MIAMI-DADE TPO
COVID-19 TRAVEL BEHAVIOR TREND ANALYSIS

Miami-Dade Transportation Planning Organization

South Florida Regional Planning Council

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Table of Contents

List of Figures

List of Tables

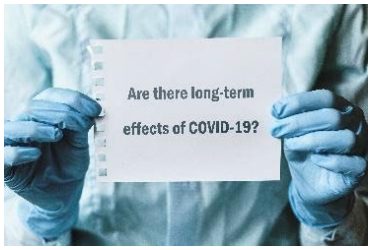
INTRODUCTION

The Miami-Dade Transportation Planning Organization (TPO) undertook a COVID-19 Travel Behavior Trend Analysis to investigate the effects of the COVID-19 pandemic on travel behavior in Miami-Dade County. This was done by comparing pre-pandemic transportation related data sets to data collected during various phases of the pandemic and post lock down. Trend analysis for highway volumes, transit usage, airport/cruise port passengers and other transportation data were completed using 2019 (pre-pandemic), 2020 and available 2021 data. The objective of the study is to identify any changes in travel behavior trends from the onset of the pandemic, through to 2021, that may inform the long-range transportation planning process. 2020 data was analyzed in relation to key phases of the pandemic, determined by the severity of lockdowns issued by Miami-Dade County. Additional available 2021 data was also analyzed and may give some insight on continued impacts and trends to come. The data comparison and literature review provide the basis for any conclusions and recommendations.

KEY QUESTIONS

1. What does the literature indicate about the changes in travel behavior because of the COVID-19 pandemic?

2. What does local data analysis show about effects on travel behavior from COVID-19?



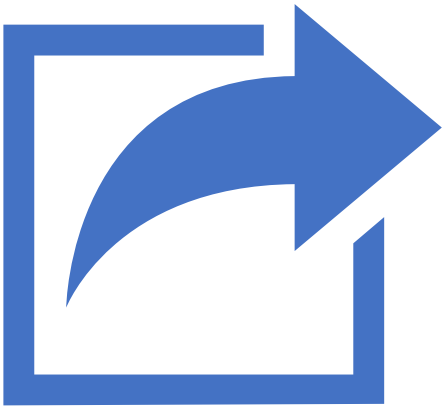
3. What long term effects on travel behavior does the literature and data analysis indicate may be sustained?

To address the three key questions, this report is organized into three sections. Each section is based on research and data collected to guide this study.

1. **Literature Review** – Peer-reviewed literature and local articles regarding changes in travel behavior caused by the pandemic are summarized. International, national, and local travel behavior literature is included. Trends that are anticipated to have long term effects on travel behavior are identified and compiled. Additional data needs and caveats on conclusions are listed to determine the need for further analysis.

2. **Data Analysis** – Local and national data, pre-pandemic and during various phases of the pandemic, were analyzed using 2019, 2020, and available 2021 data. Information was collected on a variety of modes and travel-related topics, including but not limited to traffic, transit, airport / seaport volumes, hotel occupancy, and pedestrian and bicycle activity. This was done to determine any effects the pandemic may have had on travel behavior throughout Miami-Dade County.

3. **Conclusions and Recommendations** – The findings of the literature review and data analysis are used as a basis to consider potential changes in long-term travel behavior beyond the pandemic.



1. LITERATURE REVIEW

The COVID-19 pandemic has had a globally disruptive impact on travel behavior, creating significant changes to the way people live and move in cities around the world. A review of global and local literature regarding the effects of the pandemic on travel behavior allows for a glimpse into forecasts of the effects this disruptor may have on long-term trends.

1.1 Lessons Learned from Prior Pandemics

Limited research on the effects on mobility during past pandemics prior to COVID-19 provides some insight. Some studies evaluated the impact of earlier viral outbreaks, such as SARS and H1N1, on travel behavior variation at the urban, regional and international levels. For example, during the 2015 MERS outbreak in Seoul, South Korea, the number of transit trips sharply decreased by 11.8% as compared to the prior condition (***Figure 1***).

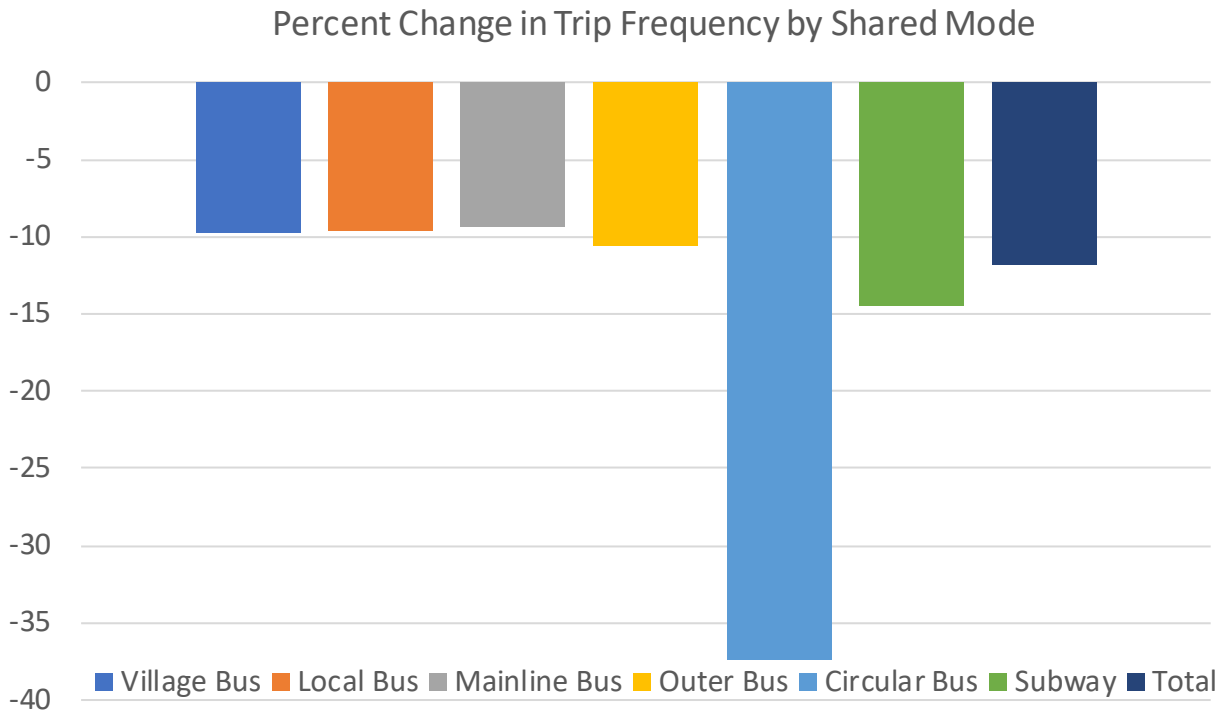


Figure 1: Percent Change in Trip Frequency by User Type during MERS Outbreak, Seoul, South Korea (Kim, Cheon, Choi, Joh, & Lee, 2017)

This large reduction in public transit use in a short period of time could not be explained by any other reason except for a pandemic situation. Of the types of shared modes in Seoul, the "Circular Bus" was the most negatively affected. The "Circular Bus" is described as a downtown circulator, similar to Miami-Dade's Metromover system. A more detailed analysis of variation in travel behavior according to different transit demographic groups provides further insight (***Figure 2***). Children (labeled as "Kid" in the data chart) are defined as primary or elementary school children. The children and senior users drastically reduced their use of public transport, whereas adults and youths, defined as minors older than elementary school age, only slightly reduced public transport use, but overall, it was a significant decrease.[1]

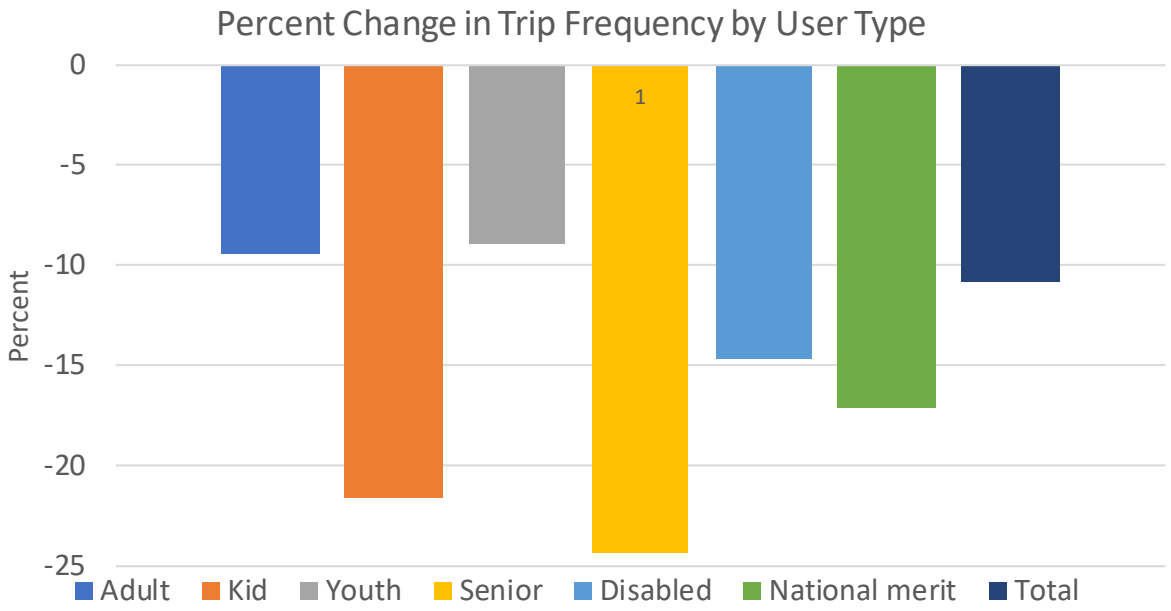


Figure 2: Percent Change in Trip Frequency by Share Mode Prior and During MERS Outbreak, Seoul, South Korea (Kim, Cheon, Choi, Joh, & Lee, 2017)

The findings of the MERS study show a remarkable decrease in travel and mobility during the pandemic periods. However, these studies are limited due to the short timeframe in which the event takes place and does not explore the post-pandemic world. The question of long-term

1 Kim C., Cheon H., Choi K., Joh C.H., Lee H.J. Exposure to fear: Changes in travel behavior during MERS outbreak in Seoul. KSCE Journal of Civil Engineering. (2017)

effects of the current pandemic on travel behavior cannot be answered by looking at the historical record and requires further analysis during the post-pandemic period.

1.2 Modal Shifts Pre and Post Pandemic

A review of the literature shows a travel behavior trend away from shared modes, such as bus and rail, to active modes and private car when needed. These changes in attitudes are also reflected in the fact that most people (88%) indicate that, during the pandemic period, they prefer to use individual modes (such as car or bicycle) over public or shared modes of transport.[2] ***Figure 3*** shows that in the Netherlands attitudes towards shared modes, such as train and bus, have skewed negative during the pandemic.

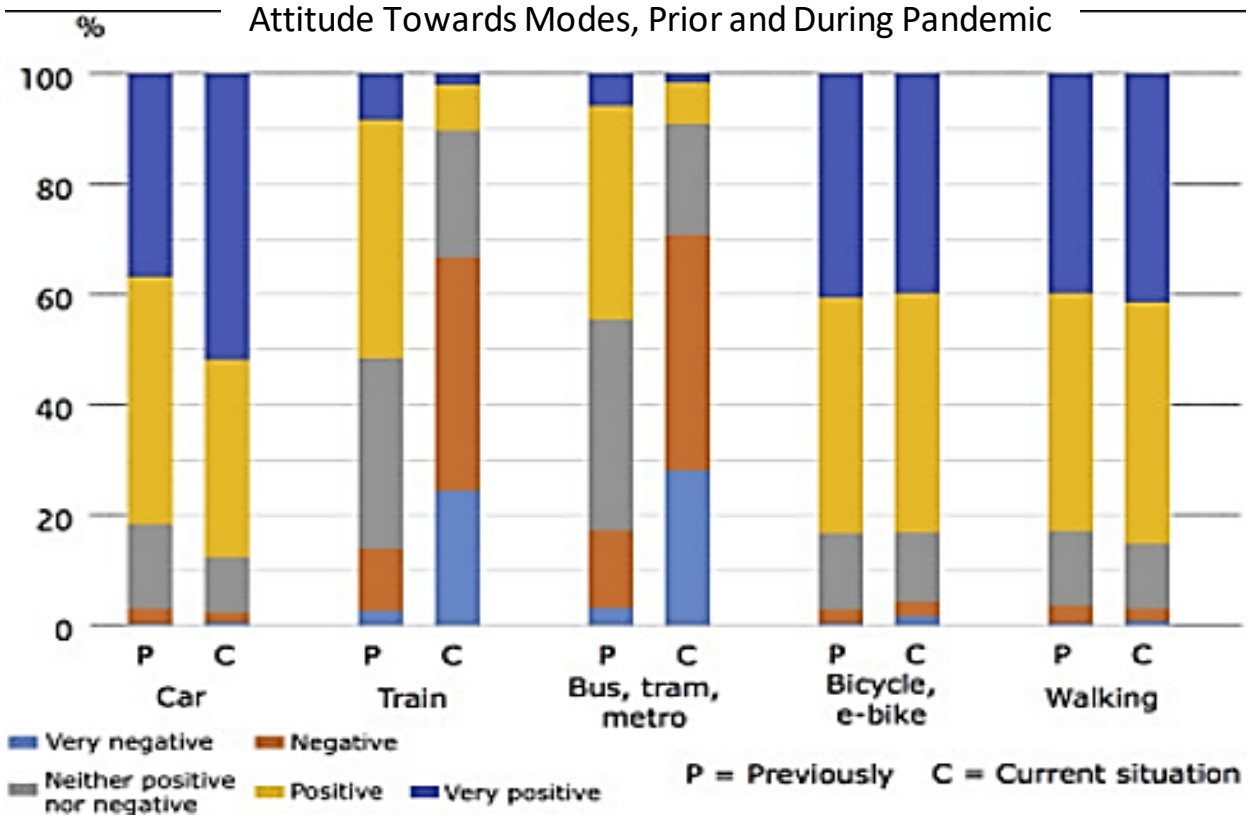


Figure 3: Attitudes Towards Modes, Prior To (P) and During (C) Pandemic (De Haas, 2020)

2 De Haas M., Faber R., Hamersma M. How Covid-19 and the Dutch 'intelligent lockdown' change activities, work and travel behavior: Evidence from longitudinal data in the Netherlands. Transportation Research Interdisciplinary Perspectives. (2020)

This negative trend results from the same rationale behind lockdowns, which were ordered to stem the severity of the pandemic. Lockdowns were enforced by government action and varied between geographic regions. As a result of the need and desire for social distancing, people favored the use of private cars over public transportation and other shared modes.

Prior to the pandemic, there had been a push for a diverse use of modes, and a debate on how to improve urban mobility.[3] Many studies and policy makers had concluded that transportation decision-making should be more reflective of sustainability issues and quality of life in cities.[4]

Most developing cities and developed countries are also facing escalating motorization and mobility demands, increased traffic congestion, and air quality issues, which demands sustainable policy making to counter these effects. However, in the short term, the pandemic reversed the tide that policy was making in increasing mode shift towards shared modes. Data trend analysis in this study, and over the longer term, will determine if this trend will be sustained beyond the pandemic.

1.3 Increased Focus on Active Modes - Bicycle and Pedestrian Mobility

In addition to a shift away from shared modes, the pandemic has contributed to the recognition of the importance of more active modes of transportation: i.e., bicycle and pedestrian mobility, but also scooters and e-bikes have been highly profiled.[5] In the years leading up to the COVID-19 pandemic, early leadership came from the global south where Bogota, Colombia expanded its cycle network to alleviate the pressure on their public transportation. The global north also

3 Foltynova H.B., Vejchodska E., Rybova K., Kveton V. Sustainable urban mobility: One definition, different stakeholders' opinions. Transportation Research Part D, Transport and Environment. 2020. Shakibaei S., Alpkokin P., Gunduz U. Oil rich countries and sustainable mobility: Challenges in Tabriz. Procedia - Social and Behavioral Sciences. (2011)

4 Bertolini L., le Clercq F., Kapoen L. Sustainable accessibility: A conceptual framework to integrate transport and land use plan-making. Two test-applications in the Netherlands and a reflection on the way forward. Transport Policy. 2005

5 Budd L., Ison S. Responsible transport: A post-COVID agenda for transport policy and practice. Transportation Research Interdisciplinary Perspectives. (2020); Zhang J. Transport policymaking that accounts for COVID-19 and future public health threats: A PASS approach. Transport Policy. (2020)

followed this trend prior to the COVID-19 pandemic, and cities like New York and Oakland in the USA, Milan, Paris, and Brussels in Europe, took up non-motorized initiatives with common themes. In some cases, it has involved "taking back" road space such as suspending parking spaces or closing-off and/or narrowing of redundant lanes. This repurposing of space is intended to create wider footpaths and/or temporary cycle lanes to improve the safety and increase the use of active modes. Since the onset of the COVID-19 pandemic, these strategies were expanded in targeted areas to alleviate the changes in mobility needs. Specific examples of transportation policy responses to COVID-19 are listed in ***Table 1***.[6] The policy responses featured a combination of temporary and permanent changes to accommodate for increased bicycle and pedestrian activity.

Table 1: International Modal Shift Policy Responses to COVID-19

Region	Policy Responses to COVID-19
Melbourne, Australia	• Removed car parking spaces to create wider footpaths • Installed 12 km of temporary bike lanes
Vancouver, Canada	• Repurposed some roads for walking and cycling • Introduced an indefinite ban on vehicles in Stanly Park
Budapest, Hungary	• Created 17 km of pop-up bike lanes
Rome, Italy	• Created 150 km of pop-up bike lanes
Paris, France	• 650 km of temporary and permanent cycleways will be created
Brussels, Belgium	• Created an additional 40 km of cycle lanes
Amsterdam, Netherlands	• Opened up car parking spaces for bike storage • Introduced one-way pavements (sidewalks) • Redirected traffic through temporary road closures if levels are above capacity

In Florida, certain regions also responded to the pandemic with transportation interventions to accommodate the need for social distancing with a concurrent increase in pedestrian activity. In Fort Lauderdale, a single 1.3 mile-lane of A1A was closed to vehicular traffic to provide increased space for pedestrian activity.

6 Nurse A., Dunning R. Is COVID-19 a turning point for active travel in cities? Cities & Health. (2020)

The City of Miami Beach also temporarily closed Ocean Drive to vehicular traffic from Fifth Street to 15th Street from mid-May 2020 until the beginning of July 2020 to allow for more pedestrian activity (***Figure 4***), making the pedestrian button on this road no longer required. To prioritize the heavy pedestrian activity, for which the area is well known, the pedestrian signal was removed. [7]

These strategies were intended to provide safe contexts for bicycle and pedestrian activity. Moving forward, there is an indication that the shift to active modes may have long term implications. Administered surveys in peer reviewed literature reflect that up to 20% of people expect to cycle and walk more in the future. [8]

Figure 4: Ocean Drive in Miami Beach Closed to Vehicular Traffic for Pedestrian Activity

7 COVID-19 Livable Streets Response Strategies. Miami-Dade TPO. (2021)
8 De Haas M., Faber R., Hamersma M. How Covid-19 and the Dutch 'intelligent lockdown' change activities, work and travel behavior: Evidence from longitudinal data in the Netherlands. *Transportation Research Interdisciplinary Perspectives.* (2020)

1.4 Key Findings by Region

It is relevant to frame key findings related to impacts of the pandemic on travel behavior in the context of the region in which they were observed. Key findings regarding the impacts of the COVID-19 pandemic on travel behavior in cities or countries outside of the United States are noted as follows:

International Findings

- In the Netherlands, 44% of workers started teleworking or increased their level of teleworking. There was a reduction of 55% and 68% in the number of trips and distance traveled, respectively, during the pandemic compared to the Fall of 2019 and a decrease of around 90% in transit trips. There was a significant increase in the choice to use active modes such as walking, bicycle as well as private car.[9]
- The Tokyo region experienced a large drop in activity levels including a severe reduction in leisure activities, eating out, and a moderate reduction in grocery shopping.[10]
- Stockholm experienced dramatic decreases in transit use with a significant decline in bus use and even more for rail, driven by shifts to the private car, and to some extent bicycles.[11]
- In Australia, the largest reduction in travel mode was in the use of private cars, but there was a significant reduction in the use of rail and bus. There was almost a 200% increase in the number of workers shifting to five days of teleworking.[12] During periods of eased restrictions, which have been periodic and recurring, aggregate travel has increased by 50% but is still less than 65% of pre-pandemic levels. There has been a significant rebound in private car use, and

9 De Haas M., Faber R., Hamersma M. How Covid-19 and the Dutch 'intelligent lockdown' change activities, work and travel behavior: Evidence from longitudinal data in the Netherlands. *Transportation Research Interdisciplinary Perspectives.* (2020)
10 Parady G., Taniguchi A., Takami K. Travel behavior changes during the COVID-19 pandemic in Japan: Analyzing the effects of risk perception and social influence on going-out self-restriction. *Transportation Research Interdisciplinary Perspectives.* (2020)
11 Jenelius E., Cebecauer M. Impacts of COVID-19 on public transport ridership in Sweden: Analysis of ticket validations, sales and passenger counts. *Transportation Research Interdisciplinary Perspectives.* (2020)
12 Beck M.J., Hensher D.A. Insights into the impact of COVID-19 on household travel and activities in Australia – The early days under restrictions. *Transport Policy*. (2020)

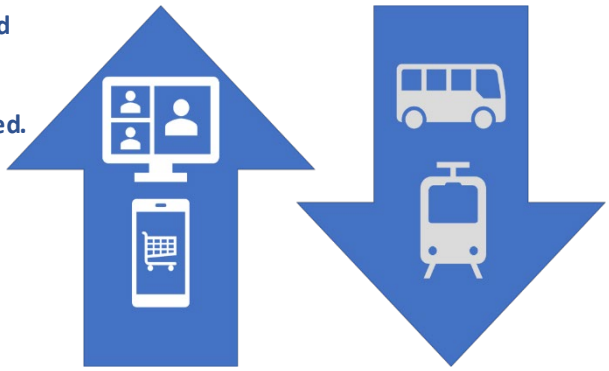
teleworking has been found to continue, post restrictions, along with a significant increase in bicycle use.[13]

National Findings

Literature focused on effects of COVID-19 on travel behavior in the United States were consistent on key findings as follows:

- Across the United States, there has been significant declines in transit, and relative increases in private car use, and a shift to active modes from transit and paratransit were reflected (i.e., bicycle and pedestrian).[14]

Telecommuting and online shopping commonly increased. Transit ridership, especially rail, commonly decreased.



- In Chicago, a significant increase in teleworking was found during the pandemic. There was a 65% growth in online grocery shopping.[15]
- In the U.S., downtowns were the hardest hit areas by the pandemic, due to their densification and are projected to be last in their recovery during the re-emergence period, lagging behind suburban and rural areas throughout 2021. Over the first two months of 2021, trips to downtown were down 44% from pre COVID levels in the U.S., according to INRIX data analysis.[16]

13 Beck M.J., Hensher D.A. Insights into the impact of COVID-19 on household travel and activities in Australia – The early days under restrictions. *Transport Policy*. (2020)
14 Deepti Muley & Md. Shahin & Charitha Dias & Muhammad Abdullah. Role of Transport during Outbreak of Infectious Diseases: Evidence from the Past. *Sustainability, MDPI.* (2020)
15 Shamshiripour A., Rahimi E., Shabanpour R., Mohammadian A.K. How is COVID-19 reshaping activity-travel behavior? Evidence from a comprehensive survey in Chicago. *Transportation Research Interdisciplinary Perspectives.* (2020)
16 Pishue, B. INRIX Global Traffic Scorecard. (2020)

1.5 Local Factors for Southeast Florida

Southeast Florida's economy creates a unique ecosystem for travel in the region. Local studies have provided insight into the factors that should be considered when analyzing travel behavior trends during the pandemic period. South Florida's unique factors that affect travel behavior and could differentiate the region from trends found in the literature include, but are not limited to:

- **Tourism** is a significant sector of the economy and was nearly halted during the pandemic.
- **The medical, commerce, and education sectors**. These sectors of Southeast Florida's economy are unique from other U.S. regions, as they rely mostly on international activity.
- **Freight transportation**. Freight transportation a significant sector of the economy, experienced growth during the pandemic.
- **The region's sub-tropical weather**. Cooler months encourages active modes while hotter months significantly challenges active modes.
- **Pedestrian and bicycle safety concerns**. Such concerns can challenge the widespread adoption of these active modes and dampen the overall positive trend towards these modes as the pandemic winds down.

As a result of Southeast Florida's unique factors, data analysis that follows as part of this report, and local surveys that have been administered by other organizations, should be considered in forecasting long-term trends. Research results published in *Natural Hazards Review* (2021) showed that the State of Florida saw a drop in overall statewide traffic volume of 47.5% compared to similar days in March 2019 vs. March 2020.[17] However, during the pandemic, not all types of travel were equally affected in Southeast Florida. These differences require a closer

17 Scott, P., Wolshon, B., Renne, J, et al. Traffic Impacts of the COVID-19 Pandemic: Statewide Analysis of Social Separation and Activity Restriction. *Natural Hazards Review.* (2021)

look.

Tourism-related Travel

A significant downturn in tourism-related travel is evident but forecasts for a rebound by 2022 are optimistic and robust. Hotel occupancy rates indicate some activity in the key Southeast Florida tourism reflects industry and hotel occupancy nationwide, however, rates are still down 20% from pre-COVID levels in the first quarter of 2021.

The reopening of the cruise industry (***Figure 5***) has proven to be slower than anticipated. However, optimism is reflected in cruise industry reports. In a UBS bank report released on March 31, 2020, analysis showed that around 76% of the passengers whose cruises were cancelled due to the pandemic have opted for a credit for future trips instead of a refund.[18] Royal Caribbean Group reported its bookings are within historic ranges for the first half of 2022 and at higher-than-normal prices. Carnival Corp. recently reported that it has more bookings for the first half of 2022 than it did for the same period in 2019.[19]

Figure 5: Port Miami

18 Jainchill, J. *Travel Weekly*. (2020) UBS Analysis Reports (2020)
19 Dolven, "It's been one year since the last U.S. cruise. What's in the waters ahead?" *Miami Herald.* (2021)

Telecommuting in Southeast Florida

Telecommuting in Southeast Florida was examined by the Miami-Dade TPO in a separate effort, and survey results showed that the number of employees telecommuting to work daily jumped from 8% pre-covid to 28% during COVID. One of the efforts examined showed 76% of employers having a telecommuting policy, and over half of employers were willing to accommodate a preference for telecommuting (***Figure 6***).[20] During the pandemic, one survey showed that 70% of students were taking all their classes online.

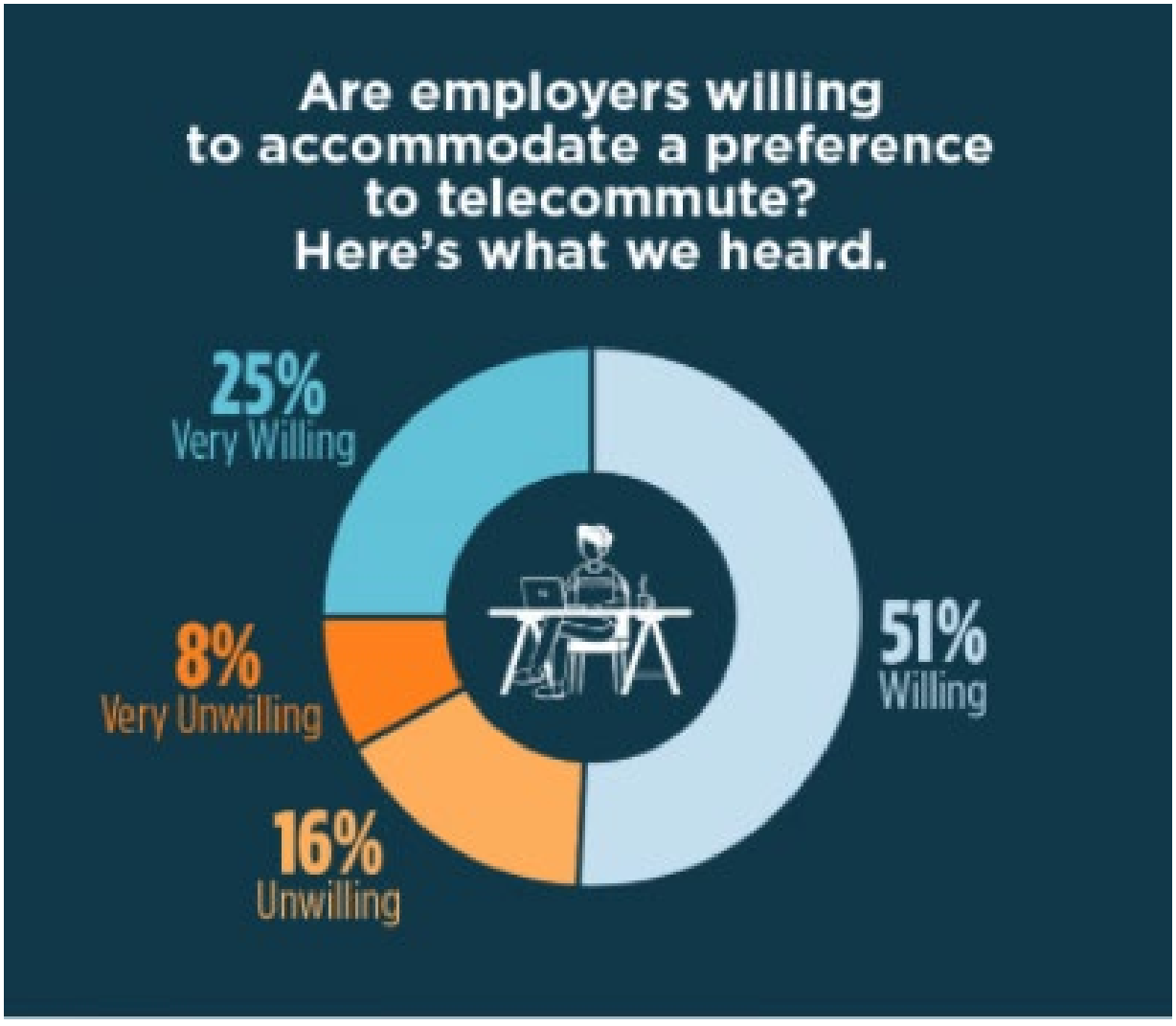


Figure 6: Miami-Dade TPO Telecommute Study (Kittelson, 2021)

20 Kittelson. Miami-Dade TPO Telecommute Study. (2021)

A separate effort conducted by Florida International University (FIU)[21] showed that around 52% of workers were already engaged in a job that offered them a telework option. A further breakdown showed around 19% never used the opportunity, while 15% teleworked every single day. During the outbreak, as expected, telework activities significantly surged. The survey data showed that around 43% were teleworking every day with another 30% working-from-home partially during the week. Regarding future preferences, only 16% mentioned they did not expect to telework after the pandemic was over. A TPO conducted survey indicated that around 77% of employees surveyed preferred to telework more frequently compared to pre-pandemic times,[22] indicating the need to consider long-term telecommuting policies that provide the flexibility to meet workers' preferences and needs.

A survey on telecommuting conducted by South Florida Commuter Services (SFCS) in 2020 showed that prior to the pandemic, only 28% of organizations embraced a policy that allowed working from home and less than 20% of the employees surveyed telecommuted. However, during the pandemic, 81% of organizations either allowed or required work to be done from home, and post pandemic, 56% of organizations expect a work-from-home policy to continue. A long-term trend observed in the SFCS survey results, was an increase from 28% to 56% of employers expecting to embrace a work-from-home policy. The literature also forecasted 10% of the workforce to telecommute post-pandemic, a 2% increase from pre-pandemic levels.[22]

Prior to the pandemic, telecommuting trends were increasing, suggesting a long-term trend. The share of employees telecommuting surpassed the number of employees using public transit for the second year in a row. In 2018 the City of Miami had an average of 6.1% of employees telecommuting, surpassing the nationwide average of 5.3%.[23]

21 Xia Jin, et al., The Post-Pandemic Role of Telework: What Do We Learn from the COVID-19 Experience? FIU. (2020)
22 Miami-Dade TPO Telecommute Study. (Kittelson, 2021)
23 Aevaz, R. ACS Survey: While Most Americans' Commuting Trends are Unchanged, Teleworking Continues to Grow, and Driving Alone Dips in Some Major Cities. *Eno Center for Transportation.* 2019

Considering workers' preference to continue telecommuting post-pandemic, the willingness of employers to embrace telecommuting policies, and the TPO's year to year post pandemic forecast, the literature reflects that telecommuting is a long-term trend and should be considered for future planning purposes. The TPO has already taken steps to include telecommuting in its long-term planning processes by endorsing specific policies promoting telecommuting as a congestion mitigation strategy and by working with the SFCS to launch a regional telecommute pilot program.

Education and Commerce Related Travel

Regarding education-related travel and remote learning, local surveys found that most of students (52%) responded as wanting to take online classes more frequently after COVID-19 than before Covid. These changes in telecommuting patterns will be more apparent and permanent after the pandemic.[24]

Attitudes toward online shopping benefited from a sustained long-term increase in trends. The result of an Florida International University model indicates that having a higher frequency of online grocery shopping is positively correlated with a higher likelihood of online shopping post pandemic.[25]

24 Miami-Dade TPO Telecommute Study. (Kittelson, 2021)
25 Xia Jin, et al., The Post-Pandemic Role of Telework: What Do We Learn from the COVID-19 Experience? FIU. (2020)

Although there was an overall reduction in economic activity, air cargo commerce in Southeast Florida showed growth during the pandemic. At Miami International Airport (MIA), air cargo increased by 3% year to year, 2019 to 2020.[26] E-commerce and pharma shipments made in 2020 was the busiest year ever for MIA air cargo.[27]

1.6 Long Term Implications

Behavioral changes, noted in the studies, might only reflect short term effects, primarily as a consequence of directives issued by governments. The consensus is that because long-lasting impacts on travel behavior from the pandemic have not been fully realized there should be another evaluation in a post-COVID-19 world. Past pandemics have shown that disrupting impacts on travel behavior are only achievable during the period when the event took place. Caution needs to be taken and more research completed to determine long-term effects.[28] Despite what the caveats caution the need for additional research is notable from evidence in the literature that the following trends in travel behavior may in fact have long-term implications.

Observed trends to consider in long-term transportation planning are as follows:

- The concerns of transit riders regarding medical safety may continue to persist and will need to be addressed before a full rebound can be achieved. Moving forward, essential workers may benefit from transit planning's particular and intensified focus on their travel needs.
- Globally, bicycle use and other active modes increased during the pandemic. There is some evidence that this trend has been maintained even as restrictions were eased. More detailed monitoring of bicycle and pedestrian use should be implemented in communities with high activity, especially for safety and heat effect issues.

26 Reed, T. Was A Terrible Year for Air Cargo, With A Big Exception At Miami International Airport. *Forbes.* (2021)
27 Osorio, S. Miami International Airport sets new cargo record in 2020. *Miami Herald*. (2021)
28 Nguyen-Phuoc D.Q., Currie G., de Gruyter C., Young W. How do public transport users adjust their travel behavior if public transport ceases? A qualitative study. *Traffic Psychology and Behavior*. (2018)

- Downtowns are expected, and have shown thus far, to lag behind other areas in rebounding as a work trip attractor. As such, geographic decentralization of work will need to be further studied.
- Tourism related travel is expected to rebound, though there may be a one or two-year lag before taking full effect.
- Sustained increases in Online shopping are anticipated. As such, negative demand for retail space will continue to decrease the need of this land use as a trip attractor.
- Telecommuting trends were already on the rise pre-pandemic and increased dramatically during the pandemic. Local surveys of workers' sentiment express enthusiasm for telecommuting. Finally, the implications are substantial if the telecommuting trend continues, i.e., negatively affecting the demand for commercial spaces as trip-attractors.

2. DATA COLLECTION

Existing and historic traffic patterns, transit (bus, rail, people mover), pilot smart Transportation Network Company (TNC) programs, hotel occupancy, bicycle and pedestrian, cruise ship and air passenger, and aggregated mobility data in Miami-Dade County were collected from a variety of sources to support the evaluation of COVID-19's possible long-term travel impacts in the County. This section describes the data available, the collection process, and provides an overview of the datasets used for analysis.

2.1 Traffic Data

2.1.1 FDOT Telemetered Continuous Traffic Monitoring Sites (TTMS) Counts

Telemetered Continuous Traffic Monitoring Sites (TTMS) are permanently installed traffic counters used by FDOT's Transportation Data and Analytics Office to collect traffic data from strategic locations throughout the state that are mostly higher in expressway volume. An image of a TTMS can be found in ***Figure 7***. Complete total monthly traffic counts in 2019, 2020 and the first half of 2021 are available at 10 TTMS locations in Miami-Dade County. These continuous traffic counts reflect the general variations in traffic volume at different times and locations to determine the impact of COVID-19 on state roads across the county.

Figure 7: Photograph of Florida Department of Transportation (FDOT) Telemetered Continuous Traffic Monitoring Site

Table 2 includes a list of these TTMS, and their corresponding locations can be found in ***Figure 8***. ***Appendix A*** includes the Monthly Traffic Totals for each location in 2019, 2020, and available 2021 data. ***Appendix B*** features maps of percent change for each location.

Table 2: Available Total Monthly Traffic Counts in 2019, 2020 and the first half of 2021 for 10 Continuous TTMS in Miami-Dade County

TTMS #	Road Name
31	SR-A1A/Macarthur Causeway
96	SR-9 / SW of Biscayne Canal Bridge
108	SR-112/I-195/Julia Tuttle Causeway
137	SR-826/Palmetto Expressway
178	SR-5/US-1/South Dixie Highway
193	SR-878/Snapper Creek Expressway
258	SR-915/NE 6th Avenue
382	SR 887/Port of Miami Tunnel
383	SR-90/US-41/SW 8th Street
9947	US-27/Okeechobee Road

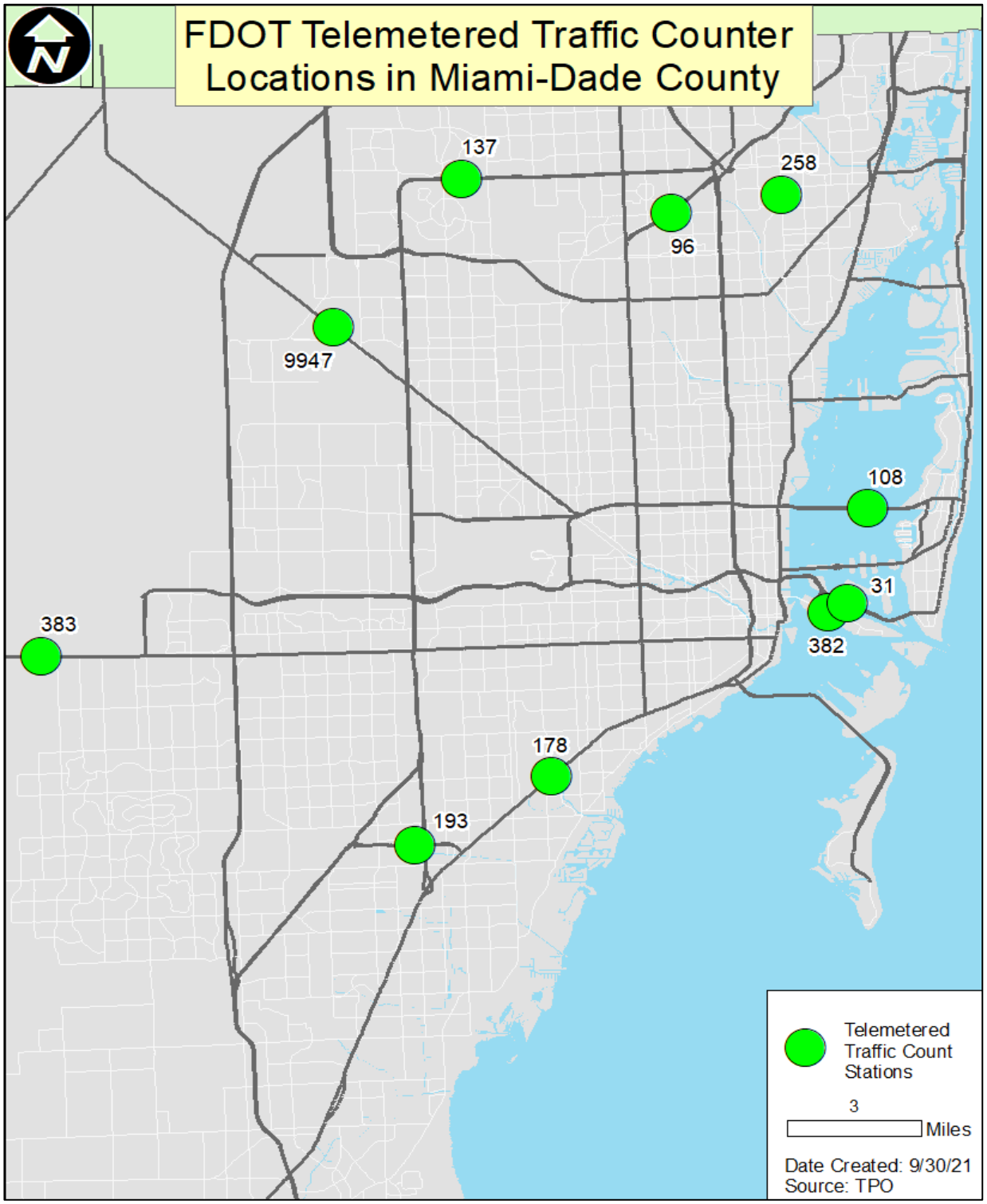


Figure 8: FDOT Telemetered Traffic Counter Locations in Miami-Dade County – Study Area

2.1.2 Miami-Dade County Department of Transportation and Public Works (DTPW) Annual Average Daily Traffic Counts

Annual average daily traffic counts in 2019, 2020 and the first half of 2021 are collected by the Miami-Dade County Department of Transportation and Public Works (DTPW) from 187 locations in Miami-Dade County. These annual traffic counts reflect lower volume local roadways when compared to FDOT's TTMS high volume. These data counts were used to reflect the general spatial and temporal variations in traffic volumes between 2019, 2020 and the first half of 2021 to determine the impact of COVID-19 on traffic across the county.

Analysis of the impacts from the pandemic is limited to documented direct impacts on various transportation modes, highlighting comparisons with trends identified in the literature. Consideration of possible mid-term and long-term impacts on travel demand will depend on data collected in the latter half of 2021 and beyond, when resumption of full economic activity makes it possible to discern the characteristics of any changes in behavior.

This analysis is intended to serve as a baseline, as conclusions about future impacts on travel are difficult to discern, as the pandemic is ongoing and has affected 2019, 2020 and the first half of 2021 data. A follow-up study collecting the same data for the latter half 2021 and potentially further into the future is recommended to properly hypothesize long-term potential impacts to travel modes and volumes. ***Appendix C*** includes the complete list DTPW count stations, and their locations can be found in ***Figure 9.***

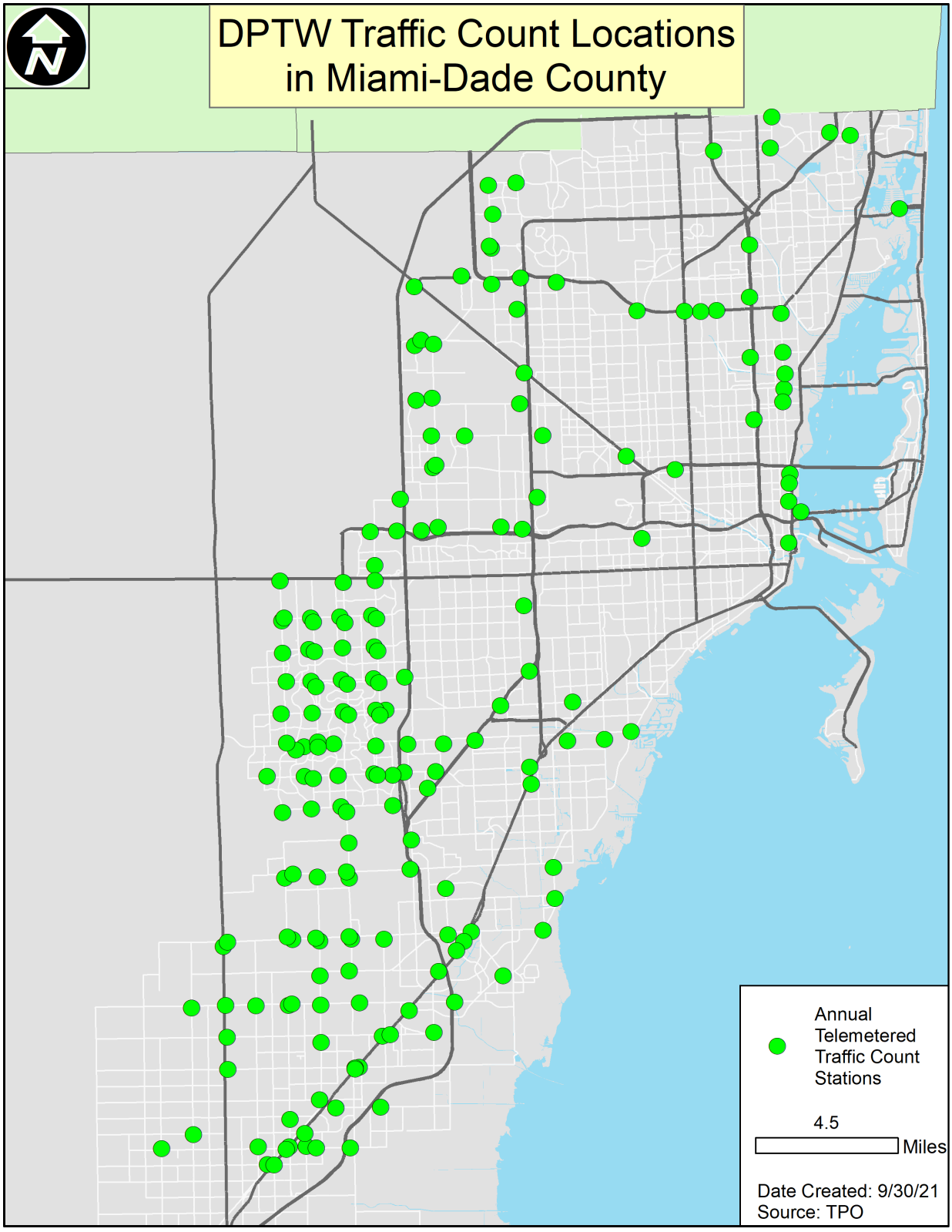


Figure 9: DTPW Traffic Count Locations in Miami-Dade County

2.2 Transit Data

2.2.1 Miami-Dade County Metrobus Ridership

The Miami-Dade Department of Transportation and Public Works publishes monthly transit ridership statistics in its Ridership Technical Reports. Monthly ridership data for 2019, 2020 and the first half of 2021 are available for 85 Metrobus routes in Miami-Dade County. The ridership data reflect the general spatial and temporal variations in transit ridership between 2019, 2020 and the first half of 2021 to determine the impact of COVID-19 on traffic across the county.

Appendix D includes the complete list of DTPW Bus Routes used in this study, along with the monthly ridership for each route in 2019, 2020 and the first half of 2021. The bus route locations are found in . Maps of percent change from 2019 to 2020 for each month and bus route can be found in ***Appendix E.***

Figure 10: Miami-Dade Metrobus (Miami and Beaches)

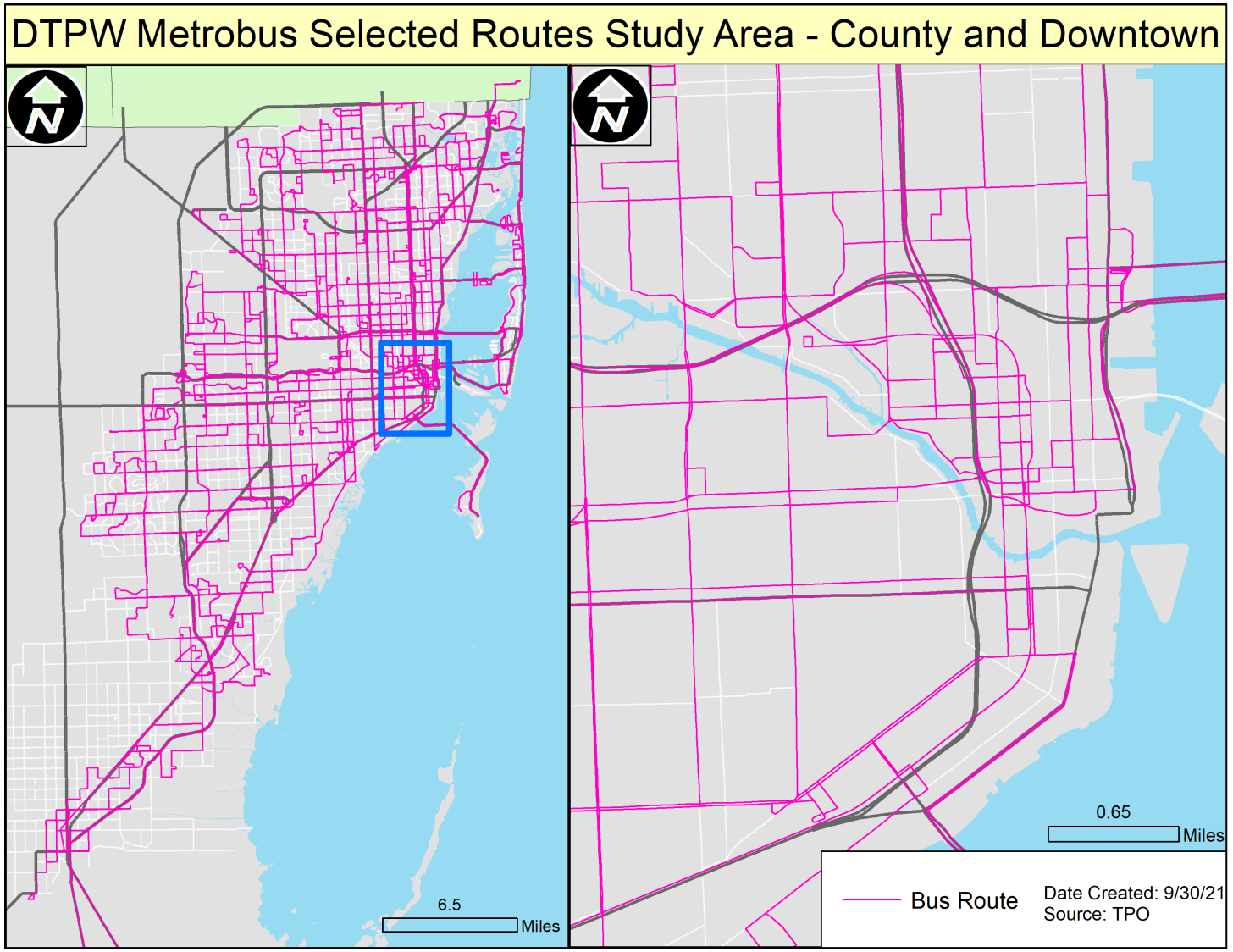


Figure 11: Miami-Dade County Metrobus Routes – Study Area

2.2.2 Miami-Dade County Metrorail Ridership

Monthly ridership statistics for Miami-Dade's Metrorail are available for 2019, 2020 and the first half of 2021 for 23 Metrorail stations in Miami-Dade County and were acquired through the Ridership Technical Reports. These ridership counts reflect the general spatial and temporal variations in rail transit ridership volumes between 2019, 2020 and the first half of 2021 to determine the impact of COVID-19 on ridership across the county. ***Appendix F*** includes the complete list of DTPW Metrorail stations used in this study and their corresponding monthly ridership data between 2019, 2020 and the first half of 2021. ***Figure 13*** features a list of Metrorail stations and their respective locations. Maps of percent change from 2019 to 2020 for each month for each Metrorail station can be found in ***Appendix G.***

Figure 12: Miami-Dade Metrorail Car at Station (Miami Herald)

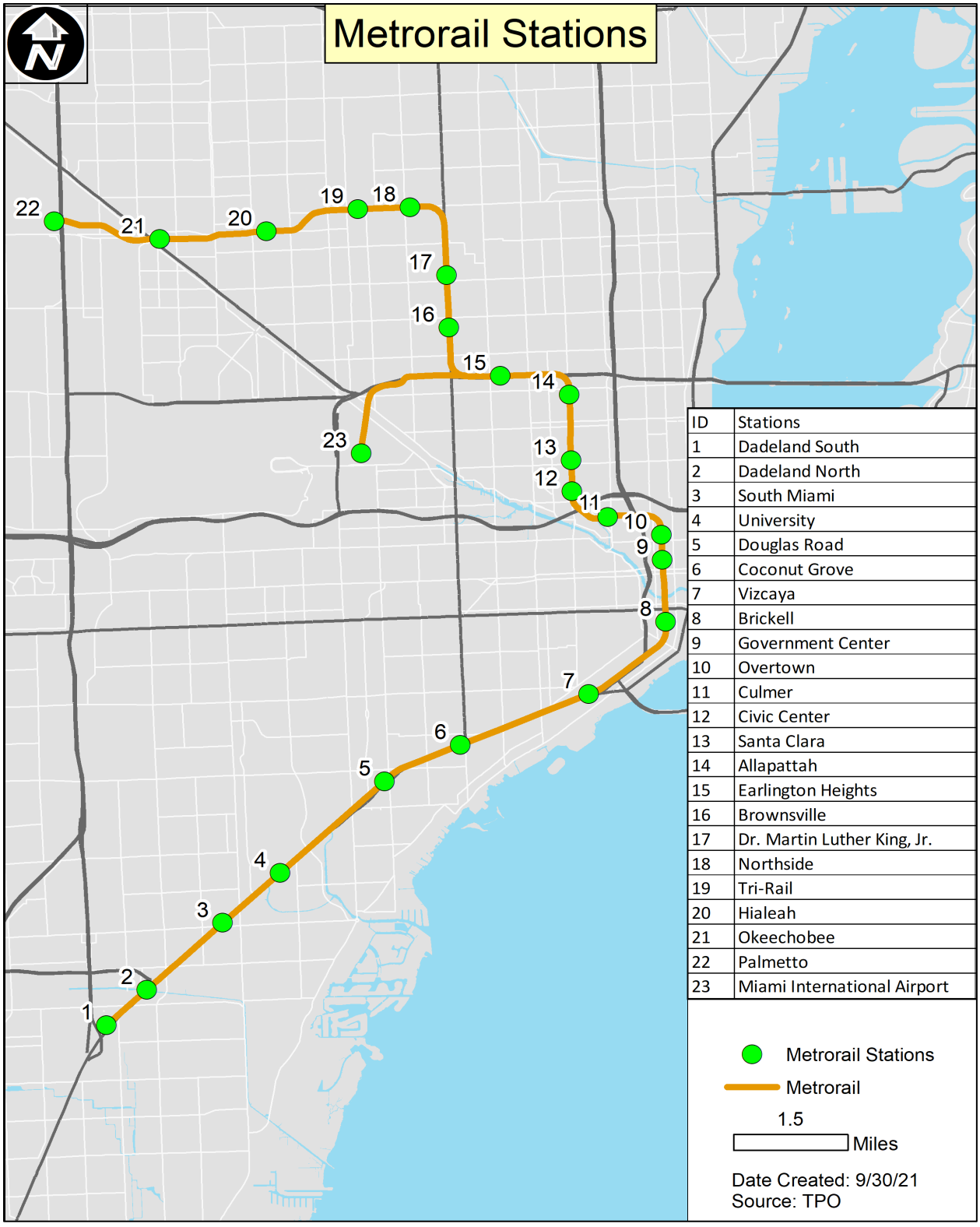


Figure 13: Miami-Dade County Metrorail Station Locations – Study Area

2.2.3 Miami-Dade County Metromover Ridership

Monthly ridership statistics for Miami-Dade's Metromover are available for 2019, 2020 and the first half of 2021 for all Metromover stations in Miami-Dade County and were acquired through the Ridership Technical Reports. These ridership counts reflect the general spatial and temporal variations in Metromover ridership volumes between 2019, 2020 and the first half of 2021 to determine the impact of COVID-19 on ridership across the county. ***Figure 15*** depicts the locations of Metromover stations. ***Appendix H*** includes the complete list of DTPW Metromover stations used in the study and monthly ridership between for 2019, 2020 and the first half of 2021. Maps of percent change from 2019 to 2020 for each month for each Metromover station can be found in ***Appendix I.***

Figure 14: Miami-Dade Metrorail Car on tracks (elektriske.com via Youtube)

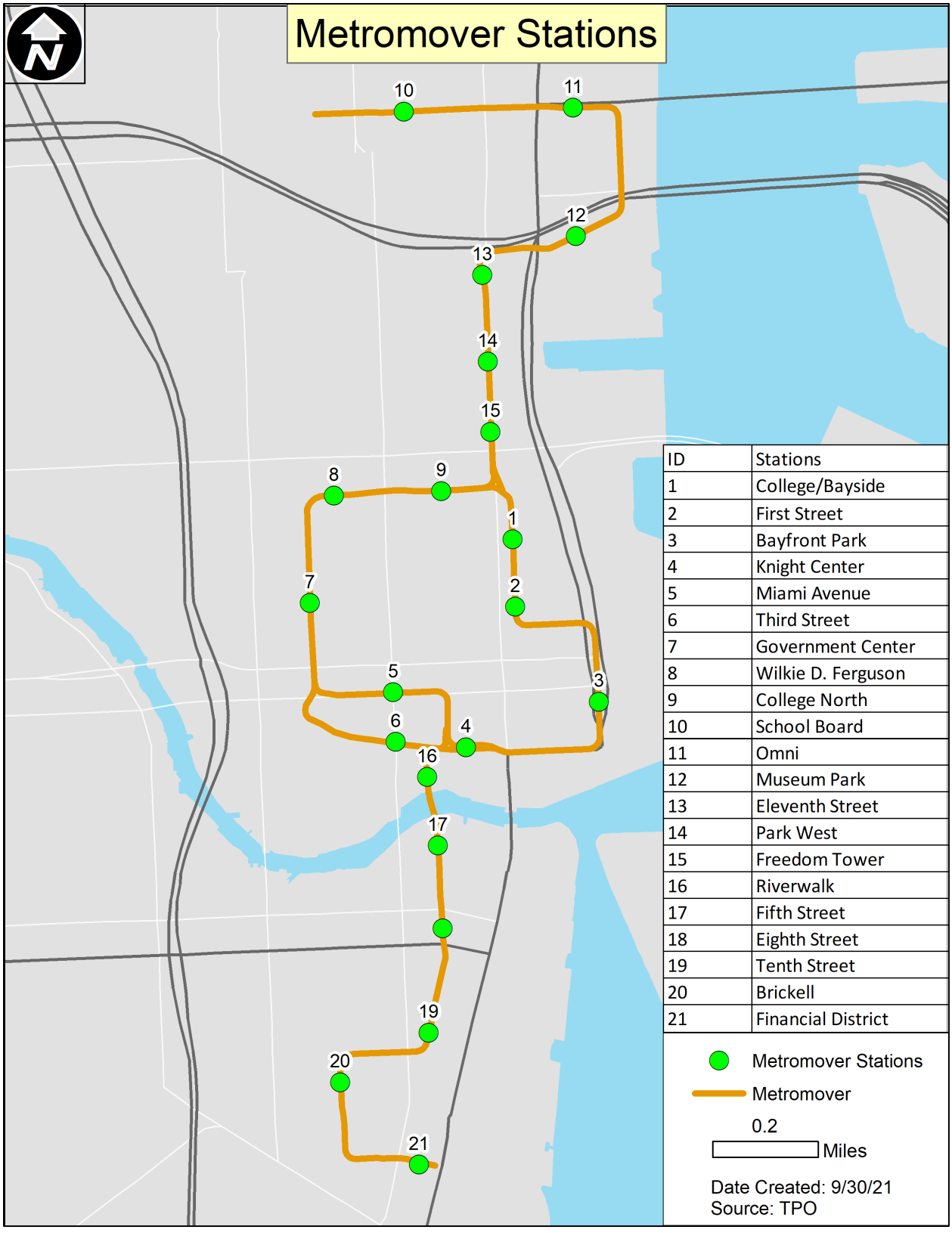


Figure 15: Miami-Dade County Metromover Station Locations – Study Area

2.3 SMART Plan Demonstration Projects

As part of the Miami-Dade TPO's SMART Plan, "first/last mile" TNC Demonstration Projects were implemented in various cities throughout the County. The Demonstration Program showcased an "on demand" TNC pilot service implemented and funded through the Citizens Independent Transport Trust (CITT) program. The "on demand" service is similar to an app-based Uber/Lyft type service. The TPO operated nine demonstration lines in 2019 and eleven in 2020, and data is available for both years on two routes (City of Doral/FIU Trolley and City of Coral Gables on-demand service). Locations of these SMART Program TNC Demonstration Study Areas are presented in *Error! Reference source not found.*

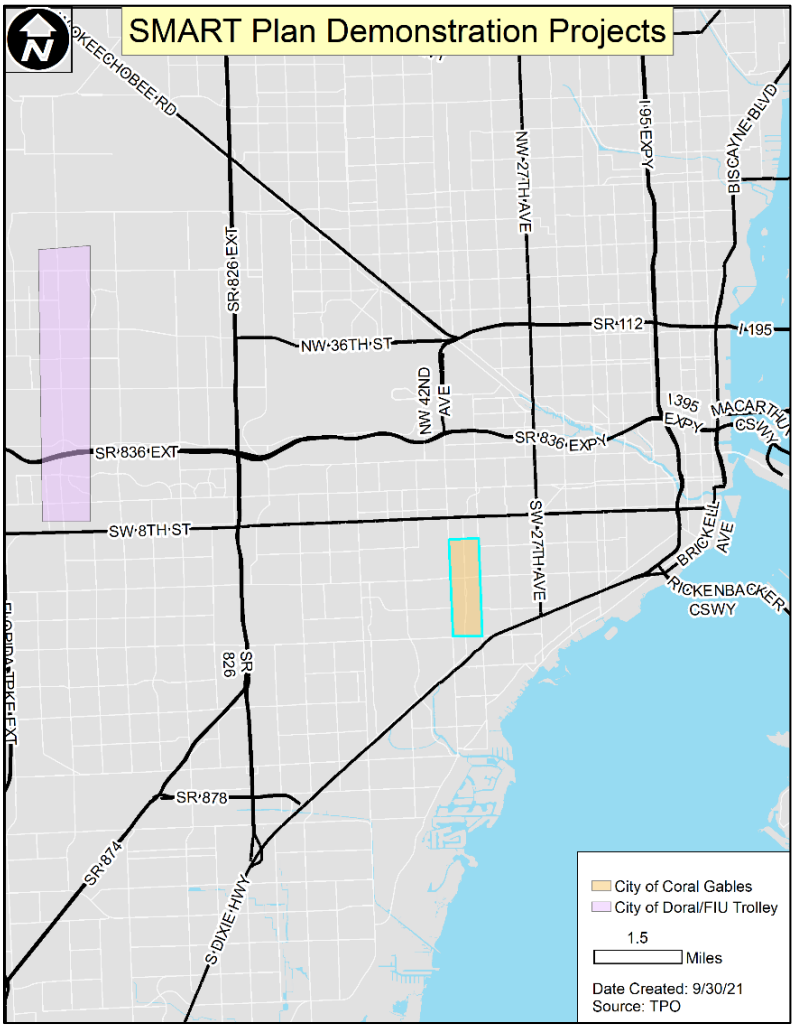


Figure 16: TNC Demonstration Projects Available for 2019 – 2020

2.4 Miami-Dade County Hotel Occupancy

Hotel Occupancy were collected through surveys of hotels by the Miami-Dade County Visitors and Convention Center Bureau (GMVCB). Hotel occupancy data is available at the monthly level for 2019, 2020 and the first half of 2021 for 12 designated neighborhoods. These occupancy rates reflect the general spatial and temporal variations in volume of visitors to the County between 2019, 2020 and the first half of 2021 to determine the impact of COVID-19 on visitor traffic across the county. These neighborhoods and locations are presented in ***Figure 18. Appendix J*** contains the hotel occupancy for each location and month for 2019, 2020 and the first half of 2021, and ***Appendix K*** contains a chart and maps of percent change in hotel occupancy for each month from 2019 to 2020.

Figure 17: South Beach Hotels Along Ocean Drive (Flickr)

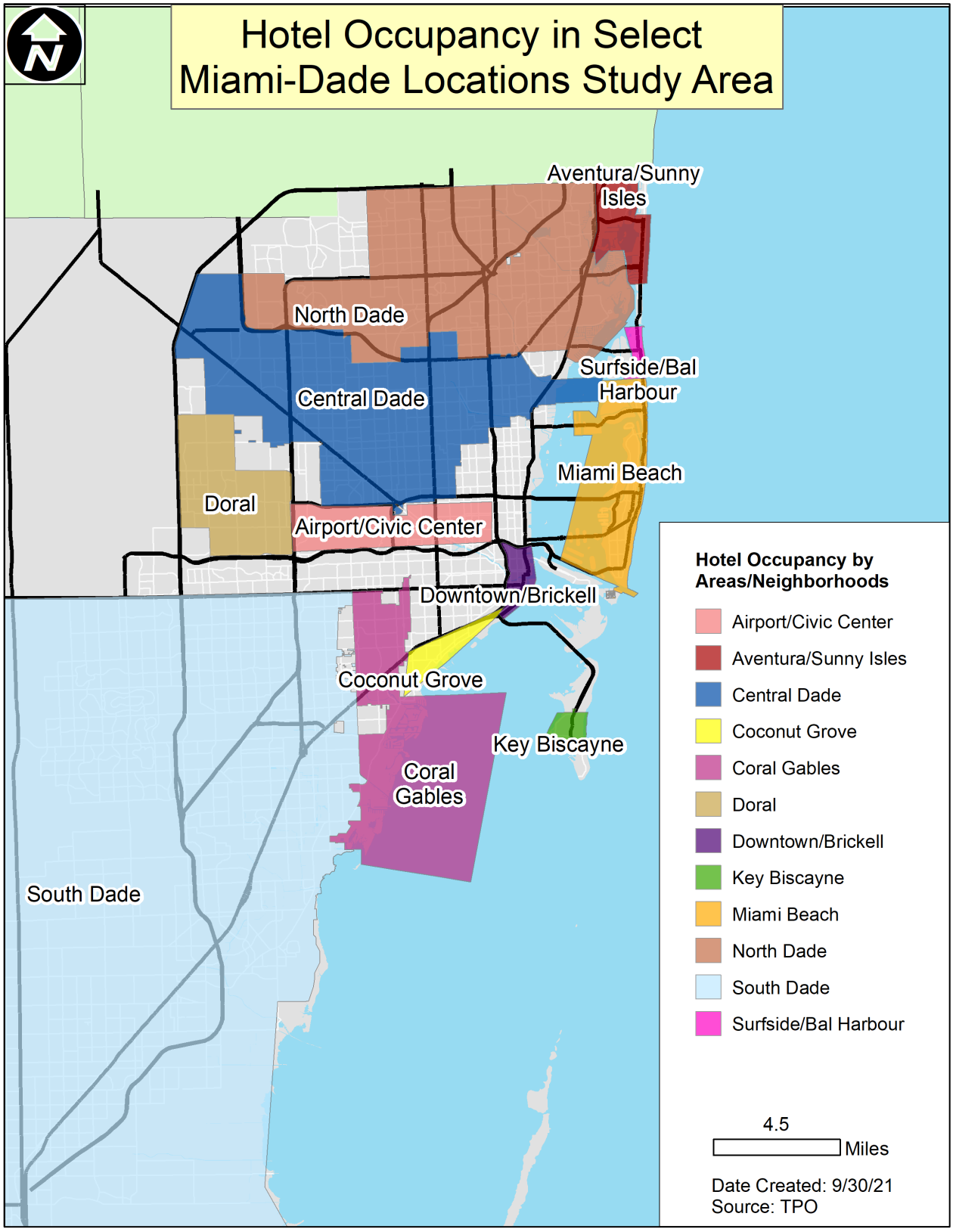


Figure 18: Miami-Dade County Hotel Occupancy in Select Areas/Neighborhoods – Study Area

2.5 Bicycle and Pedestrian Activity

Bicycle and Pedestrian counters were installed by the TPO to collect data on the M-path near the Vizcaya Metrorail station. Monthly bicyclist and pedestrian counts for 2019 and 2020 were available and used for this analysis. These bicyclist and pedestrian counts reflect the variations in volumes between 2019 and 2020 to determine the impact of COVID-19 on bicycle and pedestrian activity along the M-path near the Vizcaya Metrorail Station. The location is shown in ***Figure 19.***

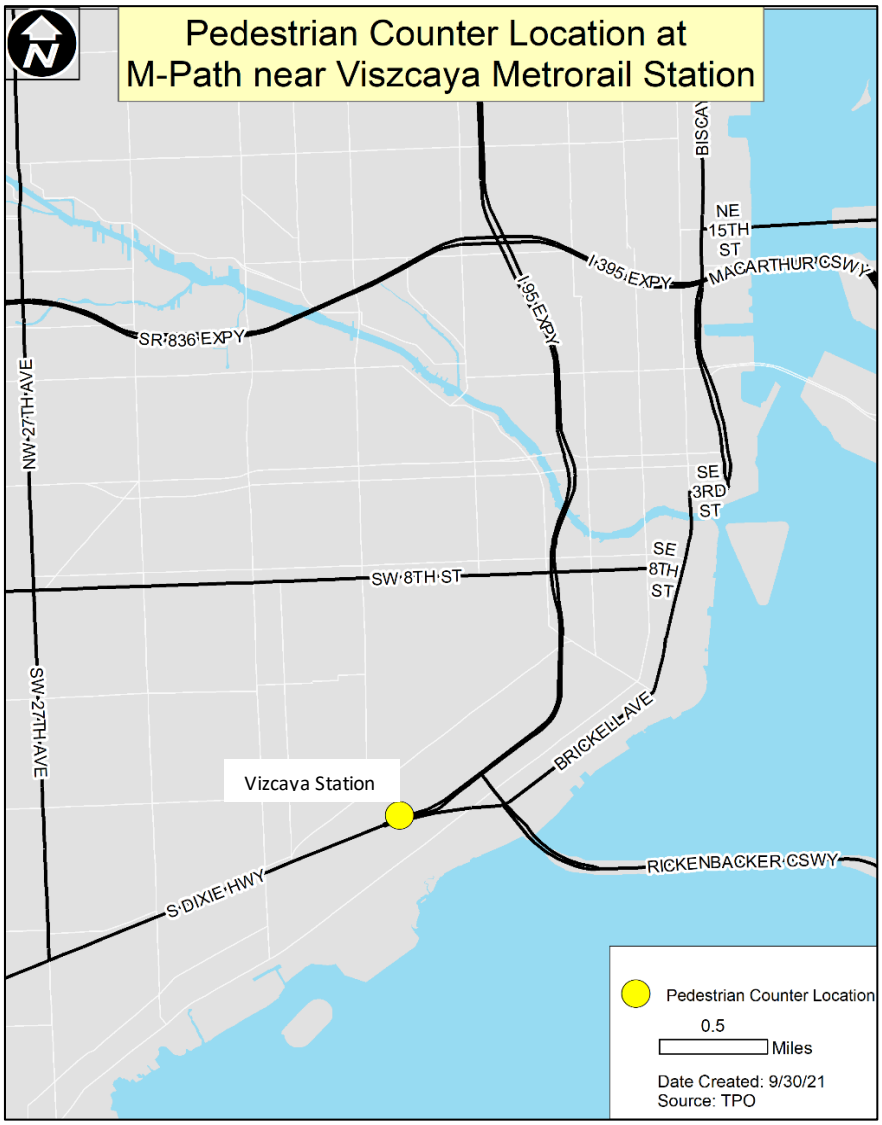


Figure 19: Pedestrian Counter Location at the M-Path near Vizcaya Station

2.6 Port of Miami Cruise and Miami International Airport

Port of Miami Cruise and Miami International Airport Total Passenger data was provided by Port of Miami and Miami International Airport (***Figure 20***) and is available at the monthly level for 2019, 2020 and the first half of 2021. These data sets are sufficient to determine the effect of COVID-19's impact on visitor traffic and travel.

Figure 20: Miami International Airport

2.7 Aggregated Mobility Metrics

County-level mobility metrics from the University of Maryland COVID-19 Impact Analysis Platform[29] and Google's COVID-19 Community Mobility Reports for Miami-Dade County[30] were collected to provide additional insights into traffic, transit, and other supplemental data.

29 https://umd.edu/covid-19-dashboard
30 https://www.google.com/covid19/mobility/

2.7.1 University of Maryland Mobility Metrics

The University of Maryland (UMD) COVID-19 Impact Analysis Platform offers free mobility and other COVID-19 related metrics for states and counties in the United States. The project team first integrated and cleaned location data from multiple sources representing person and vehicle movements to improve the quality of the mobile device location data panel. The data sources and computational algorithms have been validated based on a variety of independent datasets and peer reviewed by an external expert panel in a previous project funded by the U.S. Department of Transportation Federal Highway Administration's Exploratory Advanced Research Program, titled "Data analytics and modeling methods for tracking and predicting origin-destination travel trends based on mobile device data."

The following travel-related and behavioral metrics in Miami-Dade County were collected to reflect COVID-19's traffic impacts at the county level:

- Social Distancing Index[31]
- Percentage of residents staying at home
- Number of trips per person per day
- Number of miles traveled per person per day
- Number of work trips per person per day
- Number of non-work trips per person per day
- Percentage of all trips that cross county borders
- Percentage of all trips that cross state borders
- Unemployment Rate
- Percent Working from Home
- Percent Change in Consumption

31 The social distancing index is computed from six mobility metrics by this equation: social distancing index = 0.8*[% staying home + 0.01*(100 - %staying home)*(0.1*% reduction of all trips compared to pre-COVID-19 benchmark + 0.2*% reduction of work trips + 0.4*% reduction of non-work trips + 0.3*% reduction of travel distance)] + 0.2*% reduction of out-of-county trips. The weights are chosen based on share of residents and visitor trips (e.g., about 20% of all trips are out-of-county trips, which led to the selection of a weight of 0.8 for resident trips and 0.2 for out-of-county trips); what trips are considered more essential (e.g., work trips more essential than non-work trips); and the principle that higher social distancing index scores should correspond to fewer chances for close-distance human interactions and virus transmissions.

Daily data from 2020 for each University of Maryland mobility metric is in ***Appendix L,*** and charts for each metric are found in ***Appendix M*** through ***Appendix W***.

2.7.2 Google Mobility Metrics

Google COVID-19 Community Mobility Reports are created with aggregated, anonymized sets of data from users who have turned on their location history setting. Typically, this setting is off by default. These reports provide the percent change in the number of visitors (or time spent) compared to baseline days. A baseline day is the median value for that day of the week from the 5-week period: January 3, 2020 – February 6, 2020. Google mobility metrics were first reported on February 15, 2020 and are available through 2021. This study gathered six county-level metrics for Miami-Dade County to examine if the traffic impacts of COVID-19 vary by trip destinations, as suggested in the literature.

The data is associated with six categorized places:

- Retail & Recreation (e.g., restaurants, cafes, shopping centers, theme parks, museums, libraries, and movie theaters).
- Grocery & Pharmacy (e.g., grocery markets, food warehouses, farmers markets, specialty food shops, drug stores, and pharmacies).
- Parks (e.g., national parks, public beaches, marinas, dog parks, plazas, and public gardens).
- Transit Stations (e.g., public transport hubs such as subway, bus, and train stations).
- Workplaces.
- Residential.

Daily data through 2021 for each Google mobility metric is in ***Appendix X,*** and charts containing each metric are found in ***Appendix Y.***

Due to different intensities of lockdowns, throughout 2020, impacting travel levels inconsistently, data from 2020 serves as a baseline. Initial analysis documents the impact of the lockdowns on transportation throughout the first year of the pandemic by comparing 2019 to 2020 data sets as they relate to different phases of lockdowns. The project team also included additional analysis of available data for 2021 to get a better idea of current pandemic trends post lockdowns.

Available 2021 data sets include:

- FDOT Telemetered Continuous Traffic Monitoring sites (TTMS) Counts through October (***Figure 26*** *and* ***Figure 27*** *of* **Appendix AA**).
- Miami-Dade County Department of Transportation and Public Works (DTPW) Annual Average Daily Traffic Count (***Figure 28*** *of* **Appendix AA**).
- Airport Passengers through August (***Figure 29*** *of* **Appendix AA**).
- Miami-Dade County Hotel Occupancy through August (***Figure 29*** and ***Figure 30*** *of* **Appendix AA**).
- Miami-Dade County Metrobus Total Ridership through September (***Figure 29*** *of* **Appendix AA**).
- Miami-Dade County Metrorail Total Ridership through September (***Figure 29*** *of* **Appendix AA**).
- Miami-Dade County Metromover Total Ridership through September (***Figure 29*** *of* **Appendix AA**).
- SMART Plan Demonstration Projects through the second quarter (***Table 19***).
- University of Maryland Mobility Metrics through April (***Appendix L***).
- Google Mobility Metrics through November (***Appendix X***).

3. KEY PHSASES OF ANALYSIS

To determine future travel impacts brought about by COVID-19, data sets were stratified into 5 key phases of analysis. Key phases were determined by establishing a representative sample of typical pre-pandemic (Prior to March 2020) travel patterns and behavior and a pandemic sample. The pandemic sample consists of 2020 data stratified by lockdown phases as defined by the Color Identification System in Miami-Dade County's *The New Normal: A Guide for Residents and Commercial Establishments,*[32] outlined below in ***Figure 21*** below.

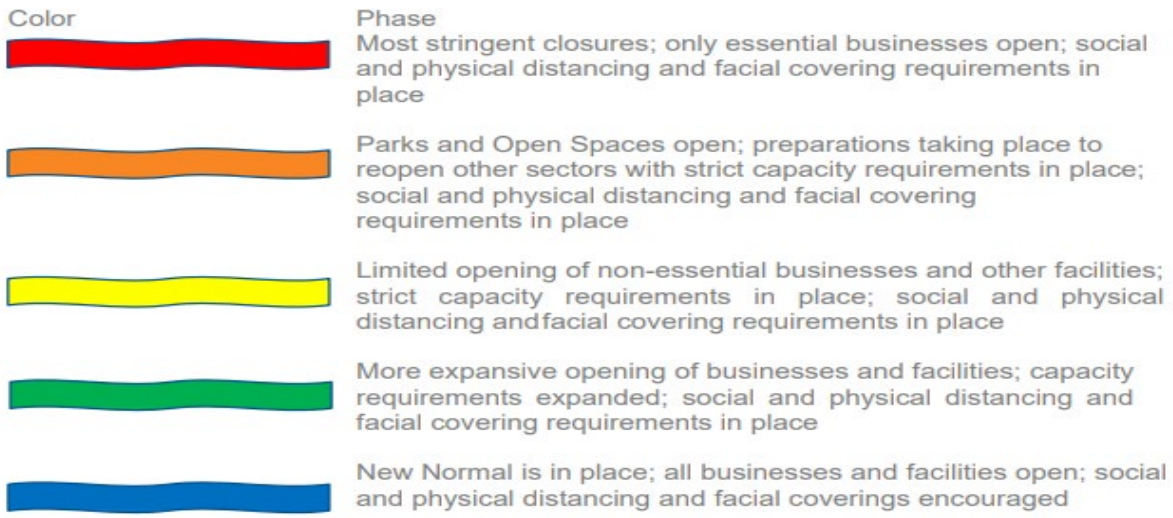


Figure 21: COVID-19 Lockdown Phases Color Identification System

The legal restriction of public activity and travel in 2020 by 42 Miami-Dade County Emergency Orders[33], as documented in ***Appendix Z***, were aligned to the Color Identification System definitions to determine a color definition for each month. This resulted in a monthly framework as outlined on ***Table 3***.

32 Miami-Dade County's The New Normal: A Guide for Residents and Commercial Establishments - https://www.miamidade.gov/information/library/new-normal.pdf
33 Coronavirus (COVID-19) Emergency Orders (miamidade.gov) - https://www.miamidade.gov/global/initiatives/coronavirus/emergency-orders.page

Table 3: Designated Phases for Analysis by Color and Month according to Miami-Dade County's The New Normal: A Guide for Residents and Commercial Establishments.

Month	Note	Phase	Phase definition
January-February	Pre Covid	N/A	N/A
March	Buildup	N/A	N/A
April- May	Shutdown	Red Phase	Most stringent closures; only essential businesses open; social and physical distancing and facial covering requirements in place
June	Parks Open	Orange Phase	Parks and Open Spaces open; preparations taking place to reopen other sectors with strict capacity requirements in place; social and physical distancing and facial covering requirements in place
July	Opening non-essential businesses	Yellow Phase	Limited opening of non-essential businesses and other facilities; strict capacity requirements in place; social and physical distancing and facial covering requirements in place
August	Reopening Expansion	Yellow Phase	Limited opening of non-essential businesses and other facilities; strict capacity requirements in place; social and physical distancing and facial covering requirements in place
September	Capacity expansion	Green Phase	More expansive opening of businesses and facilities; capacity requirements expanded; social and physical distancing and facial covering requirements in place
October-December	Reopening by Executive Order	Blue Phase	New Normal is in place; all businesses and facilities open; social and physical distancing and facial coverings encouraged

4. DATA ANALYSIS

4.1 Overview

The COVID-19 outbreak was officially declared a pandemic in March 2020. In Miami-Dade County a sequence of restrictions on non-essential activities were mandated in March and early April, with direct impacts on transit usage, vehicle traffic patterns, air traffic, cruise traffic and general economic activity. As a result, transit usage and usage of other modes of transportation fell dramatically.

In May and June, as reopening was allowed, transit usage and usage of other modes of transportation began to slowly recover. By the end of 2020, cruise lines were still shut down, air traffic was well below pre-pandemic levels, as well as transit usage. Auto traffic levels were the least impacted in the aggregate but were still below 2019 levels, albeit with significant variations by trip type and origin-destination. Economic activity was also still constrained.

The impacts on travel were constantly changing throughout the scope of this report and continued to do so through the following year of 2021. As a result, the analysis of pandemic impacts for this report is limited to documenting direct impacts on various transportation modes, highlighting their comparison with trends identified in the literature. Consideration of possible mid-term and long-term impacts on travel demand will depend on data collected for the remainder of 2021 and beyond, when economic recovery should make it possible to discern the characteristics of any changes in behavior.

Table 4 and ***Figure 22*** provide an overview of the direct impacts on travel and tourism-based activities in Miami-Dade County in 2020 when compared with 2019. For each indicator, monthly data on rail and bus ridership, air/cruise passengers, vehicle counts or hotel occupancy in 2020 is compared with 2019 data, presented as a percent change.

Response to the stages of lockdowns implemented, in March and April of 2020, was unprecedented in its scope and magnitude, with offices, schools and most non-essential businesses closed or operating online. In April:

- Transit use was down 64% to 85%, depending on mode.
- Auto traffic was down by half (in the aggregate for 10 counters).
- Cruises (and their passengers) completely stopped for the rest of the year (and into mid-2021).
- Air traffic was down by more than 95%.
- Hotel occupancy was down by 70%.

There was a substantial shift away from shared transportation modes, such as bus and rail, to active modes and private cars in the months that followed the lockdown through to the end of the year, with variable rates of recovery for both economic activity and various travel modes. None of the indicators returned to prior 2020-year levels. Metrobus had the best recovery among transit options, down only 28% at the end of 2020. These shifts are consistent with the responses cited in the literature review.

Table 4: Miami-Dade County COVID-19 Impacts, Percent Change by Month, 2019 – 2020

Indicator	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metrobus	2%	2%	-27%	-64%	-58%	-45%	-43%	-40%	-39%	-37%	-37%	-28%
Metrorail	-7%	1%	-35%	-83%	-78%	-60%	-58%	-59%	-59%	-55%	-56%	-50%
Metromover	15%	17%	-40%	-85%	-80%	-74%	-73%	-73%	-72%	-72%	-72%	-71%
Highway Traffic*	2%	3%	-24%	-50%	-39%	-20%	-25%	-23%	-15%	-18%	-24%	-21%
Air Passengers	0%	5%	-46%	-97%	-93%	-83%	-79%	-77%	-73%	-66%	-57%	-54%
Cruise Passengers	3%	14%	-59%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%
Hotel Occupancy	4%	2%	-50%	-70%	-61%	-57%	-59%	-53%	-41%	-40%	-45%	-38%

*collected at selected locations

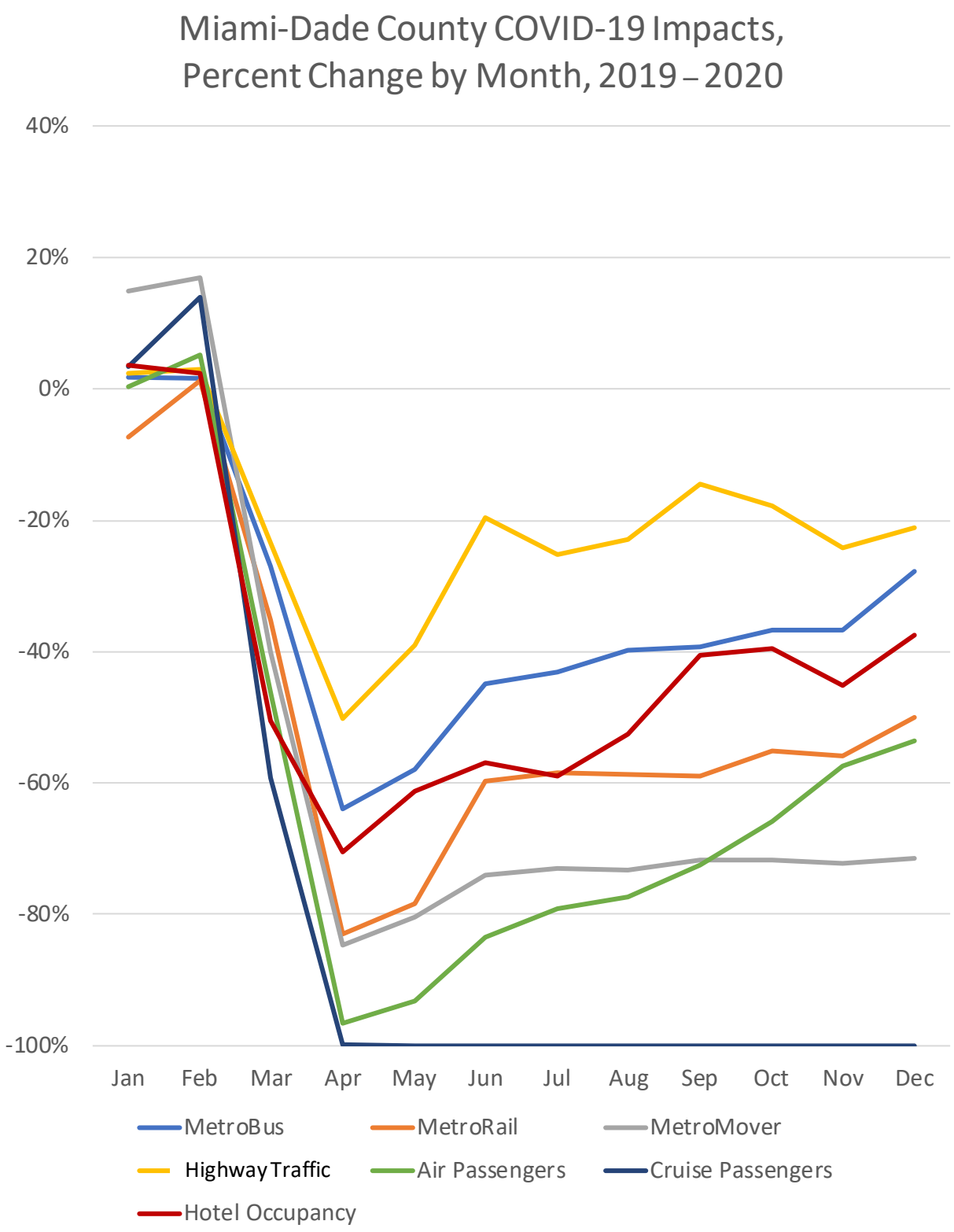


Figure 22: Miami-Dade County COVID-19 Impacts, Percent Change by Month, 2019 – 2020

The COVID-19 outbreak continued throughout 2021 and is still ongoing. Traffic and transit usage declined with increases in new cases on a short-term basis. By June of 2021, total highway traffic was higher than 2019 levels, while transit usage remained below average. Airport passengers and hotel occupancy numbers experienced consistent growth since being impacted by lockdown orders in April 2020. Airport passengers traffic significantly dropped in February 2021, following new peak recorded cases in mid-January 2021. Reductions in hotel occupancy and airport passengers occurred in July and August 2021, immediately following another peak of new cases spiking in July 2021 and continued to rise until peaking for a third time in mid-August. At the same time, driven by a sharp decrease in traffic near the Port, overall highway traffic declined in June. Through 2021 highway traffic continued to grow with little disruption from new cases, while major impacts to tourism travel are observed in the month following a spike. This follows the logic that decisions to book hotels and flights are planned well in advance, thus showing their impacts later.

Table 5 and ***Figure 23*** provide an overview of the direct impacts on travel and tourism-based activities in Miami-Dade County in 2021 when compared with 2019. For each indicator, monthly data on ridership, passengers, vehicle counts or hotel occupancy in 2021 as compared with same-month 2019 data, presented as a percent difference. ***Figure 23*** shows the entire timeline from 2019 through 2021 showing the full trend throughout that period

The impacts to travel behavior caused by COVID-19 are ongoing. However, some hypotheses regarding future impacts to travel, or at least possible correlations between COVID-19 and travel behavior can be observed from the past.

- Spikes in new cases impact negatively on travel patterns, reducing transit usage and travel to the Port.
- The impact on hotel occupancy, airport passengers, and personal travel is less than it is for transit.
- Transit usage in 2020/2021 is still significantly lower than 2019, especially for Metrorail and Metromover.

- Local traffic increased in 2021 compared to 2020 for most locations. However, most locations were not above 2019 pre pandemic levels, especially suburban locations.
- Overall local traffic is still below 2019 levels.
- SMART Demonstration Program (TNC) usage is negatively impacted.
- Overall, travel patterns in 2021 began to return to normal as the number of new cases declined, although transit is still impacted across all three modes. The return to normal is dependent on reducing the number of new cases per day. Record new cases per day causes decreases in traffic and transit. Tourism, despite being impacted by the number of new cases early in the pandemic, was resilient to the summer spike in new cases. This could indicate that demand for tourism may be less sensitive to the number of new cases than personal travel. Moving forward analysis of future data is necessary to make this determination. Further long-term analysis would have to be completed to see if there is a permanent shift from regular transit users to personal drivers. There may also be long term reductions in suburban traffic, as working from home is adopted by suburban commuters.

Table 5: Miami-Dade County COVID-19 Impacts, Percent Change by Month, 2019 – 2021

	Metrobus	Metrorail	Metromover	Hotel Occupancy	Airport Passengers	Highway Traffic
Jan-21	-24%	-54%	-66%	-30%	-56%	-15.0%
Feb-21	-22%	-51%	-64%	-22%	-56%	-14.8%
Mar-21	-15%	-45%	-62%	-15%	-41%	-6.8%
Apr-21	-15%	-47%	-64%	-11%	-25%	-4.1%
May-21	-11%	-42%	-58%	-2%	-12%	-8.2%
Jun-21	-32%	-51%	-55%	-1%	-8%	0.8%
Jul-21	-30%	-50%	-52%	-6%	-5%	
Aug-21	-28%	-50%	-54%	-18%	-12%	
Sep-21	-28%	-48%	-54%			

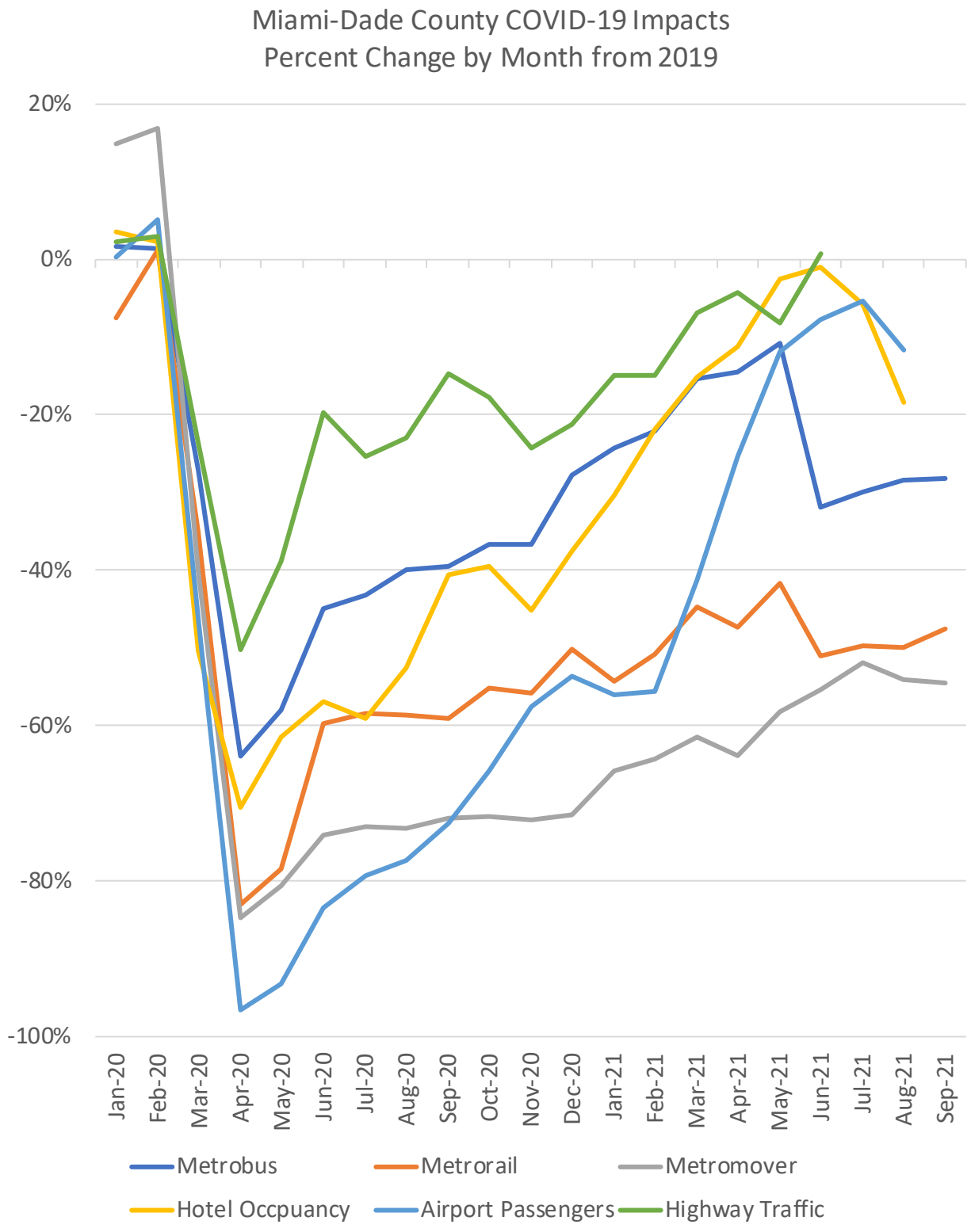


Figure 23: Miami-Dade County COVID-19 Impacts, Percent Change by Month from 2019

4.2 Tourism

Activities related to tourism were among the most affected by the restrictions put in place in response to the pandemic (***Figure 24***). New cruise boardings fell to zero from April 2020 onwards and air passenger traffic was down by more than 90% in April and May 2020. Hotel occupancy rates countywide fell to 24% in April of 2020, 70% below the rates in April of 2019, and were still below 50% at the end of the year.

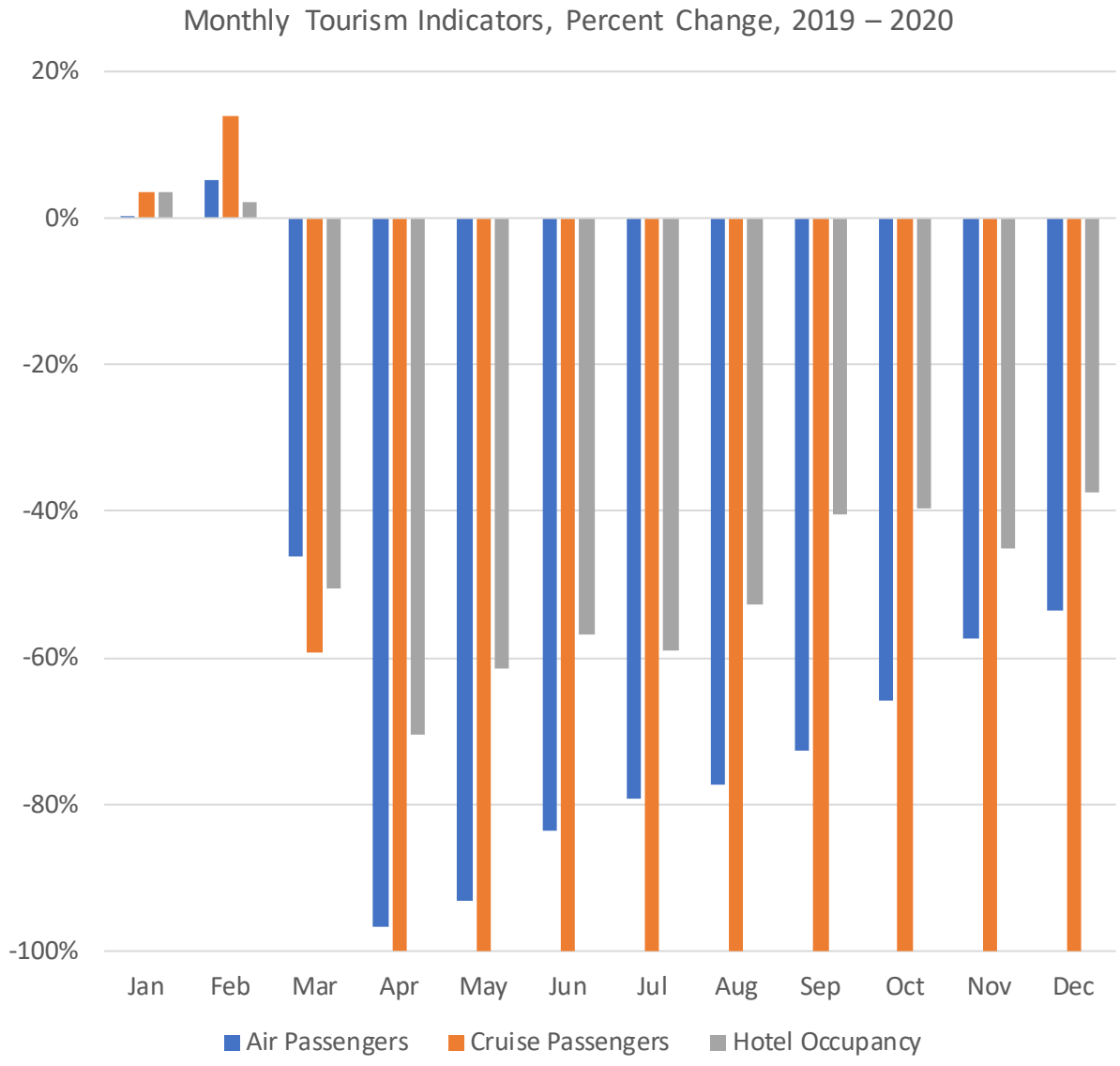


Figure 24: Monthly Tourism Indicators, Percent Change, 2019 – 2020

Except for cruise passengers, which did not begin operating until July 2021, tourism activities recovered through 2021 as restrictions were relaxed. Hotel occupancy and airport passengers nearly reached 2019 levels in June of 2021 ***(Figure 25)***, however recent spikes in new cases in the later part of the year contributed to a reversal in this trend. Recent spikes in new cases seem to have had less of an impact on tourism than previous spikes and this trend may continue in the future.

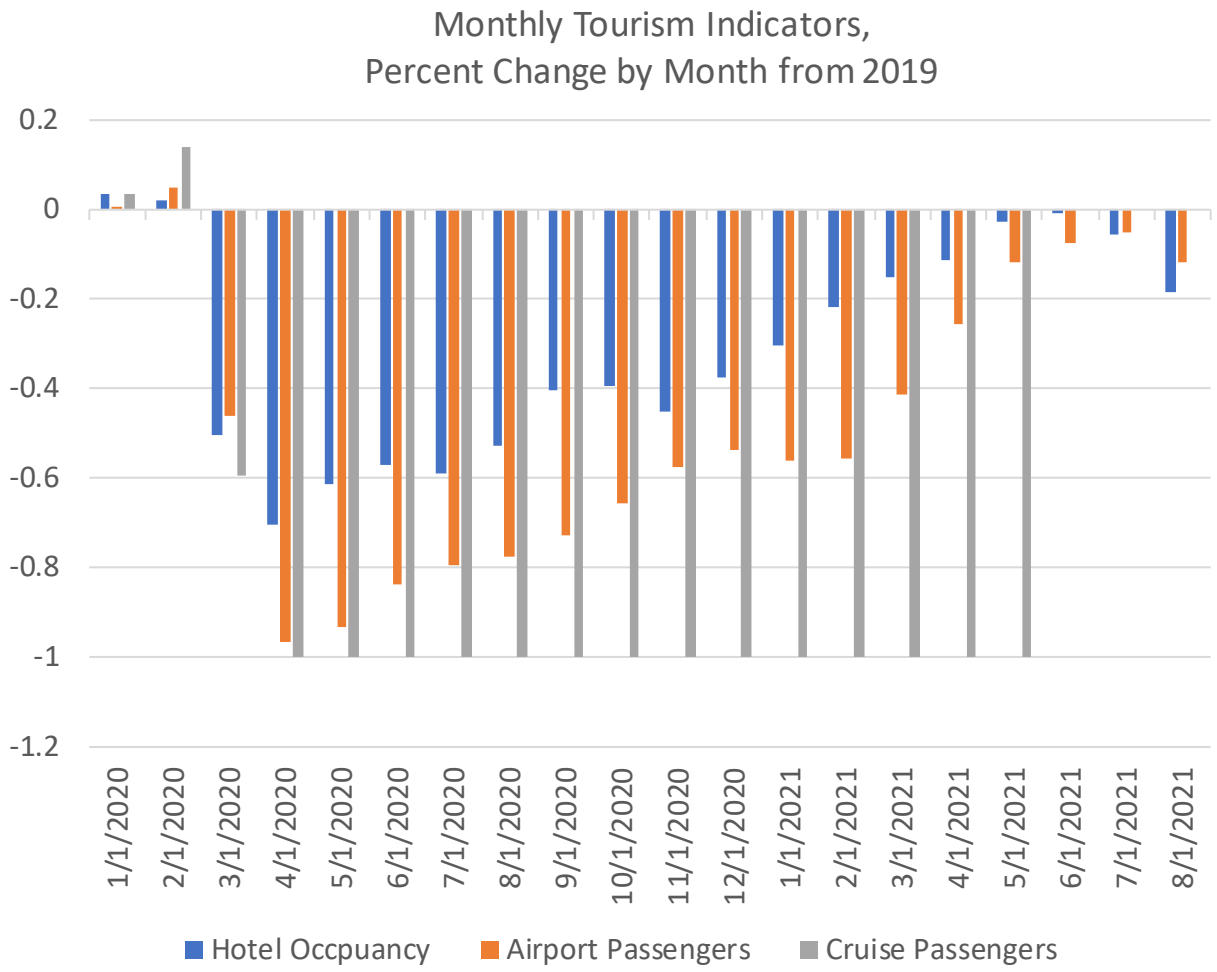
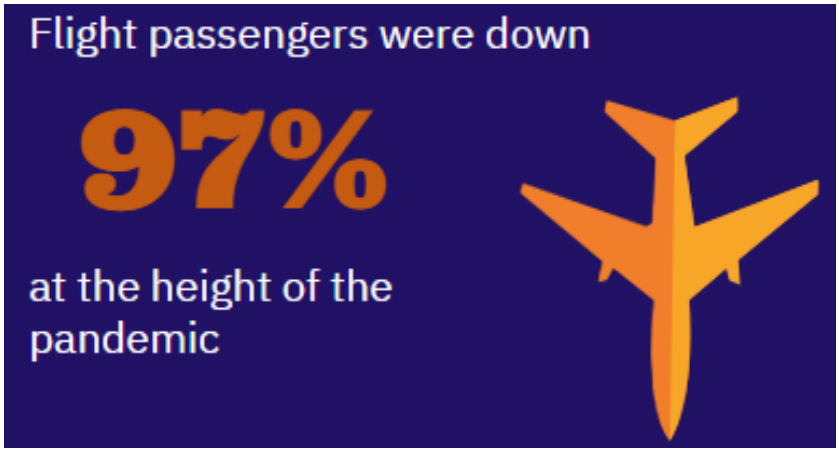


Figure 25: Monthly Tourism Indicators, Percent Change by Month from 2019

Cruise Passenger data is not available for 2021, although cruises did resume from Miami in July.

4.2.1 Miami International Airport and Port of Miami Cruise and Air Passengers



After modest increases in January and February, air passenger boardings fell to fewer than 130,000 in April of 2020, compared to 3.8 million a year earlier, a decrease of 97% (***Table 6***). The number of passengers in December 2020 was still down by more than half when compared to the previous year. ***Figure 26*** shows the monthly percentage change in passengers at the Port of Miami and Miami International Airport from 2019 to 2020.

Table 6: MIA Passengers, 2019 – 2020

Month	2019	2020	Change	% Change
Jan	4,195,763	4,211,272	15,509	0.4%
Feb	3,732,381	3,924,588	192,207	5.1%
Mar	4,210,141	2,268,331	-1,941,810	-46.1%
Apr	3,779,459	129,827	-3,649,632	-96.6%
May	3,789,658	256,910	-3,532,748	-93.2%
Jun	3,789,880	627,362	-3,162,518	-83.4%
Jul	4,023,556	836,387	-3,187,169	-79.2%
Aug	3,828,043	868,221	-2,959,822	-77.3%
Sep	3,192,720	876,621	-2,316,099	-72.5%
Oct	3,423,480	1,172,074	-2,251,406	-65.8%
Nov	3,673,408	1,561,783	-2,111,625	-57.5%
Dec	4,152,298	1,930,482	-2,221,816	-53.5%
Average	3,815,899	1,555,322	-2,260,577	-59.2%

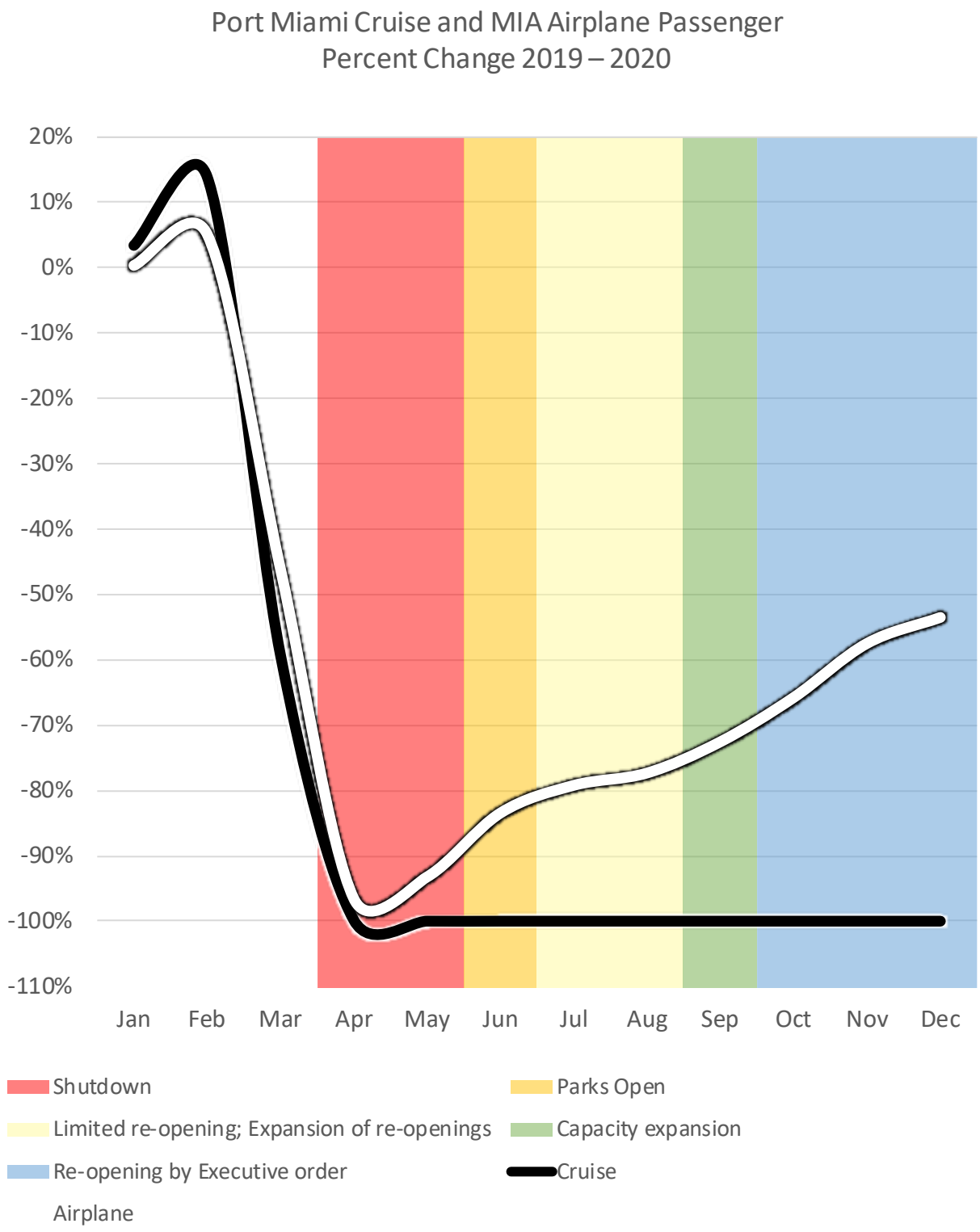


Figure 26: Monthly Port of Miami Cruise and Miami International Airport Passengers, Percentage Change, 2019 – 2020

There were 3.3 million total airport passengers in August 2021, 12% below air passenger boardings in August of 2019 (***Figure 43*** of ***Appendix AA***). ***Figure 27*** shows the total passengers at Port of MIA International Airport from 2019 through 2021. Looking at the trend line in ***Figure 27*** with the inclusion of 2021 data, we observed that airport passengers followed consistent increases from January 2021 and throughout the available months with two exceptions, in February and August. These months are the months following a spike in the number of new cases, indicating that passengers have a consistent reaction to spikes in new cases, as seen in the data in the months following a spike.

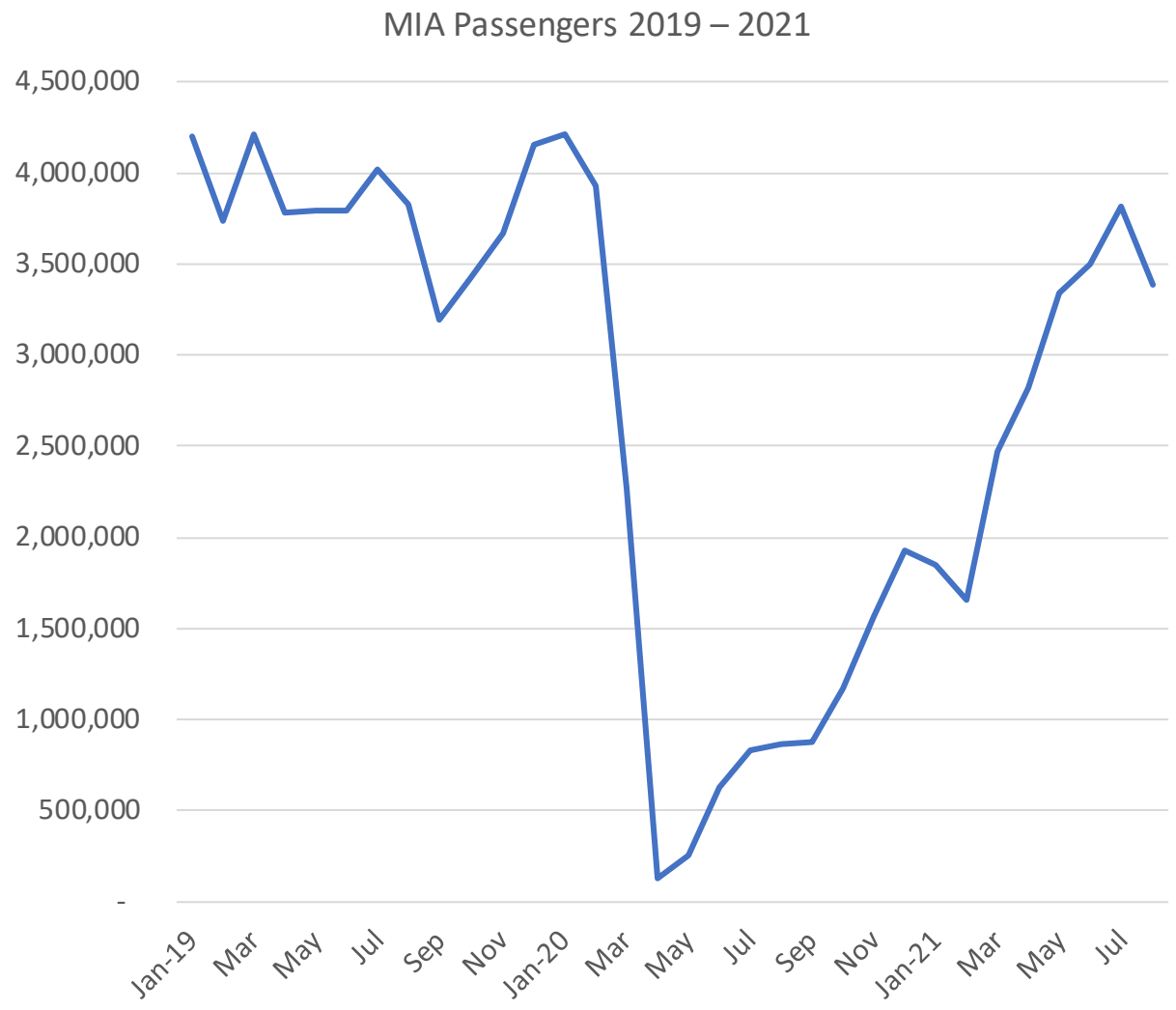
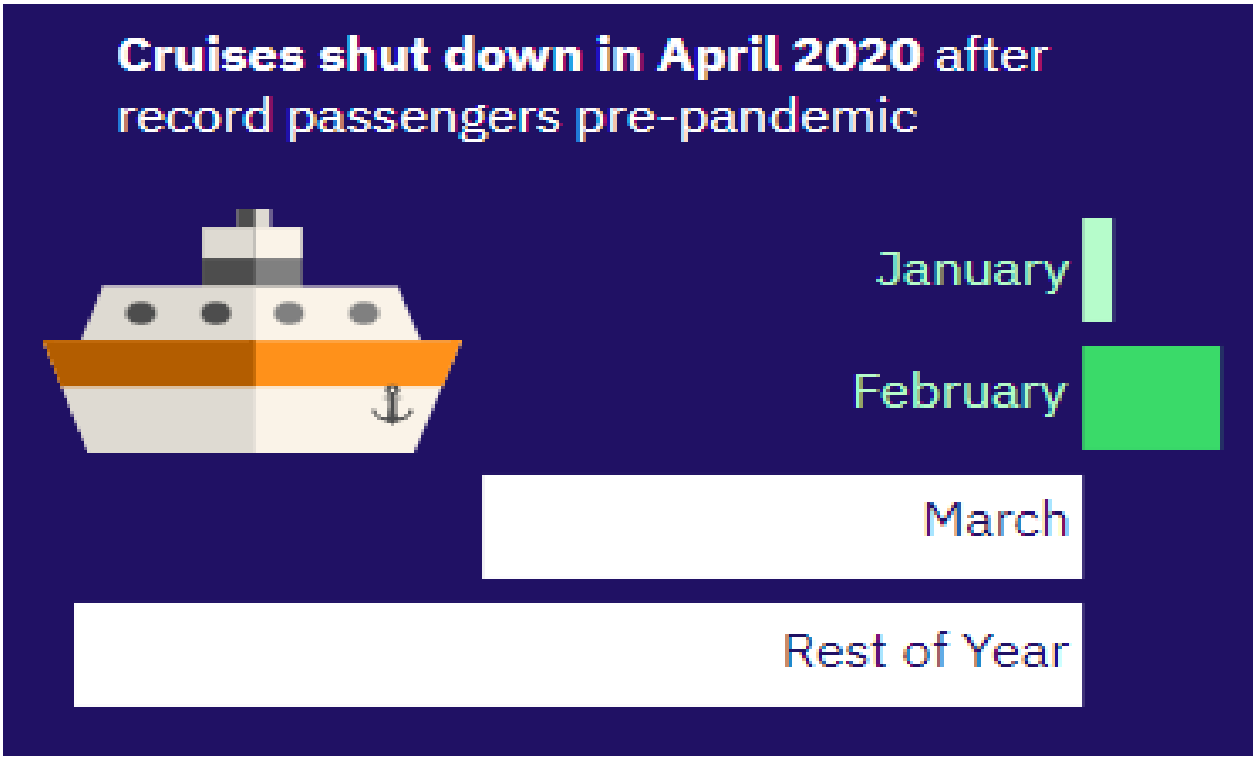


Figure 27: MIA Passengers, 2019 – 2021

The cruise industry effectively shut down in April, after seeing modest growth in the first two months of 2020. From a monthly average of 561,622 passengers in 2019, embarkations fell to zero from May onward (***Table 7***).

Table 7: Port of Miami Passengers, 2019 – 2020

Month	2019	2020	Change	% Change
Jan	672,742	695,869	23,127	3.4%
Feb	618,166	704,274	86,108	13.9%
Mar	749,911	305,162	-444,749	-59.3%
Apr	637,947	1,018	-636,929	-99.8%
May	490,545	0	-490,545	-100%
Jun	487,389	0	-487,389	-100%
Jul	467,716	0	-467,716	-100%
Aug	473,466	0	-473,466	-100%
Sep	380,434	0	-380,434	-100%
Oct	422,292	0	-422,292	-100%
Nov	591,274	0	-591,274	-100%
Dec	747,587	0	-747,587	-100%
Average	561,622	142,194	-419,429	-74.7%



4.2.2 Hotel Occupancy

In March 2020, countywide hotel occupancy rates in Miami-Dade County fell to 43%, less than half of the level observed in 2019 (***Table 8***). Occupancy rates fell further in April, to 24%, down 70% year on year. Recovery in the following months was slow, and in December rates were still at 49%.

Table 8: Hotel Occupancy Rates, 2019 – 2020

Month	2019	2020	Change	% Change
Jan	78.3%	81.1%	2.8%	3.6%
Feb	83.9%	85.8%	1.9%	2.3%
Mar	85.7%	42.5%	-43.2%	-50.4%
Apr	81.0%	23.9%	-57.1%	-70.5%
May	76.1%	29.4%	-46.7%	-61.4%
Jun	72.9%	31.4%	-41.5%	-56.9%
Jul	75.2%	30.8%	-44.4%	-59.0%
Aug	71.5%	33.9%	-37.6%	-52.6%
Sep	60.9%	36.2%	-24.7%	-40.6%
Oct	68.8%	41.6%	-27.2%	-39.5%
Nov	78.4%	43.0%	-35.4%	-45.2%
Dec	78.1%	48.8%	-29.3%	-37.5%

When looking at changes observed in the first year of the pandemic (2020), ***Figure*** *Error! Reference source not found.****28*** and ***Figure 29:*** Hotel Occupancy Percent Change 2019 – 2020 in Select Miami-Dade Locations show the impact on hotel occupancy rates in different neighborhoods on a monthly and annual level, respectively. Hotel occupancy fell to zero in three neighborhoods in April: Coconut Grove, Coconut Grove / Key Biscayne, and Surfside / Bal Harbour (see figure 30 for the location of the neighborhoods defined for hotel occupancy). The neighborhoods that were least affected were all inland and away from downtown and the beaches: North Dade and South Dade, both at 34% occupancy, and Central Dade at 30% (see appendix j). In December 2020, only half of the neighborhoods had occupancy rates above 50%; Downtown (37%) and Coconut Grove / Key Biscayne (39%) were the neighborhoods with the lowest occupancy rates. The locations of these neighborhoods and their corresponding occupancy percent change overall from 2019 to 2020 can be seen in ***Figure 30***: Hotel Occupancy Percent Change 2019 – 2020 in Select Miami-Dade Locations**.**

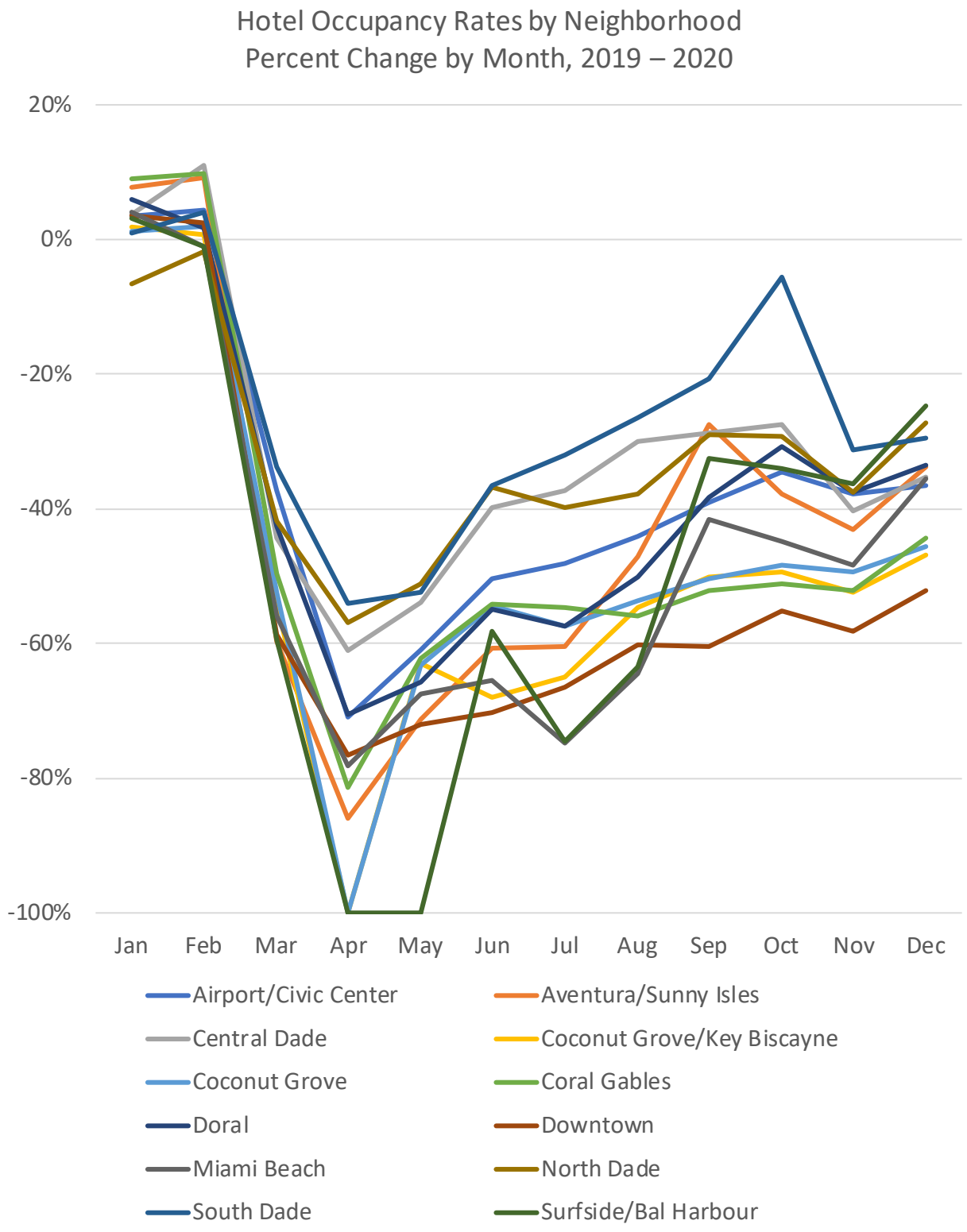


Figure 28: Hotel Occupancy Rates by Neighborhood, Percent Change by Month, 2019 – 2020

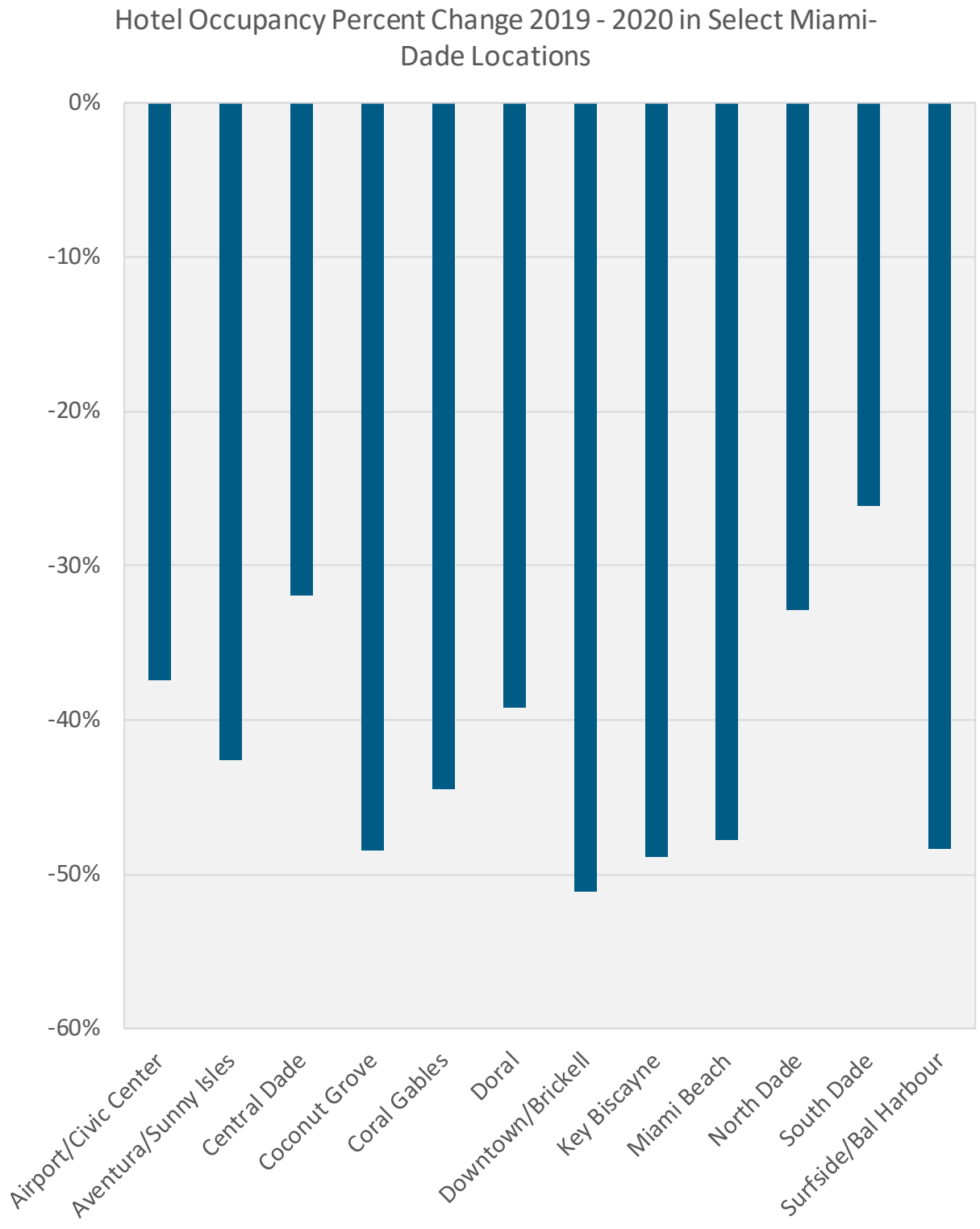


Figure 29: Hotel Occupancy Percent Change 2019 – 2020 in Select Miami-Dade Locations

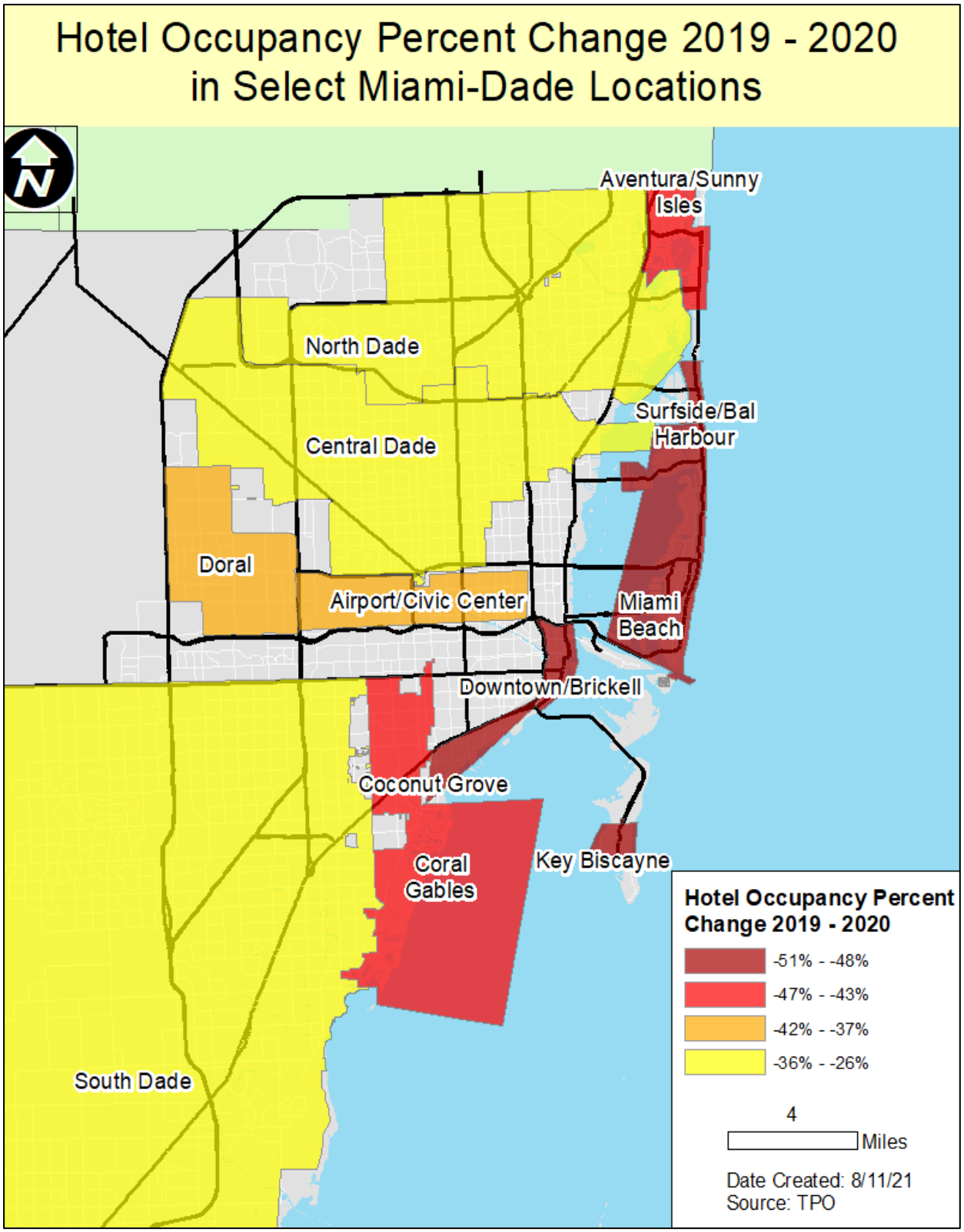


Figure 30: Hotel Occupancy Percent Change 2019 – 2020 in Select Miami-Dade Locations

When we look at all the current data available, county-wide hotel occupancy continues to make a strong recovery in the first quarter of 2021 (***Figure 31***), coinciding with a downward trend in new cases. By March 2021, hotel occupancy was 73%, up 50% from April 2020, but still 15% below March 2019 levels (***Figure 43*** of ***Appendix AA***). Total hotel occupancy plateaued in the second quarter of 2021, although only down 1% from 2019 levels in June, indicating a continual recovery despite seasonal occupancy fluctuations. However, total hotel occupancy decreased in the third quarter of 2021, coinciding with increasing new cases.

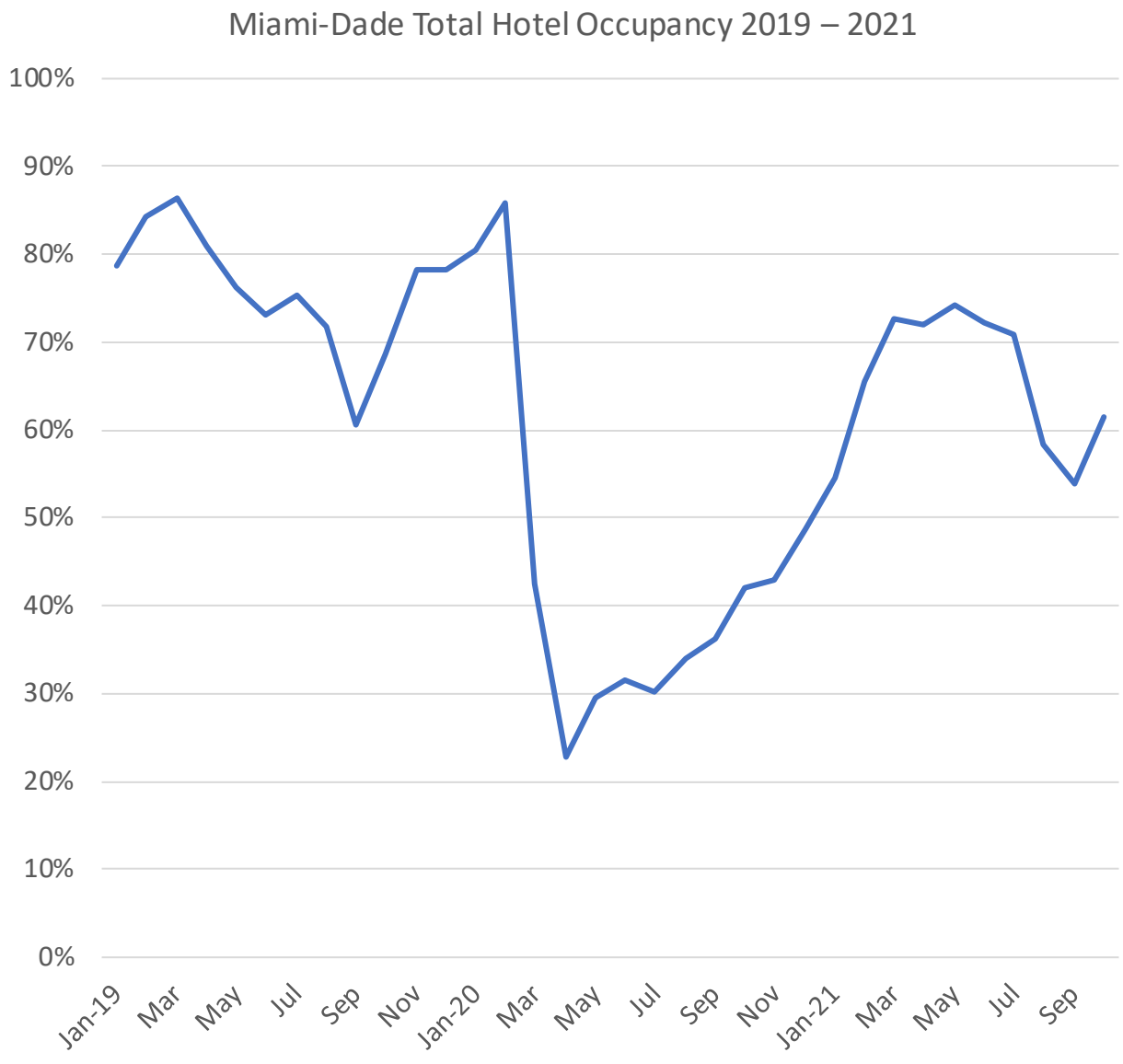


Figure 31: Miami-Dade Total Hotel Occupancy, 2019 – 2021

The pandemic had varying impacts on hotel occupancy rates in each of the selected neighborhoods on a monthly and annual basis for 2019-2021. While hotel occupancy percent change was down from 2019 for every location, they reached nearly zero in April of 2020 (***Figure 28***). Occupancy then later jumped higher for some neighborhoods during May, June, and July of 2021 (primarily South Dade and Central Dade) ***(Figure 44*** of ***Appendix AA)***. This coincided with decreasing new cases during the summer months. Other areas experienced reductions in hotel occupancy compared to other neighborhoods, particularly Downtown. Downtown hotel occupancy specifically was down an average of 23% for the year in 2020, more than double the average of all other areas. As new cases started increasing, hotel occupancy decreased in all areas from July through October 2021. There is a clear impact on hotel occupancy and new cases per day, although the impact is decreasing over time. This is likely caused by a combination of hotels adapting to safety protocols, increasing their operations, pent up tourism demand, and decreasing public perception of risk relative to new cases.

After recovery from the pandemic, the data suggest that the "return to normal" will likely involve most locations returning to previous occupancy averages, following previous growth trends. More research would have to be done to determine if long term hotel occupancy in Downtown will have lasting impacts, particularly if the digital communications wave initiated by the pandemic continues.

4.3 Transit

Transit use was in decline years before the pandemic (***Table 9***) although the Metromover observed a small increase in ridership in Fiscal Year 2019 when compared to Fiscal Year 2018. The cumulative decrease in the total number of passengers between Fiscal Year 2016 (beginning October 2015) and Fiscal Year 2019 (ending September 2019) was 23.3% for Metrobus, 13.8% for Metrorail and 14.1% for Metromover, according to monthly Miami-Dade Transit technical reports[34].

The most significant decrease prior to the pandemic was for Metrobus, but the impact of the pandemic was more pronounced on Metrorail and Metromover. Fiscal Year 2020 total ridership was down by an additional 25.5% for Metrobus when compared to Fiscal Year 2019, and by 35.9% and 35.2%, respectively, for Metrorail and Metromover.

Table 9: Miami-Dade County Transit Ridership, Fiscal Year 2016 – 2020

Fiscal Year	Metrobus	Metrorail	Metromover
FY2016	65,150,553	21,461,039	10,318,149
FY2017	58,000,998	19,984,735	9,463,403
FY2018	51,759,916	19,150,308	8,802,523
FY2019	49,960,359	18,494,501	8,863,809
FY2020	37,232,806	11,862,059	5,741,996
% Change			
FY16 to FY17	-11.0%	-6.9%	-8.3%
FY17 to FY18	-10.8%	-4.2%	-7.0%
FY18 to FY19	-3.5%	-3.4%	0.7%
FY16 to FY19	-23.3%	-13.8%	-14.1%
FY19 to FY20	-25.5%	-35.9%	-35.2%

These declines in ridership suggest that the "return to normal" after recovery from the pandemic should not mean achieving the levels previously observed prior to the pandemic, such as, in Fiscal Year 2018 or Fiscal Year 2019. Further, some reduction in transit ridership can be attributed to reductions in service in response to the pandemic. A better understanding of the factors

[34] (https://www.miamidade.gov/global/transportation/ridership-technical-reports.page)

responsible for the reduction in transit usage in recent years will be necessary to project the impact of the pandemic on transit usage in the post-pandemic future.

While Metromover was the only Miami-Dade County transit system to observe increasing ridership before the pandemic, it is the system with the most impact to ridership post-pandemic (***Figure 32***). In contrast, while Metrobus was experiencing the most significant decreases prior to the pandemic, it is the least impacted system post-pandemic. As previously stated, a "return to normal" for Metrobus and Metrorail likely does not involve returning to 2019 levels as they were trending downward before the pandemic. However, the relative impacts to Metrorail are closer to that of Metromover. These systems primarily serve downtown travel and downtown commuters, indicating that ridership of these systems will remain impacted as long as demand for traveling to downtown remains below pre-pandemic levels. 2021 Aggregate transit Ridership data can be found in ***Figure 43*** of ***Appendix AA***.

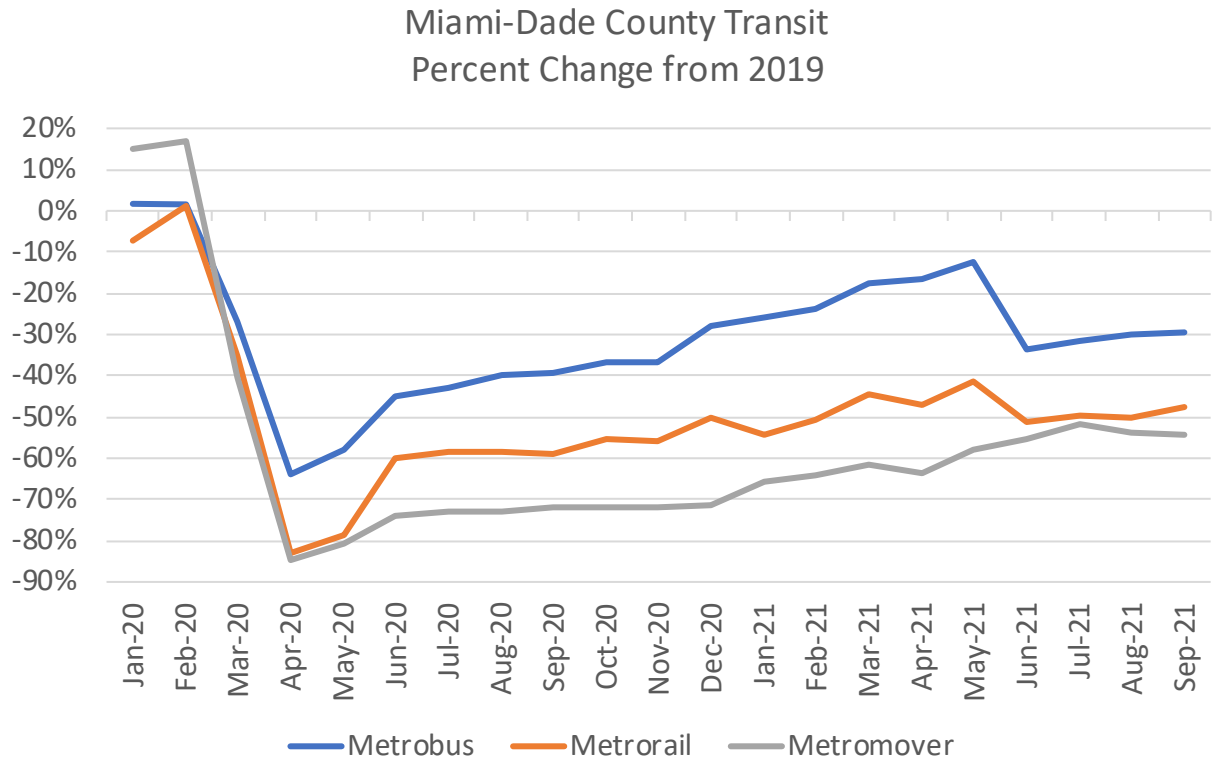


Figure 32: Miami-Dade County Transit, Percent Change from 2019

4.3.1 Metrobus

The Metrobus system is responsible for the largest share of daily transit ridership in the county, operating approximately 100 routes. Average weekday ridership data for 2019 and 2020 was tabulated by month for 85 routes (***Appendix B***). After modest growth in January and February of 2020, compared to the same months in 2019, ridership dropped precipitously starting in March and April, before recovering slowly for the remainder of the year (**Table 10**). In December 2020, average weekday ridership on Metrobus was still down by 27.7% compared to 2019, and the annual average for 2020 was down by over a third.

Table 10: Miami-Dade County Average Weekday Metrobus Ridership, 2019 – 2020

Month	2019	2020	Change	% Change
Jan	154,802	157,506	2,704	1.7%
Feb	160,610	163,096	2,486	1.5%
Mar	157,384	114,747	-42,637	-27.1%
Apr	159,456	57,496	-101,960	-63.9%
May	157,737	66,460	-91,277	-57.9%
Jun	147,644	81,245	-66,399	-45.0%
Jul	148,990	84,781	-64,209	-43.1%
Aug	148,813	89,518	-59,295	-39.8%
Sep	156,364	94,766	-61,598	-39.4%
Oct	161,648	102,396	-59,252	-36.7%
Nov	162,380	102,791	-59,589	-36.7%
Dec	153,502	110,925	-42,577	-27.7%
Average	155,778	102,144	-53,634	-34.4%

Figure 33 presents the percent change of annualized monthly totals for 2019 to 2020 for ridership at the available Metrobus Routes in Miami-Dade County. (***Figures 41 through 44 in Appendix F*** show maps of the 85 Metrobus routes, one map per month, with color-coded lines showing the percentage change in average weekday ridership on each route in 2020 compared to 2019.)

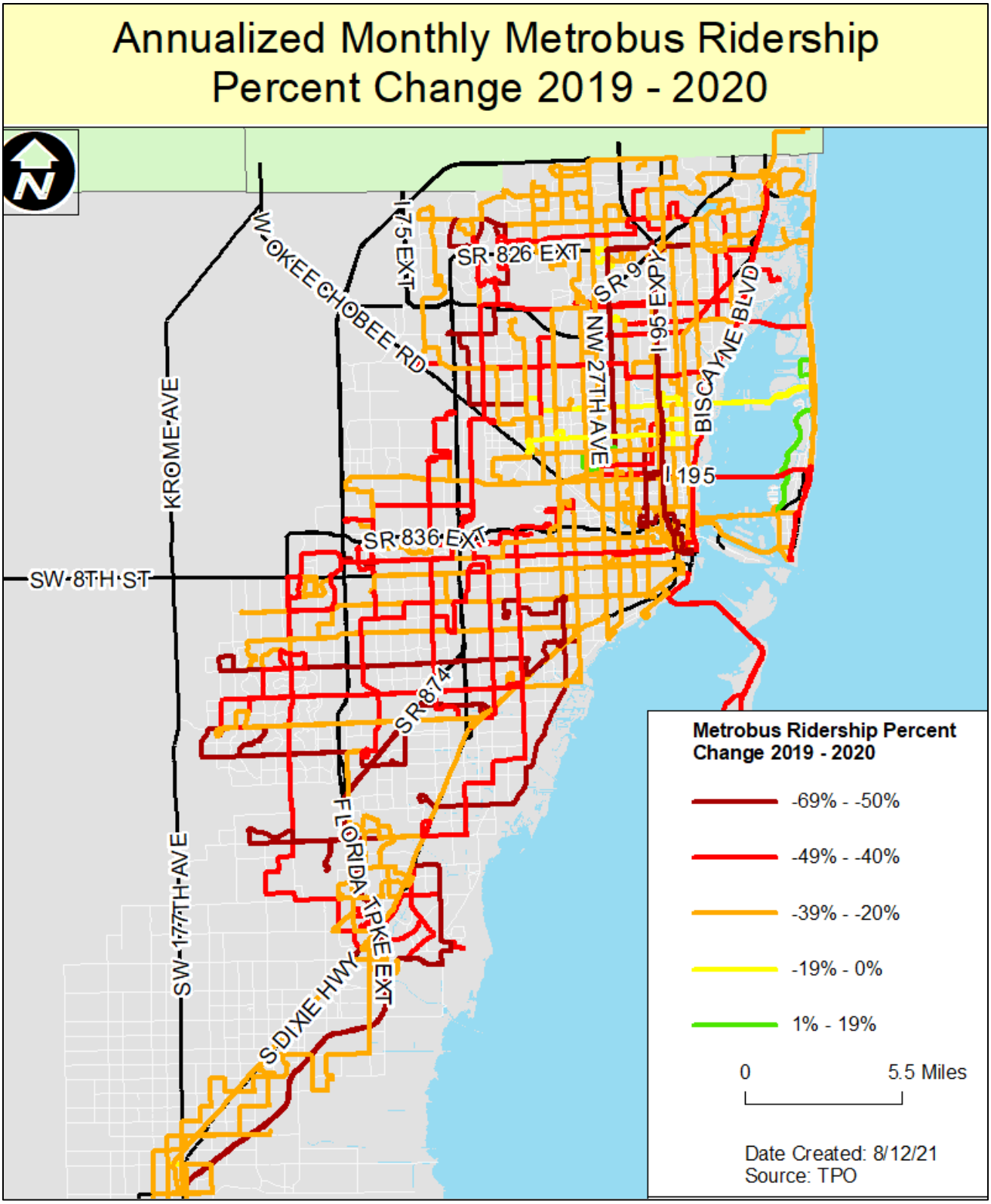


Figure 33: Annualized Metrobus Monthly Ridership, Percent Change, 2019 – 2020

Total monthly Metrobus ridership data through October 2021 was collected in aggregate by month. After consistent growth after April 2020, ridership dropped in June 2021 (***Figure 34***), down 50% from 2019, and recovered the next two months, but still down 25% (***Figure 43*** of ***Appendix AA***). Total ridership on Metrobus in September 2021 was still down by 28% (112,359) compared to 2019. The annual average for the available months in 2021 was down by 23%, less than the average for the same months in 2020, which was over a third below 2019 levels.

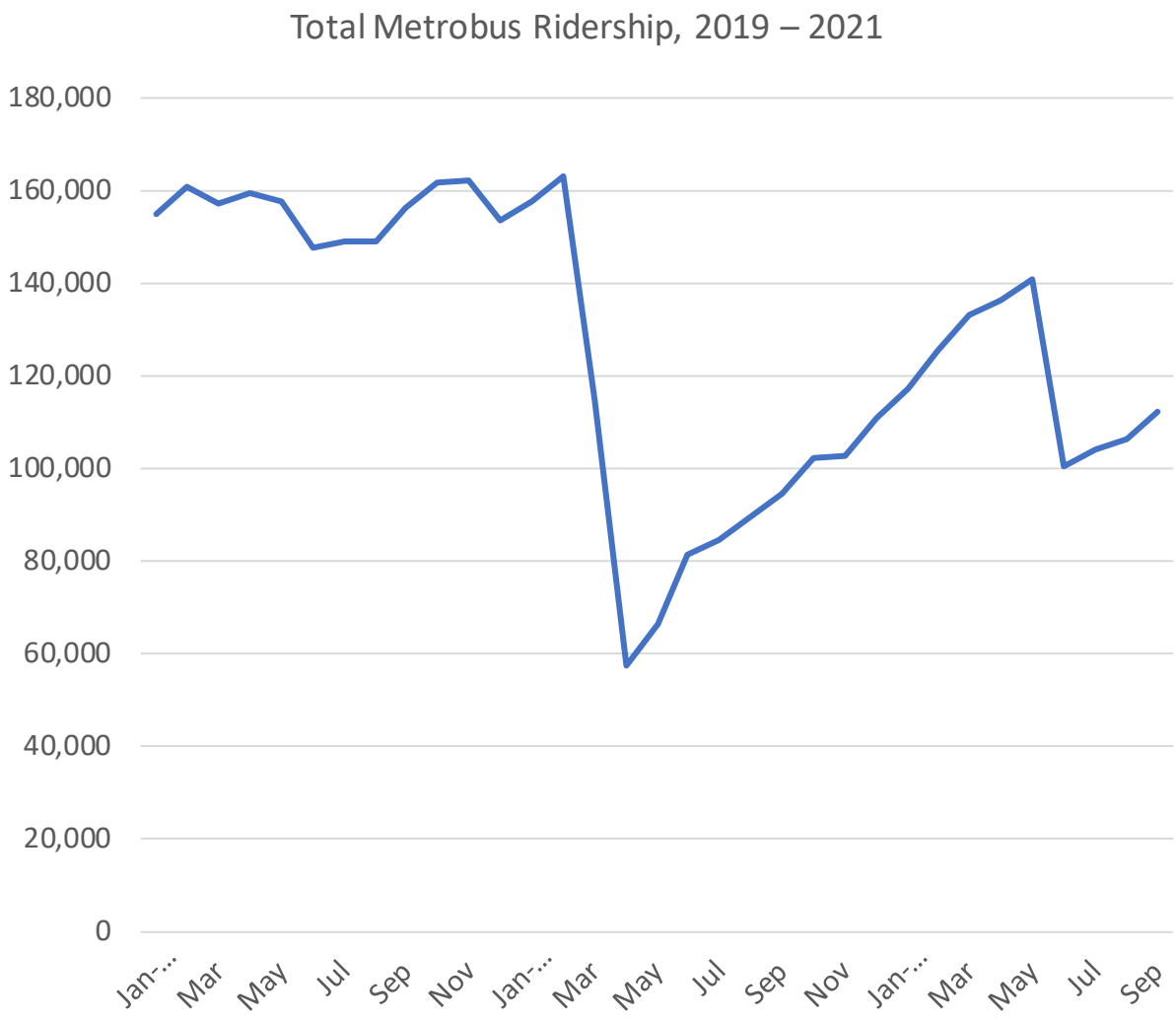


Figure 34: Total Metrobus Ridership, 2019 – 2021

4.3.2 Metrorail

The Metrorail system consists of 23 stations. Average weekday ridership data for 2019 and 2020 was tabulated by month for all stations (***Table 11***). In a pattern similar to that observed with Metrobus ridership, Metrorail experienced a small decrease in January of 2020 when compared to the same month in 2019 (***Table 11***), followed by a small increase in February, and a precipitous decline in March and April as lockdown measures were implemented. Starting in June, ridership increased very slowly through the end of the year and was still down by half in December.

Table 11: Miami-Dade County Average Weekday Metrorail Ridership, 2019 – 2020

Month	2019	2020	Change	% Change
Jan	69,224	64,080	-5,144	-7.4%
Feb	66,547	67,368	821	1.2%
Mar	62,786	40,733	-22,053	-35.1%
Apr	63,012	10,724	-52,288	-83.0%
May	60,953	13,135	-47,818	-78.5%
Jun	58,176	23,366	-34,810	-59.8%
Jul	56,522	23,477	-33,045	-58.5%
Aug	58,593	24,233	-34,360	-58.6%
Sep	61,961	25,357	-36,604	-59.1%
Oct	64,489	28,861	-35,628	-55.2%
Nov	64,975	28,720	-36,255	-55.8%
Dec	58,276	29,098	-29,178	-50.1%
Average	62,126	31,596	-30,530	-49.1%

The Metrorail stations with the highest average weekday ridership in 2019 were Government Center (9,717), Dadeland South (6,733), Brickell (5,965), Civic Center (5,650) and Dadeland North (5,622) (***Table 12***). Each of those stations lost in excess of 2,500 average weekday riders in 2020, with the Government Center showing the largest absolute decline (-5,684) and Dadeland South (-3,556) in second place.

The University station had the largest percentage decline in average weekday ridership (-63.1%) in 2020, when compared to 2019.

Table 12: Miami-Dade County Average Weekday Metrorail Ridership by Station, 2019 – 2020

Station		2019	2020	Change	% Change
0	Dadeland South	6,733	3,178	-3,556	-52.8%
1	Dadeland North	5,622	2,654	-2,969	-52.8%
2	South Miami	2,805	1,298	-1,507	-53.7%
3	University	2,225	820	-1,404	-63.1%
4	Douglas Road	3,418	1,620	-1,799	-52.6%
5	Coconut Grove	1,592	871	-720	-45.3%
6	Vizcaya	1,220	676	-544	-44.6%
7	Brickell	5,965	3,376	-2,589	-43.4%
8	Government Center	9,717	4,033	-5,684	-58.5%
9	Overtown	2,101	927	-1,174	-55.9%
10	Culmer	1,229	865	-364	-29.6%
11	Civic Center	5,650	2,696	-2,955	-52.3%
12	Santa Clara	727	482	-246	-33.8%
13	Allapattah	1,805	1,146	-659	-36.5%
14	Earlington Heights	1,529	954	-575	-37.6%
15	Brownsville	819	669	-151	-18.4%
16	Dr. Martin Luther King, Jr.	1,101	746	-355	-32.3%
17	Northside	1,363	919	-444	-32.6%
18	Tri-Rail	1,105	735	-370	-33.5%
19	Hialeah	1,247	790	-457	-36.6%
20	Okeechobee	1,135	628	-507	-44.7%
21	Palmetto	1,412	775	-637	-45.1%
22	MIC Station	1,606	741	-865	-53.9%
Total		62,126	31,596	-30,530	-49.1%

Figure 35 presents the percent change of annualized monthly totals for 2019 to 2020 for ridership at the available Metrorail stations in Miami-Dade County. ***Figures 45 through 50 in Appendix G*** present maps of the 23 Metrorail stations, one map per month, with color-coded dots showing the percentage change in average weekday ridership at each station in 2020 compared to 2019.

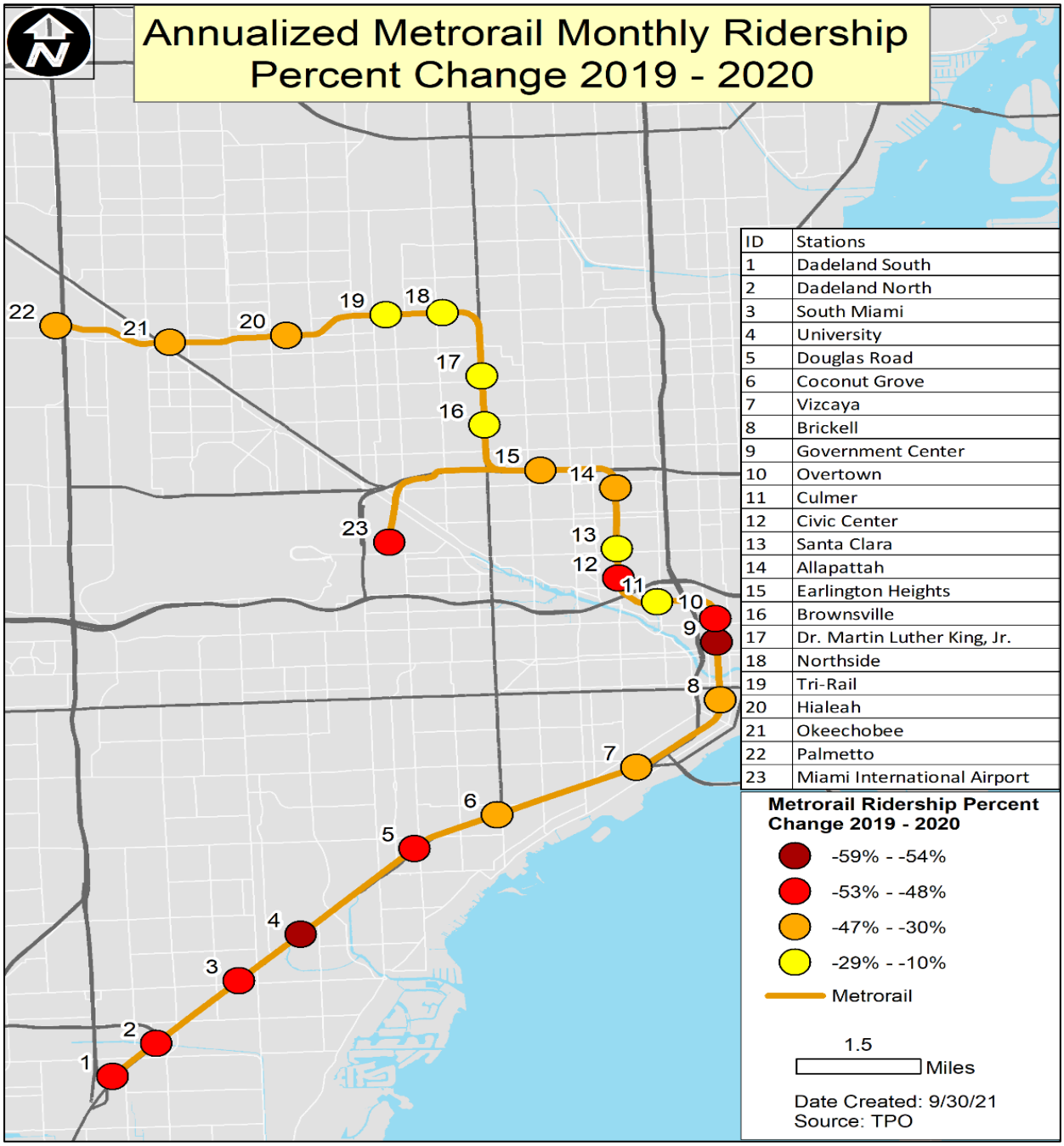


Figure 35: Annualized Metrorail Monthly Ridership, Percent Change, 2019 – 2020

Average weekday ridership data for 2021 was tabulated in aggregate by month through September 2021 (**Figure 43 of Appendix AA**). Similar to the pattern observed with Metrobus ridership, Metrorail ridership decreased in June 2021 after which, ridership consistently increasing throughout 2020 and 2021. By September 2021, average weekday ridership on Metrorail was still down by 48% (-29,459) compared to 2019, showing mild and stalling recovery compared to 2020.

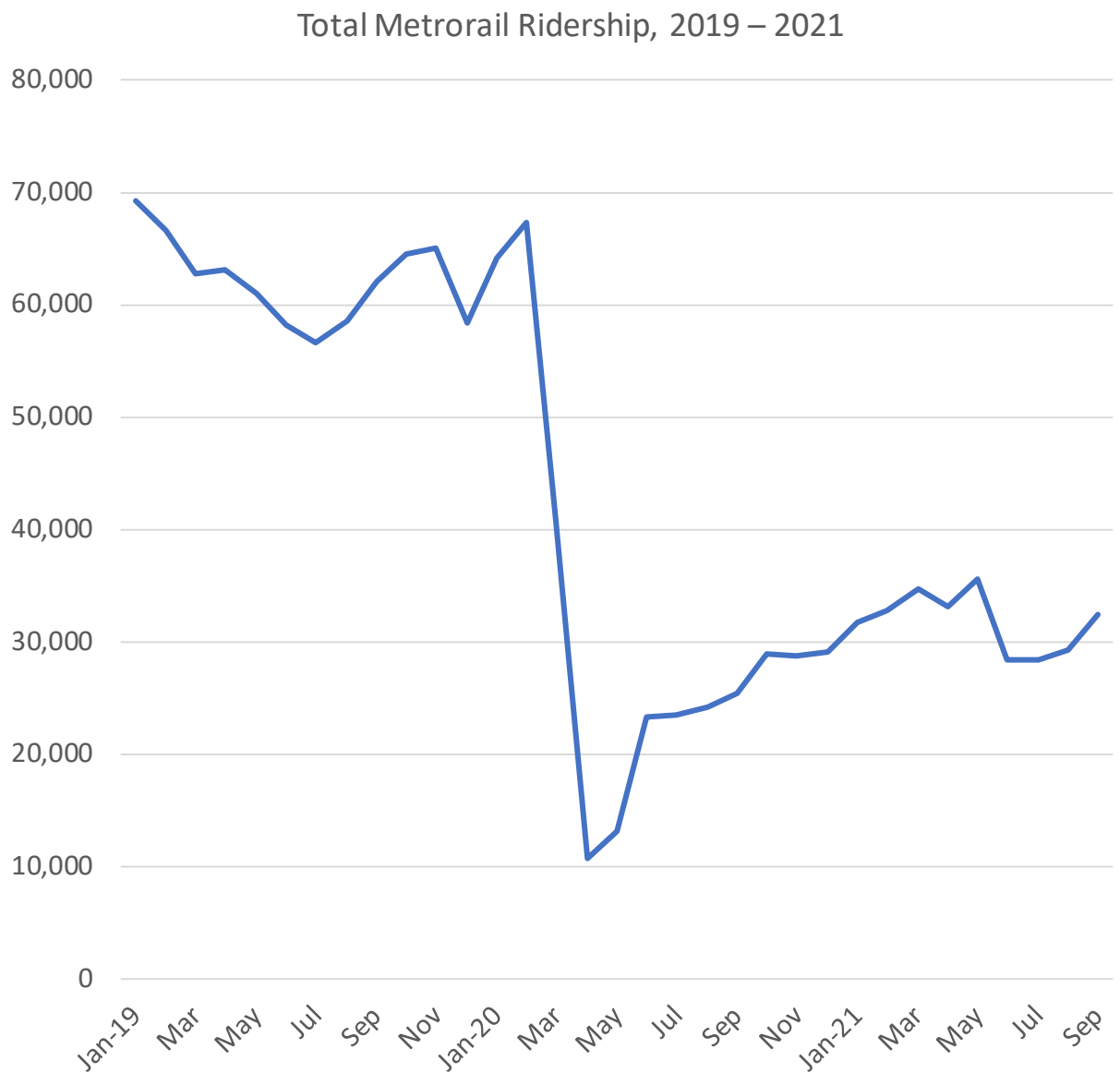


Figure 36: Total Metrorail Ridership, 2019 – 2021

4.3.3 Metromover

The Metromover system consists of 21 stations. Average weekday ridership data for 2019 and 2020 was tabulated by month for all stations (***Table 13 Appendix Y***). Similar to the pattern observed with Metrobus ridership, Metromover experienced a small increase in January and February of 2020 when compared to the same months in 2019 (***Table 13***) followed by a precipitous decline in March and April as lockdown measures were implemented. Starting in June, ridership increased very slowly through the end of the year and was still down by 57.2% in December.

Table 13: Miami-Dade County Average Weekday Metromover Ridership, 2019 – 2020

Month	2019	2020	Change	% Change
Jan	27,869	32,036	4,167	15.0%
Feb	28,797	33,663	4,866	16.9%
Mar	28,082	16,800	-11,282	-40.2%
Apr	30,449	4,667	-25,782	-84.7%
May	27,423	5,361	-22,062	-80.5%
Jun	28,061	7,297	-20,764	-74.0%
Jul	27,127	7,342	-19,785	-72.9%
Aug	27,529	7,368	-20,161	-73.2%
Sep	28,347	8,004	-20,343	-71.8%
Oct	30,918	8,755	-22,163	-71.7%
Nov	32,385	9,029	-23,356	-72.1%
Dec	31,990	9,122	-22,868	-71.5%
Average	29,081	12,454	-16,628	-57.2%

Average weekday ridership on Metromover in 2019 was highest at the Government Center (7,009), Brickell (3,535), Bayfront Park (3,043), and College/Bayside (2,005) stations (***Table 14***). These same four stations had the largest absolute declines in ridership in 2020. The largest percentage reductions in ridership in 2020 occurred at the College/Bayside (-67.6%), Government Center (-66.6%), College North (-64.6%) and Freedom Tower (-63.4%) stations.

Table 14: Miami-Dade County Average Weekday Metromover Ridership by Station, 2019 – 2020

Station		2019	2020	Change	% Change
1	College/Bayside	2,005	649	-1,356	-67.6%
2	First Street	1,592	756	-836	-52.5%
3	Bayfront Park	3,043	1,281	-1,762	-57.9%
4	Knight Center	1,004	414	-589	-58.7%
5	Miami Avenue	440	260	-180	-40.9%
6	Third Street	325	161	-163	-50.3%
7	Government Center	7,009	2,344	-4,665	-66.6%
8	Wilkie D. Ferguson	520	345	-176	-33.8%
9	College North	906	321	-585	-64.6%
10	School Board	767	454	-313	-40.8%
11	Omni	1,637	848	-789	-48.2%
12	Museum Park	242	94	-147	-61.0%
13	Eleventh Street	264	152	-112	-42.3%
14	Park West	289	194	-95	-33.0%
15	Freedom Tower	383	140	-243	-63.4%
16	Riverwalk	757	312	-445	-58.8%
17	Fifth Street	491	288	-203	-41.4%
18	Eighth Street	1,990	801	-1,190	-59.8%
19	Tenth Street	705	390	-316	-44.7%
20	Brickell	3,535	1,700	-1,836	-51.9%
21	Financial District	1,180	552	-628	-53.2%
Average		29,081	12,454	-792	-57.2%

Figure 37 presents the percent change of annualized monthly totals for 2019 to 2020 for ridership at the available Metromover stations in Miami-Dade County. ***Figures 36 through 40 in Appendix E*** present maps of the 21 Metromover stations, one map per month, with color-coded dots showing the percentage change in average weekday ridership at each station in 2020 compared to 2019.

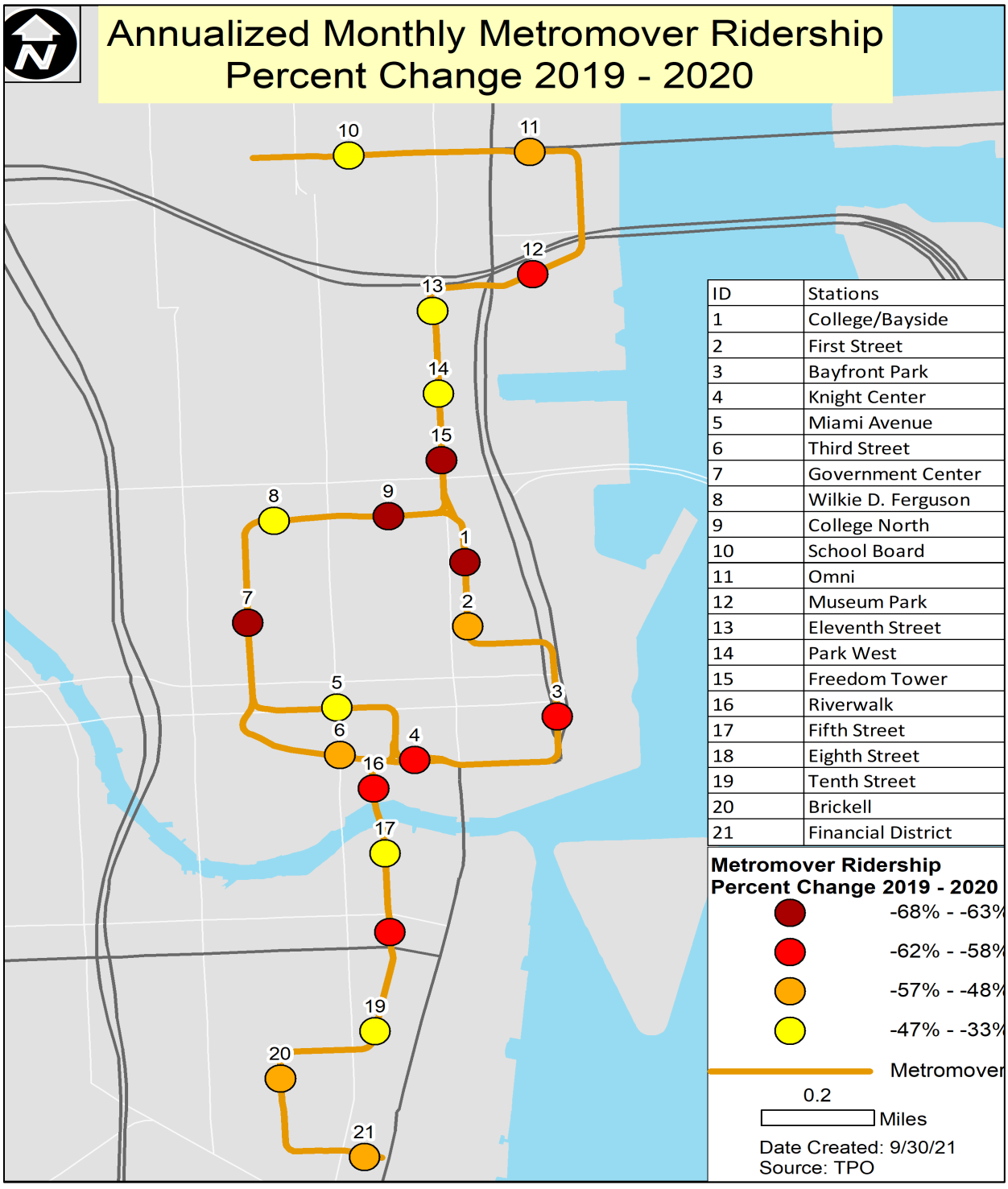


Figure 37: Annualized Monthly Metromover Ridership, Percent Change, 2019 – 2020

Total ridership data for 2021 was tabulated in aggregate by month through September 2021 (***Figure 43***). In a pattern different to that observed with Metrobus and Metrorail ridership, Metromover experienced an increase in ridership in June 2021, up 3% from June 2020 and continuing growth following shutdowns in April 2020. Metromover remained between 52% and 66% below 2019 levels throughout 2021 (***Figure 43*** of ***Appendix AA***). Of the three Miami-Dade transit systems analyzed, Metromover ridership was the most impacted by COVID-19, however it avoided the drop in ridership that other transit systems experienced in late 2021.

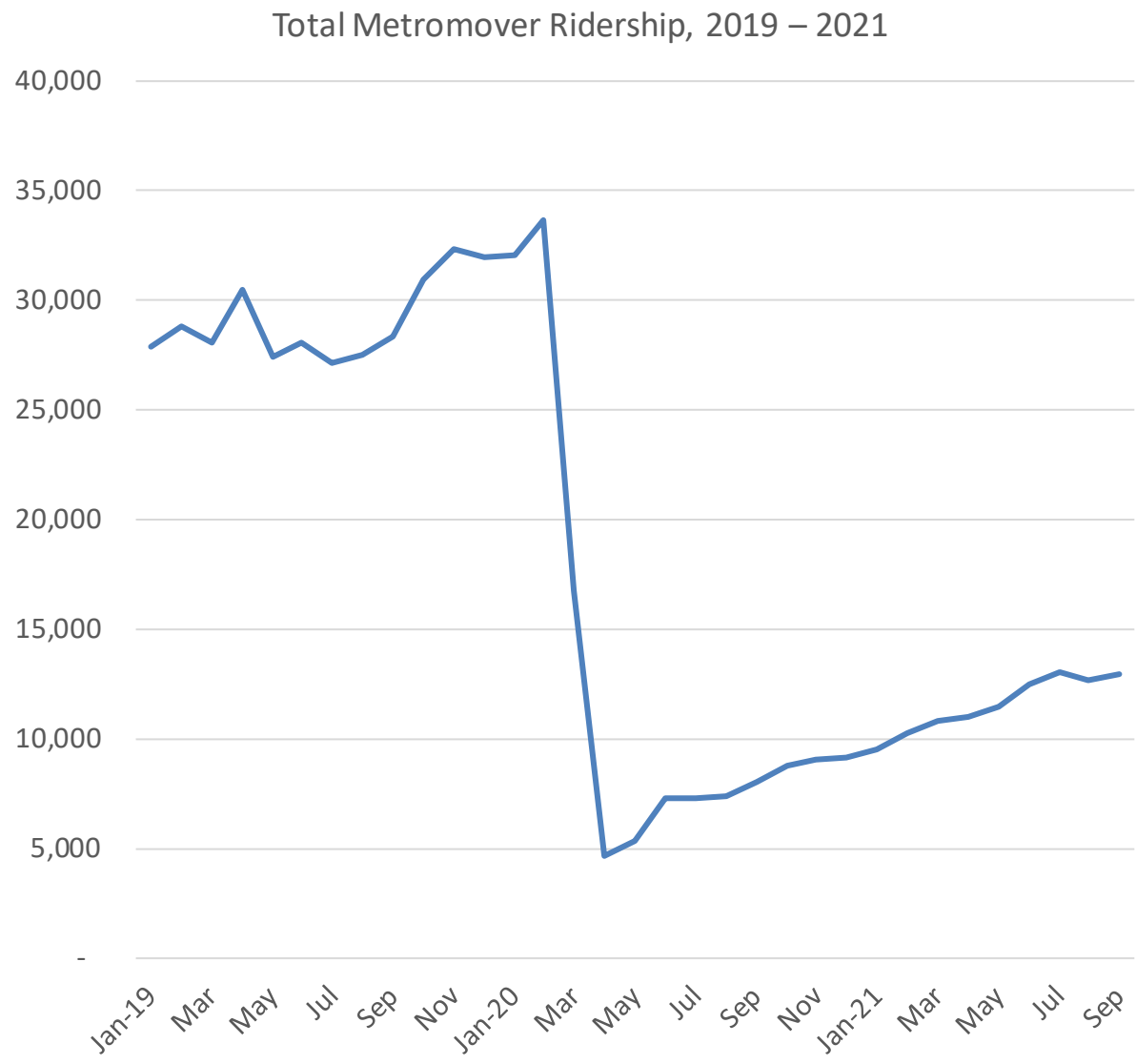


Figure 38: Total Metromover Ridership, 2019 – 2021

4.4 SMART Plan Demonstration Projects

A total of eleven SMART Demonstration Programs were either operating or planned for operation in local municipalities in 2020. Only two programs operated for all of 2019 and 2020, the City of Coral Gables On-Demand Service and the City of Doral / FIU Trolley, and therefore were the only services analyzed.

On-Demand ridership was over 45% higher in January 2020 compared to 2019 and declined each month until reaching a low point in -95% in total in April. Significant reductions in ridership continued through May (-91%) and recovered slightly in June (-82%). Ridership remained relatively flat from July through December. ***Figure 39*** presents the percent change from 2019 to 2020 for the two participating municipalities.

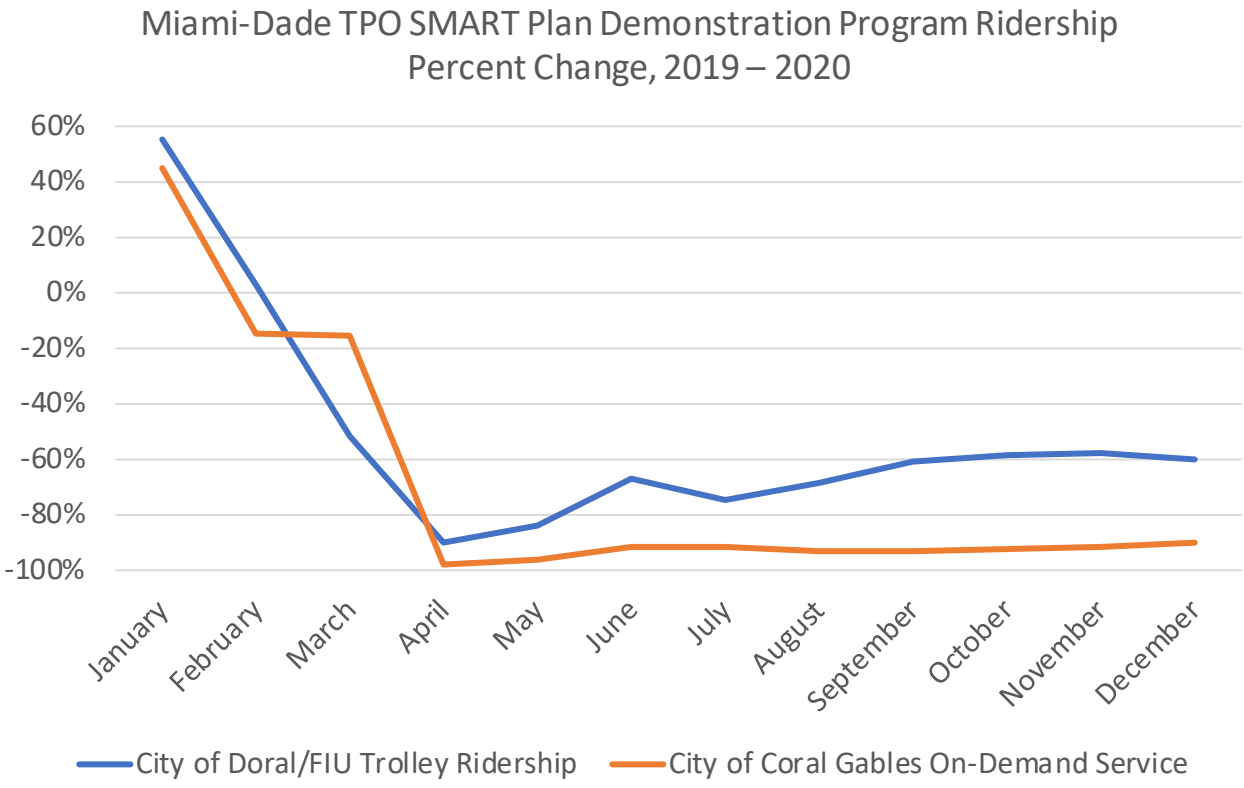


Figure 39: Miami-Dade TPO SMART Demonstration Program Ridership Percent Change 2019 – 2020

2021 SMART Demonstration Program data was also available for the same two routes and as such was compiled below. The City of Doral / FIU Trolley data was available monthly for January through June and Coral Gables On-Demand Service was available quarterly. ***Table 15*** contains the available 2021 On-Demand ridership data and ***Table 16*** contains the percent change from 2019-2020 and the first two quarters from 2019-2021.

Table 15: Available 2021 SMART Demonstration Program Data

	Q1 2021			Q2 2021		
	January	February	March	April	May	June
City of Doral/FIU Trolley	4,292	4,204	4,750	4,840	4,067	4,309
	13,246			13,216		
City of Coral Gables On-Demand Service	9,808			10,513		

Table 16: SMART Demonstration Program Percent Change, 2019 – 2020 and 2019 – 2021

	Q1 2020	Q2 2020	Q3 2020	Q4 2020	Q1 2021	Q2 2021
City of Coral Gables On-Demand Service	-7%	-80%	-68%	-59%	-52%	-58%
City of Doral/FIU Trolley	2%	-95%	-93%	-91%	-68%	-68%

Figure 40 presents the total quarterly ridership for 2019 to 2021. ***Figure 41*** presents the percent change from 2019 to 2020 and 2019 to 2021 for the two locations. The City of Coral Gables On-Demand service ridership gradually recovered throughout 2020 and was relatively flat in the first two quarters of 2021, still down 15,000 riders in Q2 of 2021 compared to Q2 of 2019 (-58%). The City of Doral/FIU Trolley ridership was significantly impacted in 2020 and experienced a relatively flat recovery in the last two quarters of 2020 but experienced an increase in ridership to 13,246 in Q1 of 2021 and remained flat in Q2 of 2020 (-68%).

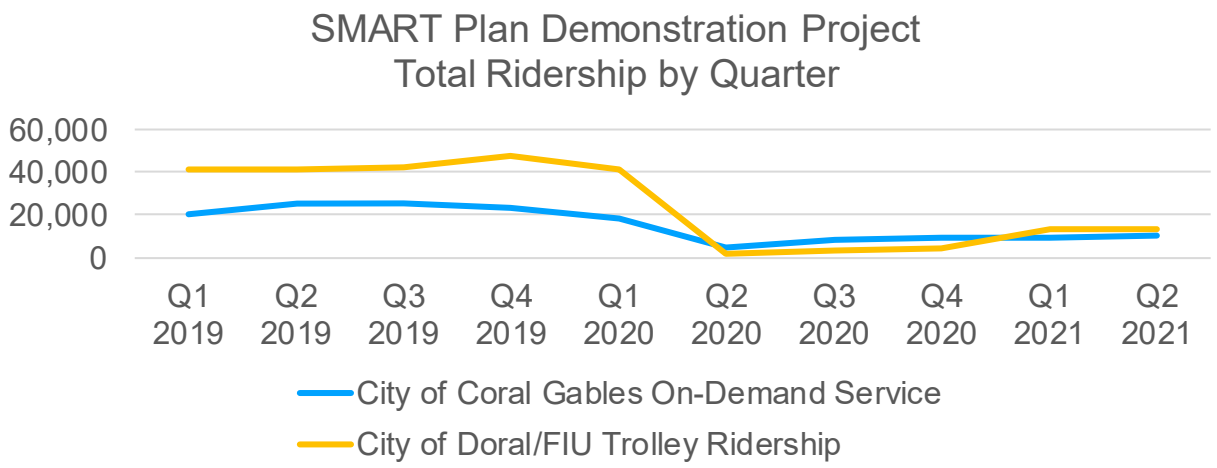


Figure 40: SMART Demonstration Program Total Quarterly Ridership, 2019 – 2021

The City of Doral/FIU Trolley was clearly impacted by remote learning implemented throughout 2020 in response to social distancing measures. After substantial impacts throughout 2020, the City of Doral/FIU Trolley recovered in January, coinciding with a new semester. This shows the correlation between ridership and implementation of remote learning. We also see that the City of Coral Gables On-Demand service was influenced by business closure due to social distancing measures. Ridership of both routes were significantly impacted by COVID-19 and remain down at least 58% and 70%.

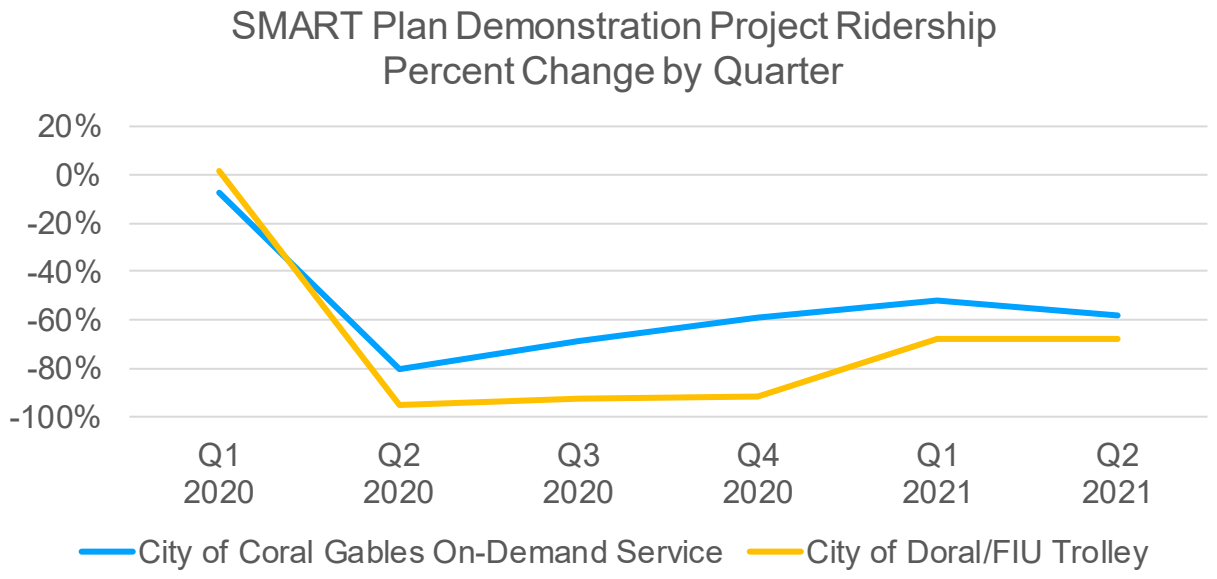


Figure 41: SMART Demonstration Program Percent Change, 2019 – 2020 and 2019 – 2021

4.5 Traffic

4.5.1 FDOT Telemetered Continuous Traffic Monitoring sites (TTMS) Counts

Traffic counts were analyzed from ten Florida Department of Transportation (FDOT) Continuous Telemetered Traffic Monitoring Sites for which complete monthly data was available for both 2019 and 2020 (***Appendix U***). In ***Table 17,*** the monthly totals for those ten sites were summed to simulate the aggregate impact on traffic levels at strategic locations throughout the county. The sites saw moderate growth in the number of trips in January and February 2020, followed by a substantial decline in March and April under lockdown. As restrictions were relaxed, the number of trips rose slightly from May to Oct but still at least 14.6% below 2019 levels. At the end of the year, the aggregate number of trips during 2020 (the sum of 12 months) was 21.1% lower than the comparable sum in 2019.

Table 17: Aggregate Monthly Trip Counts at Selected FDOT Monitoring Sites, 2019 – 2020

Month	2019	2020	Change	% Change
Jan	18,005,880	18,422,421	416,541	2.3%
Feb	17,051,243	17,554,365	503,122	3.0%
Mar	18,621,446	14,245,045	-4,376,401	-23.5%
Apr	17,695,476	8,812,871	-8,882,605	-50.2%
May	18,197,349	11,113,327	-7,084,022	-38.9%
Jun	16,712,772	13,431,891	-3,280,881	-19.6%
Jul	17,653,077	13,183,965	-4,469,112	-25.3%
Aug	17,534,677	13,527,666	-4,007,011	-22.9%
Sep	16,154,796	13,792,707	-2,362,089	-14.6%
Oct	18,040,917	14,842,602	-3,198,315	-17.7%
Nov	17,451,606	13,228,200	-4,223,406	-24.2%
Dec	18,182,209	14,352,771	-3,829,438	-21.1%
Average	17,608,454	13,875,653	-3,732,801	-21.1%

In 2020, average monthly traffic counts were lower than in 2019 at all of the selected sites. Monthly traffic at SR-915 / NE 6th Avenue (870258) was down the least, 9%, and SR-112 / I-195 / Julia Tuttle (870108) was down the most, 32%. (*Table 18*). On average, total monthly traffic I 2020 for all locations was down 21.2% from 2019.

Figures 30 through 35 in Appendix D present maps of the ten continuous telemetered traffic monitoring sites, one map per month, with color-coded dots showing the percentage change in traffic counts at each of the sites in 2020 compared to 2019. ***Figure 42*** and ***Figure 43*** present the percent change for 2019 to 2020 for monthly total traffic counts at the available traffic counting stations in Miami-Dade County.

Table 18: Average Monthly Trip Counts at Selected FDOT Monitoring Sites, 2019 – 2020

TTMS	Description	2019	2020	Change	%
870031	SR-A1A / Macarthur Causeway	2,535,338	1,904,064	-631,274	-24.9%
870096	SR-9 / SW of Biscayne Canal	885,141	726,603	-158,538	-17.9%
870108	SR-112 / I-195 / Julia Tuttle	3,471,955	2,361,856	-1,110,099	-32.0%
870137	SR-826 / Palmetto Expressway	4,586,767	3,947,367	-639,400	-13.9%
870178	SR-5 / US-1 / South Dixie Highway	2,278,356	1,844,484	-433,871	-19.0%
870193	SR-878 / Snapper Creek	1,090,600	792,886	-297,714	-27.3%
870258	SR-915 / NE 6th Avenue	761,043	691,002	-70,042	-9.2%
870382	SR-887 / Port of Miami Tunnel	326,701	244,907	-81,794	-25.0%
870383	SR-90 / US-41 / SW 8th Street	644,413	440,906	-203,507	-31.6%
879947	US-27 / Okeechobee Road	1,028,140	921,578	-106,562	-10.4%
Total	10 Sites	17,608,454	13,875,653	-3,732,801	-21.2%

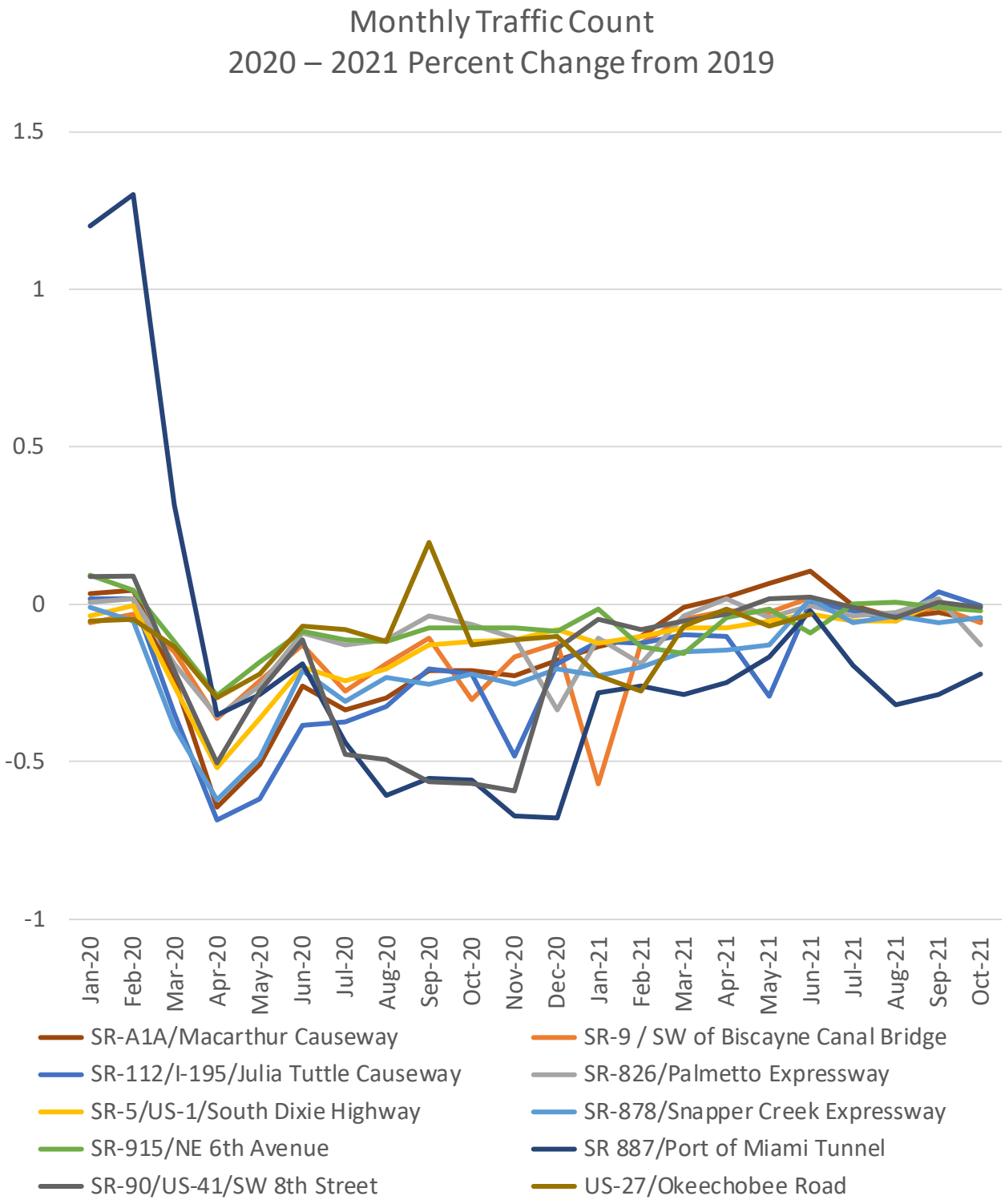


Figure 42: Monthly Traffic Count, Percent Change, 2019 – 2020

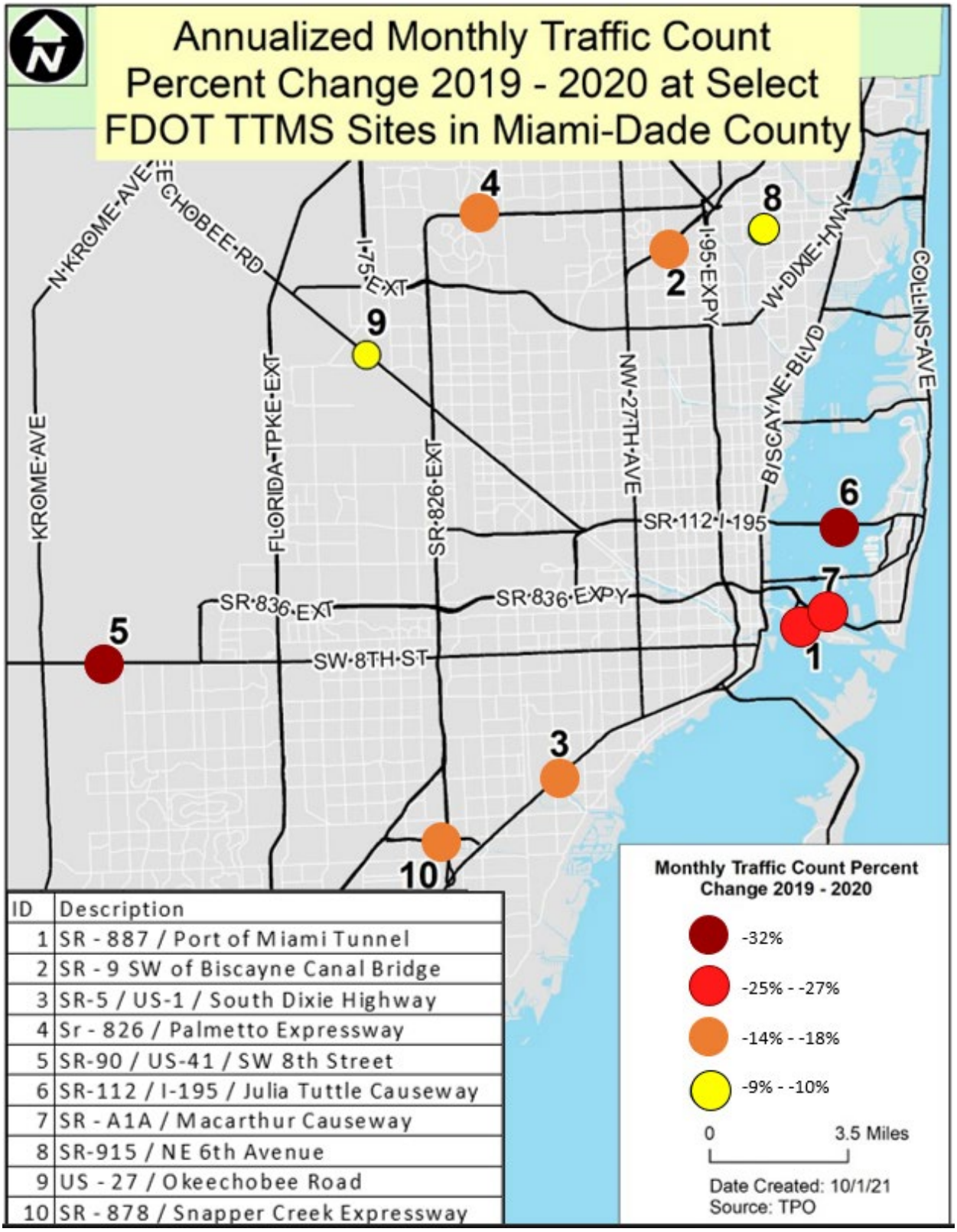


Figure 43: Annualized Monthly Traffic Count, Percent Change, 2019 – 2020

The traffic counts were available through June of 2021 (***Figure 40*** of ***Appendix AA***). The monthly totals were summed to simulate the aggregate impact on traffic levels for all the strategic locations throughout the county (***Figure 44)***. The sites saw a significant decrease in the number of trips in January 2021 and fluctuated between 15 million and 17.3 million for the rest of the year. In June 2021, aggregate highway traffic at the available locations was 16.8 million, just above June 2019 total highway traffic of 16.7 million. Highway traffic increased back to 2019 levels in 2021 by Feb 2021. Total highway traffic was 7% lower overall in 2021 than 2019.

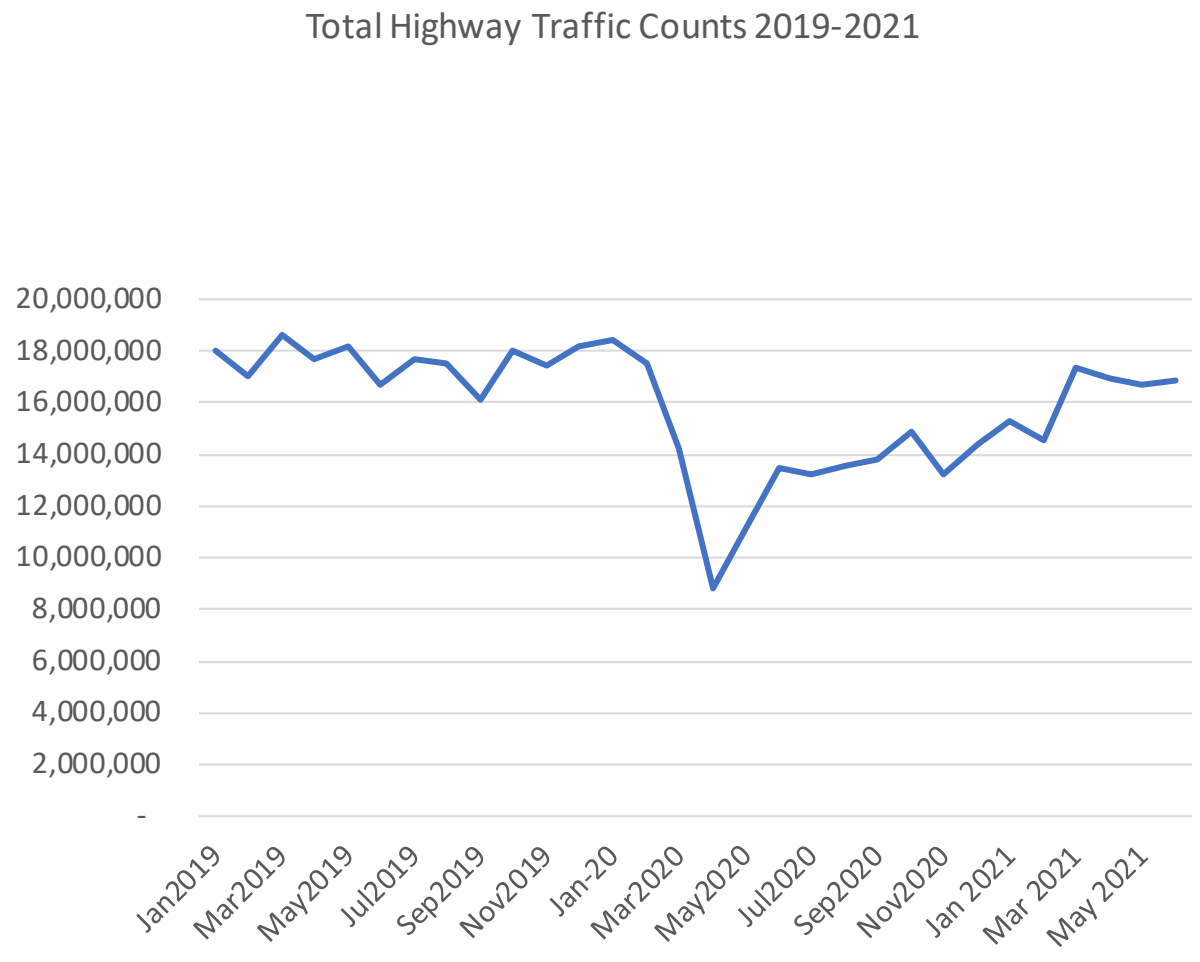


Figure 44: Total Highway Traffic Counts, 2019 – 2021

Figure 45 displays the monthly highway traffic totals for each available TTMS location from 2019 to 2021. In similar pattern to transit, highway traffic decreased at all locations in January 2021, coinciding with increasing new cases per day. Interestingly, as new cases began to decline in February 2021, most locations continued to decline and recovered in March. This lagged response follows a similar pattern to hotel occupancy, reinforcing the connection between traffic and tourism volume. For the rest of 2021, traffic increased on average each month at individual locations, except for small, lagged reactions to spikes in new cases per day. SR 887/Port of Miami Tunnel is the most impacted location with an average reduction in traffic of 23%. SR-

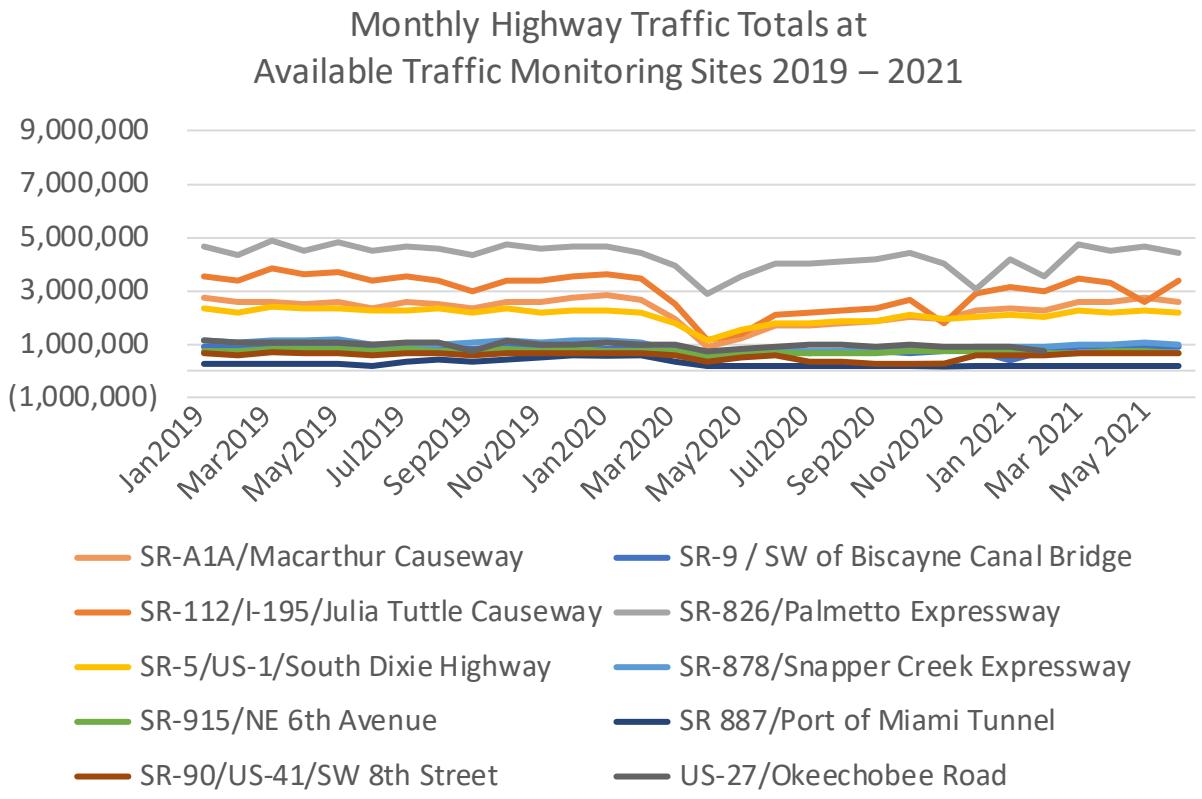


Figure 45: Monthly Highway Traffic Totals at Available Traffic Monitoring Sites, 2019 – 2021

A1A/Macarthur Causeway and SR-90/US-41/SW 8th Street experienced the smallest decrease in 2021 traffic compared to 2019 (-2%).

Data is lower for November 2020 at SR-112/I-195/Julia Tuttle Causeway due to missing data for 10 days in November 2020 for that location.

4.5.2 Miami-Dade County Department of Transportation and Public Works (DTPW) Annual Average Daily Traffic Counts

The average annual daily traffic counts were also reviewed and tabulated at 187 of the County's 590 traffic monitoring sites that contained data for both 2019 and 2020 (***Appendix V***). These counts show significant declines in 2020 when compared to 2019 at a vast majority of sites; only 20 of the 187 sites show increases in average annual daily traffic counts. In the aggregate for the 187 sites, average annual daily traffic counts fell from 4,277,736 in 2019 to 3,606,610 in 2020, a decrease of 671,126 (15.7%).

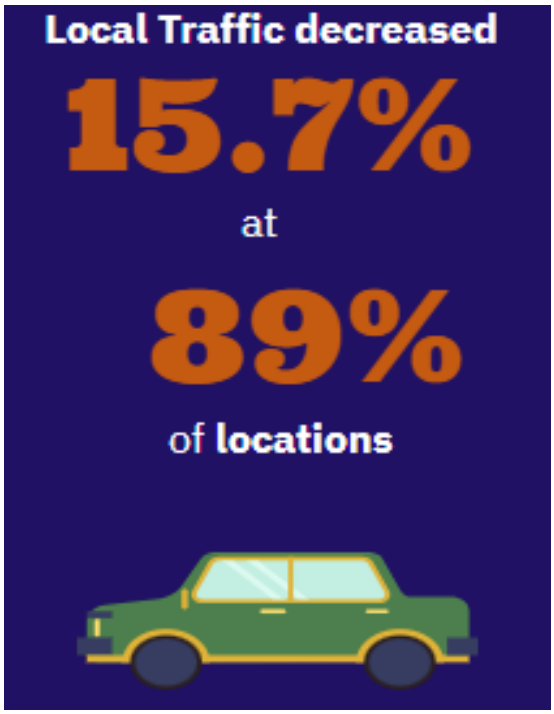


Figure 46 displays the 187 County monitoring sites with color-coded dots showing the percentage change in average annual daily traffic counts at each location. Of interest, there is a cluster of eight sites in the southwest region of the County where the change in the traffic counts from 2019 to 2020 was positive, suggesting that local trips there increased more than in other parts of the County.

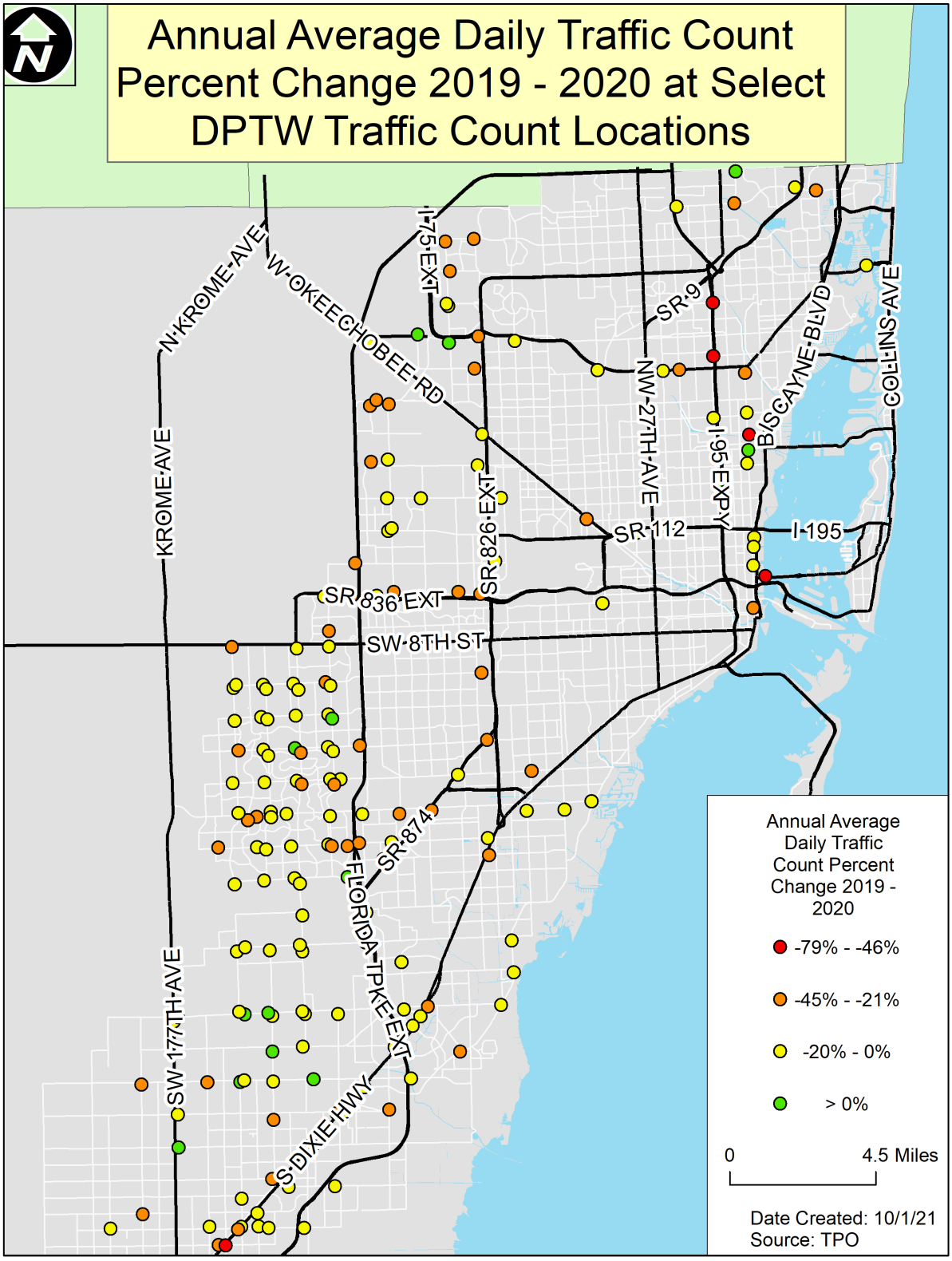


Figure 46: Annual Average Daily Traffic Count, Percent Change, 2019 – 2020

2021 average annual daily traffic counts were also available for all the 187 locations in Miami-Dade County (***Figure 42*** of ***Appendix AA***). After reviewing 2019, 2020, and 2021 traffic counts, there was a significant reduction in overall traffic in 2020, but 2021 counts represent a near exact return in traffic for the available locations, 4.21 million total in 2021, and 4.28 million in 2019 (***Figure 47***).

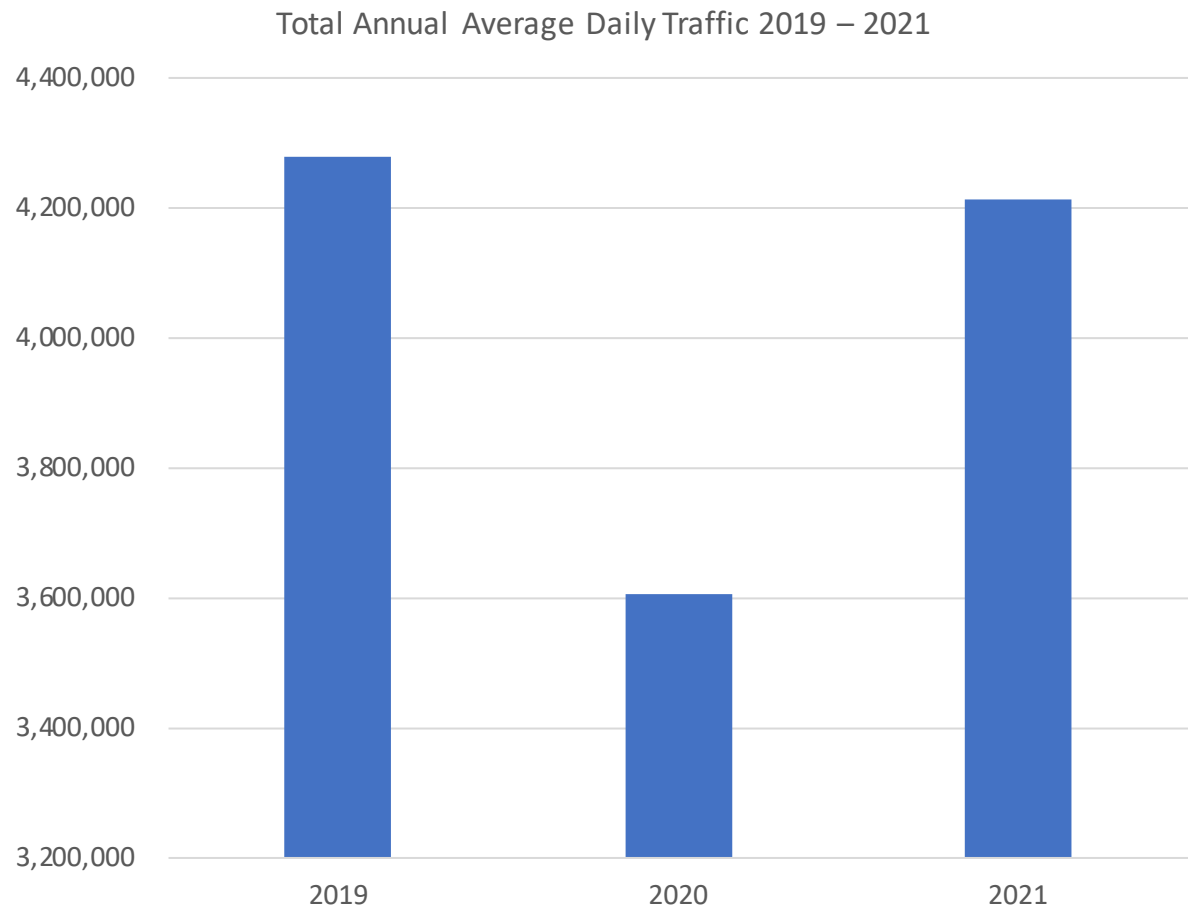


Figure 47: Total Annual Average Daily Traffic, 2019 – 2021

Figure 48 displays the 187 County monitoring sites with color-coded dots showing the percentage change in the average annual daily traffic counts at each location for 2020-2021. Most locations experienced an increase in traffic from 2020 to 2021. On average, main corridors experienced the largest increases in local trips, the western suburbs experienced a moderate increase, and there are scattered instances of reduced traffic.

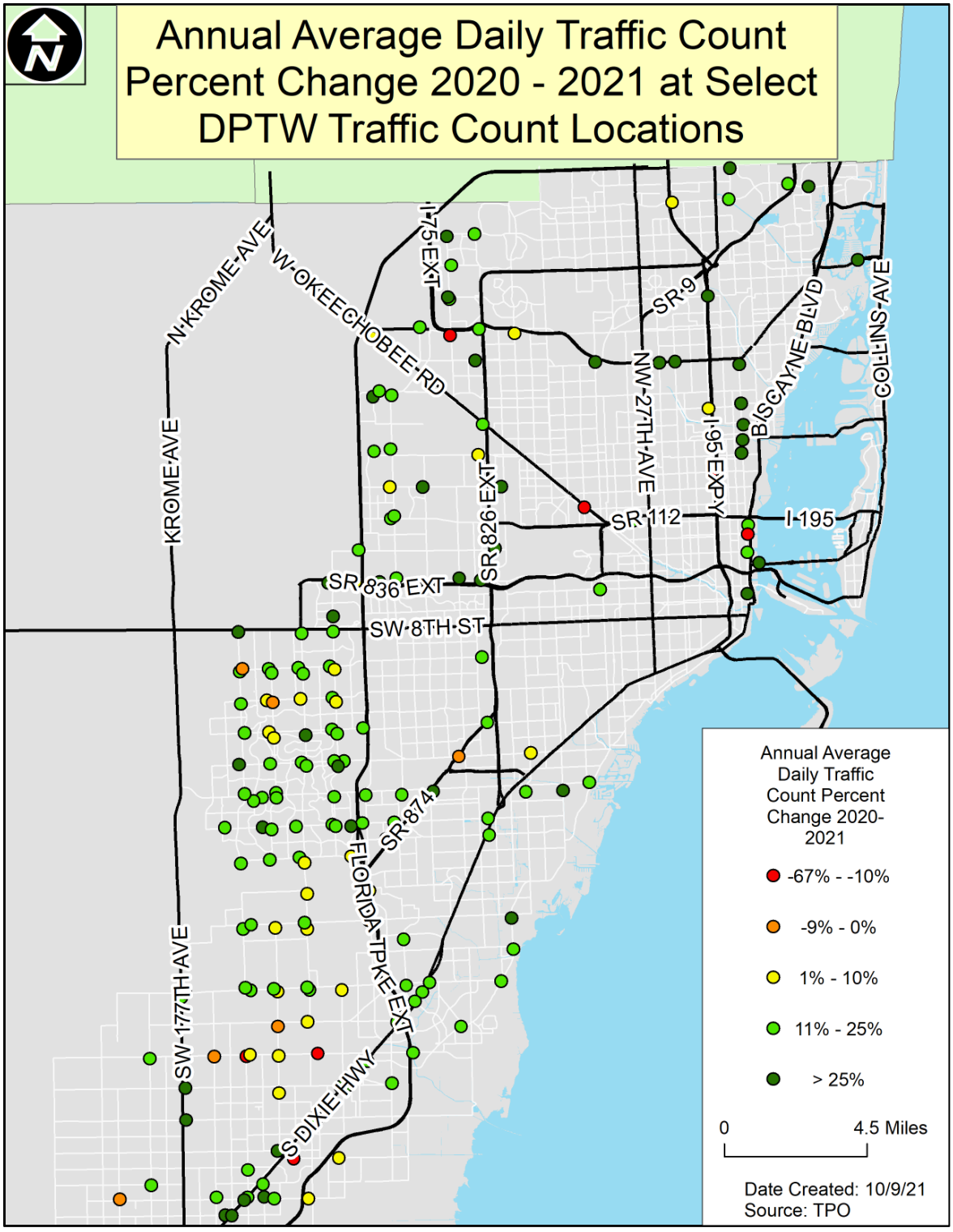


Figure 48: Annual Average Daily Traffic, 2020 – 2021

Figure 50 displays the 187 County monitoring sites with color-coded dots showing the percentage change between 2019 and 2021 in the average annual daily traffic counts at each location. Most locations experienced an increase in traffic during the period. On average, local traffic along main corridors increased the most, particularly NW 119th Street and NE 2nd Avenue. Local traffic in the western suburbs largely decreased modestly, between 0% and -10%. More significant reductions in local traffic, between -10% and -49% are scattered, but more common father away from downtown. Interestingly, the two largest decreases occurred along NE 2nd Avenue in northern Miami and in Miami Shores, about 2 miles away from each other and amongst general increases in traffic in Miami Shores/northern Miami and Downtown Miami. ***Figure 49*** below demonstrates these broad trends in the changes in traffic from 2019 to 2021.

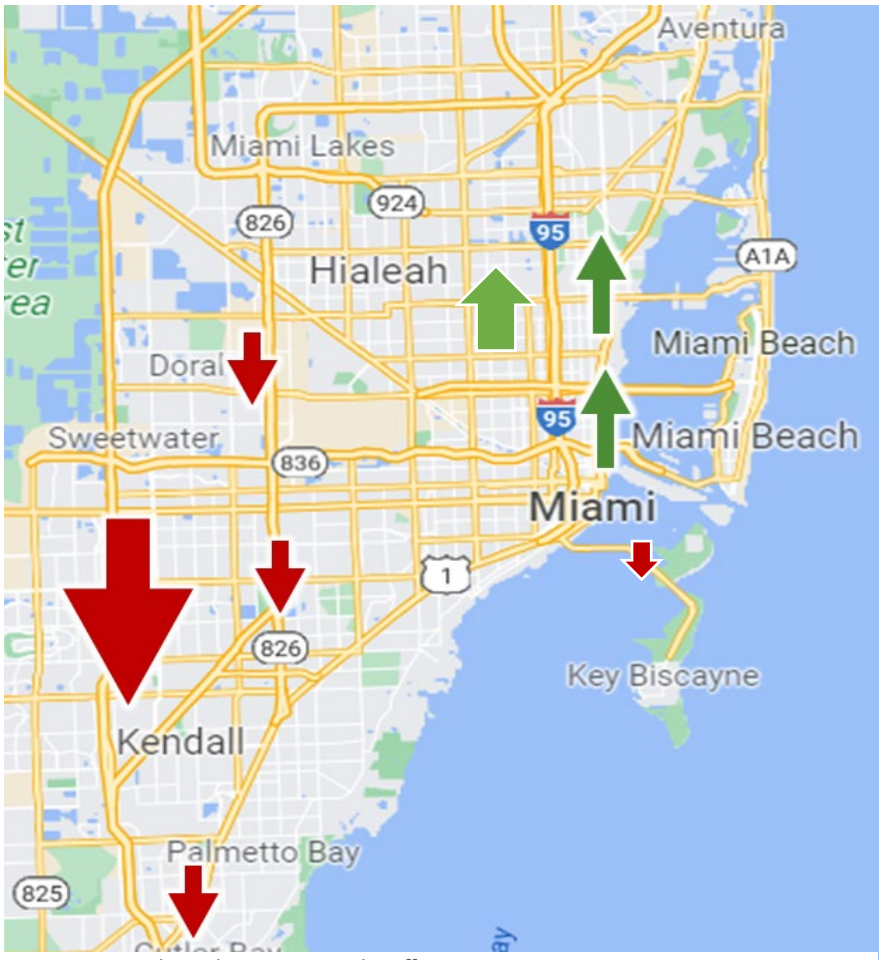


Figure 49: Trends in Changes in Local Traffic, 2019 – 2021

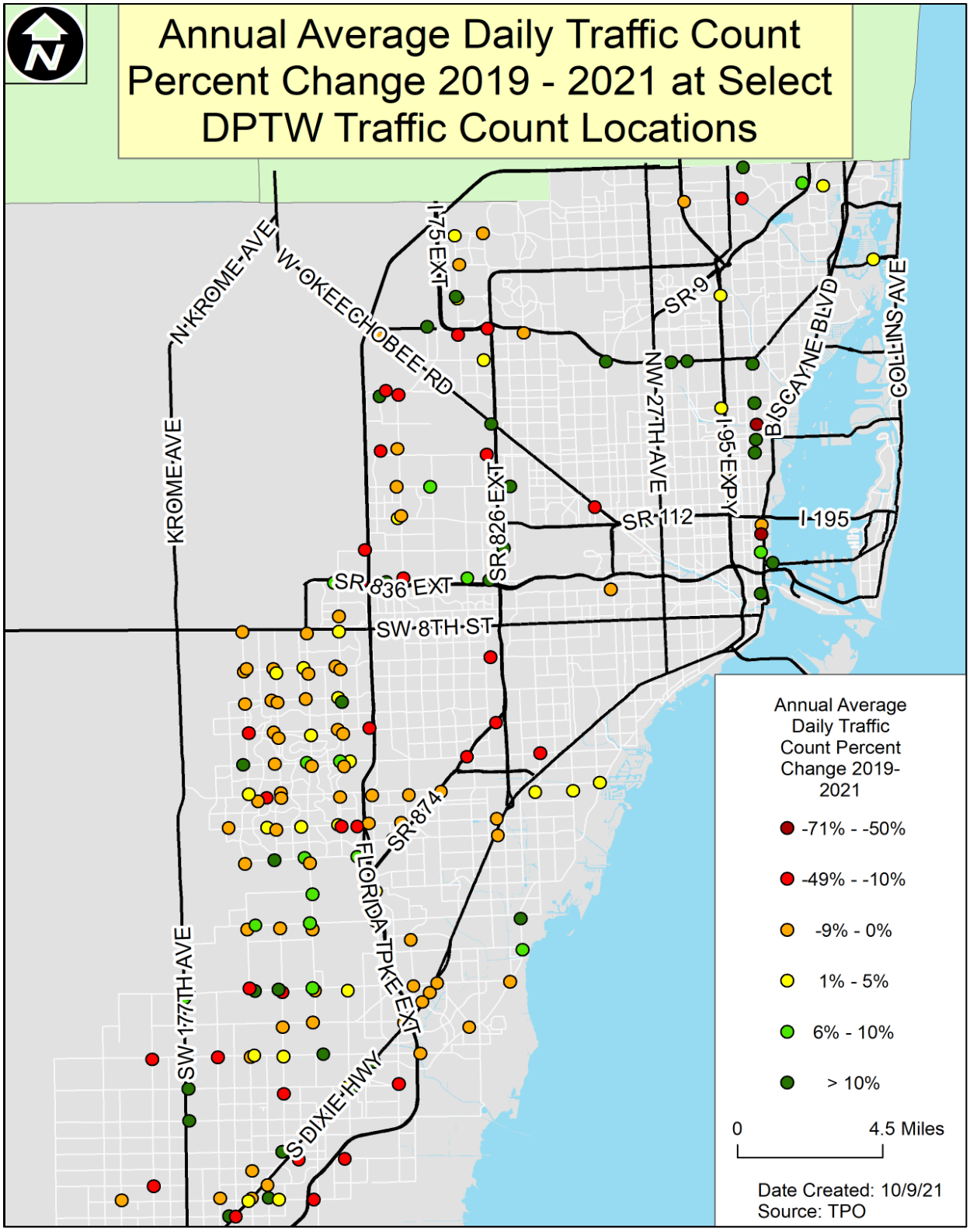


Figure 50: Annual Average Daily Traffic, 2019 – 2021

4.6 Bicycle and Pedestrian Activity

Limited data is available to measure the absolute impact of the pandemic on the use of active modes of transportation such as walking and cycling. However, data is available for pedestrian and cyclist traffic at a single location: the Vizcaya Metrorail station.

At that location, what we see are pedestrian counts more than quadruple in May 2020 (the peak of the shutdown) when compared with the same month in 2019 and remained more than twice as high in June through August of the same month of the prior year (***Table 19***). Average monthly counts were up by 78% for the year. It is worth noting that pedestrian counts in the second half of 2019 were down about a third from the first half of 2020, probably reflecting a seasonal variation due to weather and other factors.

Table 19: Vizcaya Station Pedestrian Counts Change and Percent Change by Month, 2019 – 2020

Month	2019	2020	Change	% Change
Jan	3,307	2,826	-481	-14.5%
Feb	2,888	2,889	1	0.0%
Mar	4,292	7,521	3,229	75.2%
Apr	4,490	7,495	3,005	66.9%
May	3,139	15,276	12,137	386.7%
Jun	2,031	4,625	2,594	127.7%
Jul	1,579	4,401	2,822	178.7%
Aug	1,498	3,027	1,529	102.1%
Sep	2,615	3,838	1,223	46.8%
Oct	2,581	3,896	1,315	50.9%
Nov	2,739	3,963	1,224	44.7%
Dec	2,401	N.A.	N.A.	N.A.
Average	2,797	4,980	2,183	78.1%

Cyclist counts fell in January and February, then rose in March and April of 2020, when compared with the same months in 2019 (***Table 20***). They more than doubled in May 2020, but gradually returned to a level consistent with the previous year as restrictions on activity were relaxed.

Table 20: Vizcaya Station Cyclist Counts Change and Percent Change by Month, 2019 – 2020

Month	2019	2020	Change	% Change
Jan	5,285	4,852	-433	-8.2%
Feb	5,296	4,716	-580	-11.0%
Mar	6,115	8,384	2,269	37.1%
Apr	5,953	11,555	5,602	94.1%
May	5,552	11,257	5,705	102.8%
Jun	4,958	8,548	3,590	72.4%
Jul	5,473	7,870	2,397	43.8%
Aug	5,269	6,904	1,635	31.0%
Sep	5,078	6,086	1,008	19.9%
Oct	5,065	5,496	431	8.5%
Nov	4,963	5,301	338	6.8%
Dec	4,095	N.A.	N.A.	N.A.
Average	5,259	6,747	1,489	28.3%

Figure ***51*** shows the monthly percentage change in bicyclists and pedestrians at the Vizcaya Metrorail Station from 2019 to 2020.

Figure 51: Vizcaya Bicycle and Pedestrian Monthly Percent Change, 2019 – 2020

4.7 Aggregated Mobility Metrics

4.7.1 University of Maryland Mobility Metrics

The University of Maryland collected COVID-19 Mobility metrics based on the January 2020 baseline until April 20, 2021. The data can be found in ***Appendix L***.

4.7.1.1 Social Distancing Index

The 2020 daily Social Distancing Index in Miami-Dade County can be found in ***Figure 52***.

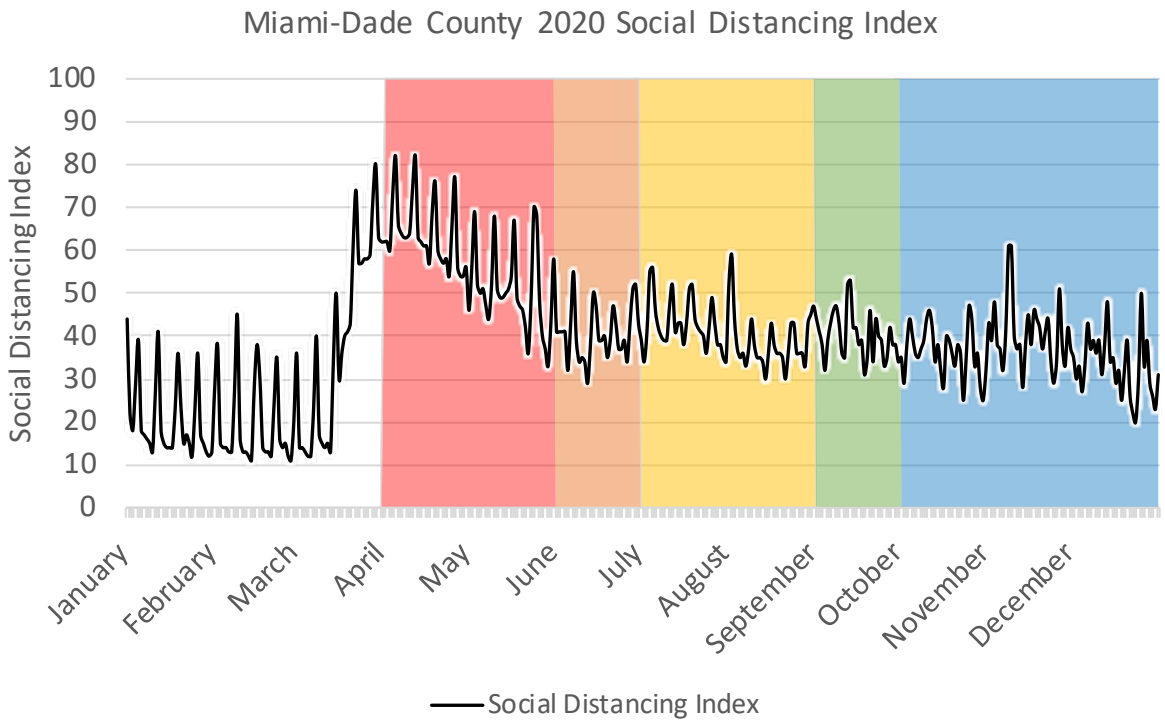


Figure 52: Social Distancing Index, Change from Baseline, 2019 – 2020

The social distancing index fluctuates in a regular pattern on a weekly basis. Typically, the social distancing index reaches a maximum for the week on Sundays, and Saturday comes in second highest. Social distancing then sharply declines the following Monday, followed by a slight but steady decline until reaching a minimum on Fridays.

Social distancing in January through early March was found to range from 10% to 40% above the January 1, 2020 baseline. In response to the COVID-19 outbreak causing widespread social distancing, the social distancing index increased significantly beginning in late March 2020, reaching a maximum in mid-April with a score of 82. Average social distancing dropped consistently throughout the Red Lockdown phase until levelling off beginning in June. From June to October, the index remained relatively steady at an average of 40 and ranging from 30 to 60, despite restrictions being reduced during this time. Starting in November and continuing through December, social distancing began to decrease, to an average of 35 in December with a range of

20 to 50, correlating to the full business reopening by executive order beginning in November. However, social distancing remained higher in December than before lockdowns began.

In 2021, the trend of decreasing average social distancing continued, from about 30% above the baseline in January 2021 to about 25% in April 2021 (***Figure 53***). This trend continued steadily despite fluctuations in the trend of new cases, in contrast to other travel metrics such as transit and traffic.

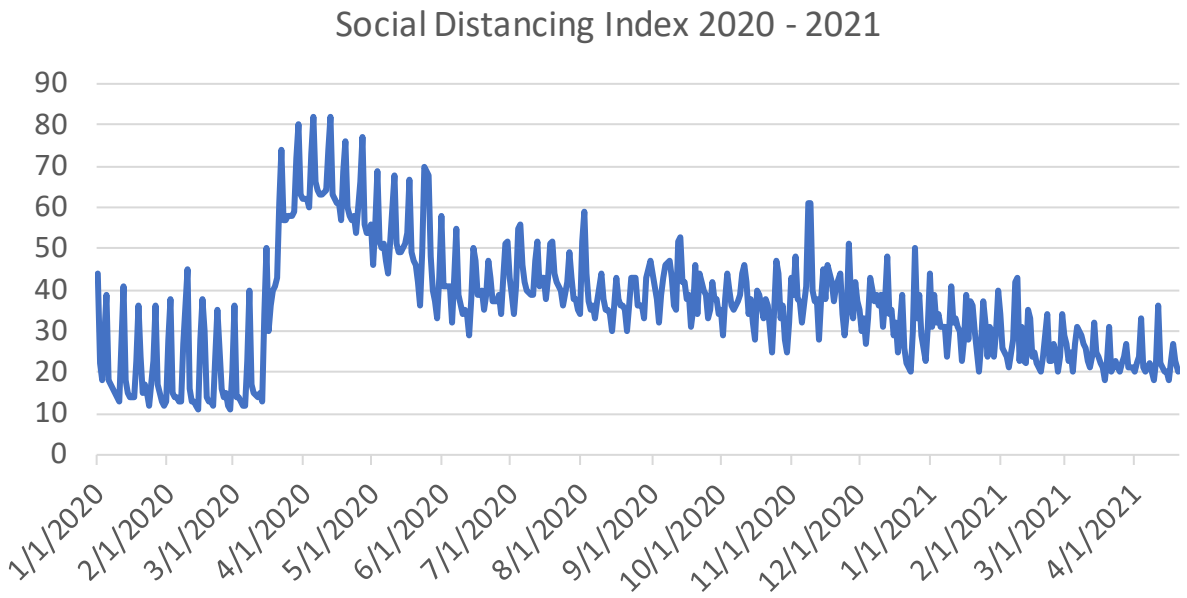


Figure 53: Social Distancing Index, 2020– 2021

4.7.1.2 Percentage of Residents Staying Home

The percentage of residents staying home in Miami-Dade County in 2020 can be found in ***Figure 54.***

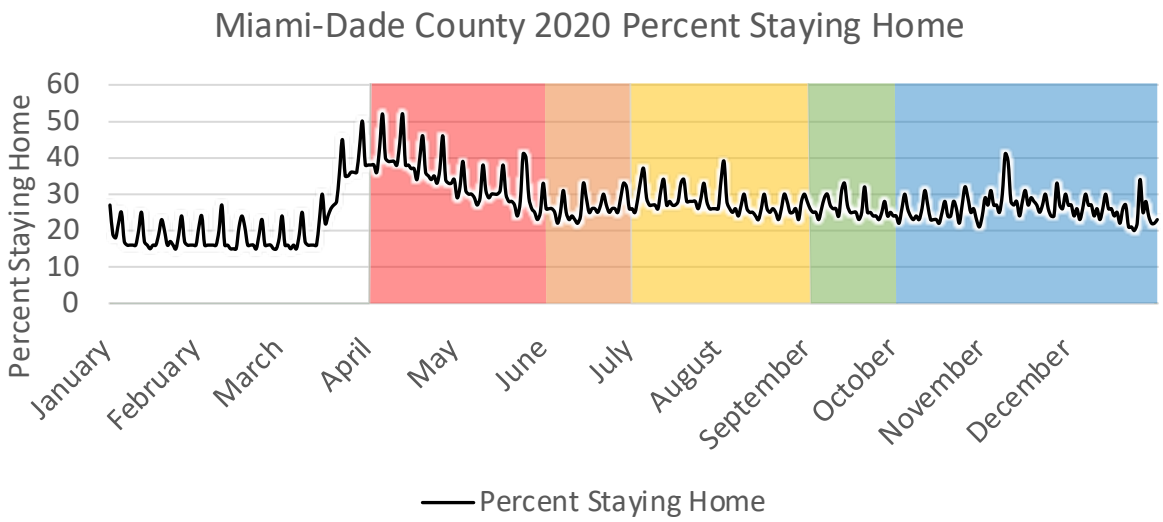


Figure 54: Percent Staying Home Change from Baseline, 2019 – 2020

The percentage of residents staying home fluctuates in a similar pattern to the Social Distancing Index.

The percentage of residents staying home in January through mid-March was found to range from 15% to 27%. In response to the COVID-19 outbreak, widespread social distancing occurred, causing the percentage of residents staying home to increased significantly beginning in mid-March 2020, reaching a maximum in mid-April 2020 of 52%. Average percentage of residents staying home dropped consistently throughout the red lockdown phase, levelling off beginning in June 2020 and remained relatively steady for the rest of the year despite restrictions being reduced during this time. From June through December 2020, the percentage of residents staying home was on average 26% and ranged from 20% to 41%. There was no significant change in percentage of residents staying home in response to full reopening by executive order beginning in November. Further, no differences were observed when comparing fluctuations of the percent of residents staying home on the weekends between pre-pandemic levels and Dec 2020. This indicates that the main factor in staying home and social distancing was related to traveling to work, as people, on average, still left their homes on the weekends at similar levels pre- and mid-pandemic.

In 2021, the trend of less people staying home continued to slowly decline from January 2021 to April 2021, from 25% above the baseline to about 22% (***Figure 55***). This trend steadily continued, despite fluctuations in the upward trend in new cases, in contrast to other travel metrics, such as transit and traffic. On average, about 7% more people stayed home during the workday in April 2021 compared to before the pandemic, and 2% more during the weekends.

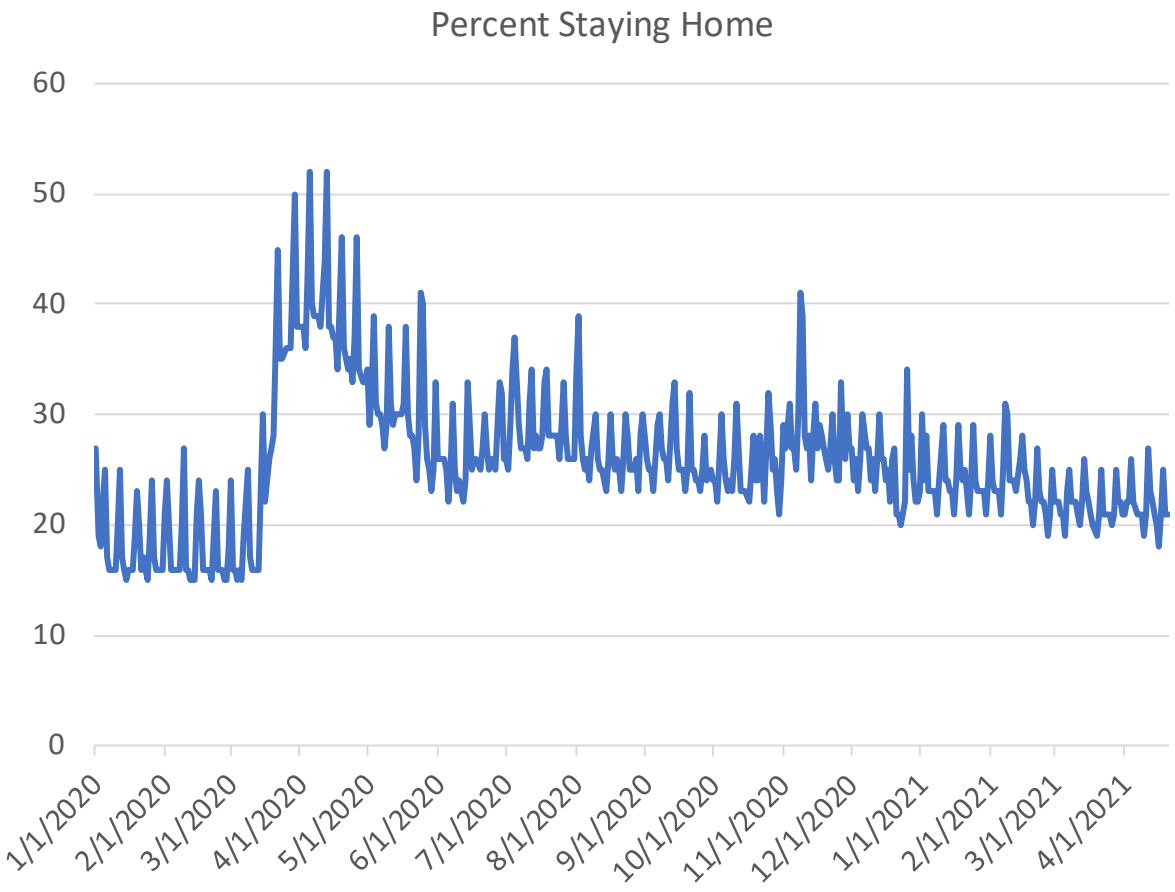


Figure 55: Percent Staying Home, 2020 – 2021

4.7.1.3 Average Daily Trips Per Person

The average daily trips per person per day in Miami-Dade County in 2020 can be found in ***Figure 56.*** Typically, the number of trips per person per day reaches a minimum for the week on Sundays and Saturday is a close second. Number of trips per person per day then sharply increases the following Monday, followed by a slight but steady increase until reaching a maximum on Fridays.

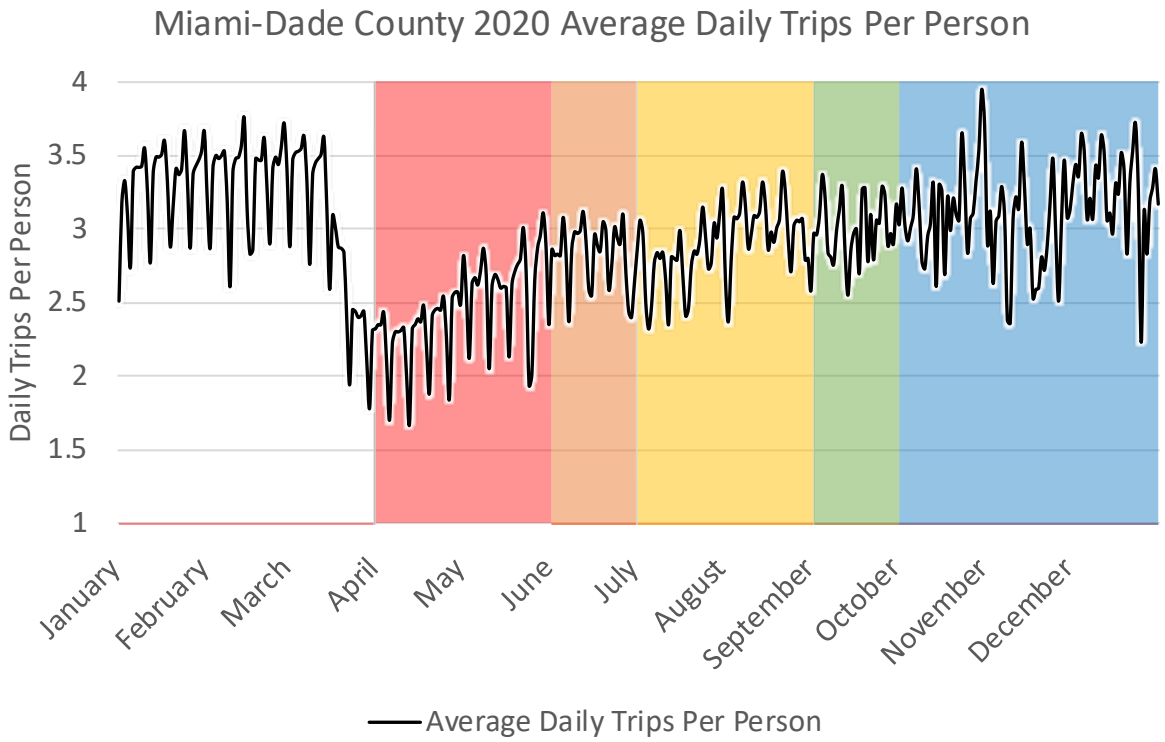


Figure 56: Average Daily Trips per Person, 2019 – 2020

Average daily trips per person in January through mid-March 2020 was found to range from 2.5 to 3.75, averaging 3.33 trips per person per day. In response to the COVID-19, outbreak causing widespread social distancing, average daily trips per person decreased significantly beginning in mid-March 2020, and reached a minimum of 1.67 trips per day in mid-April. Average daily trips per person increased throughout the red lockdown phase then slowed down in the beginning of June, with the daily average increasing from 2.3 in April to 2.8 in June. Average daily trips per person increased slightly through the remainder of the year, from an average of 2.8 in June to 3.3 in December. Trips per person returned to pre-pandemic levels by December 2020.

In 2021, the trend of average daily trips per person started to increase, from an average of about 3 trips per person per day in January 2021 to about 3.7 trips in April 2021 (***Figure 57***). This trend steadily continued despite fluctuations in the upward trend in new cases, in contrast to other travel metrics, such as transit and traffic. Before the pandemic, average daily trips followed a predictable intra-week pattern with less trips on the weekends. This predictable trend continued throughout the pandemic, but became more volatile starting in September of 2020. Intra-week volatility of average daily trips increased slowly from Sep 2020 until February 2021, when the difference in the number of average daily trips per person on weekends and weekdays starts to become much smaller.

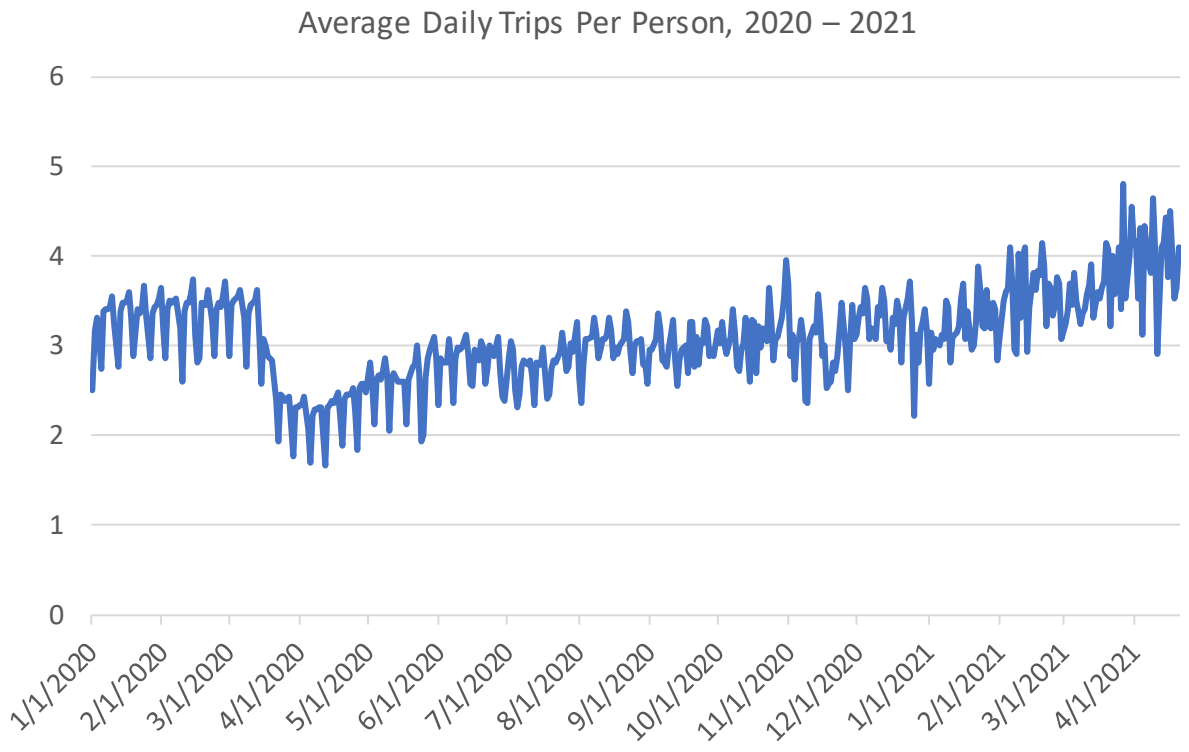


Figure 57: Average Daily Trips per Person, 2020 – 2021

4.7.1.4 Percentage of All Trips that Cross County Borders

The percentage of all trips that cross county borders per day in Miami-Dade County in 2020 can be found in ***Figure 58***.

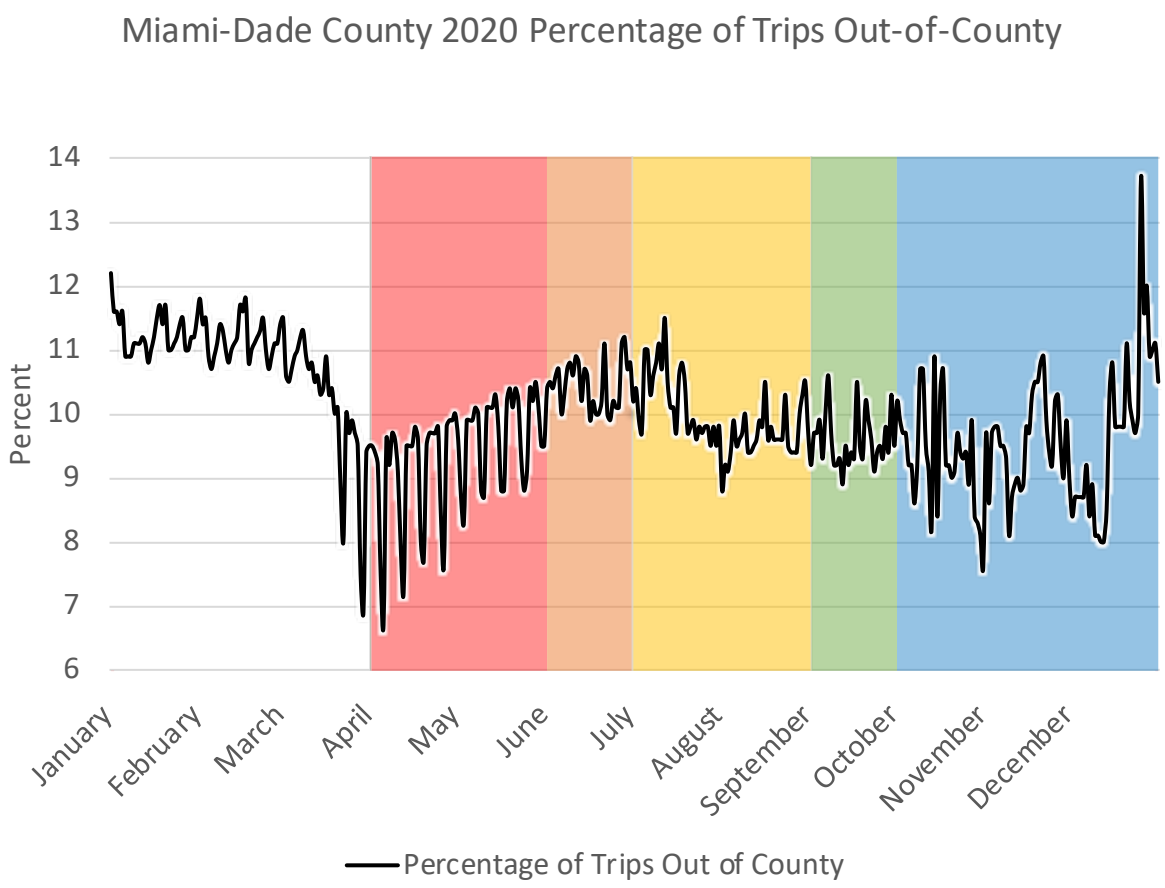


Figure 58: Miami-Dade County Percentage of Trips Out-of-County, 2019 – 2020

During the no-phase months of January through March 2020, there was no consistent pattern throughout the week, with no day typically being the highest or the lowest. During this period, the percentage of trips that crossed county borders fluctuated regularly between 8% and 12%. Beginning in late March, out-of-county trips declined, reaching a low point of 6.7% in early April. Out-of-county trips increased steadily in April and May and showed a pattern of significant decreases on the weekends, indicating that weekend leisure trips were reduced while out-of-county work trips were not affected much. This pattern in reductions in out-of-county travel on the weekends ceased in June, indicating that leisure trips on the weekends started back up as restrictions began loosening. Out-of-county trips began decreasing in mid-July, a trend that continued until reopening by executive order in November. Out-of-county trips were significantly

higher in December than for November, hinting at holiday-related travel having a significant impact on out-of-county travel. Despite the increase in December, out-of-county travel did not return to pre-pandemic levels in 2020.

In 2021, the trend for per person out-of-county percent trips slightly increased on average (***Figure 59***). On average, the share of 2021 of out of county trips were lower than before the pandemic on weekdays and equal to pre-pandemic levels on weekends.

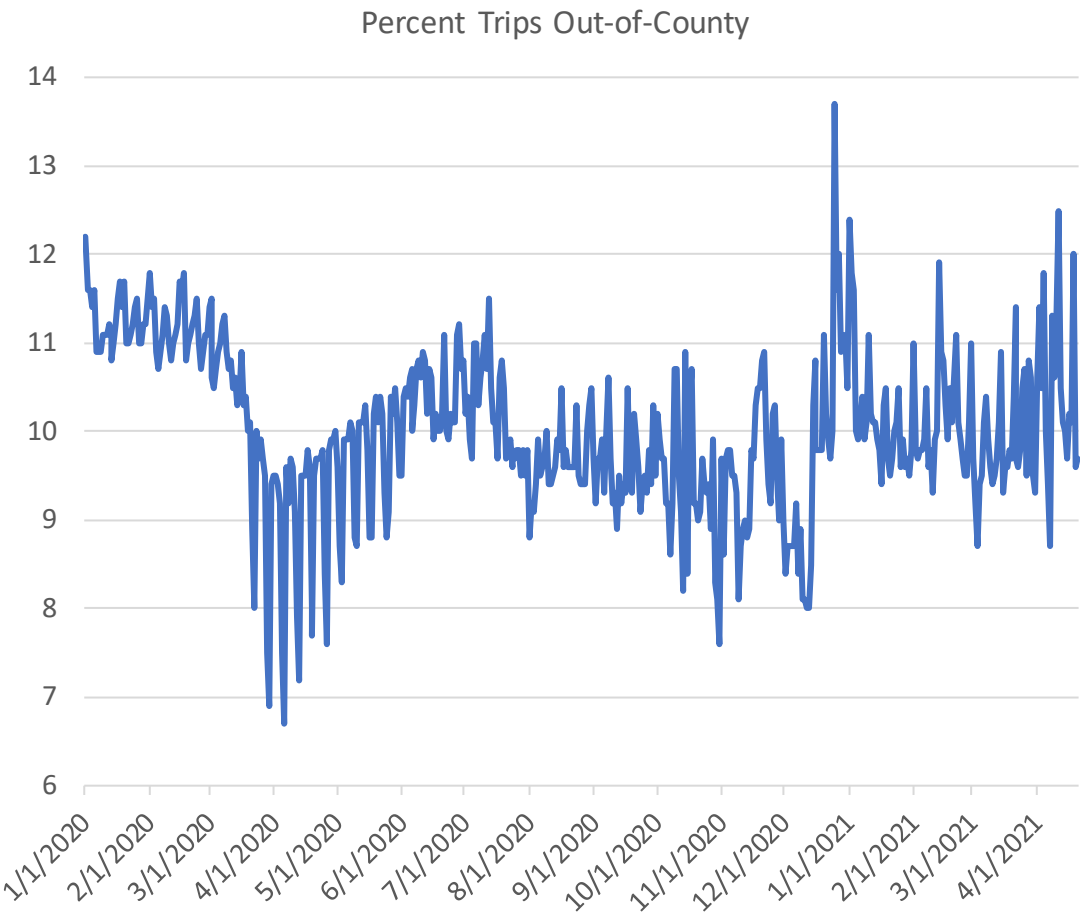


Figure 59: Percentage of All Trips that Cross County Borders, 2020 – 2021

4.7.1.5 Percentage of All Trips That Cross State Borders

The percentage of all trips that cross state borders per day in Miami-Dade County in 2020 can be found in ***Figure 60.***

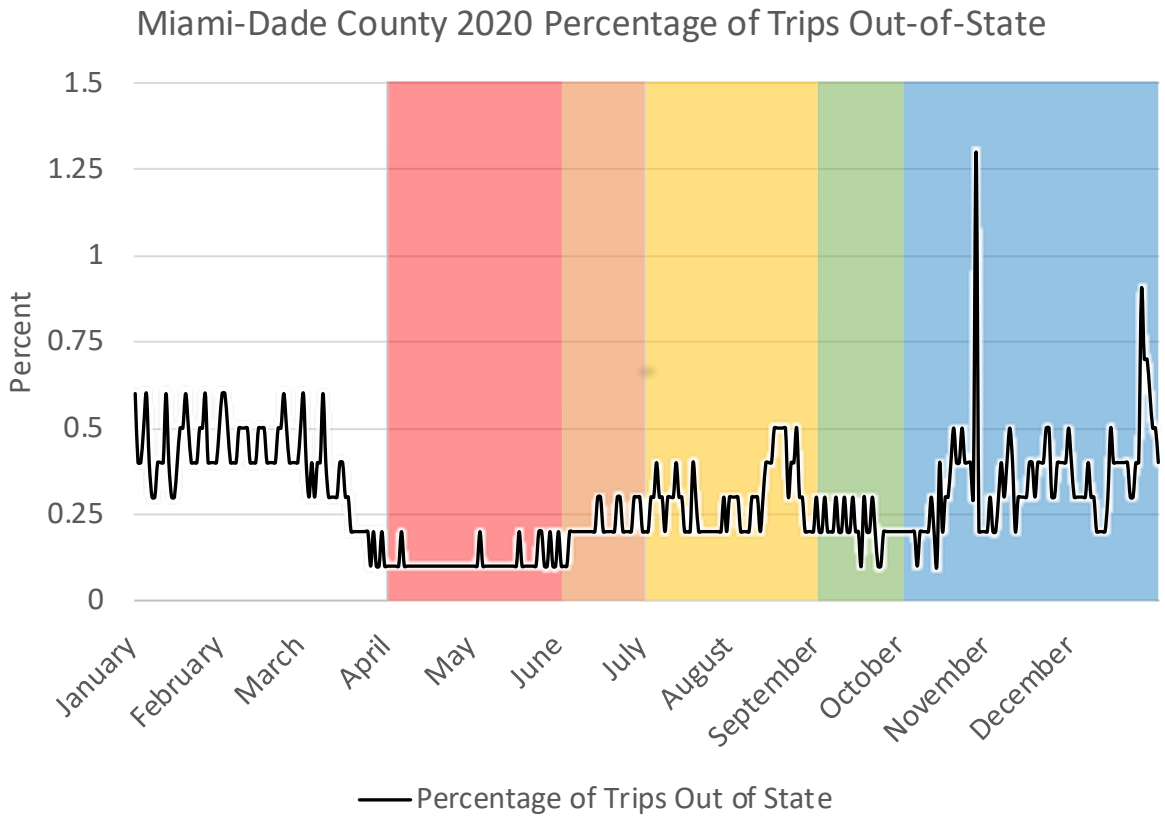


Figure 60: Miami-Dade County Percentage of Trips Out-of-State, 2019 – 2020

Typically, the number of trips per person per day reaches a maximum for the week on Sundays with Saturdays as having the lowest trips per person per day and Mondays being the second lowest.

Out-of-state trips in January through mid-March were found to range from 0.25% to 0.65%, averaging 0.4% of all trips taken out of state. Out-of-state trips dropped precipitously in mid-March until early June when lockdown restrictions began loosening. Out-of-state trips accounted for an average of 0.25% of total trips in June, remaining relatively flat until October. Out-of-state

trips increased slightly beginning in November, with occasional spikes well above the average attributable to the holidays. Despite the increase in late 2020, out of state trips did not return to pre-pandemic levels.

In 2021, the trend of percent trips out-of-county per person increased to an average of 0.4%, which is about the same level as pre-pandemic levels (***Figure 61***). The share of out-of-state trips increased, on average, in April 2021, the last month data is available, and weekend out-of-state trips in 2021 were higher, on average, than before the pandemic.

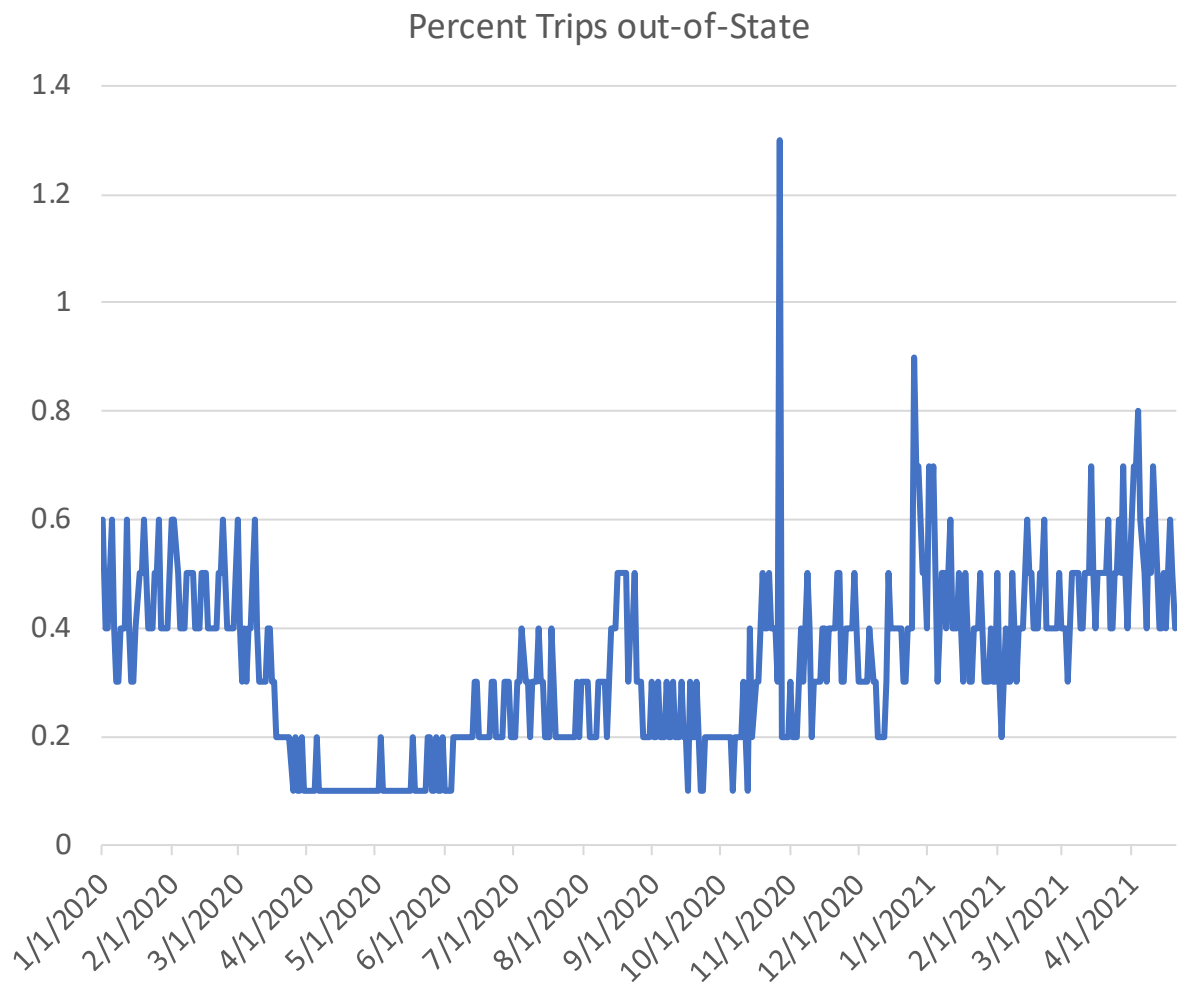


Figure 61: Percentage of All Trips that Cross State Borders, 2020 – 2021

4.7.1.6 Number of Miles Traveled Per Person Per Day

The average number of miles traveled per person per day in Miami-Dade County in 2020 can be found in ***Figure 62.***

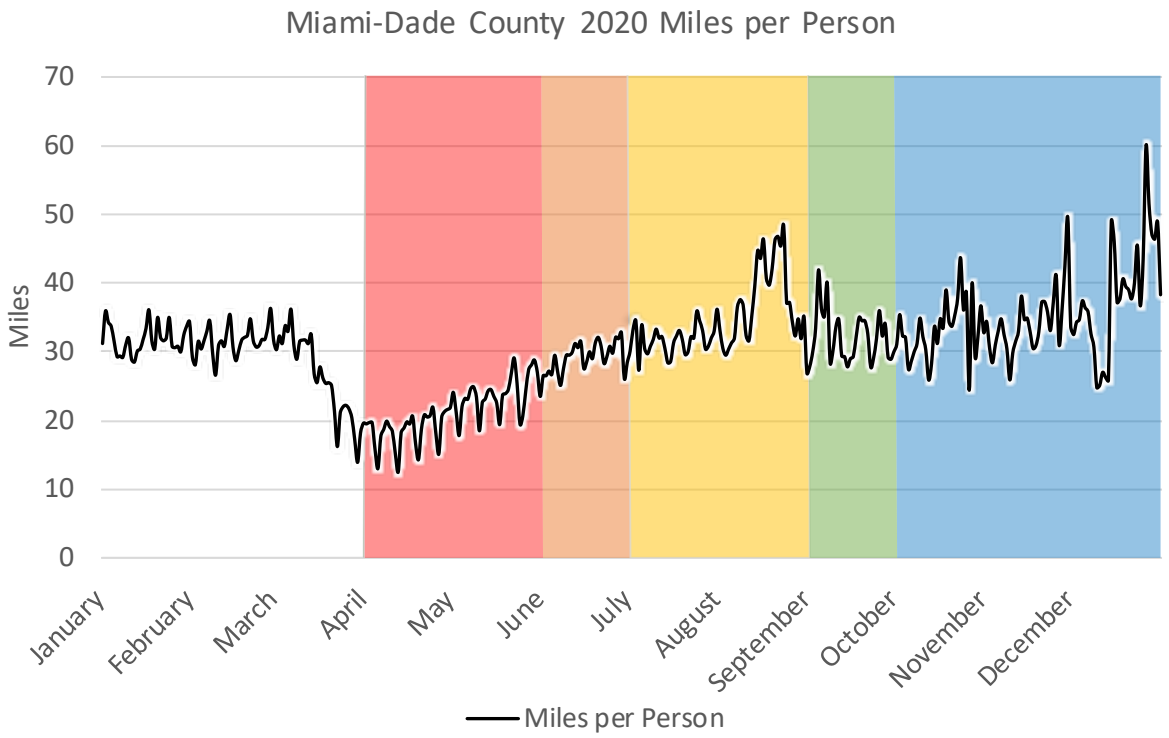


Figure 62: Number of Miles Traveled per Person per Day, 2019 – 2020

Typically, number of miles traveled per person per day reaches a minimum for the week on Sundays with Saturdays being the second lowest. Miles traveled then increased on the following Monday, followed by a slight but steady increase until reaching a maximum on Fridays.

Average number of miles traveled per person per day in January through mid-March was found to range from 25 to 36 miles, averaging 31 miles per person per day. In response to the COVID-19 outbreak and lockdowns, average number of miles per person decreased significantly beginning in mid-March 2020, reaching a minimum in mid-April of 12.5. Average miles traveled per person increased consistently until reaching pre-pandemic levels in August, as reopening expanded.

In 2021, the trend of number of miles traveled per person per day was slightly above pre-pandemic levels and gradually increasing, with a brief spike in early April 2021 (***Figure 63***). Beginning in September 2020, the volatility in number of miles travelled increased, with less intra-weekly variance. The average number of miles travelled per person on weekends increased substantially from 2020 to 2021.

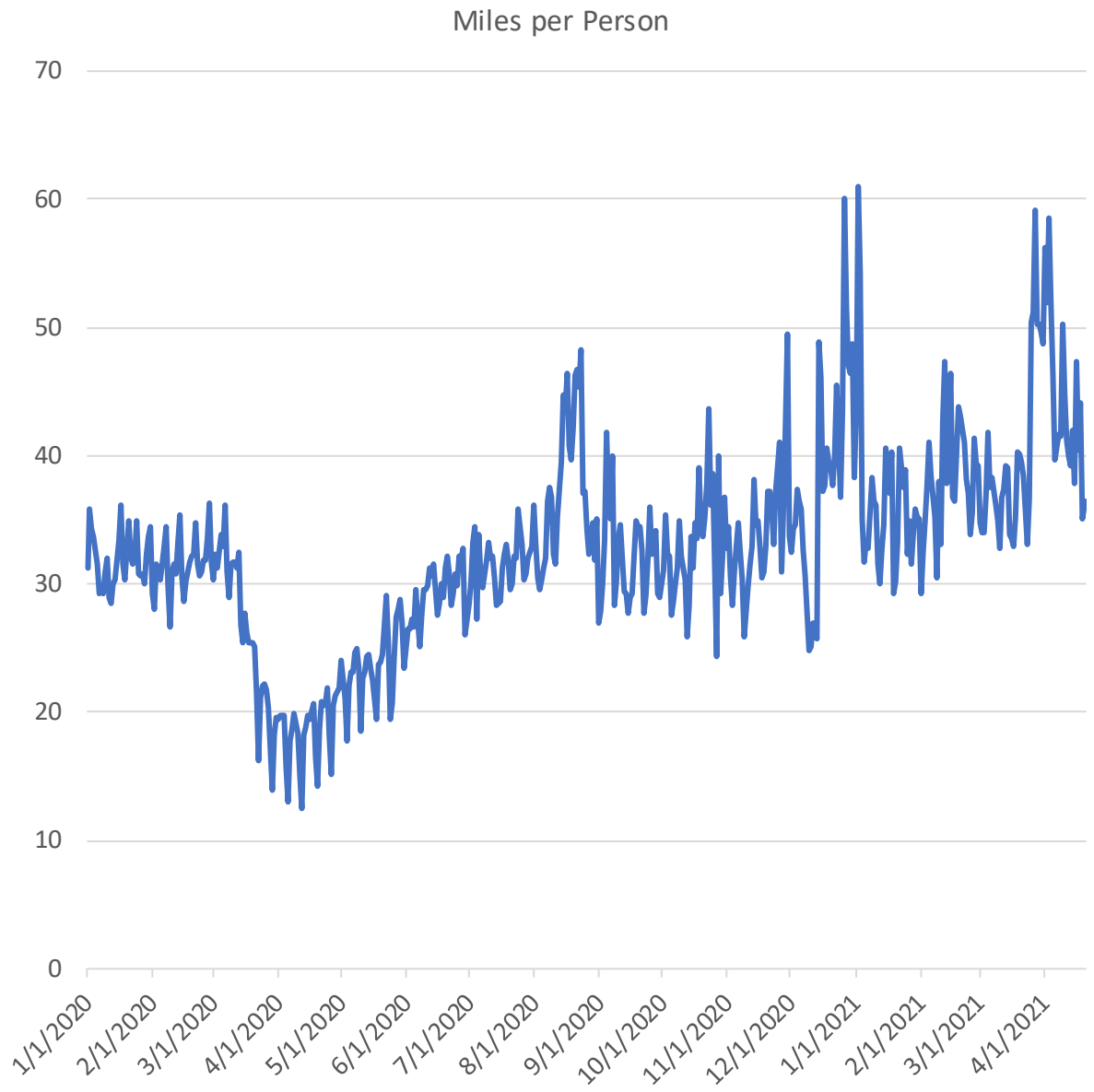


Figure 63: Number of Miles Traveled per Person per Day, 2020 – 2021

4.7.1.7 Number of Work Trips per Person per Day

The number of work trips per person per day in Miami-Dade County in 2020 can be found in ***Figure 64***.

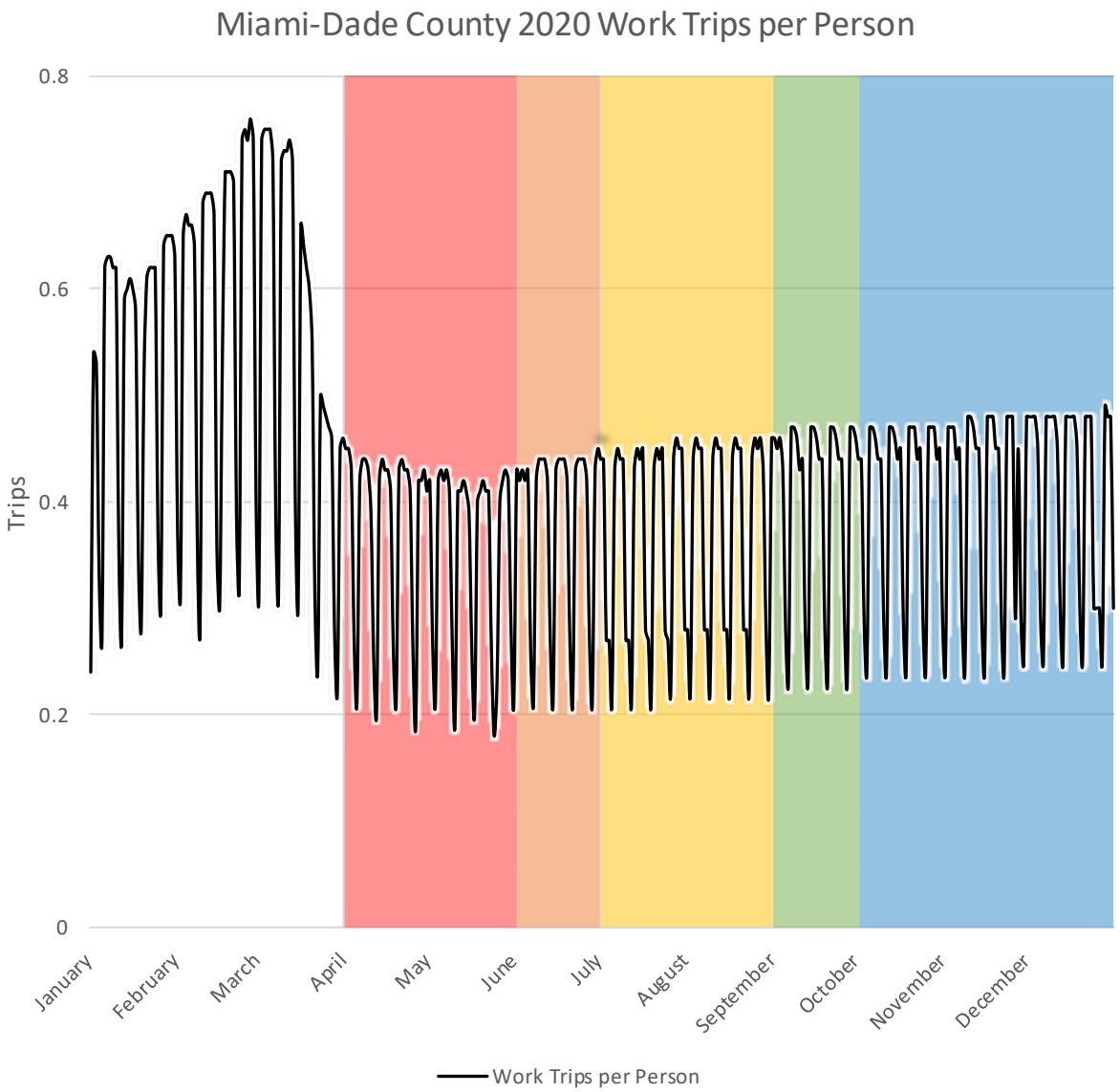


Figure 64: Number of Work Trips per Person Per Day, 2019 – 2020

Typically, work trips per person per day reaches a minimum for the week on Sundays with Saturdays being the second lowest. Number of work trips per day then increases on the following Monday and remain steady until Friday.

The number of work trips per person per day increased consistently from January until early March. Beginning in mid-March, the number of work trips declined until early April to about 50% of pre-pandemic levels. Work trips from May through December 2020 increased gradually from 50% of pre-pandemic levels in April to 65% of pre-pandemic levels in December.

In 2021, the trend of number of work trips per person per day continued after 2020 and consistently increasing since dropping 30% in April of 2020. The average number of weekday work trips remained relatively flat in 2021, around 0.5 work trips per person. Overall, the difference between the number of work trips on weekdays and weekends was smaller in 2021 than in 2020, especially before the pandemic.

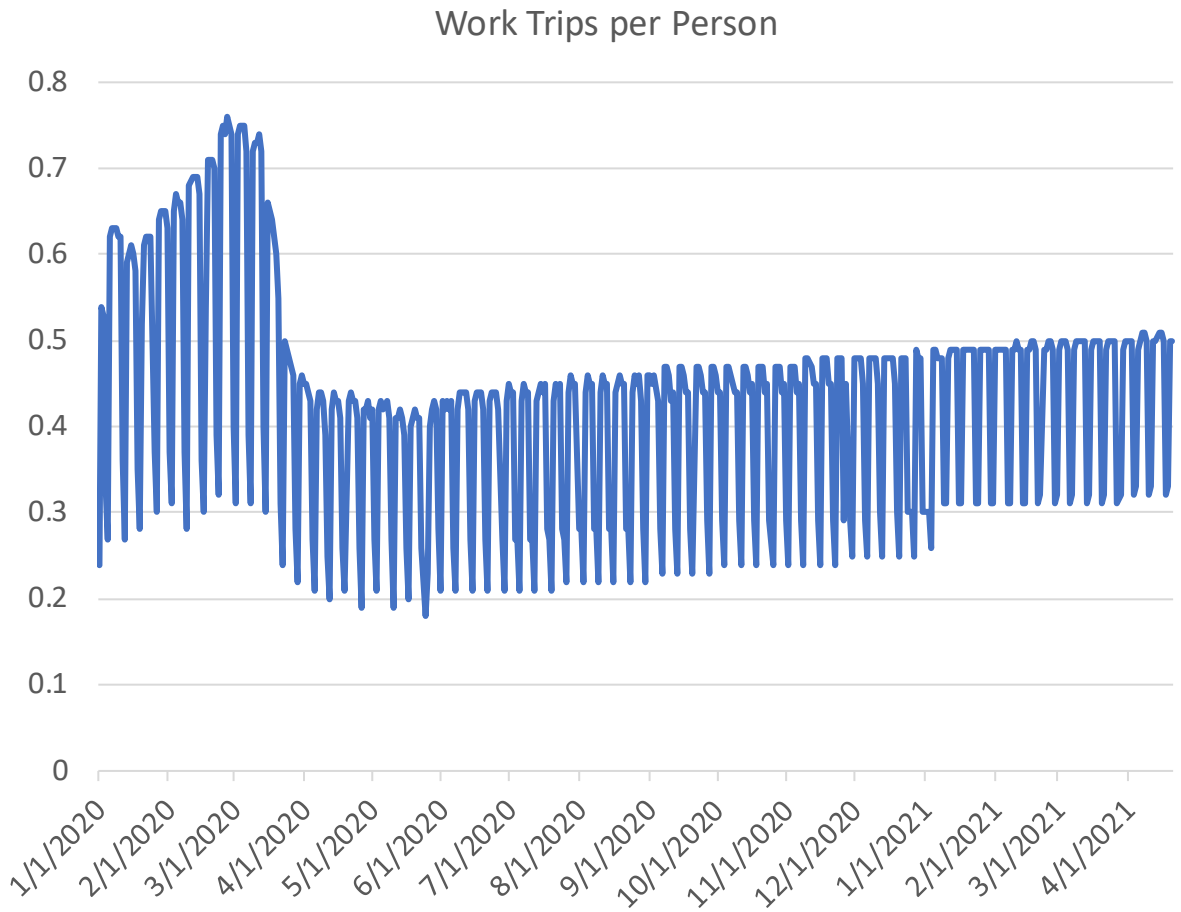


Figure 65: Number of Work Trips per Person per Day, 2020 – 2021

4.7.1.8 Number of Non-Work Trips per Person per Day

The number of non-work trips per person per day in Miami-Dade County in 2020 can be found in ***Figure 66***.

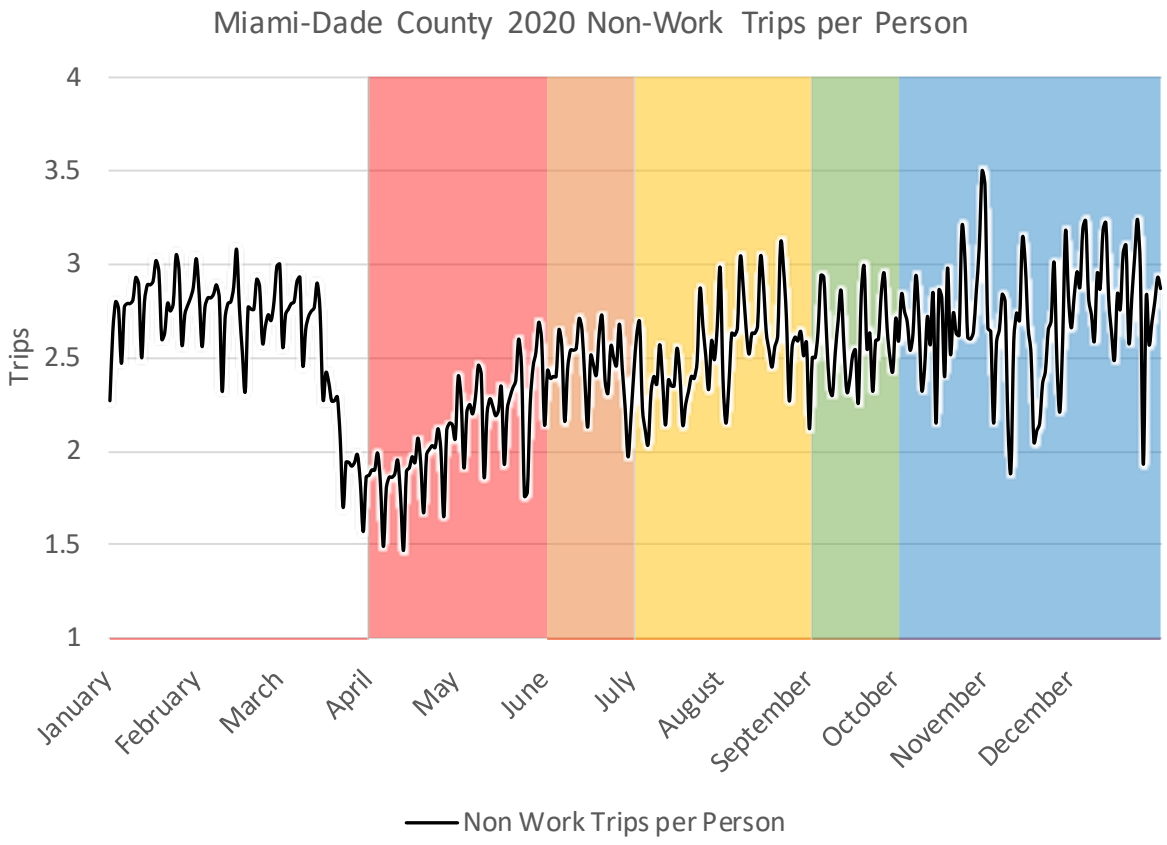


Figure 66: Number of Work Trips per Person per Day, 2019 – 2020

Typically, number of non-work trips per person per day reaches a maximum for the week on Fridays, and Sundays and Mondays having the lowest average non-work trips per person per day.

The number of non-work trips per person per day from January to early March remained steady, around a monthly average of 2.75. In April, non-work trips decreased to a monthly average of 1.9. After April non-work trips then increased consistently throughout the rest of the year, to a monthly average of 2.9 in December. The impact of holiday travel is noticeable in the increase in volatility of non-work trips in November and December 2020.

Beginning in January of 2021, average number of non-work trips per person per day started to increase to above pre-pandemic levels, particularly on weekends (***Figure 67***). The variance between number of non-work trips per person per day on weekend and weekdays started to decrease in November of 2020, a trend that intensified each of the following months.

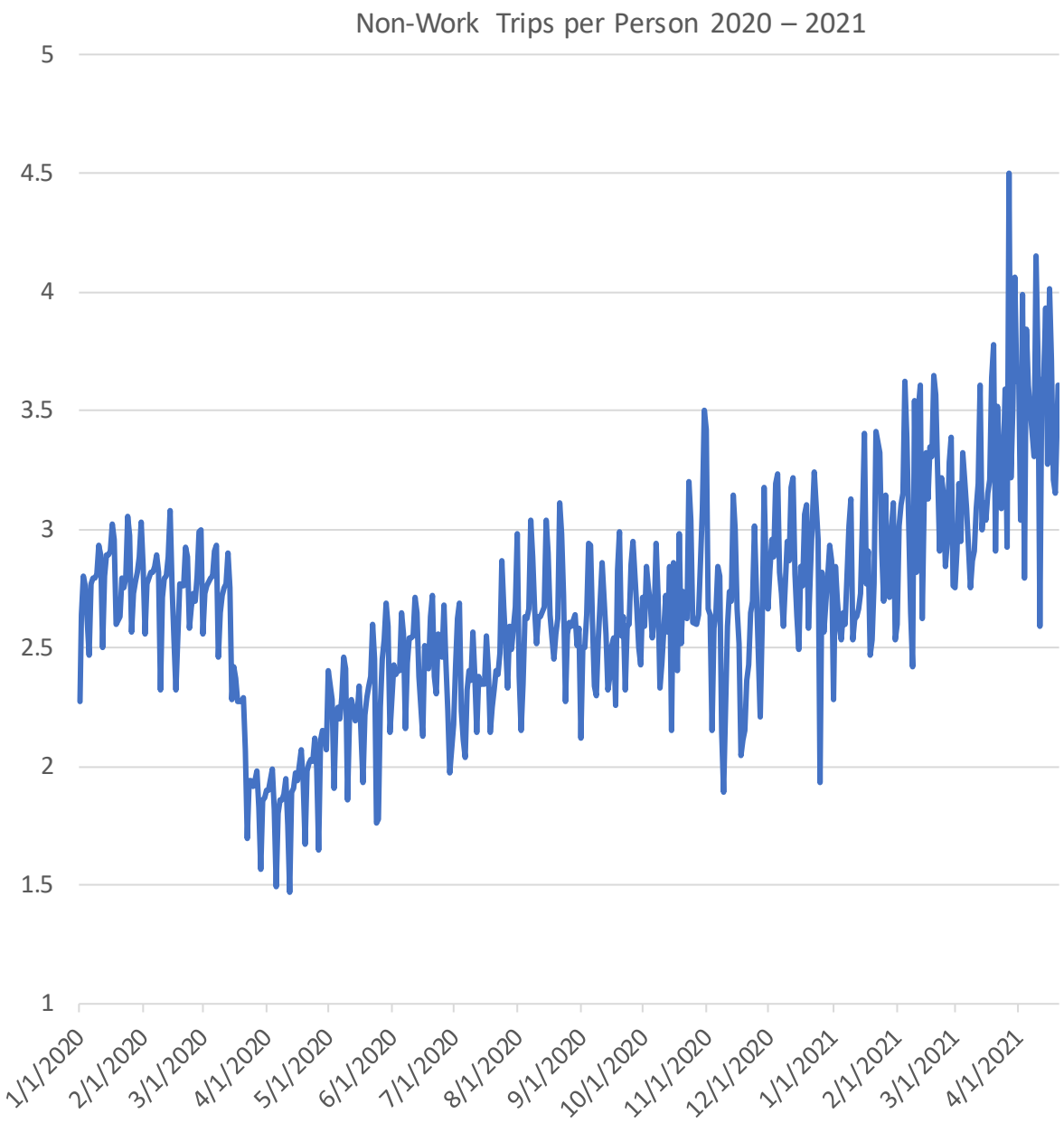


Figure 67: Number of Non-Work Trips per Person per Day, 2020 – 2021

4.7.1.9 Percent Working from Home

The percentage of people working from home in Miami-Dade County in 2020 can be found in ***Figure 68.***

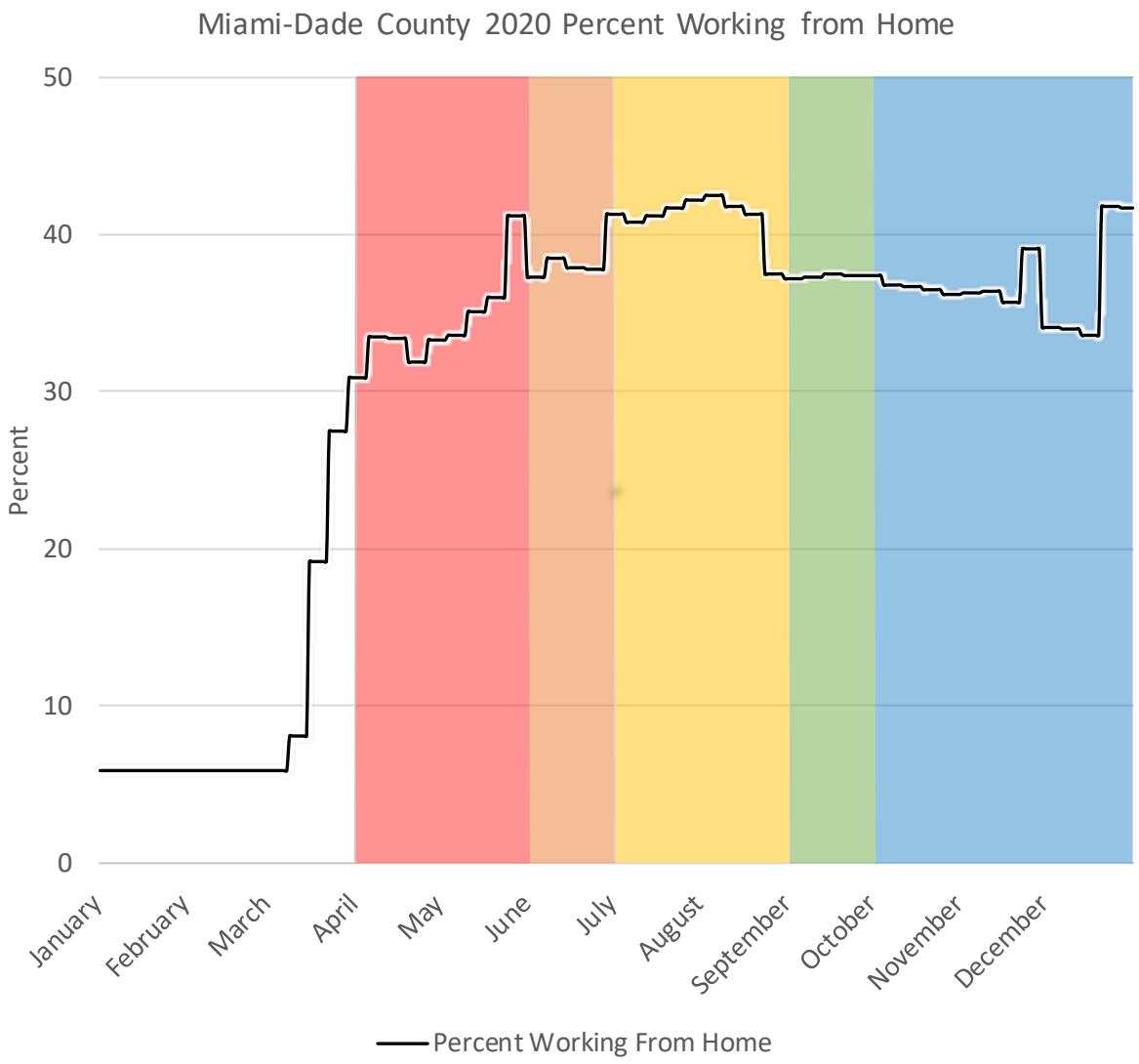


Figure 68: Percent Working from Home, 2019 – 2020

Six percent of Miami-Dade County residents worked from home prior to mid-March. Working from home increased to 8% then 19%, and finally to 28% in the second, third, and fourth weeks

of March, respectively. Working from home continued to increase in the coming months, up to 43% in the first week of August 2020, and never dropping below 34% for the remainder of the year.

Beginning in September of 2020 and continuing through April 2021, the percentage of people working from home gradually decreased from 37% in September 2020 to 29% at the beginning of April 2021, with two exceptions—the weeks of Thanksgiving and Christmas (***Figure 69***). By mid-April 2021, the percentage working from home dropped to 26%, still 20% higher than before the pandemic.

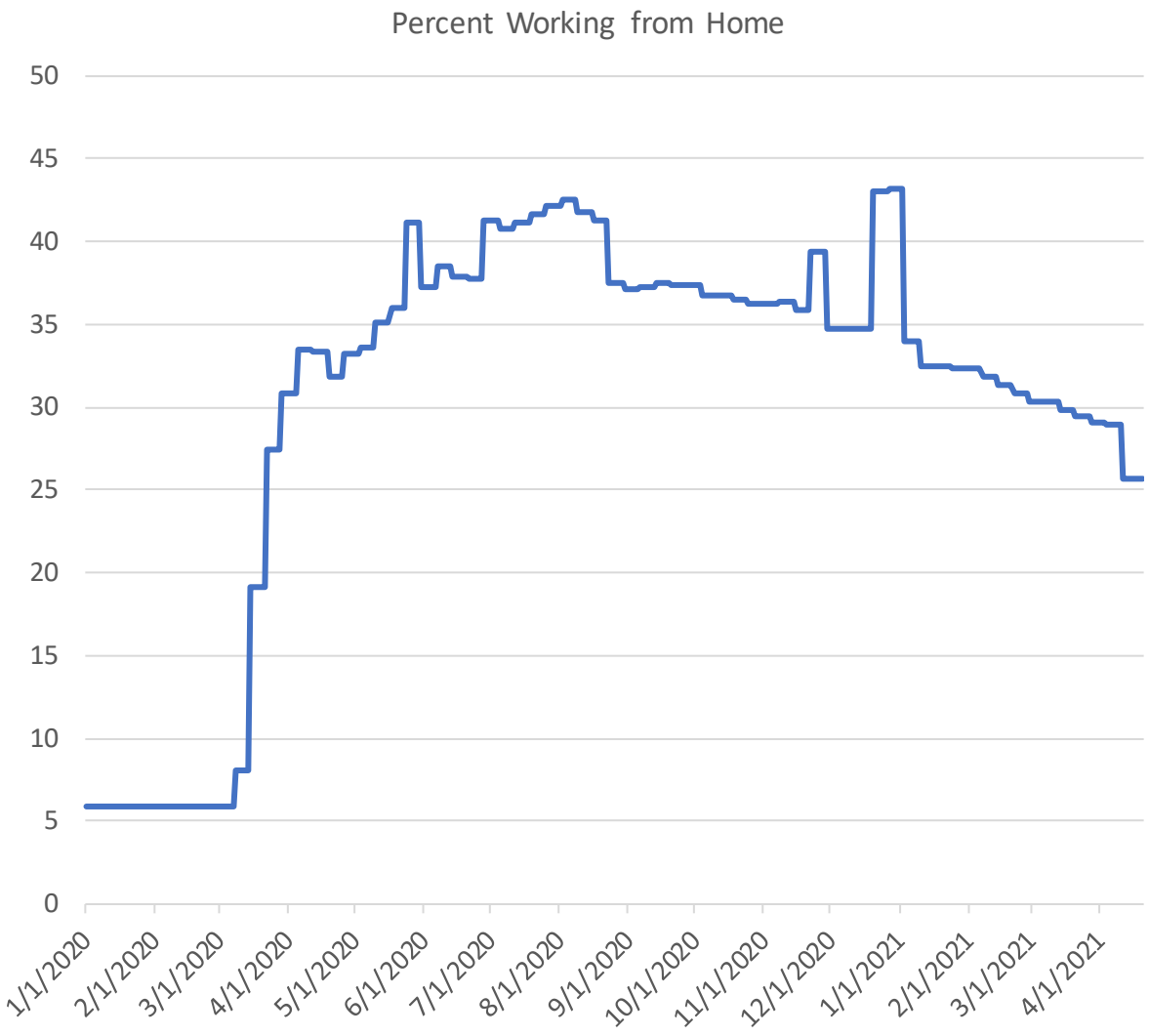


Figure 69: Percent Working from Home, 2020 – 2021

4.7.1.10 Percent Change in Consumption

The percentage change in consumption in Miami-Dade County in 2020 can be found in ***Figure 70.***

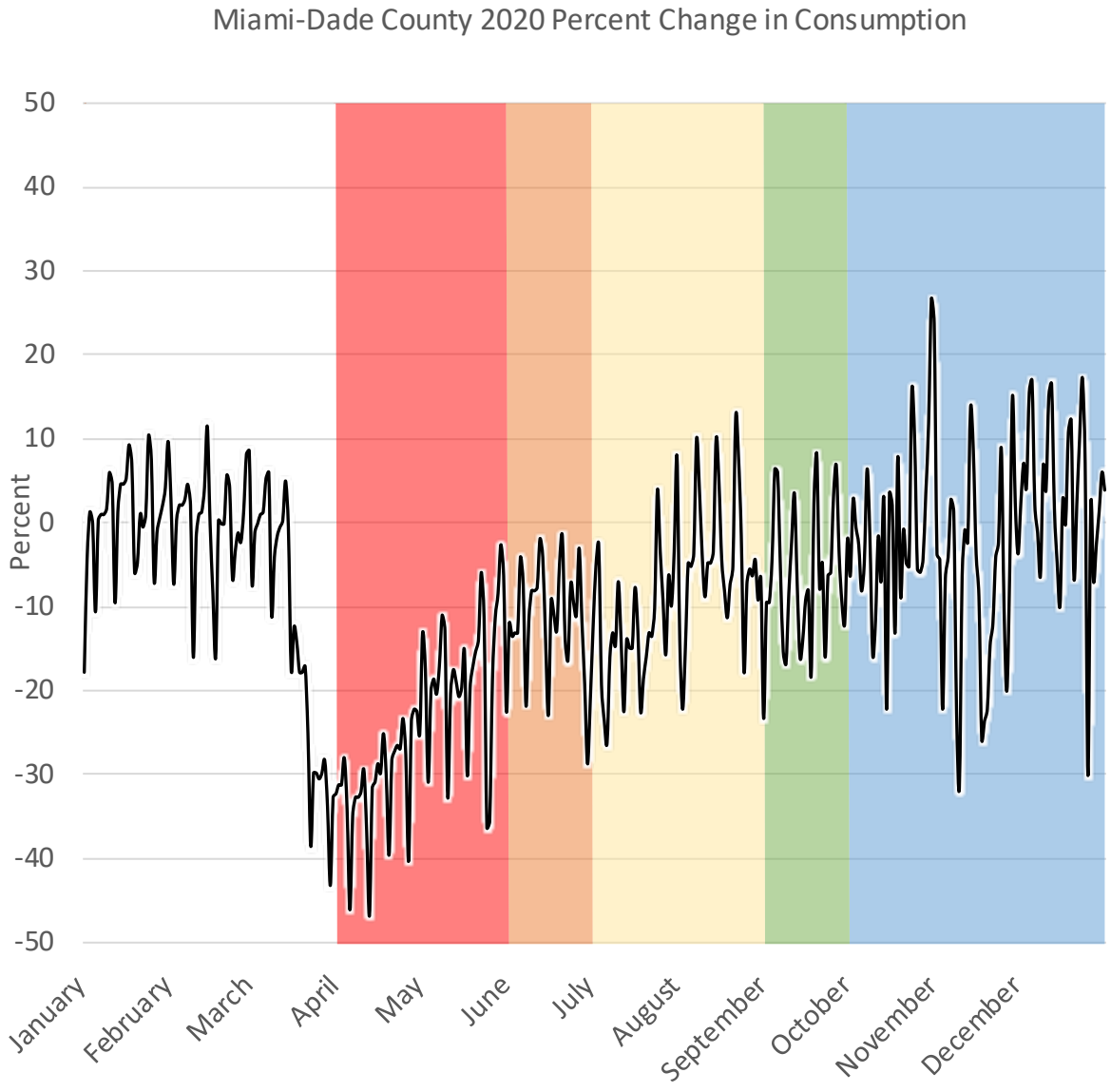


Figure 70: Percent Change in Consumption, 2019 – 2020

In January and February, the monthly average percentage change in consumption in Miami-Dade County was 0%. In March and April, monthly average consumption decreased 14% and 31%, respectively, experiencing a low point of -47% on April 12th. Monthly average change in consumption rebounded in May and June until leveling off in July at 13% below the baseline

average consumption. For the remainder of the year, change in consumption made a volatile, yet generally positive trajectory to above the baseline in December.

Percentage change in consumption followed a similar pattern to the average number of non-work trips per person per day in 2020-2021, increasing relatively consistently since April 2020 and exceeding pre-pandemic percentage change in consumption by January 2021 (***Figure 71***).

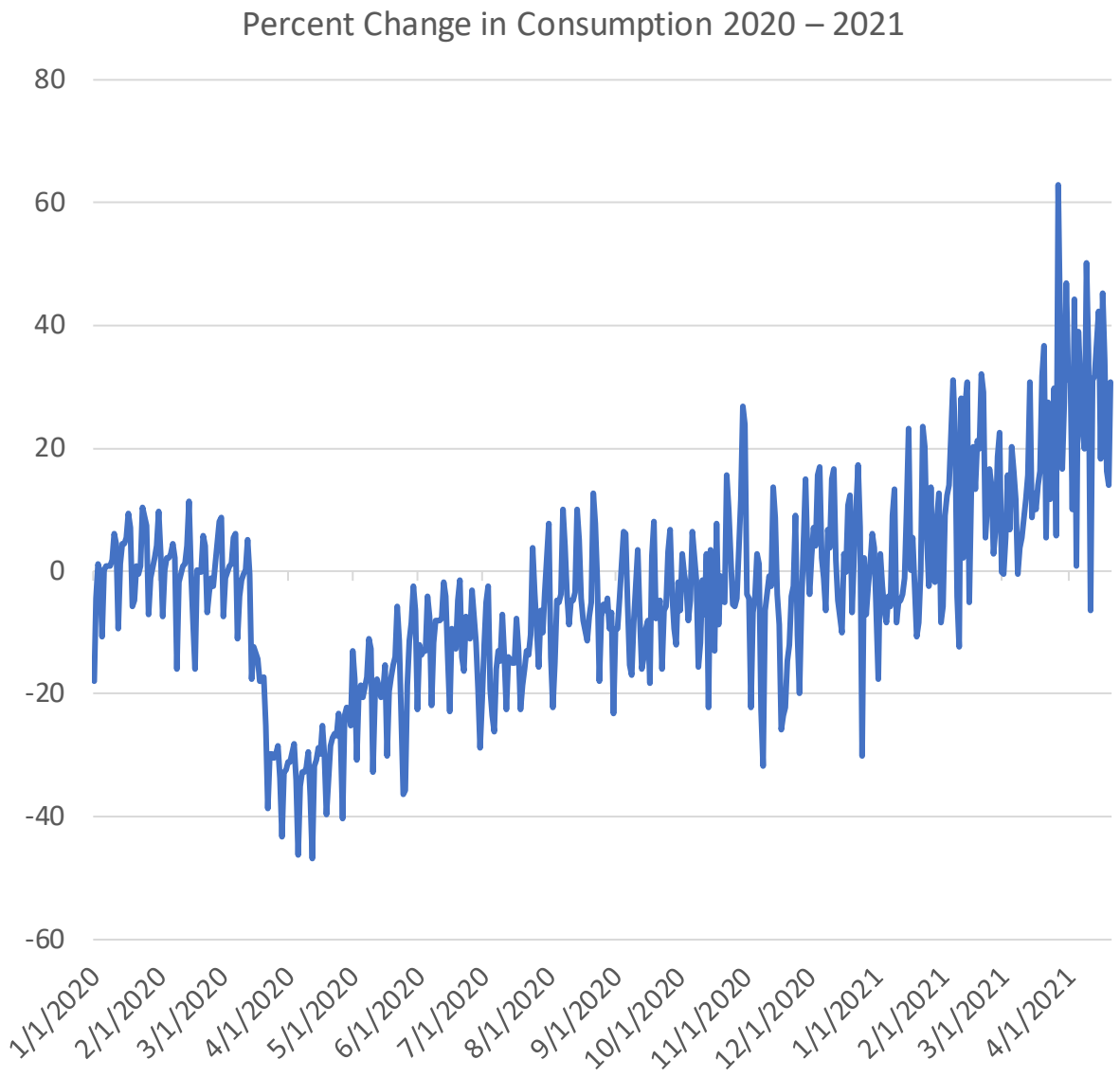


Figure 71: Percent Change in Consumption, 2020 – 2021

4.7.1.11 Unemployment Rate

The unemployment rate in Miami-Dade County in 2020 can be found in ***Figure 72.***

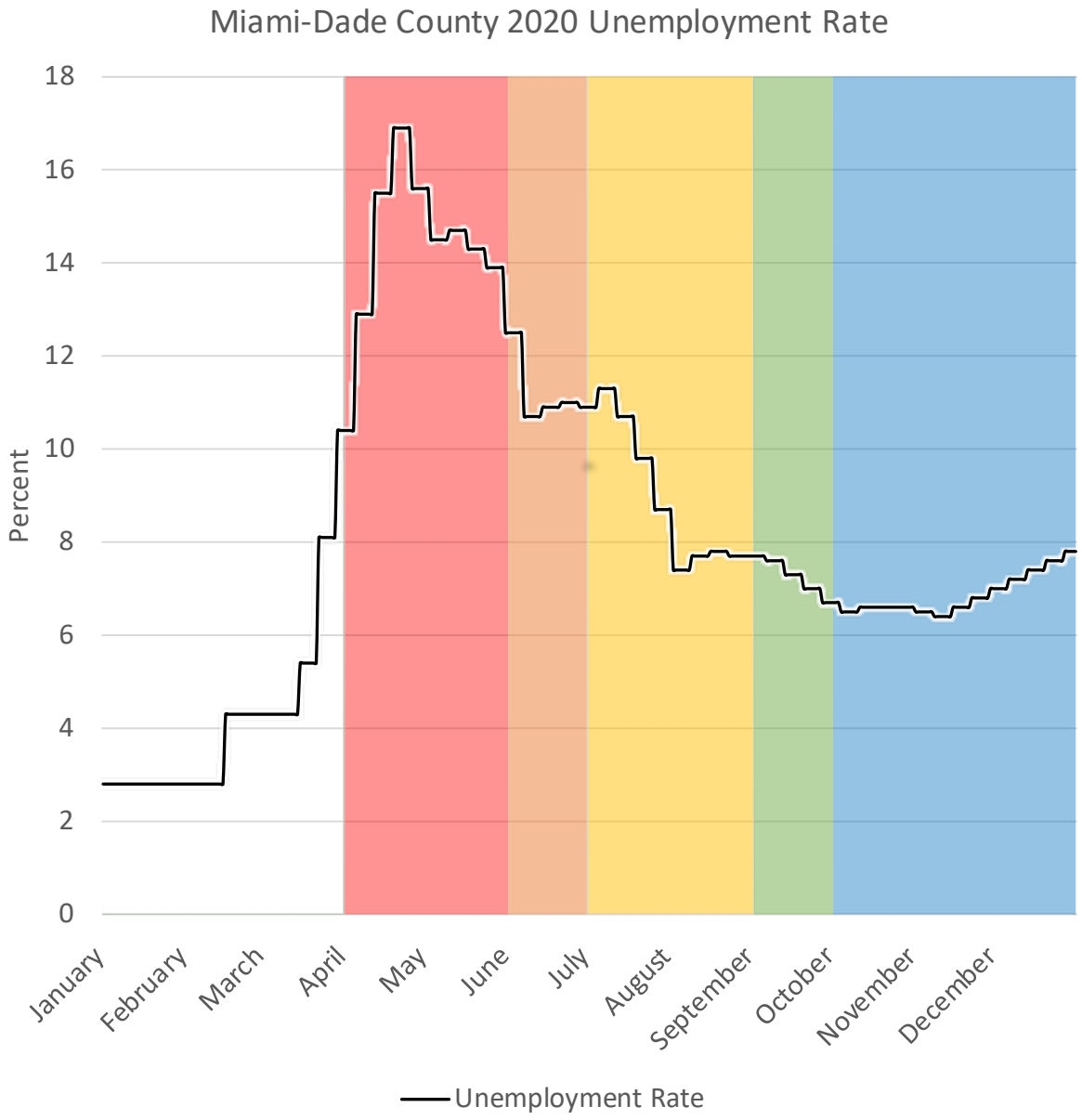


Figure 72: Unemployment Rate, 2019 – 2020

From January through mid-February, the unemployment rate in Miami-Dade County was 2.8%. Beginning in mid-February, the unemployment rate increased to a maximum of 16.9% in late April, from which it decreased continuously through May until hovering around 10% in June and

July. In August, the unemployment rate continued to decrease until early November, reaching a minimum of 6.4%. The unemployment rate started increasing each week for the remainder of 2020, reaching 7.8% in the final week of the year.

The unemployment rate in January 2021 and early February 2021 was 4.8%, representing a low point before climbing again each week until reaching 6.5% in April 2021 (***Figure 73***).

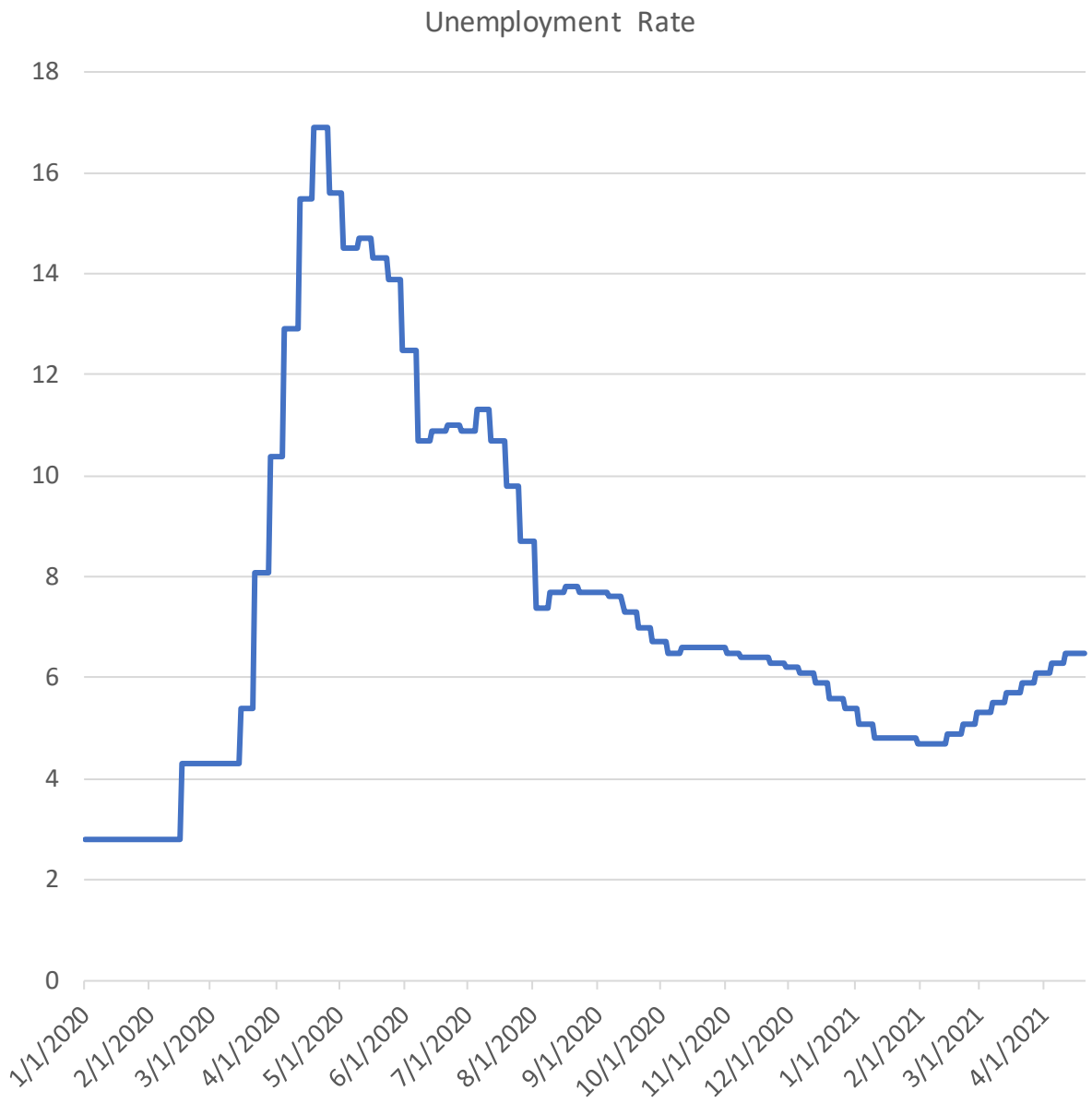


Figure 73: Unemployment Rate, 2020 – 2021

4.7.2 Google Mobility Metrics - Percent Change from Baseline

The team reviewed the Google mobility data which was available through October 15th, 2021 and can be found in ***Appendix X***. ***Figure 74*** shows the percentage change from the baseline for the available locations.

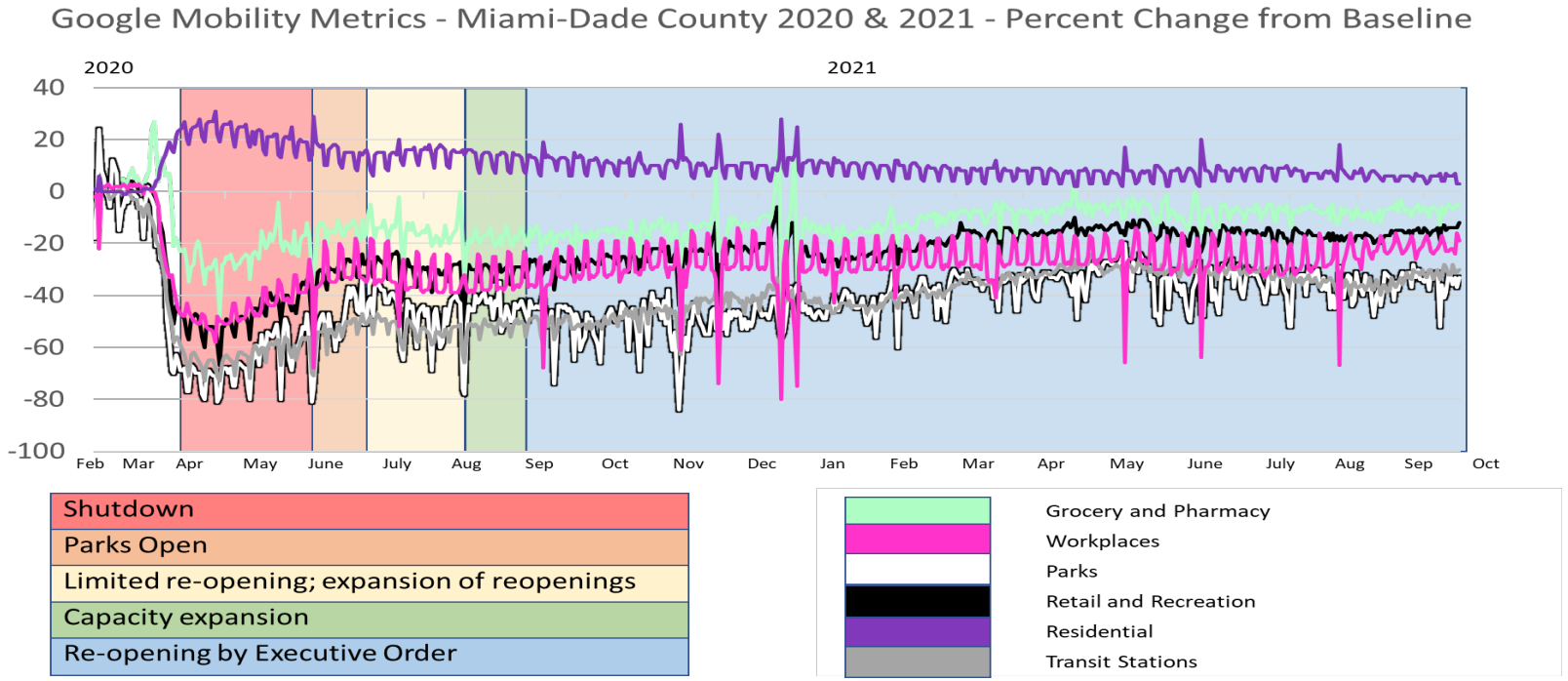


Figure 74: Google Mobility Metrics, Miami-Dade County, Percent Change from Baseline, 2020 – 2021

Mobility to all referenced locations remained near the baseline prior to March, with no pattern of intra-weekly changes for any destination. Except residential, mobility to all locations decreased significantly in April, followed by an increase, but still below the baseline in May and June. From July through the rest of the year, mobility remained relatively flat for all referenced metrics.

Retail and Recreation

Mobility to retail and recreation areas began dropping in mid-March, reaching a low point of 67% below the baseline in mid-April 2020. Beginning in late April, retail and recreation mobility began to increase, reaching 24% below the baseline by early July. Mobility remained near this level on average for the remainder of the year. Interestingly, post-pandemic trips to retail and recreation areas decreased on weekends and increased on weekdays.

Grocery

Mobility to grocery stores began increasing in early March (an average of around 5% above baseline in early March). This steady increase was followed by a quick spike to 27% above the baseline in mid-March then followed by a return down to +5%. Beginning in late March, grocery store trips declined to more than 20% below baseline, reaching a low point of 48% below the baseline in mid-April. Beginning in late April, grocery store trips began to increase, reaching 24% below the baseline by early July. Grocery store trips remained near this level, on average, for the remainder of the year. Post-pandemic trips to grocery stores decreased significantly, on average, on weekends and increased on weekdays, particularly Tuesdays.

Parks

Travel to parks began dropping in mid-March 2020, reaching an average of 69% below the baseline for the month of April. In May, average park trips decreased to 58% below the baseline. Monthly averages for June through December fluctuated between 45% and 54% below the baseline, indicating a relatively steady new baseline. Post-pandemic trips to parks decreased on weekends and increased on weekdays.

Transit Stations

Travel to transit stations began dropping in mid-March 2020, reaching an average of 65% below the baseline for the month of April. In May, average transit stations trips were 59% below the baseline. Monthly averages for June were 50% below the baseline and fluctuated throughout the year, generally declining until December, which experienced an average decrease of 42% below the baseline. Change in travel to transit stations was lowest, on average, on Sundays and highest on Tuesdays and Wednesdays.

Workplaces

Travel to workplaces began dropping in mid-March 2020, reaching an average of 49% below the baseline for the month of April. Travel to workplaces increased in May to 38% below the baseline and fluctuated between 38% and 27% below the baseline throughout the rest of the year. On average, travel to workplaces on weekends was impacted less so than workplace travel during the week.

Residential

Time spent at residences began increasing in mid-March 2020, reaching 31% above the baseline by mid-April. Time spent at residences increased in May to 38% above the baseline and fluctuated between 38% and 27% above the baseline throughout the rest of the year. On average, Time spent at residences on weekends was impacted less so than workplace travel during the week.

Our findings are as followed:

- Retail and recreation decreased about 30% below the baseline in January 2021, coinciding with an increase in new cases in that month. Travel to these destinations increased consistently until June 2021, remaining at about 15% to 20% below the baseline for the rest of the year.
- Grocery and pharmacy followed a similar pattern as retail and recreation, decreasing in January 2021, to nearly 20% below the baseline before gradually increasing until June 2021 to about 10% below the baseline and remaining around that figure for the rest of the year.
- Travel to parks also decreased in January 2021, continuing that trend through February 2021, reaching as low as 60% below the baseline before increasing consistently until June 2021. From June until October 2021, travel to parks was about 40% below the baseline.
- Travel to transit stations followed a similar pattern as the previous locations, decreasing in January 2021, on average to nearly 50% below the baseline before gradually increasing until June 2021 to about 25% below the baseline. Beginning in June 2021, travel to transit declined to as low as 40% below the baseline in September. Travel to transit stations increased again in October 2021 to an average of 30% below the baseline.
- Travel to workplaces remained at about 30% below the baseline between June 2020 and October 2021, with little variation in between.
- Residential travel was about 10% above the baseline level in January 2021 and decreased slightly throughout 2021 with no major fluctuation.
- All impacts to travel remain relatively similar for each location since the beginning of the pandemic, with only residential travel being higher than before the pandemic, and travel to transit stations and parks being the most negatively impacted.

5. TRENDS AND EFFECTS OF PANDEMIC ON TRAVEL IN MIAMI-DADE COUNTY AND TAKEAWAYS

The COVID-19 outbreak was officially declared a pandemic in March 2020. In Miami-Dade County a sequence of restrictions on non-essential activities were mandated in March and early April, with direct impacts on economic activity. As a result, mobility, as a whole (e.g., air traffic, cruise traffic, transit usage and the use of most other modes of transportation) fell dramatically.

In May and June, as partial reopening began, transit usage and other modes of transportation began a slow, albeit an incomplete recovery so far. By the end of 2020, economic activity was still constrained. Considering the effects from the first year of the pandemic and using this as a baseline, by December 2020 the following was observed:

- Passenger traffic at Miami International Airport (MIA) was a little over 1.9 million, less than half that in December 2019. However, air cargo was up 3% year over year, due to growth of e-commerce and pharmaceutical shipments.
- Port of Miami cruise passenger traffic was zero, as all cruise lines remained shut down.
- Hotel occupancy rates were at 48.8% countywide, compared to 78.1% a year earlier.
- Metrobus weekday ridership was down 27.7% compared to December 2019.
- Metrorail weekday ridership was down 50.1% compared to a year earlier.
- Metromover weekday ridership was down by 71.5%.
- Aggregate monthly traffic was down 20.9% compared to a year earlier.
- Average annual daily traffic fell at a majority of the County's traffic monitoring sites. For 187 selected sites aggregate traffic was down 15.7%, compared to a year earlier.
- Average monthly pedestrian traffic at the Vizcaya Metro station was up 78.1% for the year in 2020, compared to 2019.
- Bicycle traffic at the Vizcaya Metro station was up slightly at the end of 2020 after an enormous volume at the height of restrictions.

This analysis of the pandemic's impacts on mobility in Miami Dade County is limited to documented direct impacts on the various transportation modes, highlighting comparison with trends identified in the literature. Given the duration of the pandemic period, considerations of possible mid-term and long-term impacts on travel demand will depend on more data collected in late 2021 and beyond, when the resumption of full economic activity should make it possible to discern the characteristics of any changes in behavior.

Data reviewed for this study highlight modal shifts away from shared modes (transit) and towards private modes (vehicles, bicycles and walking). The relative rates of decline for different Metrorail and Metromover stations suggest an especially large reduction in traffic to downtown offices and educational destinations, as many associated activities went virtual.

The evidence suggests a correlation between travel behavior and the number of new cases (***Figure 75***), with spikes in new cases correlating to decreases in transit use and highway traffic. In 2021, travel started returning to 2019 levels. With time, the number of new cases per day had less of an impact on travel. This can be seen with the spike in August 2020 (***Figure 75***) not translating to a significant drop in transit ridership or highway traffic. Hotel occupancy and airport passengers were also not as affected by a spike in new cases in early 2021. Occupancy and passengers continued to approach 2019 levels and reached them by June 2021. The peak in cases in August 2020 translated to a slight decrease in hotel occupancy and airport passengers, suggesting that a rise in new cases is having less of an effect.

Travel volumes largely approached 2019 levels by September 2021, with an observable shift away from transit use, particularly with Metromover and Metrorail. Highway traffic, while up significantly during the second half of 2020, returned to near 2019 levels in 2021 for all locations. Local traffic along many arterial roads increased in 2021 compared to 2019, while traffic in western suburbs and other locations farther away from downtown experienced mild to moderate decreases in traffic, on average.

There is an observable change in the weekly travel patterns taken during the pandemic. While travel patterns typically follow a rigid pattern based on weekends and weekdays, this pattern diminished in 2021, where there was less variation between the number of trips taken on weekdays vs. weekends.

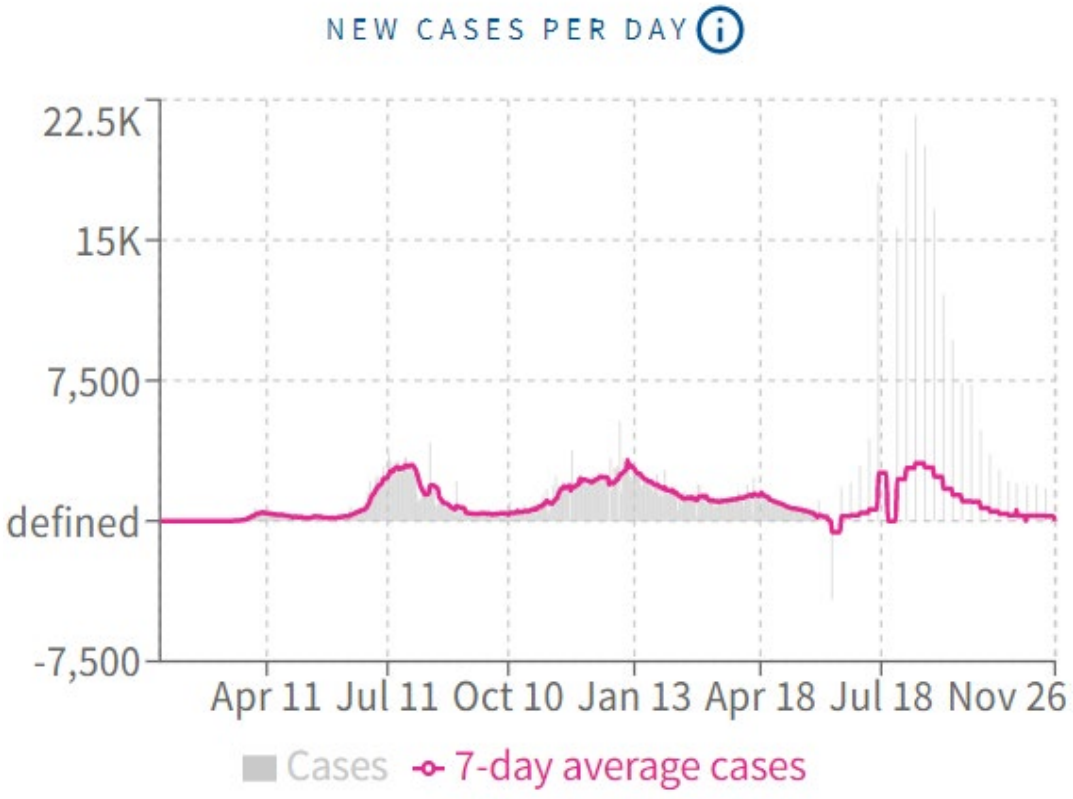


Figure 75: New COVID-19 Cases per Day in Miami-Dade County
Source: https://usafacts.org/visualizations/coronavirus-covid-19-spread-map/state/florida/county/miami-dade-county

A significant downturn in tourism-related travel is evident, but forecasts for a rebound by 2022 are optimistic and robust. Hotel occupancy reflects increased activity in the Southeast Florida tourism industry and mirrors hotel occupancy nationwide; however, occupancy was still down 20% from pre-COVID levels in the first quarter of 2021.

Surveys conducted in Southeast Florida identified preliminary preferences for telecommuting for work and education, as well as e-commerce.

- Around 77% of employee who responded to a TPO survey indicate they would prefer to telework more frequently compared to before the pandemic.
- Regarding education-related travel and online learning, local surveys also found that most students (52%) responded as wanting to take online classes more frequently now after COVID-19 than normal (pre-pandemic).
- Online shopping trends shows some potential for a sustained long-term increase.
- The concerns of transit riders regarding medical safety may continue to persist and will need to be addressed before a full rebound can take place. Moving forward, transit planning should pay particular attention and intensified focus on the travel needs of the 'essential worker' to better benefit this group.
- Bicycle use and other active modes increased during the pandemic globally and shows evidence that this trend has been maintained as restrictions were eased.

TAKEAWAYS

This effort was aimed at investigating the effects of the COVID 19 pandemic on travel behavior in Miami to determine long and short-term changes, which may need to be considered in the transportation planning process.

Upon review of the datasets analyzed, what we see is that all travel metrics were negatively impacted in April 2020, then gradually increasing in 2021. Metrics with observed short-term effects include highway traffic, hotel occupancy and airport/cruise port passengers – which points to a rebound in tourism related travel.

More long-term impacts can be seen on the transit system, with transit ridership still down late into 2021. This coincides with observed shifts away from shared modes to private modes,

including personal vehicles, walking and biking. Bicycle and Pedestrian activity showed sustained demand throughout the pandemic and more robust data collection, including more locations, may provide further insight into demand changes.

There is also a reduction in traffic volumes to downtown offices and educational destinations, as many of these activities pivoted to a virtual platform. Data reviewed definitively shows an inverse relationship between person-miles-traveled and telecommuting, confirming that telecommuting can be used as a congestion mitigation strategy. Policies supporting telecommuting as a long-term strategy should be considered in future transportation plans.

Figure 76: Pedestrian Counter in a Bike Lane (Collier MPO)

This analysis is intended to serve as a baseline. Conclusions about impacts on future travel are difficult to discern using current data, because the pandemic is still ongoing. Analysis of similar datasets post pandemic is necessary to properly hypothesize long-term potential impacts to countywide travel patterns. Continued data monitoring will support the 2050 Long Range Transportation Plan development and provide scenario planning insight related to Telecommuting and increased Bicycle and Pedestrian activity.