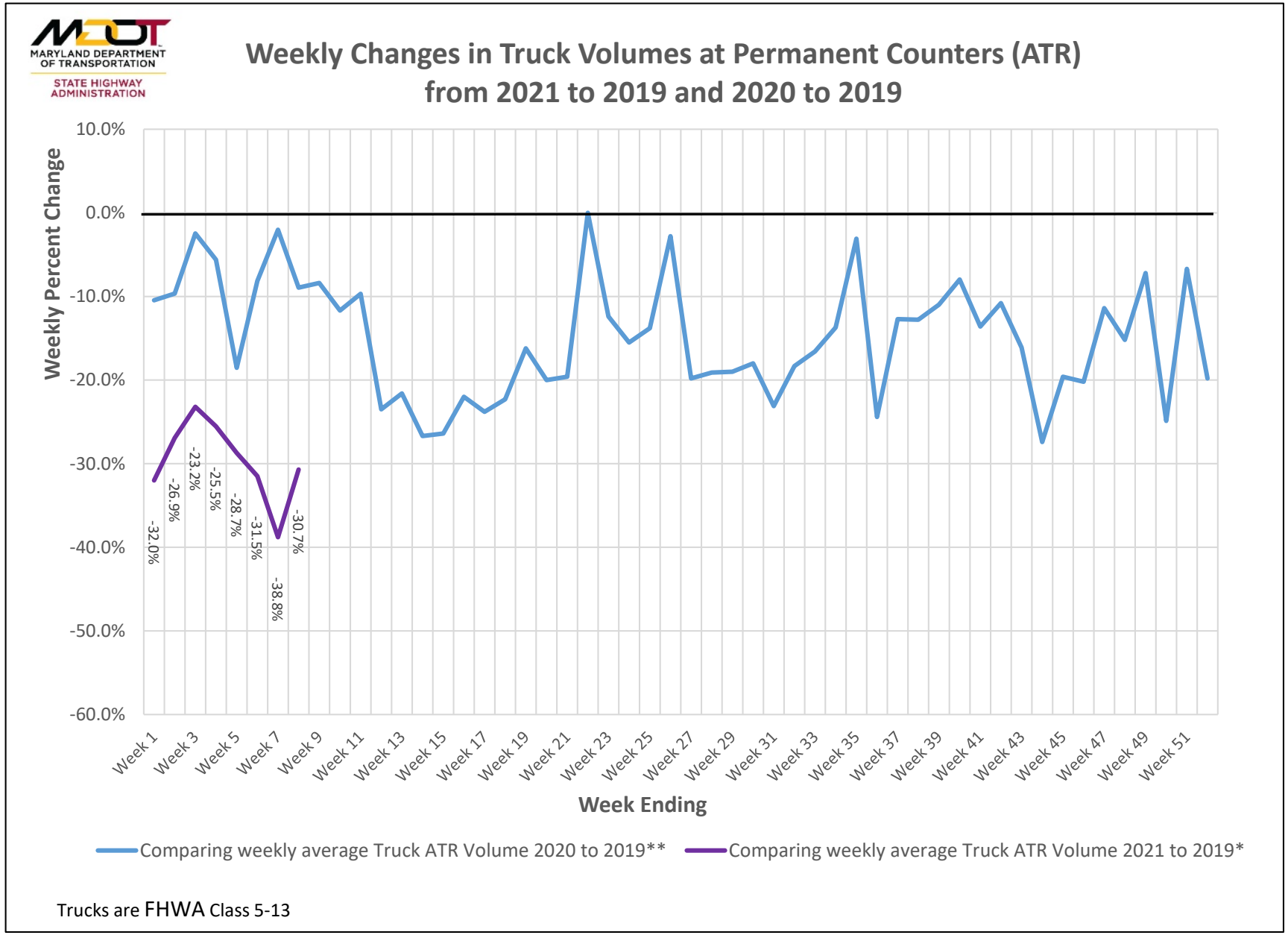
Traffic Volumes Decreased Significantly due to COVID-19

- 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.

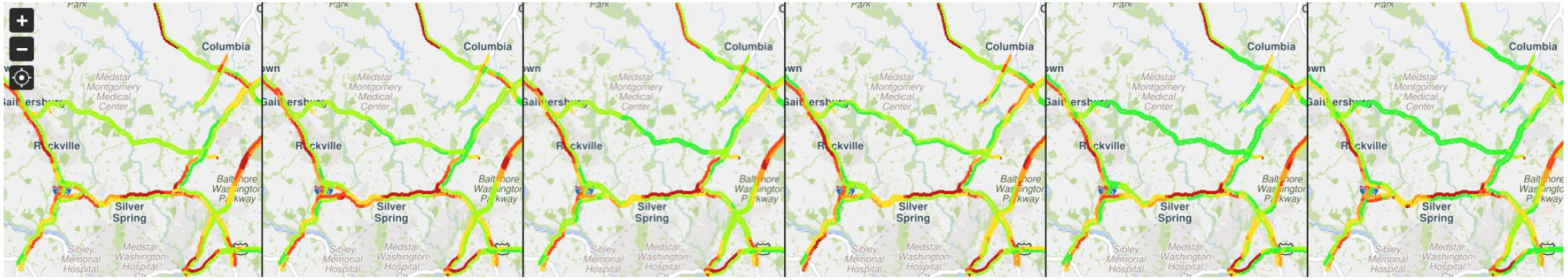
COVID-19 **Key Insights**

With Decreased Travel Demand, Traffic Congestion was also Mitigated

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

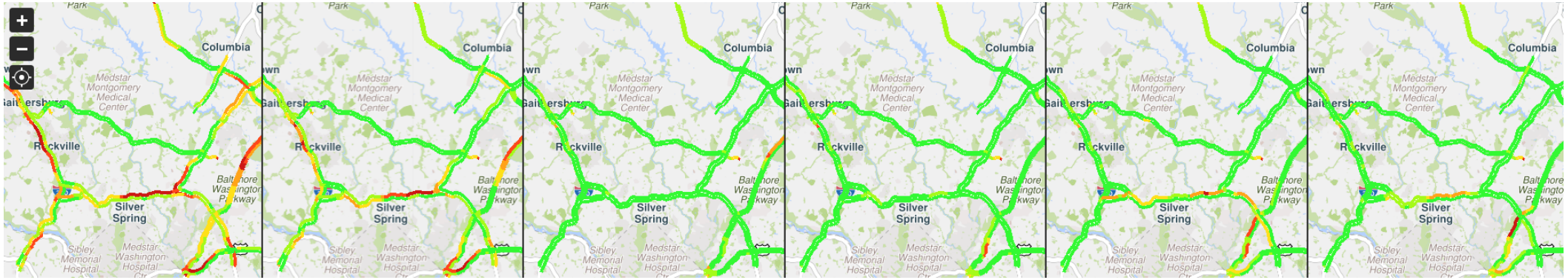
2019

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

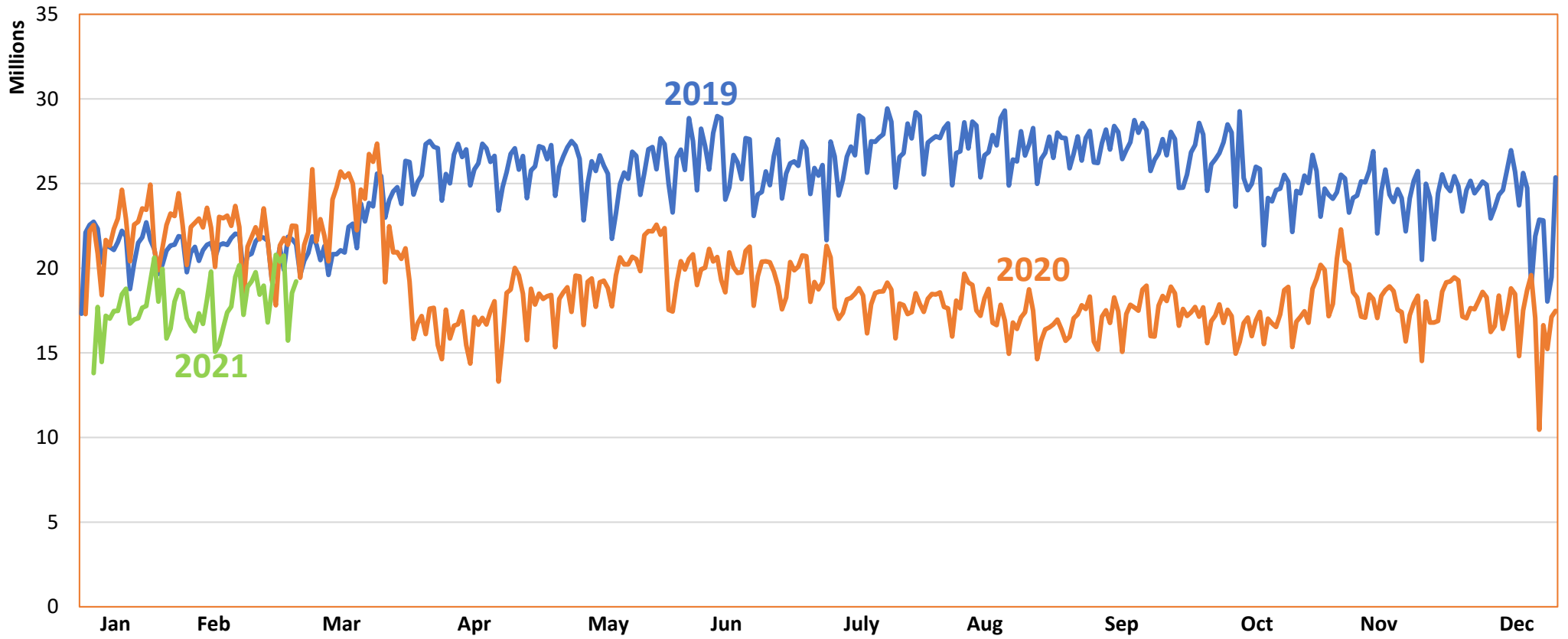
03.30.20
Stay at Home Order issued

04.15.20
Use of Face Coverings & Physical Distancing Order issued

05.15.20
Stay at Home Order replaced by Safer at Home Order

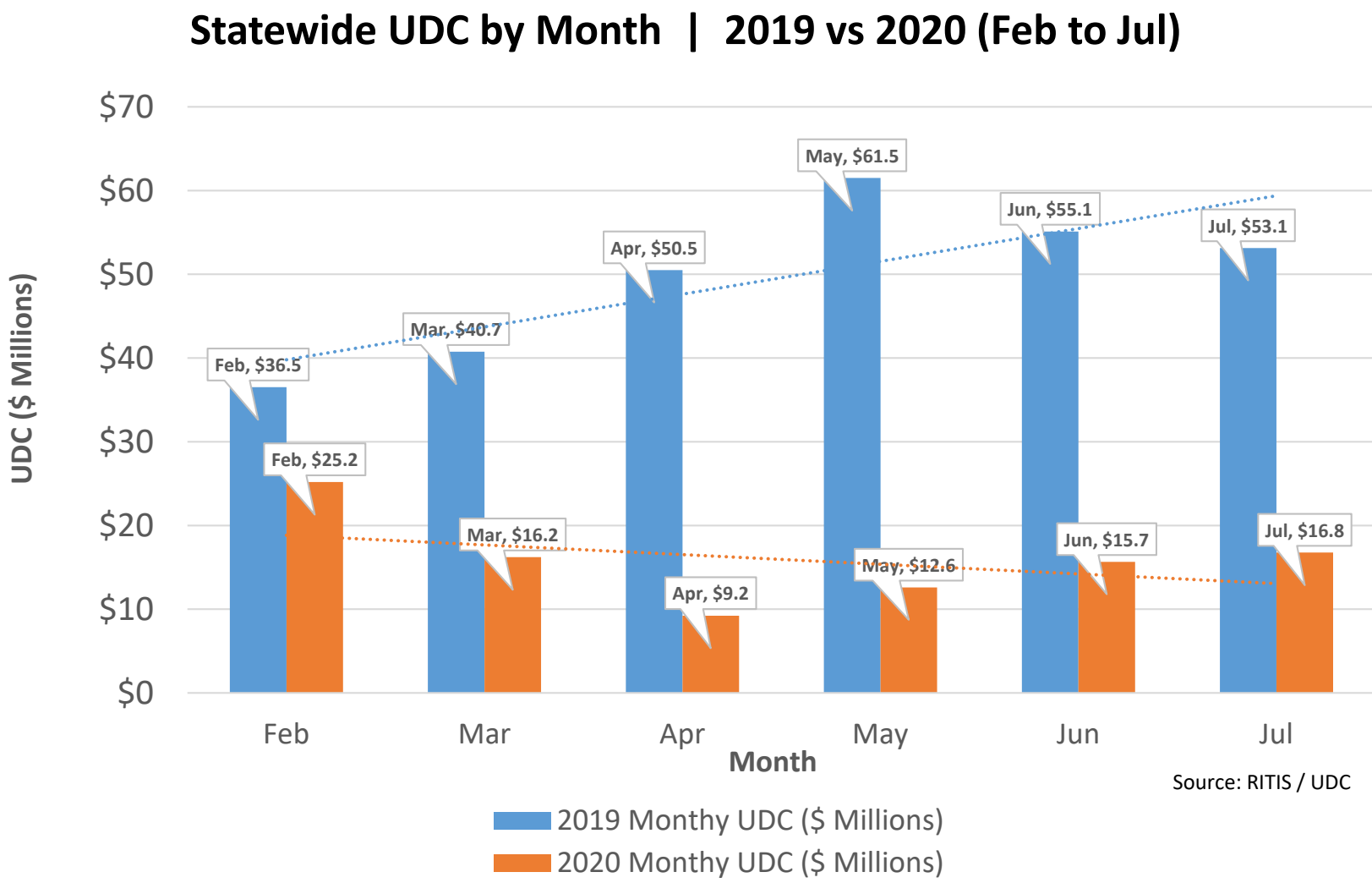
AUG 2020

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



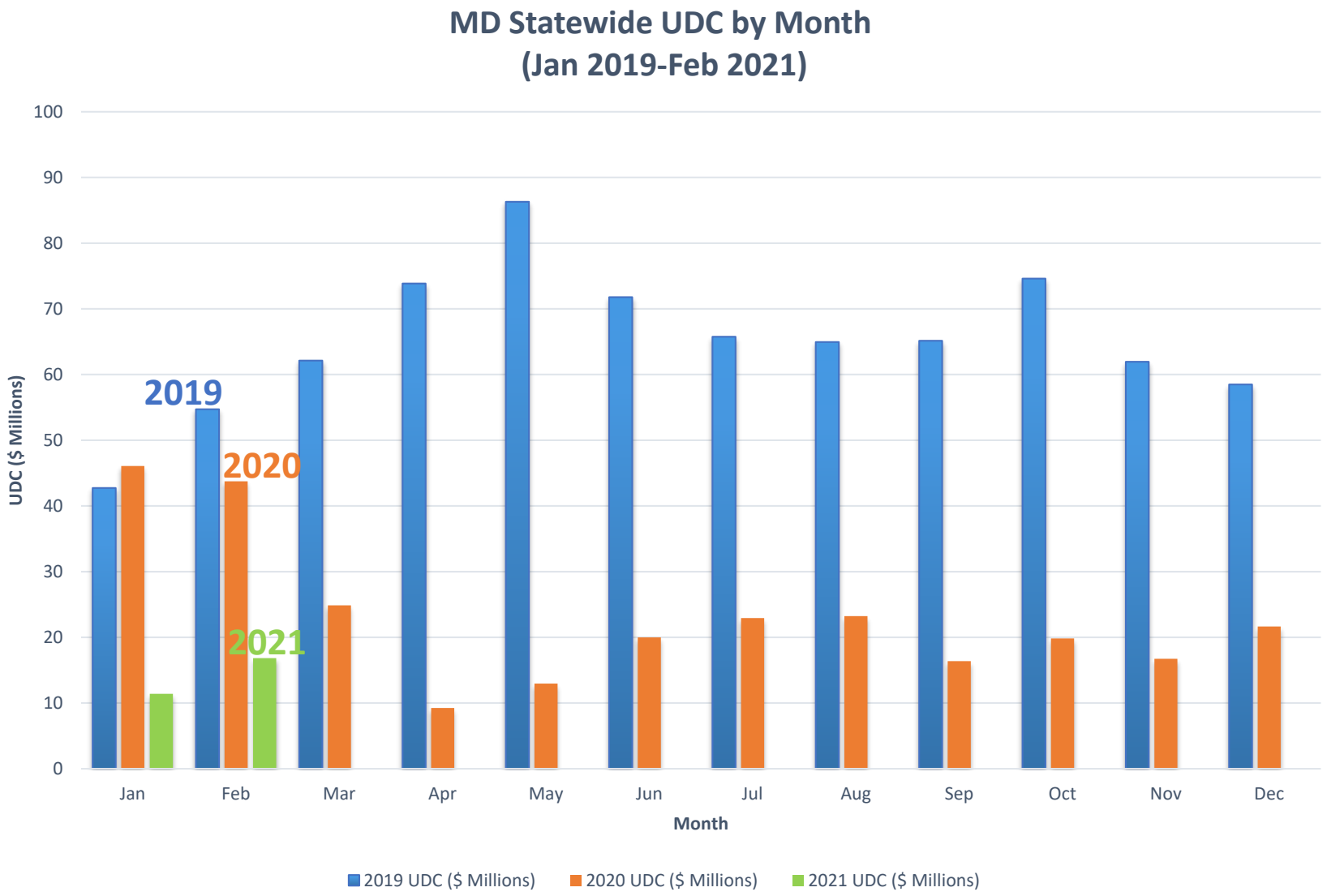
Using the UMD RITIS **User Delay Cost (UDC)** tool, comparisons were made for a six-month period between 2019 (pre-pandemic) and 2020.

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

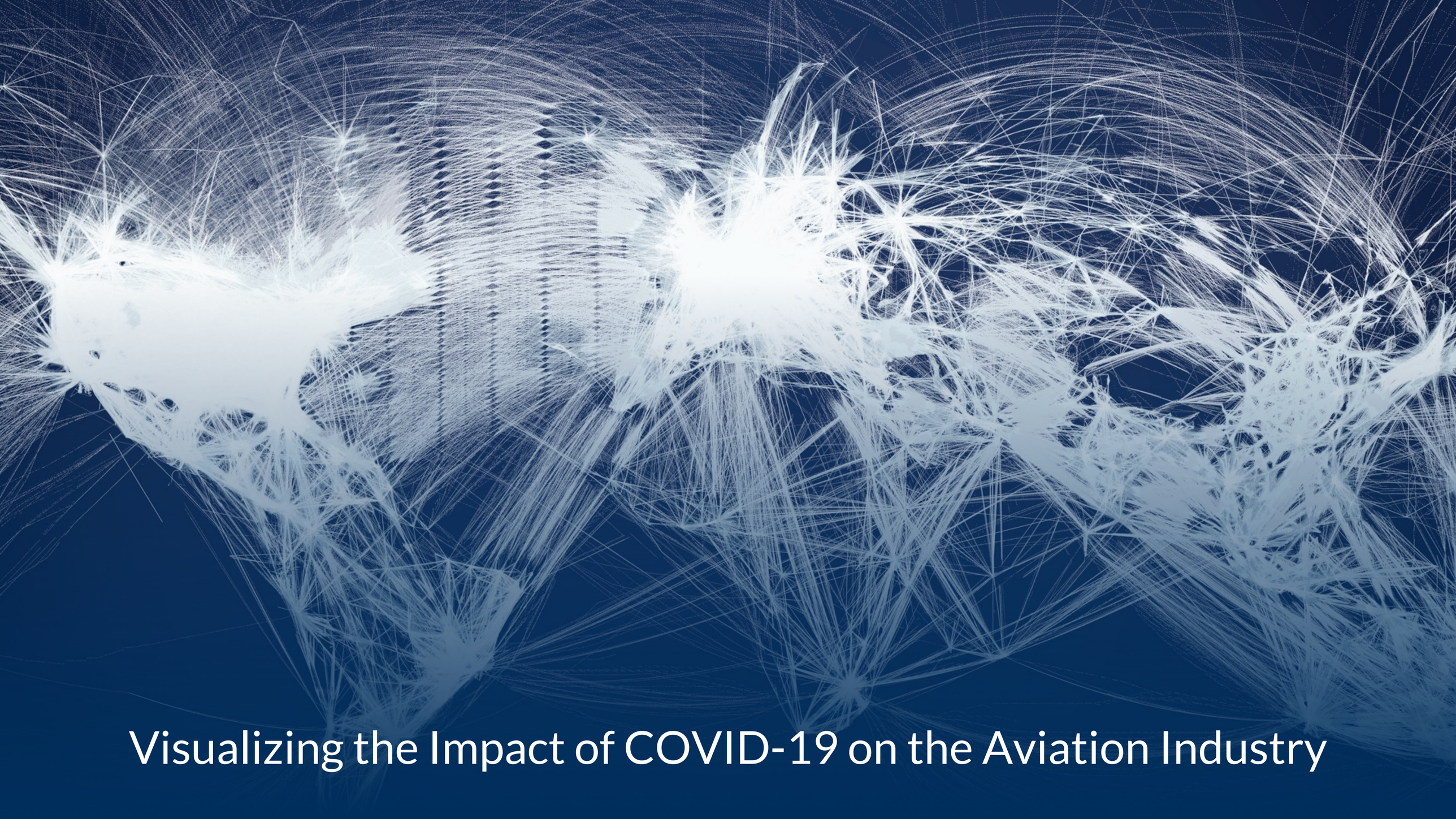
Rick Ayers
Public Agency Advocate, CATT Lab
rayers@umd.edu 703..989.3221

Or

support@ritis.org

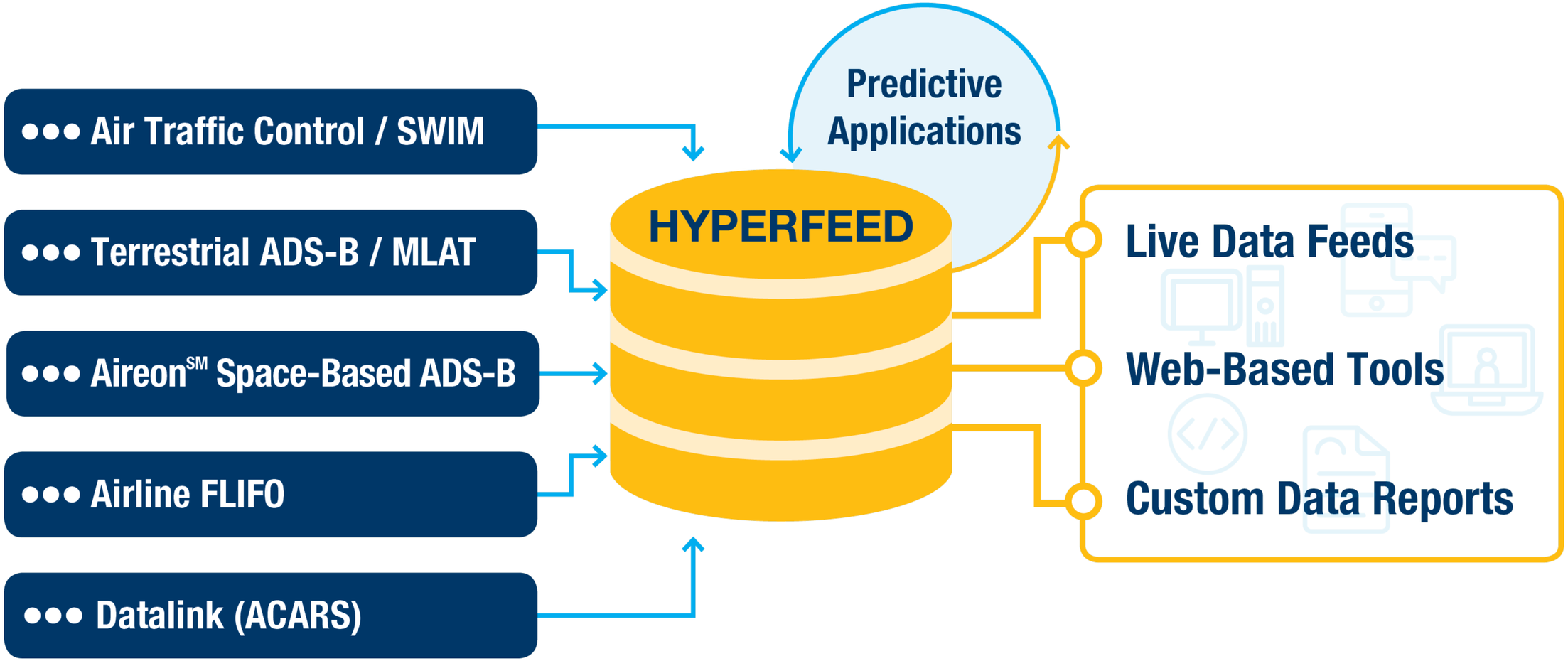
Online Training Videos available at:
https://www.ritis.org/help/tutorials/

CATT LABORATORY

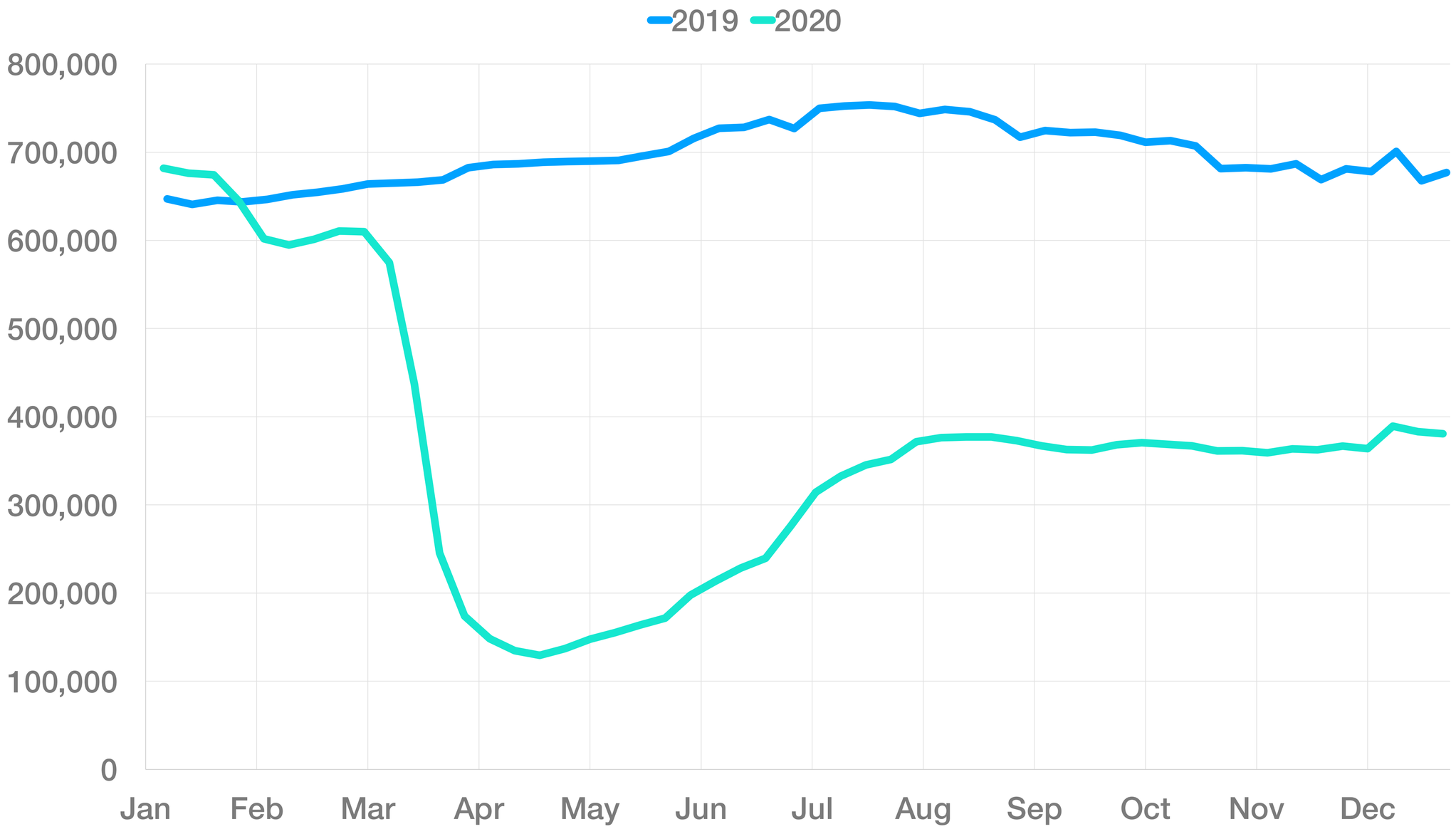


Visualizing the Impact of COVID-19 on the Aviation Industry

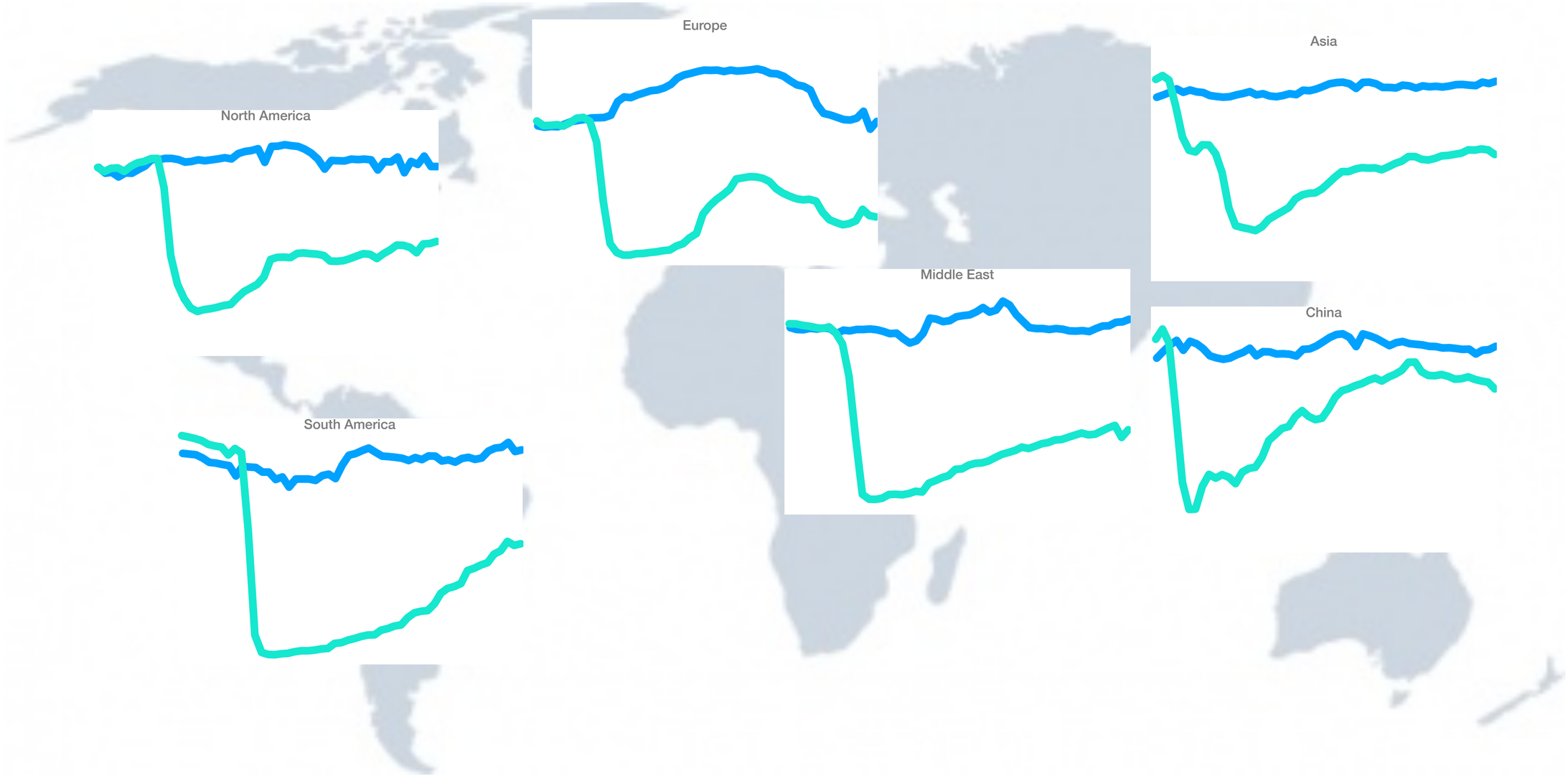
Hyperfeed


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

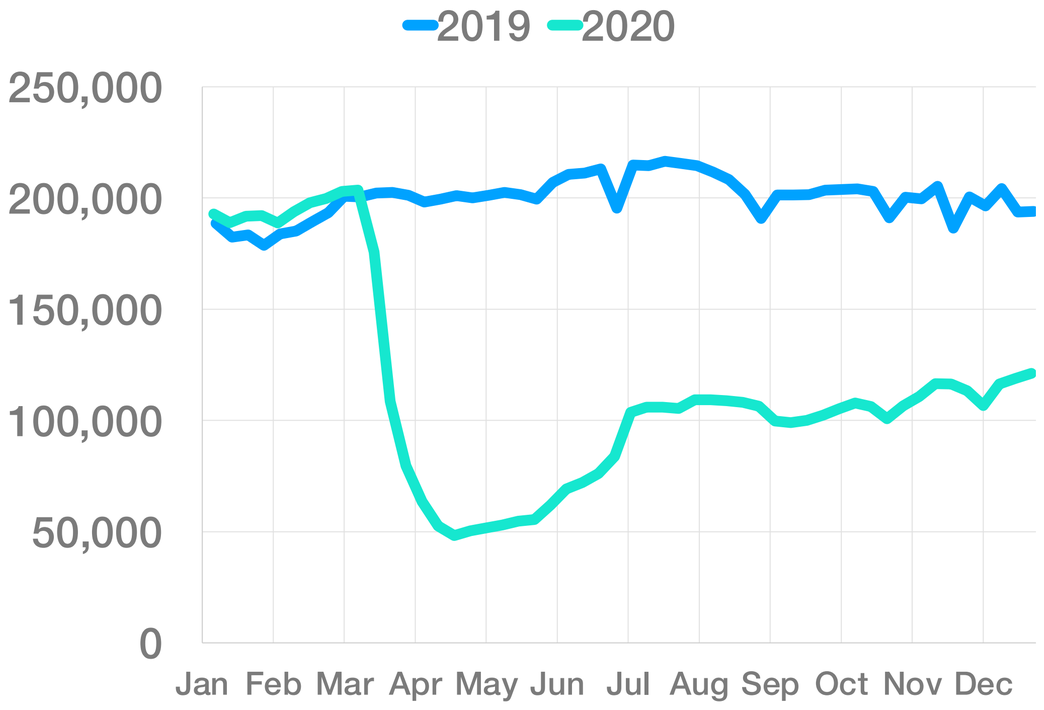
Commercial Passenger Airlines Overall



Geographic Variation

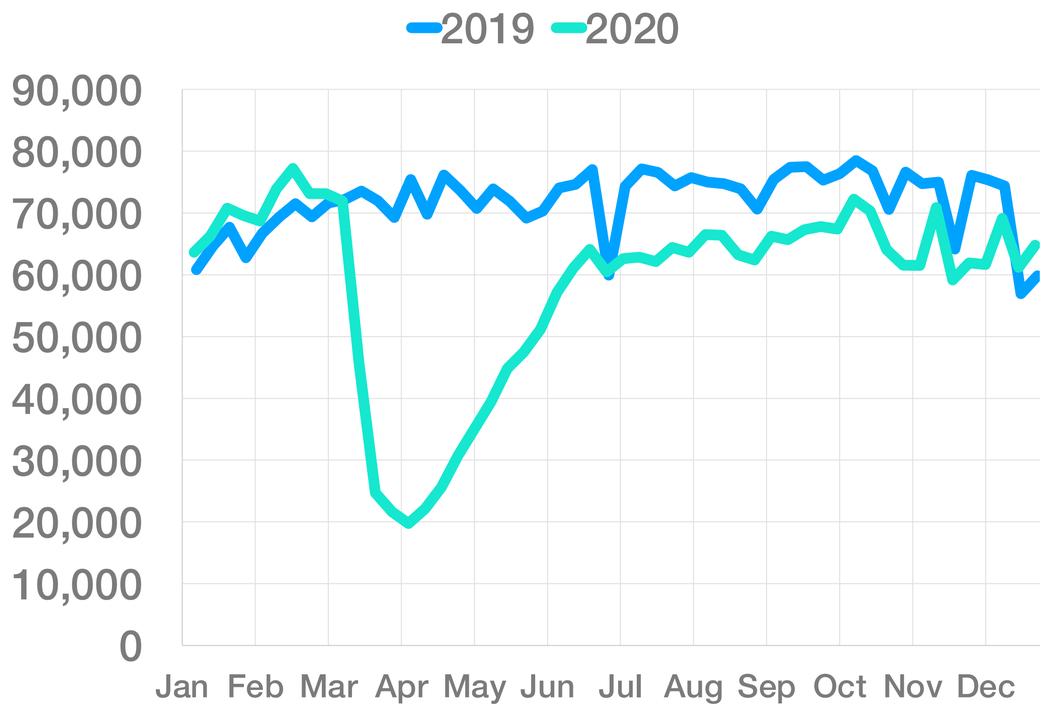


Operation Type Impact



Passenger Airlines

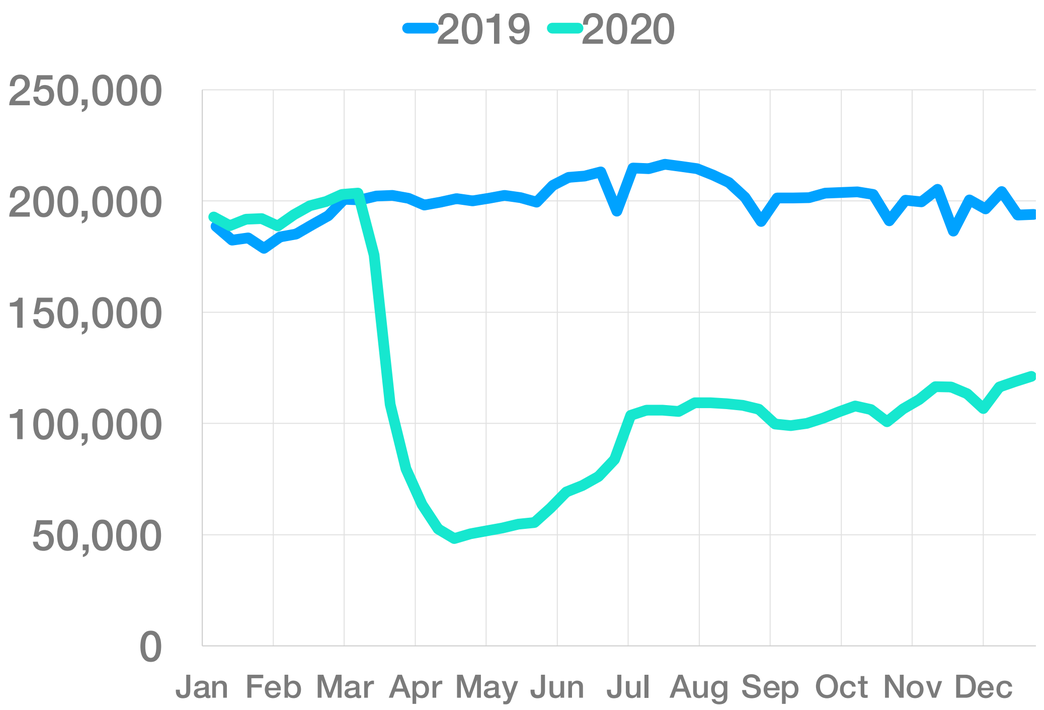
(to/from/within United States)



Business Aviation

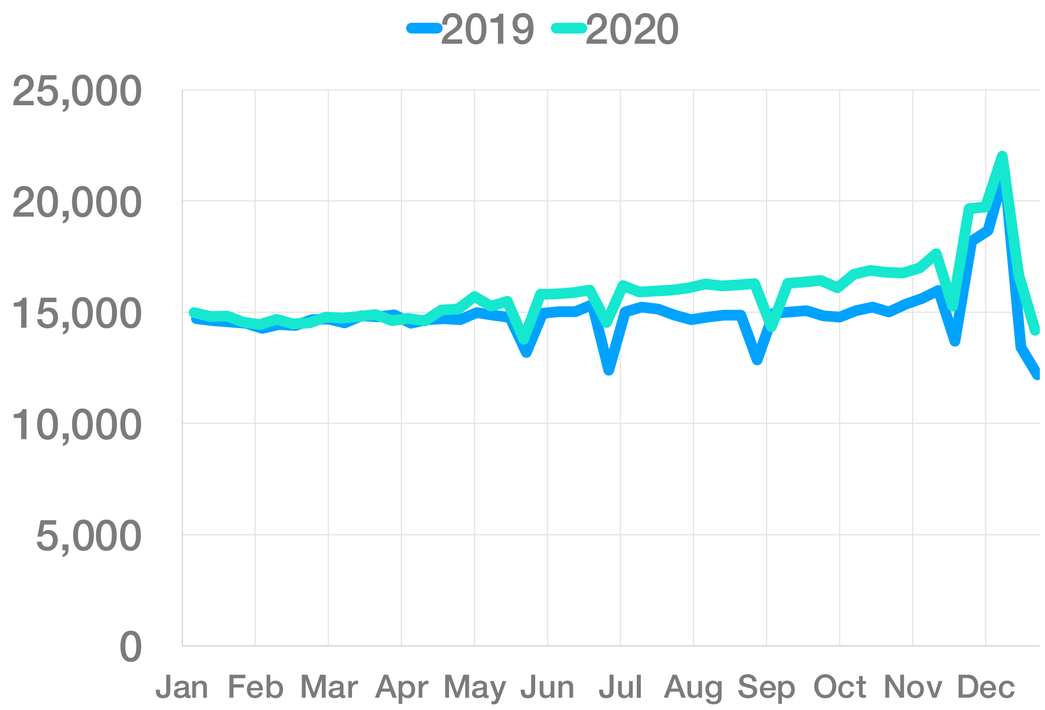
(to/from/within United States)

Operation Type Impact



Passenger Airlines

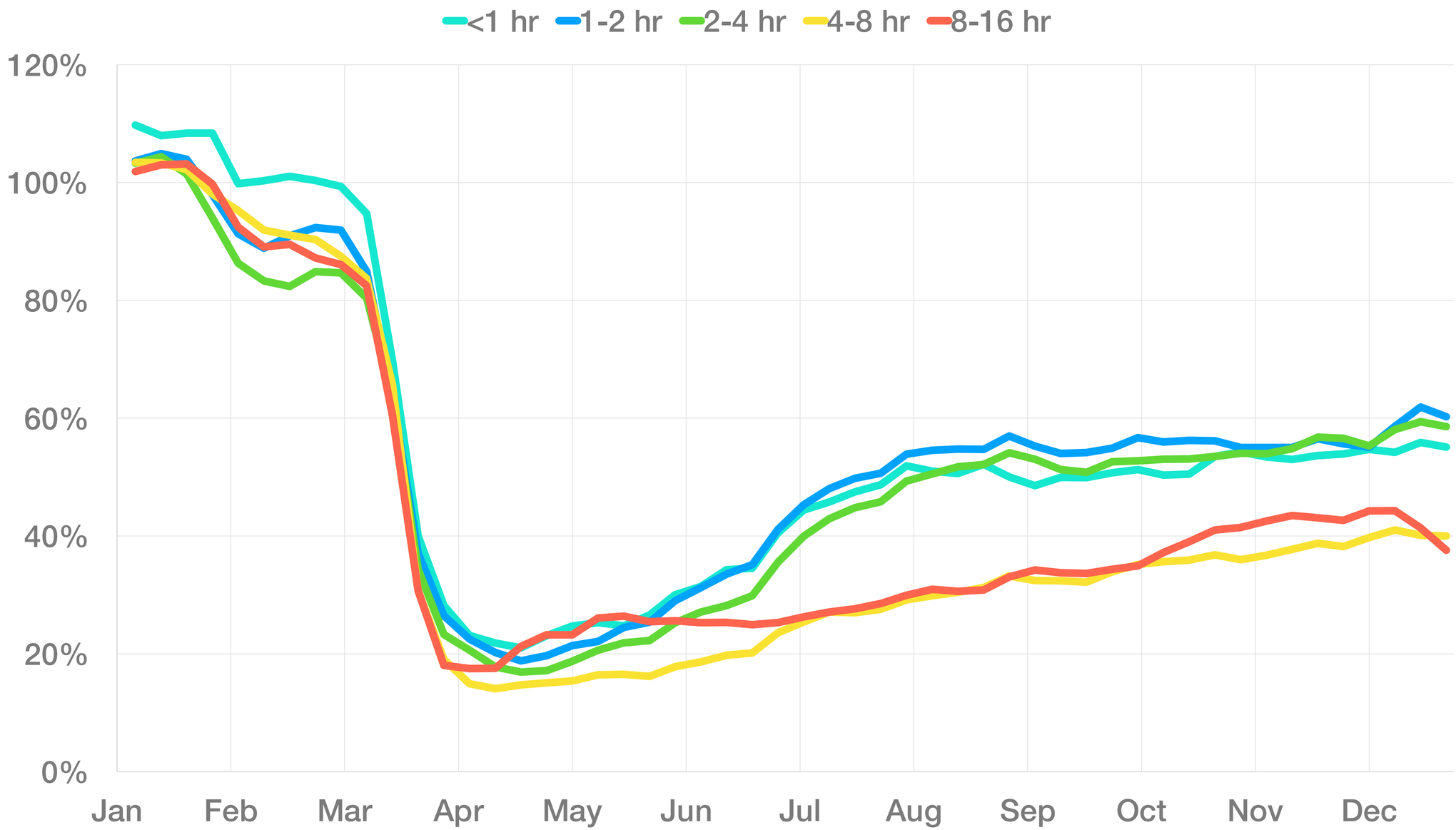
(to/from/within United States)



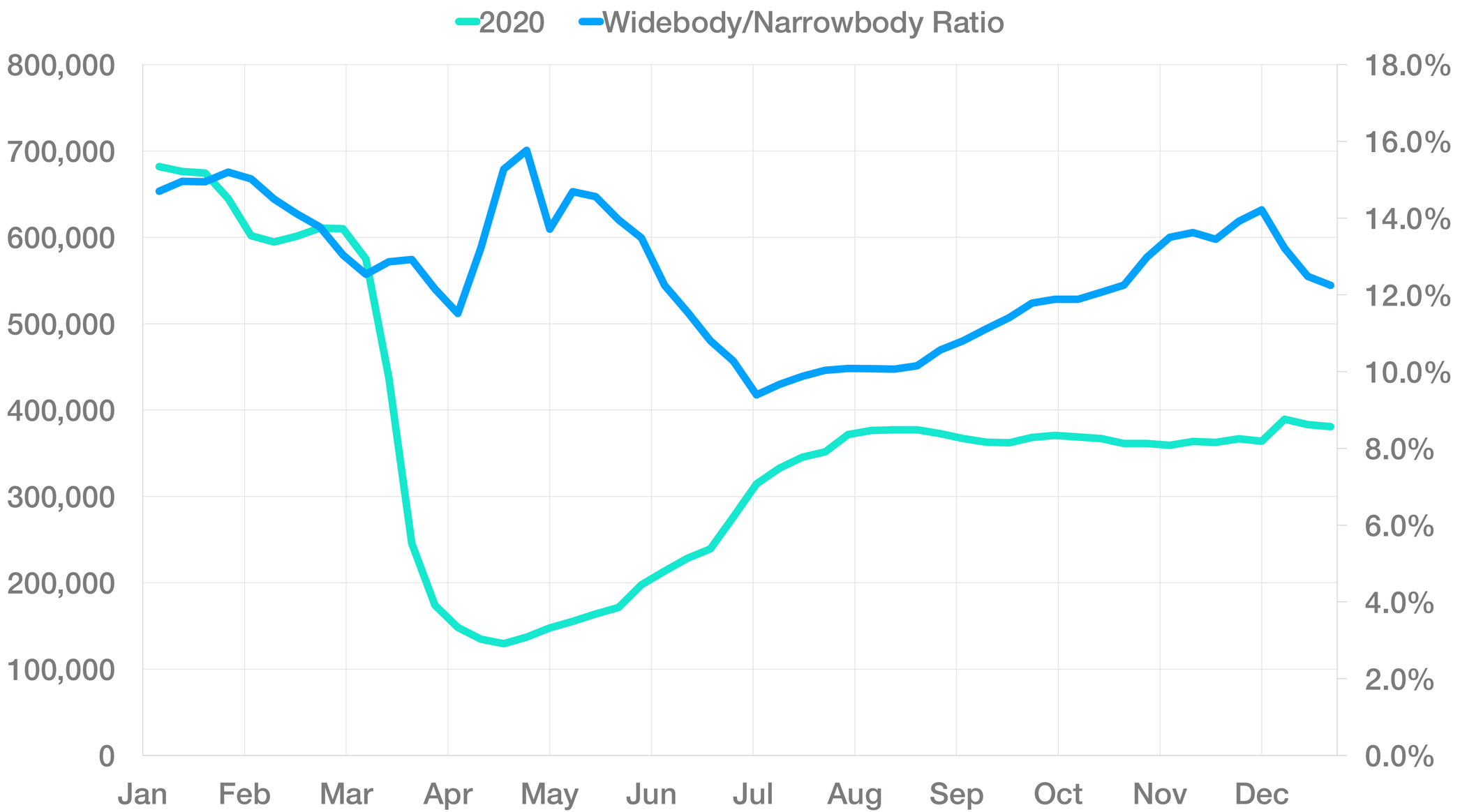
Cargo Airlines

(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

Get Involved with TRB

Receive emails about upcoming TRB webinars
https://bit.ly/TRBemails

#TRBwebinar

Find upcoming conferences
http://www.trb.org/Calendar

@NASEMTRB
@NASEMTRB
Transportation Research Board

Get Involved with TRB

#TRBwebinar

@NASEMTRB

@NASEMTRB

Transportation Research Board

Getting involved is free!

Be a Friend of a Committee bit.ly/TRBcommittees

- Networking opportunities
- May provide a path to Standing Committee membership

Join a Standing Committee bit.ly/TRBstandingcommittee

Work with CRP https://bit.ly/TRB-crp

Update your information www.mytrb.org