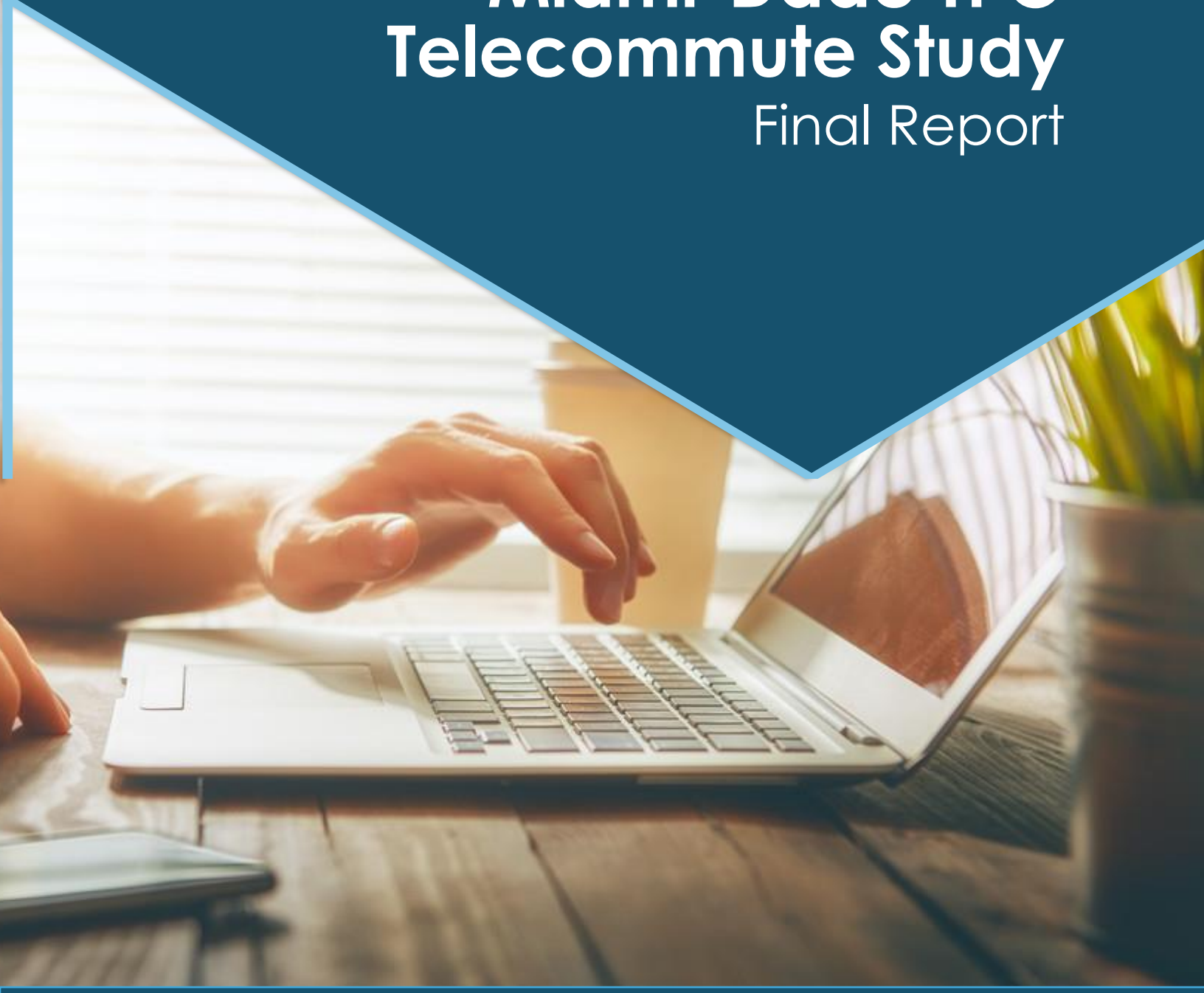
January 2021

Miami-Dade TPO Telecommute Study

Final Report



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INTRODUCTION

On July 23, 2020, the TPO Governing Board adopted Resolution #21-2020 approving a scope of services and budget to study the concept of telecommuting as an overall strategy to "flatten the congestion curve" in Miami-Dade County. This study addresses that resolution. A significant outcome of the study is the advancement of a series of policy actions, including a Pilot Telecommuting Policy in partnership with the South Florida Commuter Services (SFCS) to provide outreach and education geared to maximize telecommuting opportunities in South Florida.

The COVID-19 virus has presented a range of challenges, but it has also presented opportunities to showcase resilience. Telecommuting is one example of that resilience, reflected in a growing trend in many industries to comply with social distancing guidelines. The Miami-Dade Transportation Planning Organization (TPO) has embarked on an effort to understand telecommuting trends and the possibility that telecommuting can be used as a traffic congestion mitigation strategy post-COVID-19. As part of this effort, the Miami-Dade TPO, in coordination with Florida Department of Transportation (FDOT), developed a survey investigating telecommuting experiences. The TPO also relied on a Project Working Group and feedback from an executive roundtable held with the Miami-Dade Chamber of Commerce and business and government leaders in the Southeast Florida region, which includes Miami-Dade, Broward and Palm Beach counties. Their input helped frame some of the key questions that this study is designed to answer:

KEY QUESTIONS

How are people commuting now vs. before COVID-19?

What are peoples' telecommuting experiences?

What are the observed benefits, and challenges of telecommuting?

This report is organized in three sections, each based on an extensive research, data collection, and stakeholder coordination process that has guided the study.

1. **Telecommuting Literature Review:** This section summarizes existing telecommuting programs and literature regarding best practices and potential improvements. A summary of existing studies and programs provides an understanding of telecommuting trends and programs in other communities that can be replicated throughout Miami-Dade County.
2. **Telecommuting Data and Assessment:** This section summarizes current data on telecommuting trends and how it relates to changes in employment, traffic volumes, transit ridership, telecommunication infrastructure, and more. Following the presentation of the data gathered, an assessment of the data is included to help draw conclusions that can inform the approach to telecommuting.
3. **Policy Recommendations:** The final section of this report presents several policy recommendations that can be considered to encourage or facilitate telecommuting. The policy recommendations include guidance on their implementation that can be used to "phase-in" the recommendations, starting with those that can be realized in the short-term with relatively few resources.

1. TELECOMMUTING LITERATURE REVIEW

The survey conducted in support of this study indicates a telecommuting rate of up to 60% during the COVID-19 pandemic and an expected sustained rate of up to 50% after the pandemic. However, telecommuting is hardly a new concept. It has been part of the Travel Demand Management (TDM) toolbox for decades. According to the American Community Survey, the percentage of Americans working at home has steadily increased throughout the past decade, from 4.5 percent in 2014 to 5.3 percent in 2018. This same source shows that working at home was more common than taking public transportation to work in 2017 and 2018—the last two years for which data is available. The rise in popularity of telecommuting is supported by several studies and articles detailing the prevalence, benefits, and impacts of working from home. The literature also contains several case studies from across the world, highlighting how public and private organizations have promoted telecommuting. The following summary of existing studies and programs provides an understanding of telecommuting trends and programs in other communities that can be replicated throughout Miami-Dade County.

1.1 Telecommuting Trends

The literature review analyzes telecommuting trends, both pre-COVID-19 and during COVID-19. This pandemic dramatically transformed the telecommuting landscape and should not be considered the baseline for telecommuting expectations moving forward.

1.1.1 PRE-COVID-19

Telecommuting played a significant role in the working landscape long before COVID-19. According to the 2009 National Household Travel Survey (NHTS), 12 percent of surveyed workers reported working from home. Of these workers, more than half were in professional/managerial/technical roles, and more than 40 percent had annual household incomes greater than $100,000.[1] However, many pre-COVID-19 telecommuting studies have found that, despite reductions in commuting, total trips from telecommuting households tend to increase, dampening the traffic congestion benefits.

The prevalence of telecommuting prior to COVID-19 was assessed through Gallup surveys, Pew Research surveys, multiple planning agencies, and academic studies. While telecommuting has increased since the year 2000, 10 percent of people who were surveyed by Gallup in 2016 said they telecommuted at least sometimes.[2]

There are both logistical and other types of barriers to the more widespread use of telecommuting. The primary logistical barrier is related to Broadband internet, which is the infrastructure of telecommuting. Even as this communication technology has improved over time, broadband coverage and levels of service are not comprehensive. Some policies and/or intangible barriers include, but are not limited to, general business skepticism regarding worker productivity in a remote setting, lack of suitable equipment or workspace at home for some employees, and lack of social interaction. According to a 2010 study at the University of Johannesburg in South Africa, some of the challenges reported by a significant proportion of surveyed employees include lack of organizational support for home office equipment, lack of technical support, and

[1] https://nhts.ornl.gov/assets/NHTSBriefTelecommuting041719.pdf

[2] https://www.wsj.com/articles/the-work-from-home-shift-shocked-companiesnow-theyre-learning-its-lessons-11595649628

change in the trust relationship between supervisors and employees. Therefore, trust-based organizational culture is a crucial component of a successful teleworking practice involving limited supervision of employees.[3]

Before COVID-19, telecommuting was limited and few workers had access to a flexible workspace, and those in the hospitality industry and other service industries were limited by the fact that working remotely simply is not possible. In an Employee Commute Survey compiled for the San Diego Association of Governments (SANDAG) in 2013, 30 percent of surveyed employees always or occasionally teleworked. From the 70 percent of employees who never teleworked, 81 percent responded that their job responsibilities prevented them from telecommuting. Job responsibilities suitable for teleworking have a minimal need for specialized equipment, systems, or data. The responsibilities can involve reading, writing, data entry, and analysis.[4] The impact of job responsibilities is also apparent through Communications, and IT Manufacturing Services indicated as the only surveyed industries with more than 20 percent of respondents believing in a possible transition to telework. Employees who never telework with an income above $100,000 were 9.6 percent more likely to respond that their employer would allow them to telework.[5] This shows that employees have barriers to teleworking due to their profession, and the perceptions of these barriers are apparent to most employees who do not telework.

A critical component of successful telecommute program implementation involves establishing effective communication networks between employers and employees. According to a University of California Transportation Center survey of about 600 San Diego employees, managers believe the stereotype that telecommute programs make it difficult to supervise employees.[6] However, the same study, which also aimed to model telecommuting preference, found that productivity increases as a result of telecommuting. Research firm Gartner studied 239 large corporations and showed that 50 percent used monitoring techniques to check productivity.[7] These monitoring techniques include analysis of communications text data and checking the connections established through online meetings. The Gartner survey shows that from 2015 to 2018, 20 percent more employees were comfortable with email monitoring, and more than 50 percent of employees were comfortable once they communicated with their employer about reasons for monitoring. This shows that transparency and consistent communication can assist employees with feeling comfortable in their teleworking environment, and employers can better utilize their workforce through their acquired data.

[3] https://www.researchgate.net/publication/47727914_Teleworking_in_South_Africa_Employee_benefits_and_challenges

[4] https://www.sccgov.org/sites/led/Documents/Telework/AssessmentToolForTeleworking.pdf

[5] https://www.sandag.org/uploads/publicationid/publicationid_1878_18068.pdf

[6] https://www.accessmagazine.org/wp-content/uploads/sites/7/2016/07/access10-05-why-dont-you-telecommute.pdf

[7] https://www.lexology.com/library/detail.aspx?g=a294891b-f792-4ef2-a655-a55be7119417

1.1.2 DURING COVID-19

The COVID-19 pandemic forced many people to practice telecommuting in lieu of reporting to brick-and-mortar workplaces. Previous barriers and employer hesitations regarding telecommuting were overcome by stay-at-home orders in many parts of the country. In early May 2020, 70 percent of people surveyed by Gallup teleworked at least sometimes, decreasing to 53 percent in July.[8] Practically overnight, the telecommuting landscape in the United States was completely transformed. While there has also been a relative decline since the peak of telecommuting, the prevalence of this trend is still significant. Both employers and employees have taken away multiple lessons from this rapid shift to telecommuting.

When employers and employees rapidly transitioned to a remote environment, key lessons were learned quickly. According to Christopher Mims from the Wall Street Journal, one of the keys to successful telecommuting programs is using existing technology for telecommuting and cloud systems to connect to remote software, sometimes even resulting in a reduction in technology costs. With the shift away from in-person working, providing employees with communication software is important to replicate the in-office environment.

Since COVID-19 and the shift to remote work, a 2020 survey of corporate leaders conducted by research firm Gartner reported, workplace productivity has not dropped. Instead, the workday is changing with people starting work earlier or finishing later. The Gartner survey of 229 human resources leaders found that half of the companies surveyed have more than 80 percent of employees working at home and that up to 40 percent of employees will continue to work from home at least part time after the pandemic.

During an Executive Roundtable event conducted as a part of this study, Secretary Jim Wolfe of the FDOT stated that "traffic is down up to 10% on State roadways in the County as of September 2020 - a reduction that has significantly improved peak hour traffic congestion". Representatives of the health care, financial services, and higher education industries in Miami-Dade County have indicated a successful migration to telecommuting of up to 98 percent of employees in some cases. The majority of those who have weighed in indicate that the trend is expected to continue, not necessarily at the same levels, but at significant levels, after the pandemic.

Research to see how the COVID-19 pandemic will impact travel patterns and telecommuting in the long term is ongoing. Overall traffic reductions were tempered by recent increases to near-normal levels. In Florida, traffic volumes on freeways in urban areas were down 50 percent in early April compared to 2019; however, these traffic volumes are only down 10 to 15 percent in late July and early August.[9] The Palm Beach Transportation Planning Agency (TPA) conducted an online travel survey of 162 people from May 5th to June 9th of 2020. The results of the survey showed increases in active transportation options, telecommuting, and e-commerce, and decreases in car and transit trips.[10] The Palm Beach TPA survey data may not be reflective of current travel trends, and people may overstate decreases in car trips. Furthermore, the decrease in work commute trips could be at least partially offset by increases in e-commerce in terms of total vehicle miles

[8] https://www.wsj.com/articles/the-work-from-home-shift-shocked-companiesnow-theyre-learning-its-lessons-11595649628

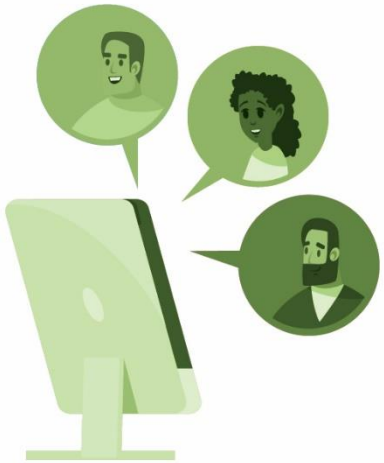
[9] FDOT Central Office

[10] Palm Beach TPA COVID-19 Travel Survey

traveled. Understanding mode choice post-COVID-19 will also help inform target populations on telecommuting and potential telecommuting incentive trade-offs for non-auto commuters.

1.2 Existing Telecommuting Policies and Case Studies

The following section will discuss existing telecommuting policies and case studies in Miami-Dade County, the United States, and internationally.



1.2.1 EXISTING POLICIES IN MIAMI-DADE COUNTY

The Miami-Dade Board of County Commissioners passed two (2) resolutions to investigate telecommuting in Miami-Dade County in 2016 and 2018. Resolutions No. R-57-16 and R-922-18 require a study about the cost and feasibility of a countywide flextime policy and creating telecommuting centers for County employees. The existing flextime policy for County employees allows individual employees to establish their own flexible schedules. Telecommuting centers would offer County employees a satellite office. Ideally, these telecommuting offices would reduce traffic by being closer to employee homes.[11]

Miami-Dade County currently has 30 percent of employees working flexible schedules, including those with flexible start and end times and those working four (4) 10-hour days. For the County's Information Technology Department, approximately 37 percent of employees participate in the department's telecommuting program.

Ultimately, the report recommended that a generalized flextime policy should not be implemented, and the policy would be more effective if customized specifically to individual schedules. Additionally, the report found that establishing telecommuting centers for County employees would not be cost-effective. Traffic reduction resulting from the use of the centers would also be negligible due to the small percentage of workers able to commute to the centers full-time. While at the time, Miami-Dade County did not recommend a universal countywide flextime policy or telework centers, the use of individual flextime schedules allows County employees to determine what works best for them while offsetting peak hour trips. Since the COVID-19 pandemic, the County has shifted to a more supportive posture and is currently exploring an updated policy on the topic.

South Florida Commute Services (SFCS) is a region-wide program covering Monroe, Miami-Dade, Broward, Palm Beach, Martin, St. Lucie, and Indian River counties funded by FDOT to provide commuter assistance to the region's residents. SFCS promotes telecommuting as an option to reduce the number of vehicle trips and enhance regional mobility. SFCS provides information on working from home and provides employers with a "Flexible and Remote Work Starter Kit." SFCS currently offers a chance to win $100 in office supplies for people who take a survey on working from home.[12]

[11] http://www.miamidade.gov/govaction/legistarfiles/Matters/Y2020/200356.pdf

[12] https://1800234ride.com/flexible-work-resources/

In August 2020, the Miami-Dade Board of County Commissioners passed a resolution to analyze wired and wireless broadband infrastructure speeds in Miami-Dade. Resolution No. R-876-20 directs the County Mayor to prepare a report recommending ways to improve broadband infrastructure and access. At the time of this report, the findings are not available.

1.2.2 FLORIDA STATEWIDE POLICY

In June 2020, Florida Governor Ron DeSantis signed into law House Bill 969, establishing the Florida Office of Broadband as a division of the Florida Department of Economic Opportunity. The new law allows the Florida Turnpike Enterprise, a division of the FDOT, to invest up to $5 million annually in broadband infrastructure. This policy is part of a broader effort to develop a system of multi-use transportation corridors traversing rural areas of the State, establishing a precedent for investing in broadband infrastructure as part of transportation infrastructure investments.

1.2.3 NATIONWIDE

1.2.3.1 Telework Enhancement Act

The Telework Enhancement Act of 2010 required the heads of federal executive agencies to establish policies authorizing agency employees to telework. The Act requires written agreements between managers and employees to ensure that productivity is not negatively affected by teleworking. Written agreements can only be signed upon the completion of interactive telework training by federal employees. Another provision of the federal teleworking law is consulting for designated federal agencies to ensure programs utilize best practices to ensure program sustainability. The Act sets a framework to leverage best management practices and available technology in support of teleworking programs and maximize the use of teleworking.[13]

While the Act is concerned with establishing policies in executive agencies, it also authorizes test programs for telework travel expenses. Under the Act, the Patent and Trademark Office (PTO) was given the duty of conducting an authorized test program. The program allowed the PTO to pay for employee travel expenses to and from the agency's worksites (four times per year). This allowed the employees to work remotely under the expectation of traveling to worksites on an agreed-upon basis.[14] These worksites are designated under the PTO's "hoteling" program, which establishes telework centers. Workers who used hoteling rather than working at the PTO headquarters worked 66.3 more productive hours per year and reviewed 4 percent more applications than workers at the PTO headquarters.[15]

1.2.3.2 Valley Metro

In Maricopa County, Arizona, businesses, or schools with more than 50 people as employees or students must implement and keep records on a travel reduction program (TRP).[16] Valley Metro, a transit authority in Maricopa County, provides consulting services for telecommuting as part of its Traffic Demand Management (TDM) program.

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[13] https://www.govinfo.gov/content/pkg/PLAW-111publ292/pdf/PLAW-111publ292.pdf

[14] http://www.businessofgovernment.org/sites/default/files/Implementing percent20Telework percent20Lessons percent20Learned percent20from percent20Four percent20Federal percent20Agencies.pdf

[15] https://www.shrm.org/ResourcesAndTools/hr-topics/talent-acquisition/Pages/HotelingUSPTOEmployees.aspx

[16] https://www.maricopa.gov/2388/Travel-Reduction-Program

Valley Metro canceled its program for funding telecommuting equipment due to a lack of interest. Despite the authority's lack of an incentivized program, Valley Metro still surveys telecommuters and gathers data regularly to understand telecommuting perceptions. Valley Metro's 2008 Employer Telework Report shows a steady increase in teleworking due to improved perceptions from 2001 to 2008.[17]

In addition, Valley Metro's 2018 TDM Survey found a downward trend in total non-automobile mode usage from the five years before 2018. Telecommuting showed a "significant increase in usage" from the previous five years. The 2018 American Community Survey (ACS) quantifies a 0.7 percent increase in Phoenix's mode share in telework from 2017 to 2018, while modes besides driving alone and transit showed a decrease.[18] The TDM survey concludes that as the economy improves and commuters do not worry about cost savings, they reduced their carpooling or transit usage due to lessened convenience.[19] This implies telework maintained a quantifiable value in its convenience to commuters.

1.2.3.3 Georgia Department of Transportation

Georgia Commute Options, a program funded by the Georgia Department of Transportation (GDOT) and managed by the Atlanta Regional Commission, provides financial incentives and consulting services for telecommuting program implementations. The organization provides a "Clean Commute" incentive where workers can log telecommutes as clean commutes.[20] The incentive program offers employees five dollars per clean commute, up to a maximum of $150 for any 90-day period. In Georgia Commute Option's 2019 Regional Commuter Survey, telework was the only transportation mode with a significant increase, changing from 25 percent to 57 percent of non-riding-alone mode share from 2007 to 2019.[21]

[17] https://www.valleymetro.org/images/uploads/rideshare_documents/2008_Employer_Telework_Report.pdf

[18] https://www.enotrans.org/article/2018-acs-survey-while-most-americans-commuting-trends-are-unchanged-teleworking-continues-to-grow-and-driving-alone-dips-in-some-major-cities/

[19] https://www.valleymetro.org/sites/default/files/uploads/event-resources/2018_tdm_annual_survey_executive_summary.pdf

[20] https://gacommuteoptions.com/commuters/ways-to-earn-cash/how-programs-work/

[21] https://cdn.atlantaregional.org/wp-content/uploads/regional-commuter-survey-for-tdm-summit-v2.pdf

1.2.3.4 Metropolitan Washington Council of Governments

In March 2020, the Metropolitan Washington Council of Governments (MWCOG) began offering resources for employers to adopt telecommuting programs. The resources include documented suggestions for managers, potential benefits of a well-implemented program, and listed telework centers for workers in the Washington, D.C., metropolitan region to utilize. While the timing of the program corresponds with businesses moving to telecommute practice regardless of the MWCOG program, the resources were developed for MWCOG's Visualize 2045 Plan. The Telework Resource Center, also coordinated by MWCOG, provides free one-day seminars to assist employers to establish policies, advisors, and coordinators for telecommuting programs.

Additionally, MWCOG works with the Maryland and Virginia Departments of Transportation to implement measures to increase business participation in telecommuting. MWCOG administers the Maryland Telework Partnership with Employers, which provides Montgomery County employers a designated telework coordinator and internal team to lead telecommute program implementation. The Maryland Department of Transportation sponsors this partnership, and teleworkers are expected to telework at least two days per month.[22]

1.2.3.5 Sacramento Area Council of Governments

The Sacramento Area Council of Governments (SACOG) is currently establishing a pilot initiative to "provide targeted and customized technical assistance" to a select group of employers. The pilot initiative will help support telework policies, provide insights on productivity, and offer other support services. From this pilot initiative, SACOG hopes to triple the number of teleworkers compared to pre-COVID-19 levels and understand policy implications.

As a baseline for the pilot initiative, SACOG performed a telecommuting analysis in 2018, which found that just under half of surveyed employees telecommute to some extent, as summarized in Table 1. Based on the results, teleworking is not limited to employees solely working from home. Employees telecommute for a variety of reasons, and the survey shows that telework is chosen for its convenience in addition to being a substitute for typical commutes.

[22] https://www.montgomerycountymd.gov/DOT-DIR/commuter/telework/index-arc.html#:~:text=The percent20Maryland percent20Telework percent20Partnership percent20with percent20Employers percent20 percent28TPE percent29 percent20offers,telework percent20programs percent20should percent20contact percent20CSS percent20at percent20240-773-BWTW percent20 percent282989 percent29

Table 1. SACOG Telecommuting Breakdown

TELECOMMUTING TYPE	PERCENTAGE
Does not telework	56%
Teleworks for convenience	24%
Teleworks as a commute substitute	10%
Works at home	10%

1.2.4 INTERNATIONAL POLICIES

Telecommuting is a global phenomenon that provides benefits for businesses, employers, and employees. The European Union (EU)established a Framework Agreement on Telework in 2002, which regulates working conditions and the rights of teleworkers. The Framework Agreement did not create one legal system for all member states; rather, it allowed each individual country to implement the agreement in its own way. Some member states chose to implement the Framework Agreement through legislation, while others implemented the agreement through guidelines. Similar to the United States, the prevalence of teleworkers has grown over time in Europe and those who telework tend to be skilled workers in industries like real estate, finances, and education.[23]

Individual EU member states have implemented different legislative incentive programs for teleworking. In the Netherlands, employers who offer telework are eligible for reduced social security contributions. Additionally, the Netherlands waived taxation on employer payments for internet and telephone for employees who teleworked. Not only does the Netherlands provide governmental incentives for telecommuting programs, but also views telework as a possible way to reintegrate disadvantaged groups or people with disabilities into the workforce.

Like the Netherlands, Hungary also views teleworking as a way to improve employment rates for marginalized people, people with disabilities, and women with children. Hungary established government subsidies in 2000 to encourage teleworking; however, the program had limited success. However, Hungary has established more than 150 telecenters in rural areas with limited internet access.[24]

Telecenters, or telecottages, provide internet access and office equipment for people to use. Telecenters can provide areas with limited internet access a centralized location for people to use communication technology. The establishment of telecenters in rural areas is seen internationally as a method which increases economic development in rural areas. Rural telecenters have been established in countries like Sweden, Australia, and Hungary. A private alternative to government-funded telecenters is "cyber cafes," which charge users for internet access[25]. Internationally, the motivation behind telecenters is not associated

[23] https://www.eurofound.europa.eu/publications/report/2010/telework-in-the-european-union

[24] https://www.sciencedirect.com/science/article/pii/S0166497213000734?casa_token=onnPIXH_c7sAAAAA:CxuMyl9JGGGinQ4_eaUK0eAqy_knoin74ebHHMRkuta3RM-phYN4sRSu_fMI7ydXrHD5HHW5yQ

[25] http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.462.6641&rep=rep1&type=pdf

with transportation-related benefits; rather, the motivation is associated with economic and equity benefits for marginalized groups. Depending on the location of a telecenter, transportation benefits like shifting commute trips from an urban central business district (CBD) to a suburban or rural area could exist. However, these potential benefits are theoretical and would require additional land-use and transportation policies to reach full potential.

1.3 Tax Credit Incentives

Tax credits can provide financial incentives to organizations considering a telework program. In addition to consulting services, Montgomery County, Maryland, has a tax credit awarded for purchasing computers to use for telecommuting. The tax credit can exempt an employer or employee for up to $2,000 in Montgomery County's personal property tax. For each computer purchased, the credit cannot exceed 50 percent of the cost.

Virginia's program Telework!VA is an MWCOG program that works with Arlington Transportation Partners to provide online resources to help businesses successfully implement telecommuting programs. The State of Virginia also provides up to $50,000 annually for businesses applying for a telework expenses tax credit. Up to $1,200 in credit can be taken for each telecommuting employee, and eligible costs include program planning costs, consulting costs, and raw labor costs.

One of the telework tax credit bill's original sponsors, Mark Herring, Virginia Attorney General, attested to remote work as a tool for reducing traffic, increasing business productivity, and improving employee work-life balance. The Pulsar Advertising Team, on behalf of Telework!VA's outreach efforts in Hampton Roads and Richmond conducted a survey of four focus groups to address topics of concern regarding teleworking among participants who managed employee policies for both small and large businesses. Communicating with small businesses showed the smaller businesses appeared to handle employee commutes on a case-by-case basis. Participants noted senior management would be concerned with program costs and potential liability issues, but solutions proposed at the focus groups involved bringing the notions of telework to the attention of multiple levels of management. Addressing local concerns aided Telework!VA in packaging its telework services and the focus groups proved effective in their engagement.[26]

Oregon's Business Energy Tax Credit program allowed for 35 percent of telework program implementation costs to be applied to a tax credit. The purpose of the program was initially to support renewable energy. The implication of providing credit for the purchase of teleworking equipment is that teleworking equipment contributes to an "other projects" category. The program was directed toward businesses utilizing and generating alternative energy sources, so in June 2011, the program eligibility was amended by Oregon HB 3672 to provide the tax credit only for renewable energy resource manufacturing facilities.

Georgia has two telework tax credits available to employers. The first tax credit can be claimed for up to $1,200 in telecommunications equipment. There are three scenarios that determine the magnitude of the tax credit relative to telecommuting expenses:

- The employer is within an air quality nonattainment area, and the employee telecommutes at least 12 days/month – 100 percent of expenses are credited

[26] http://www.virginiadot.org/info/researchdatabase/uploads/03001/2003 percent20telework percent20report percent20final percent20revised.htm

- The employer is not within an air quality nonattainment area, and the employee telecommutes at least 12 days/month – 75 percent of expenses are credited
- The employer is not within an air quality nonattainment area, and the employee telecommutes at least 5 days/month – 25 percent of expenses are credited

Washington State's Commute Trip Reduction (CTR) program requires employers in Washington cities and counties to implement trip reduction plans. While this program does not provide credits to telecommuters, the structure of the Commute Trip Reduction program could be applied to telecommuters. In Washington's CTR program, tax credits are available for ridesharing, using public transportation, and carsharing. Each credit equals 50 percent of the amount paid to or on behalf of each employee with a maximum credit of $60 per employee per year.[27] For a similar telecommuting program, credits could go towards telecommuting equipment. Overall, the state has still seen an increase in telecommuting; Thurston County had a 15 percent increase of teleworkers from 2014 to 2016. King County has had between 2 and 4 percent reduction in trips on an average day as a result of telecommuting, and in 2016, Thurston County had 2.5 percent of its trips reduced by telecommuting.[28]

1.4 Telecommuting Best Practices

The following section will discuss telecommuting best practices regarding workplace implementation, infrastructure, and support availability to all levels. It also will discuss telecommuting impacts on worker morale, traffic, and the environment.

1.4.1 WORKPLACE IMPLEMENTATION

The telework programs reviewed in this document feature a variety of incentives and strategies to promote telecommuting. One common practice is distributing promotional materials and expert technical guidance to communicate inherent workplace benefits from establishing telecommuting programs.[29] The SACOG Regional Telework Initiative was one pilot initiative emphasizing technical assistance to not only administer but maintain teleworking levels. Guidance from SANDAG encourages direct communication with influential organizations and individuals of various employment sectors for planned telecommute program outreach.

A performance-based framework is one feature that can facilitate the maintenance of a telework program. With measures established before implementation of the program and monitored consistently, the program can be optimized to ensure a return on investment, or at least that the intended consequences are realized.

[27] https://www.kingcounty.gov/depts/transportation/commute-solutions/EmployerTaxBenefits/StateTaxCredit.aspx

[28] https://www.wsdot.wa.gov/publications/fulltext/LegReports//17-19/2017StateAgencyCTR_Report.pdf

[29] https://www.sandag.org/uploads/publicationid/publicationid_1742_15723.pdf

SANDAG states performance measures for telecommuting must be achievable, measurable with maintained documentation, and verifiable. Additionally, telecommuting works with other flexible working scenarios.

The SACOG analysis noted the use of telecommuting as a commuting alternative that provides a convenience benefit for employees. Effective programs are flexible about how often workers telecommute. However, the San Francisco Bay Area Commuter Benefits Program emphasizes frequency of telework program usage; the program asserts that if telecommuting policies are implemented, companies should implement them company-wide and encourage employees to telecommute at least once a week regularly.[30]

The flexible office is one scenario that requires significant investment. This working scenario involves employees working from a remote site in temporary office space—however, best practices emphasize providing complete but flexible office space with high-speed internet and laptops. Multi-faceted implementations, such as simultaneously implementing flexible offices, could optimize cost savings. Workers who utilize telecommuting typically demand less compensation for accepting working scenarios like flexible offices, and employers can pay employees to telework more if they accept a flexible office and still save money on office space.[31]

Additional beneficial practices include safety agreements, such as those provided in the telework agreement for the city of Waukesha, Washington, to prevent workplace liability issues in the case of home-injury.[32] Telework can and should be considered for non-service industries with the advancement of communications technologies. For example, during the COVID-19 pandemic, Tallahassee, Florida, has moved to virtual building inspections by having an inspector on-site and a contractor communicating remotely, pointing the inspector to specific elements. In future telecommuting implementations, organizations can suggest leveraging telecommunications for projects where more than one person on-site is unnecessary.[33]

1.4.2 REQUIRED INFRASTRUCTURE

Telecommute programs decrease the need for physical office spaces for employees to work. The decrease in physical space comes with reduced costs for employers. For employers shifting to telecommuting, upfront technological costs exist, but they can be offset by using existing technology. The network infrastructure of a telecommuting program is essential to maintaining employee productivity and satisfaction with the program. More companies feel comfortable using an Internet Provider Security (IPSec) model of network connection, which allows telecommuters to use a Virtual Private Network (VPN) gateway to encrypt all software activity sent into the company's network. VPNs help alleviate security concerns associated with telework, such as potential data leaks from decentralized networks. Because VPNs provide security over company data, telework agreements should emphasize VPN when necessary instead of simple home Wi-Fi connections.[34] Josh Bohls, CEO of telecommunications company Inkscreen, mentions that employees switching to VPN as

[30] https://511.org/sites/default/files/pdfs/cbp/Option_4_Guide-1.pdf

[31] https://journals.sagepub.com/doi/10.1177/0013916505283422

[32] https://waukesha-wi.gov/DocumentCenter/View/932/19---Telecommuting-PDF?bidId=

[33] https://www.talgov.com/uploads/public/documents/growth/covid_virtual_inspections.pdf

[34] https://www.nist.gov/blogs/cybersecurity-insights/telework-security-basics

a result of the COVID-19 pandemic inevitably results in slowdown on company internets.[35] VPN usage should be considered when determining the number of employees who will telework. Companies should also plan their telecommute frameworks to be open to implementing new Internet Provider (IP) innovations as they become more commonly available.[36]

Telecommuting shifts some technological costs, such as the internet, onto the employee. To successfully telecommute, workers likely need internet speeds of 100/10 Mbps (upload/download). These internet speeds may be unavailable in some areas or available at higher costs. The Federal Communications Commission (FCC) tracks broadband access by internet speeds and location. As of June 2019, in Miami-Dade County, 55.2 percent of rural residents in the west and southwest parts of the County did not have access to 100/10 Mbps speeds. Rural areas are defined by the Federal Highway Administration (FHWA) as census areas with a population between 2,500 to 4,999[37]. Comparatively, only 3.76 percent of urban residents do not have access to 100/10 Mbps speeds; however, 27.4 percent of urban residents only have one internet provider at those speeds[38]. Fewer providers can lead to higher internet costs. Establishing telecenters in less dense areas in Miami-Dade County, like other countries have in rural areas, is a possible solution to ensure better support depending upon the need for internet access.

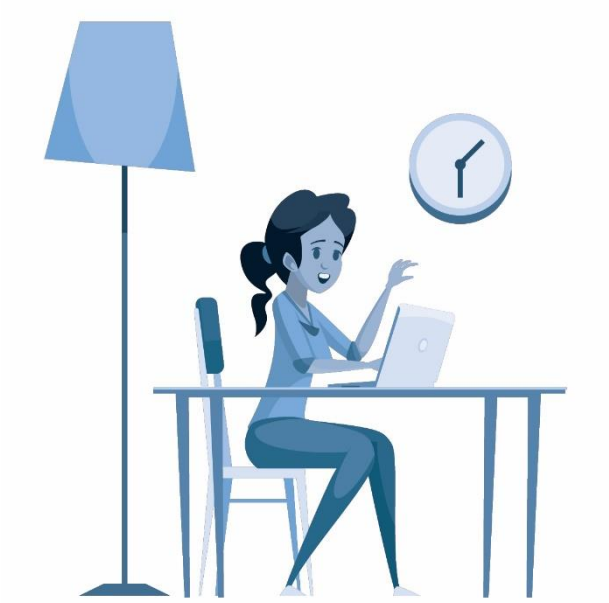
With the reduced need for physical office space in a telecommuting scenario, existing land use patterns can be significantly affected. Through resident relocation, widespread telecommuting could increase urban sprawl and lead to the decentralization of cities. Currently, no increase in urban sprawl has occurred due to telecommuting; usually, telecommuting tends to be a consequence of a longer commute rather than access to telecommuting encouraging people to move further from the city center. The impacts telecommuting has on resident relocation is currently negligible. While there is no consensus yet on telecommuting's impact on land use patterns, understanding the potential impacts informs future research and surveys performed in Miami-Dade County. Targeting telecommuting opportunities to residents who currently have long commutes, typically during peak travel hours in the morning and evening, will have the greatest impact in reducing transportation congestion in those peak periods during the day.

[35] https://www.cnbc.com/2020/03/10/working-remotely-due-to-the-coronavirus-this-technology-is-key.html

[36] http://ijbssnet.com/journals/Vol_3_No_15_August_2012/4.pdf

[37] https://www.fhwa.dot.gov/policyinformation/hpms/fieldmanual/page11.cfm#:~:text=Areas%20with%20a%20Census%20defined,as%20designated%20by%20the%20Census

[38] https://broadbandmap.fcc.gov/#/area-summary?version=jun2019&type=county&geoid=12086&tech=acfosw&speed=100_10&vlat=25.716492312234 62&vlon=-80.52284377417783&vzoom=9.507405069068236



1.4.3 PROMOTING MORE ACCESS OPPORTUNITIES

Before the COVID-19 pandemic, telecommuting was limited to primarily white-collar professionals. Few workers had access to a flexible workspace, and those in the service industry were specifically limited. In the 2013 Employee Commute Survey compiled for SANDAG, 81 percent of participants responded that their job responsibilities would prevent them from telecommuting. The impact of job responsibilities is also apparent in another analysis that shows Communications and IT Manufacturing Services were the only surveyed industries with more than 20 percent of respondents believing in a possible transition to telework..[39]

From a Pew Research survey on telecommuting and demographics, education also plays a role in the propensity to telecommute, as those with bachelor's or graduate degrees are 8–12 percent more likely to telecommute than those without a college degree.[40] Other factors also play a role in determining the propensity to telecommute. Employees who live further away from their workspace are more likely to telecommute, as are those who have children.[41] Understanding who telecommutes is key to properly marketing telecommuting programs and identifying equity gaps.

Based on the SACOG survey, workers typically want a hybrid approach to commuting going forward. Ideas to implement include telework-ready housing which has all the telecommunications infrastructure to telecommute, such as reliable internet and a computer. Building telecenters in less dense areas or underserved areas can also improve support to all levels associated with teleworking.

1.4.4 TELECOMMUTING IMPACTS

Telecommuting offers benefits for both employers and employees. For employees, telecommuting can boost morale through improving work-life balance, increasing job satisfaction, and promoting stronger individual wellbeing. For employers, benefits include cost reductions, increased worker productivity, and company attractiveness for potential staff recruits. Additionally, employers have a wider pool of candidates to choose from since they are not restricted to people who live nearby or are willing to move.

1.4.4.1 Worker Morale

Worker morale is a commonly cited benefit of telecommuting, and the effects on worker morale can be seen through the impacts of the previously discussed Telework Enhancement Act. In its pilot program supported through the Telework Enhancement Act, the Patent and Trademark Office (PTO) enabled

[39] https://www.sandag.org/uploads/publicationid/publicationid_1878_18068.pdf

[40] https://www.pewresearch.org/fact-tank/2020/03/20/before-the-coronavirus-telework-was-an-optional-benefit-mostly-for-the-affluent-few/

[41] https://link.springer.com/article/10.1007/s00168-018-0873-6

approximately 2,700 employees to work from home four to five days per week. In the 2017 Telework Annual Report, 88 percent of the office's employees teleworked at least one day a week. Workers also reported that teleworking provided an alternative to using sick leave, as they were able to work through their sickness at home rather than taking days off. Some teleworkers at PTO reported their continued tenure with the office was due to the telework program, while 96 percent of program participants reported improvements in job satisfaction, 74 percent of participants reported productivity improvements, and the agency benefited by an estimated $122.3 million.

One of the provisions in the Telework Enhancement Act calls for the Office of Personnel Management (OPM), a federal agency, to research telecommuting by public and private entities. The 2017 survey quantified a 70–80 percent increase in worker morale and productivity, similar to the PTO survey, but the OPM survey also had 76 percent of teleworking respondents report a greater desire to stay with their current agency.

1.4.4.2 Traffic Impacts

There is a consensus in the literature that increases in telecommuting are correlated with reductions in traffic congestion relative to commuting trips. Since commute trips occur during peak hours, telecommuting can lessen peak hour congestion on the roadway network. There are also safety benefits; Pirdavani et al. (2014) found that a rise in telecommuting decreases the amount of traffic crashes.[42] Their study, however, assumes a decrease in overall Vehicle Miles Traveled (VMT) due to telecommuting, which reduces crashes. The reduction in crashes is therefore theoretical, and other studies suggest that telecommuting may not reduce overall VMT.[43]

Vehicle miles traveled (VMT) are typically much lower for telecommuters during the days they telecommute. However, on days when they do not telecommute, there is a "bounce back" effect on their VMT where teleworkers increase their vehicle-miles-traveled on non-telework days. In addition to this "bounce back" effect, telecommuting can change travel patterns by decreasing linked trips and trip-chaining. For example, a telecommuter may have previously linked a commute trip with shopping trips and now has to dedicate additional trips directly toward shopping. Because of the "bounce back" effect and travel pattern changes, overall VMT for telecommuters and non-telecommuters may be similar. Specifically, in single-car households, no VMT reduction may occur. If the car previously used for commuting purposes is made available as a result of telecommuting, other family members can now use the car throughout the day for other trips.[44] In certain circumstances, telecommuting could shift trips away from carpooling and transit to driving alone.

The SACOG data also found similar results to previous studies where teleworkers increase their vehicle-miles-traveled on non-telework days. This "bounce back" effect limits the impact teleworking has on VMT reduction; however, shifting trips from peak periods to off-peak periods can still reduce congestion. Table 2 depicts the VMT differences between workers on telework and non-telework days. The SACOG survey broke telecommuters into different types of categories. Convenience teleworkers include workers such as a repairman who can do their job remotely out of convenience to themselves. Substituters consciously choose to telecommute to replace their commute trip, meaning this group may have long commutes. Those who

[42] https://www.sciencedirect.com/science/article/pii/S0966692314001355

[43] https://trid.trb.org/view/729877

[44] https://www.sciencedirect.com/science/article/pii/S0965856415002104

work at home do not choose to replace a commute trip; rather their work or industry allows them to work from home full time.

Table 2. Vehicle-Miles-Travelled by Teleworkers and Non-Teleworkers

	NON-TELEWORK DAY	TELEWORK DAY
No Telework (Baseline)	33	-
Convenience Teleworkers	36	30
Substituters	41	20
Work at Home	31	16
All Workers	34	24

Source: SACOG (2018)

1.4.4.3 Environmental Impacts

Since overall VMT may not actually decrease for telecommuters, associated emission reductions are also uncertain. Commute and peak-hour VMT reduces, which pairs with a reduction in travel-related greenhouse gases. These reductions are offset by increases in non-commute related travel described above. The key environmental benefits caused by telecommuting will come with respect to air quality. Since telecommuting impacts peak-hour commute travel the most, less travel at those times will reduce idling in traffic, which causes the emissions of Volatile Organic Compounds, (VOC) and nitrogen oxides (NOx). Telecommuting can reduce the emission of these specific compounds more than others caused by traveling. The reduction in VOCs and NOx can improve air quality.[45]

The benefits of telecommuting are offset with additional travel during non-telecommute days. Additionally, the relationship of telecommuting and increases in e-commerce is uncertain. If telecommuting causes additional delivery trips due to rises in e-commerce, the overall environmental and traffic benefits would be further offset.

Telecommuting has the potential to impact land use patterns, travel patterns, travel modes, transportation infrastructure, utility infrastructure, and the environment. However, the literature does not come to a clear consensus on the amount or type of impacts that widespread, sustained telecommuting will have.

[45] https://www.researchgate.net/publication/24122839_A_Review_of_the_Literature_on_Telecommuting_and_Its_Implications_for_Vehicle_Travel_and_Emissions

1.5 Telecommuting Literature Review Summary

The state of telecommuting and telecommuting policy in Miami-Dade County, other regions and numerous countries indicates an embrace of the trend, in a variety of ways for numerous reasons. Through the resolutions passed by the Board of County Commissioners, Miami-Dade County has shown an interest in pursuing telecommuting to alleviate congestion. The following section consists of telecommuting data and analysis for Miami-Dade County and Southeast Florida. Data representing Southeast Florida cover the three-county region that includes Miami-Dade, Broward and Palm Beach counties.

2. TELECOMMUTING DATA AND ASSESSMENT

Information was gathered to support analysis of the telecommuting trend in terms of a range of data types and variables, including traffic and transit ridership; employment type and unemployment; telecommunications infrastructure; and telecommuting trend data collected through several recent surveys. This section summarizes and analyzes the data to help inform the telecommuting assessment and policies.

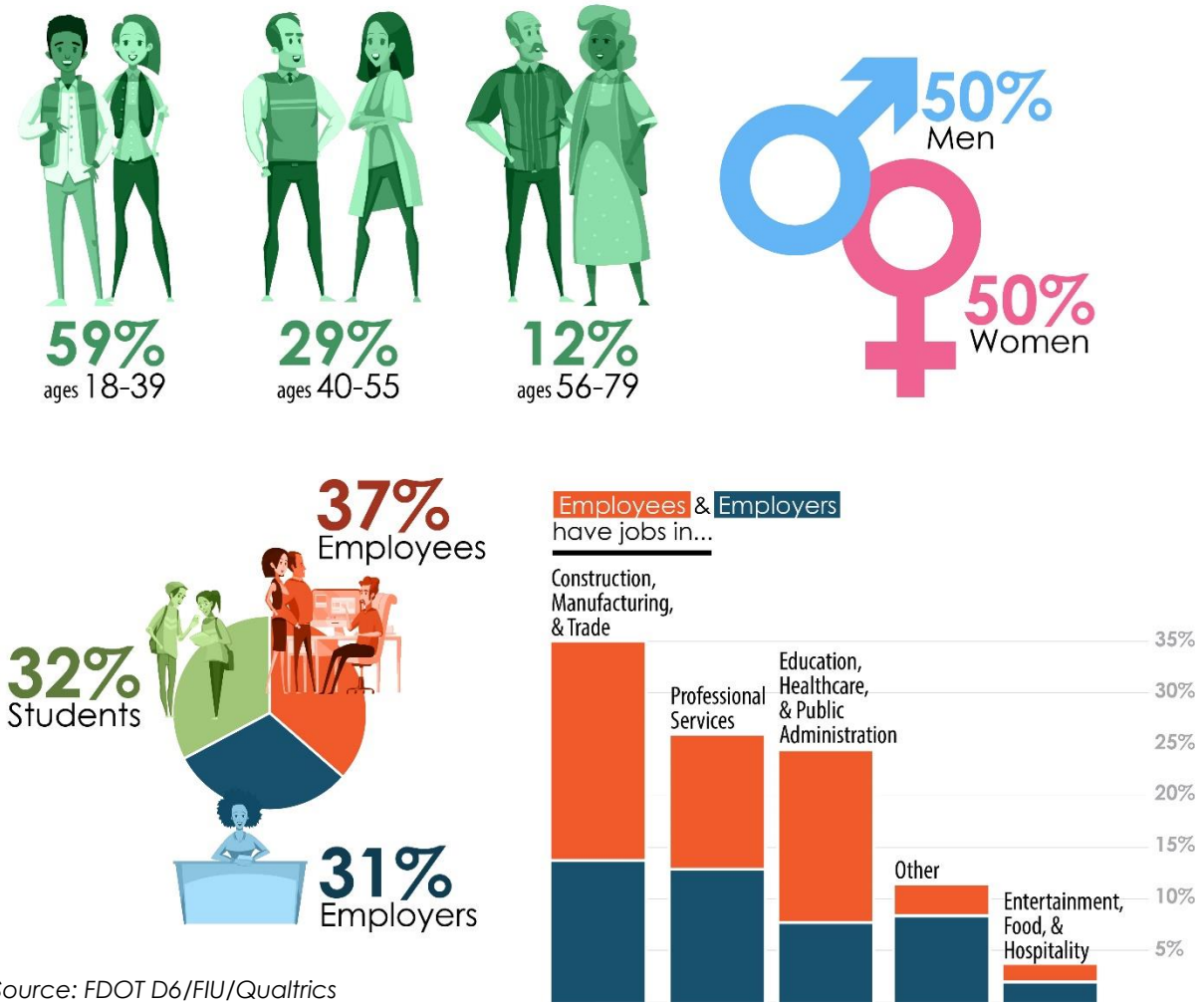
2.1 Surveys

Several surveys have been conducted in recent months to shed light on current and future trends related to telecommuting. Those targeted in these surveys include the general public, parents of school-age children, schoolteachers, college students, and employees and managers in specific industries. This section describes the surveys and the data collected and analyzes the data in terms of the general purpose and goals of the Telecommuting Study.

2.1.1 FDOT DISTRICT SIX

FDOT District Six (FDOT D6), in partnership with the Miami-Dade TPO and the Florida International University (FIU), conducted a statewide survey in August 2020. The full survey report is included in the Appendix to this report. The survey collected 1,364 responses, 83 percent of which were by Florida residents. The survey questionnaire was stratified to ask general questions to all respondents and sub-group specific questions to employees, upper managers (employers), and college-level students. A key purpose of isolating upper management respondents from employees is to gauge the anticipation of post-pandemic telecommuting from an employer policy perspective. **Figure 1** summarizes the demographics and industries represented in the survey. Approximately 88 percent of respondents are under the age of 56, heavily weighting the sample to working-age populations. The most represented industry is "Construction, Manufacturing, and Trade" with 35 percent of respondents, followed by "Professional Services" and "Education, Healthcare, and Public Administration", both with roughly 25 percent of respondents. Respondents selecting "Other" included those working in software, information technology, the military, and other professions.

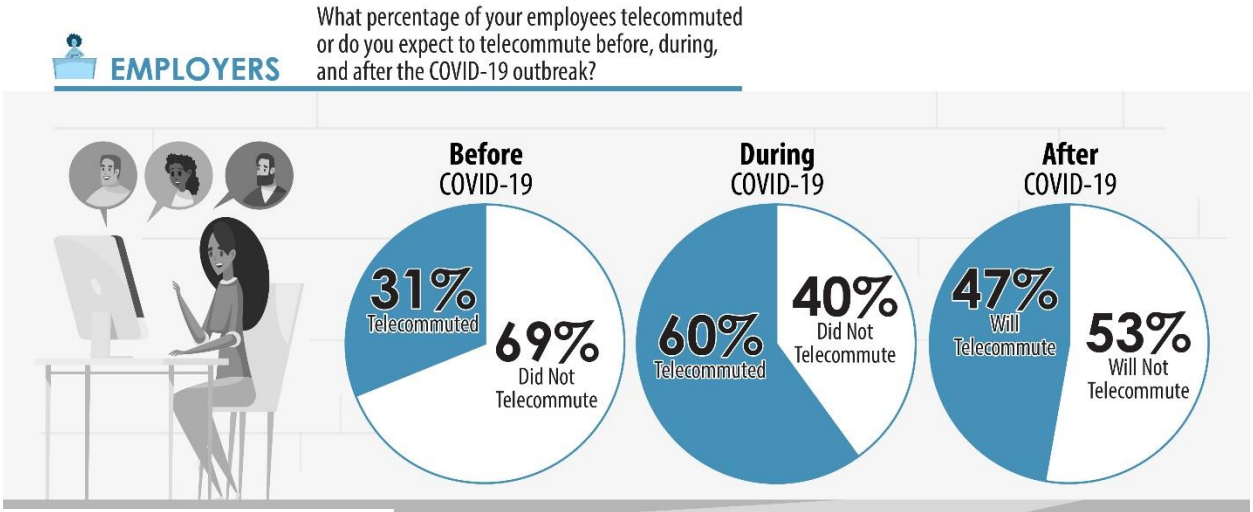
Figure 1. Survey Sample Make-up



Source: FDOT D6/FIU/Qualtrics

A key objective of the survey was to understand the level of telecommuting before, during, and assumed after the COVID-19 pandemic. To that end, employers were asked to estimate the percentage of their workforce that telecommuted or will telecommute in those three scenarios. **Figure 2** presents a summary of their responses, categorizing them by whether the employees telecommuted (or will telecommute) at least part-time or not at all. Employers reported a near doubling in telecommuting staff during the COVID-19 pandemic compared to before the pandemic (60 percent versus 31 percent). After COVID-19 is no longer a threat, employers expect a decrease in telecommuting compared to current conditions, although still significantly higher than before the COVID-19 pandemic. This will result in a sustained increase of 16 marginal percentage points, or 50 percent in terms of the number of people who will telecommute post-COVID, relative to pre-COVID levels.

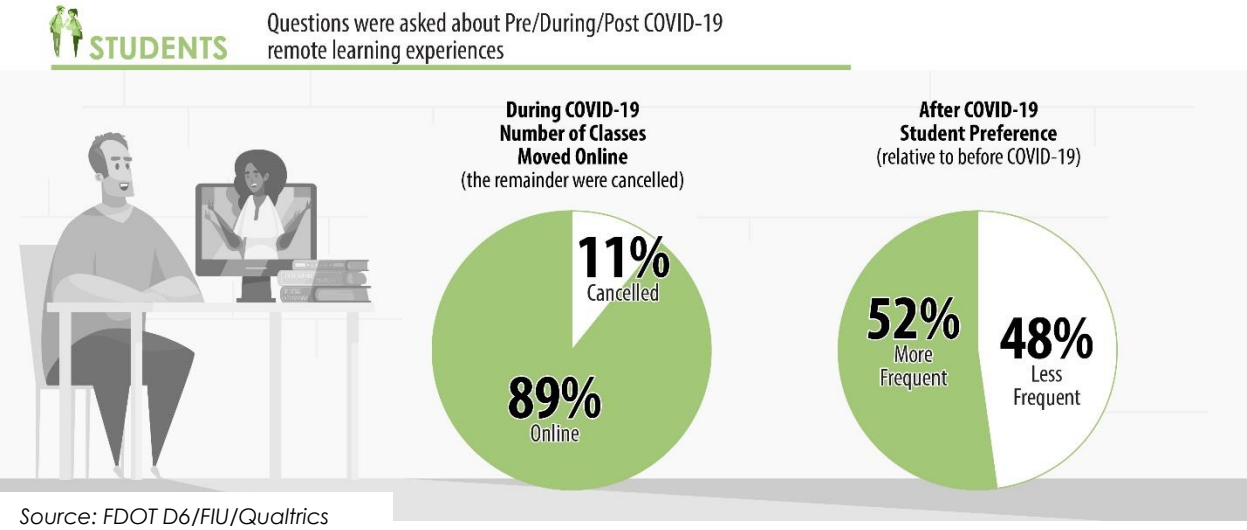
Figure 2. Employers' Estimate of Telecommuting Trends



Source: FDOT D6/FIU/Qualtrics

Similarly, students were asked how their frequency of remote learning had changed during the COVID-19 pandemic and how they expect it to change once COVID-19 is no longer a threat. As illustrated in **Figure 3**, student responses indicate that almost 90 percent of classes were moved on-line during the pandemic, with the remainder of classes cancelled. After the pandemic, more than half of students expect more frequent online classes, relative to the pre-pandemic condition.

Figure 3. Students' Remote Learning Trends

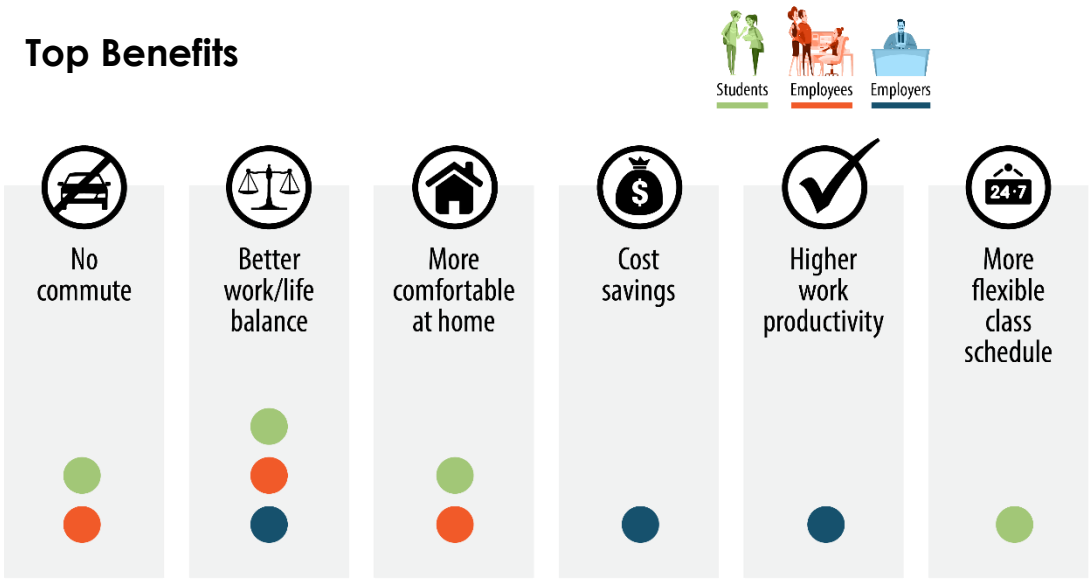


Source: FDOT D6/FIU/Qualtrics

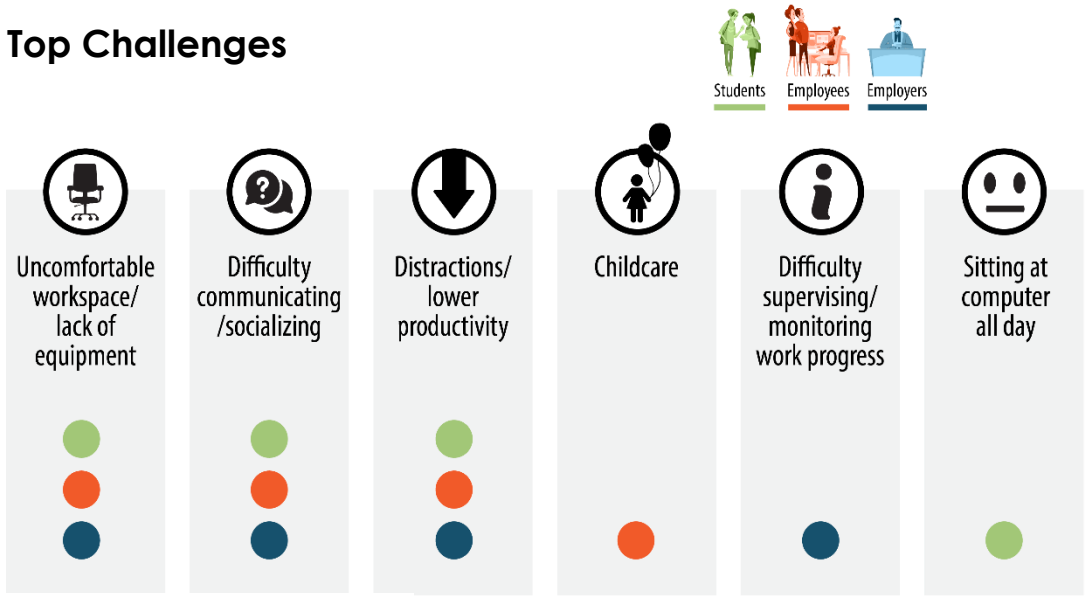
To understand the pros and cons of telecommuting and to inform policy recommendations to promote the trend, the survey asked all respondents, including employees, employers, and students, to check or rank benefits and challenges. The top six benefits and challenges reported by survey respondents are shown in **Figure 4**. The survey results indicate that the elimination of the physical commute, more comfort at home, and schedule flexibility have positively contributed to the quality of life across all or most respondents. Employers also cited cost savings as a positive aspect of telecommuting.

Challenges cited by survey respondents include lack of equipment or technology, difficulty communicating with teammates, and higher potential for distractions at home. Childcare and higher screen time were also noted as challenges. For respondents who expressed a need to go back to the office, lack of equipment or technology was one of the most common challenges cited.

Figure 4. Top Benefits and Challenges of Telecommuting



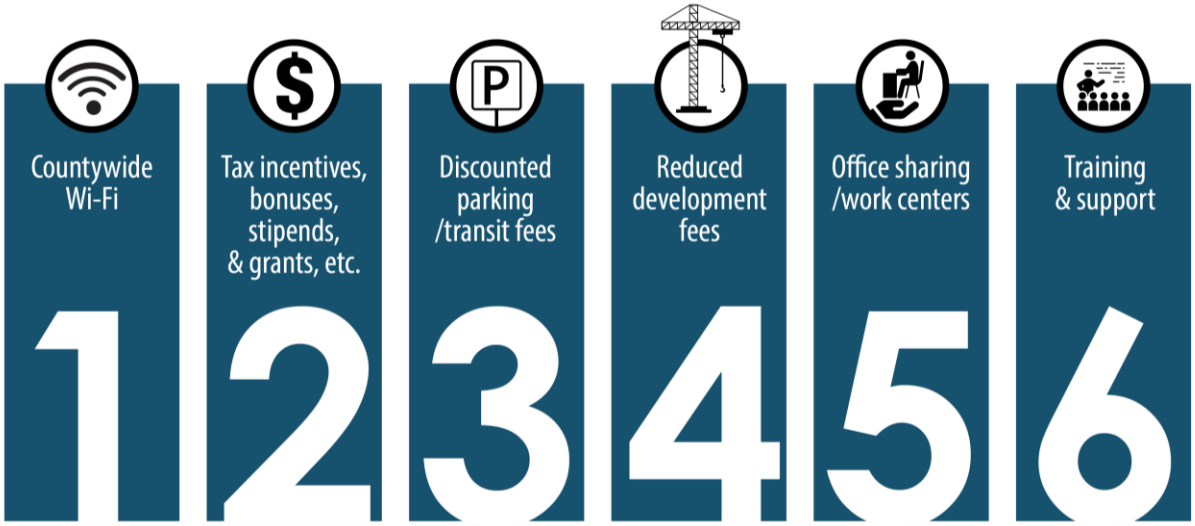
Source: FDOT D6/FIU/Qualtrics



Source: FDOT D6/FIU/Qualtrics

Finally, the survey asked respondents to provide feedback on potential incentives to facilitate telecommuting. **Figure 5** illustrates the most common responses. These ranged from countywide internet access to monetary incentives, teleworking centers, and technical support.

Figure 5. Top Considerations to Facilitate Telecommuting



Source: FDOT D6/FIU/Qualtrics

2.1.2 SOUTH FLORIDA COMMUTER SERVICES

The South Florida Commuter Services (SFCS) conducted a survey of South Florida businesses focused on telecommuting and response to COVID-19. Of the businesses surveyed, 41 percent have less than 25 employees, and 87 percent have 100 or fewer employees. Prior to COVID-19, 28 percent of respondents had a telecommuting policy which allowed employees to work from home at least once a week. Going forward, 56 percent of respondents will continue to implement telework post COVID-19, and 37 percent remain unsure. Of the 52 respondents who answered a question about awareness of SFCS, 88 percent did not know about the publicly funded program to assist Florida businesses implement working from home programs. The SFCS concluded that additional outreach may help businesses implement teleworking post COVID-19.

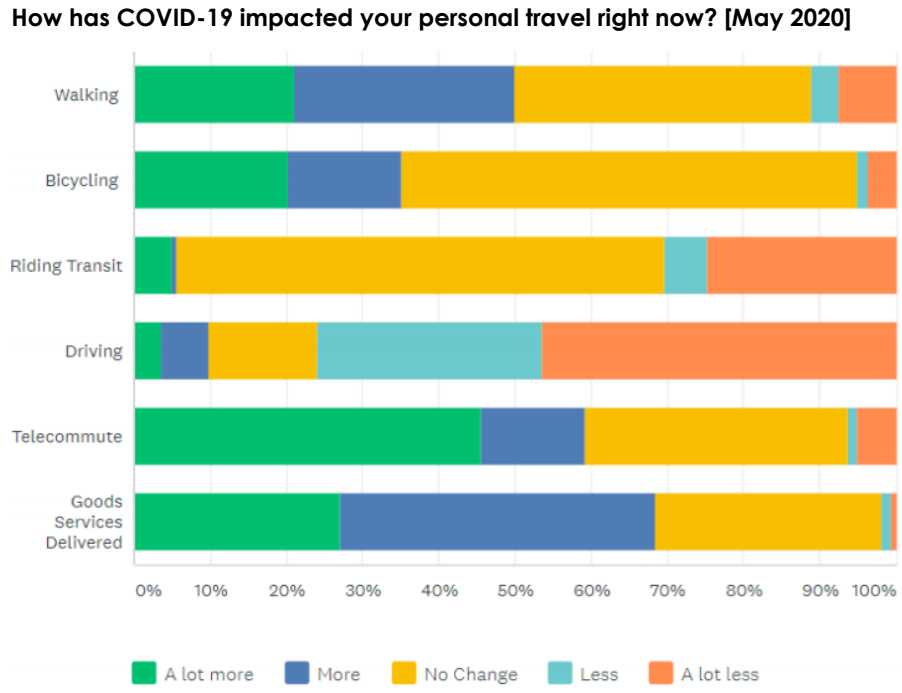
2.1.3 PALM BEACH TRANSPORTATION PLANNING AGENCY

In a brief four-question survey, the Palm Beach Transportation Planning Agency (TPA) asked local residents how their travel habits had been altered by the pandemic and how they anticipate travel to change as restrictions are lifted. **Figure 6** illustrates the responses to two questions on current (May 2020) and future travel patterns by mode. In May 2020, respondents noted large decreases in driving and riding transit and increases in telecommuting and e-commerce deliveries. When COVID-19 restrictions are lifted, respondents expect to increase walking, bicycling, telecommuting, and goods delivery compared to their pre-COVID-19 patterns. However, the increases are expected to be smaller than in May 2020, when stay-at-home restrictions were in place.

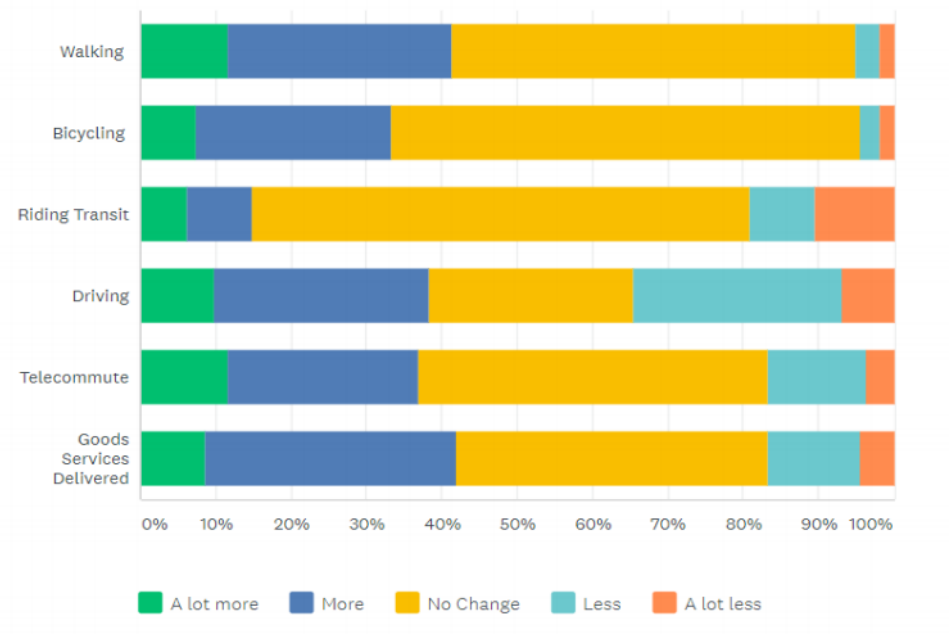
While almost 60 percent of respondents reported telecommuting more due to COVID-19, only about 35 percent expect to continue telecommuting more than pre-COVID-19 levels once restrictions are lifted. Fifty percent of respondents reported walking more, and 35 percent reported bicycling more during COVID-19. Slightly over 40 percent of respondents expect to walk more, and almost 35 percent of respondents expect to bicycle more once COVID-19 restrictions are lifted.

Overall, this stated preference survey reports that telecommuting will drop about 25 percent from during COVID-19 to after COVID-19. Walking and biking are also expected to drop about 10 percent and 5 percent, respectively, from during COVID-19 to after COVID-19. Comparatively, these results suggest that telecommuting is not the only answer in traffic reduction, and multimodal accessibility can be as well.

Figure 6. Palm Beach TPA Survey Results



How do you expect your personal pre-COVID-19 travel patterns to change when COVID-19 restrictions are lifted?

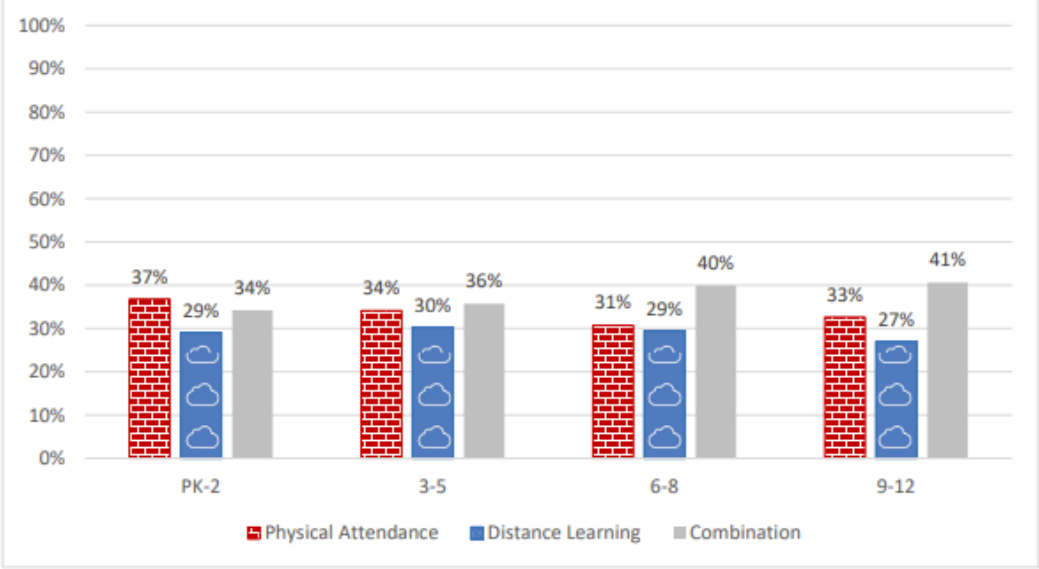


Source: Palm Beach TPA survey (May 2020)

2.1.4 MIAMI-DADE COUNTY PUBLIC SCHOOLS

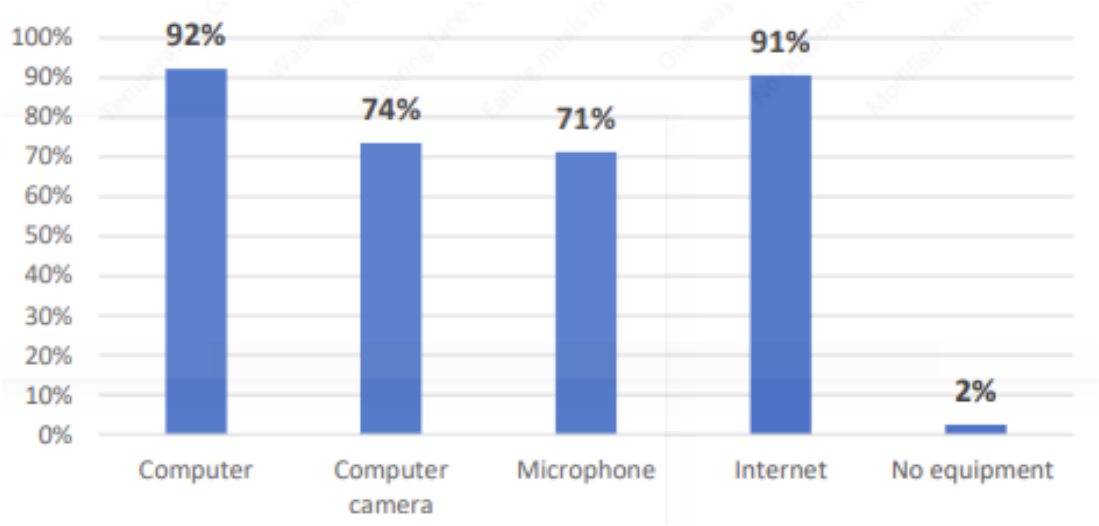
Miami-Dade County Public Schools conducted two surveys between May and June 2020. The first survey targeted parents of school-age children in Miami-Dade County. Just over 100,700 parents responded, representing over 155,500 students. The survey gathered information on parents' preferences and attitudes towards reopening schools in Fall 2020. Key findings include a fairly even split between a preference for physical attendance versus distance learning and a hybrid, or combination, approach. Hybrid or combination learning is when students attend school physically some days and do remote learning on other days. This survey applies only to during the pandemic and feelings about returning to school in Fall 2020. On average, between 63 percent and 69 percent of parents prefer distance learning full-time or a hybrid of distance learning and physical attendance. While parents of pre-Kindergarten and elementary school children are less receptive to distance learning than middle and high school students' parents, there is significant support across all grades for distance learning. **Figure 7** below depicts a breakdown in attendance preference by grade.

Figure 7. Attendance Preference by Child's Grade Level



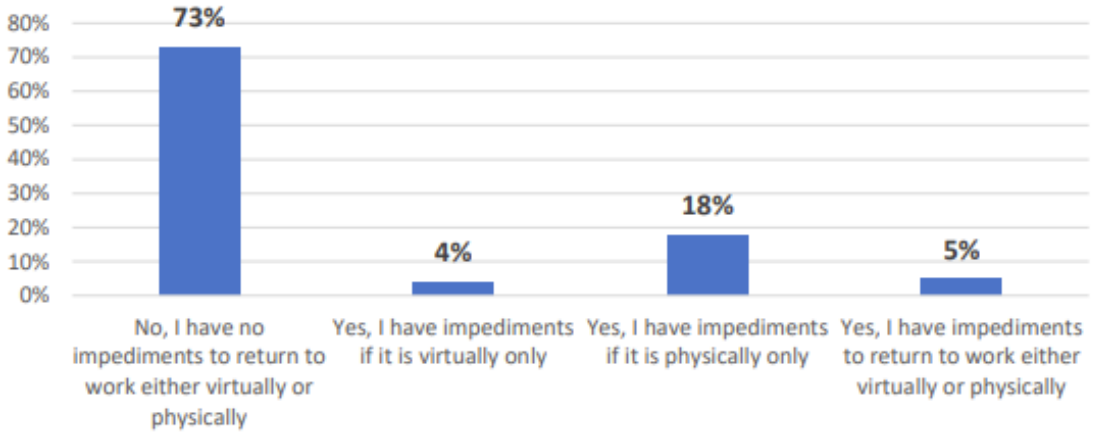
In addition to the parent survey, Miami-Dade County Public Schools surveyed more than 18,600 teachers. This survey focused on teachers' resources, preferences, and attitudes towards teaching through COVID-19. In terms of resources, the survey found most teachers have adequate equipment at home to facilitate distance learning and are willing to use it.

Figure 8. Device/Services Teachers Have at Home and are Willing to Use for Work



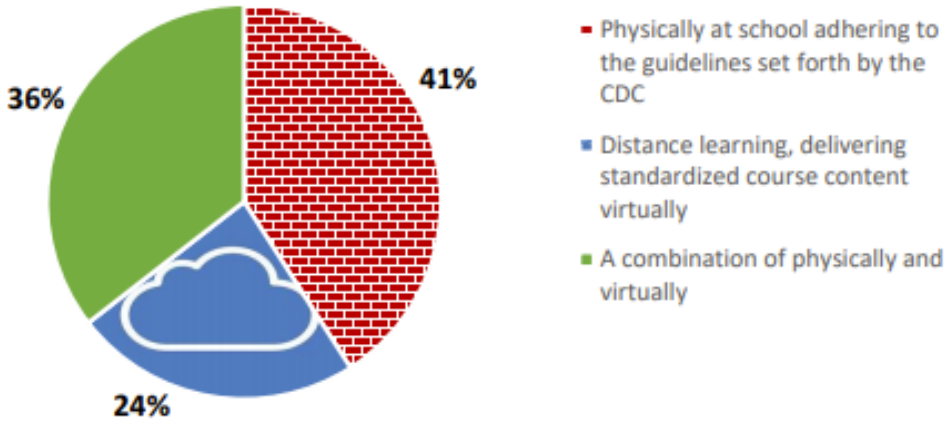
Based on the results shown in **Figure 8**, an overwhelming majority, more than 90 percent, of teachers have computer hardware and internet access at home. Fewer teachers have access to a camera and microphone. **Figure 9** depicts the teachers' responses about impediments to returning to work. Most teachers have no impediments to return to work, either physical or virtual. However, 18 percent of teachers have impediments in returning to physical classes only. Possible impediments for teachers returning for work may include childcare needs, health issues, or concern for elderly family members, among other reasons.

Figure 9. Teacher Impediments to Returning to Work for the 2020-2021 School Year



There is a clear split in the preferred method of teaching, whether physically, distance learning, or a combination for the 2020-2021 school year, in the teacher responses. As shown in **Figure 10**, none of the delivery methods had a majority, but in-person instruction following CDC guidelines had the highest percentage with 41 percent. This percentage increased to 46 percent for elementary school teachers. Distance learning was the least preferred option with 24 percent, which is more or less consistent with the responses of parents, 27 percent of whom selected virtual learning as the preferred medium.

Figure 10. Preferred Method for Delivering Instruction in 2020-2021



Source: Miami-Dade Public Schools Survey

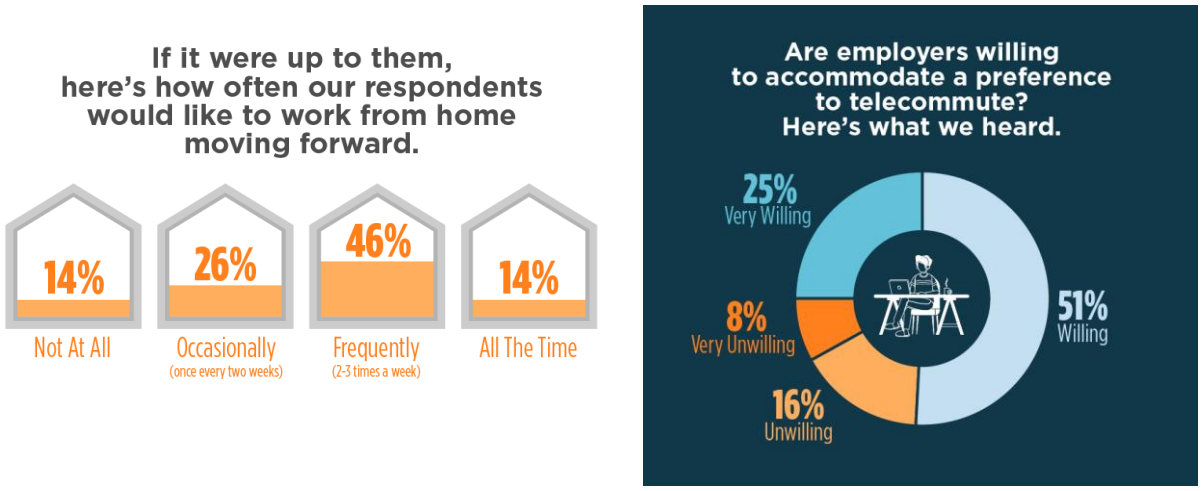
2.1.5 KITTELSON & ASSOCIATES, INC.

Kittelson & Associates, Inc. (Kittelson) conducted a national survey of 1,000+ commuters across 40+ states and 28 industries between May 14, 2020 and July 6, 2020. Because the survey was mainly distributed through Kittelson's network, the sample skews to urban professionals in the transportation sector.

Kittelson's survey focused on gauging interest in telecommuting after COVID-19 is no longer a threat, as well as the pandemic's potential impact on mode choice. **Figure 11** shows that a large majority of respondents

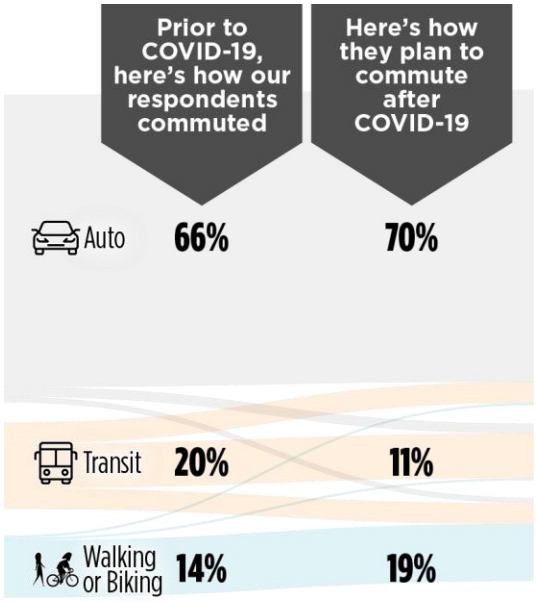
(86 percent) wish to telecommute at least occasionally. A lower number (76 percent) think that their employer will be willing or very willing to accommodate telecommuting.

Figure 11. Commuters' Desire and Expectation for Future Telecommuting



Based on responses on pre-COVID-19 commute modes and expectations for post-COVID-19 physical commuting, Kittelson estimated potential mode choice changes (see **Figure 12**).

Figure 12. Potential Mode Choice Impact



Before COVID-19, about two thirds of respondents used a private automobile to commute. Twenty percent of respondents took transit to work and fourteen percent biked or walked to work. Respondents' expectations for physical commutes once COVID-19 is no longer a threat indicate a sharp reduction in transit usage and increases in driving, walking, and biking. Notably, the increase in walking or biking trips, relative to pre-COVID-19 levels is more than 30 percent, while the increase in auto trips is only six percent. The reduction in transit mode share is the greatest expected change, in percentage terms, at almost 50 percent.

2.2 Executive Roundtable

On September 17, 2020, the Miami-Dade TPO hosted an executive roundtable including the Greater Miami Chamber of Commerce and business and government leaders in the Southeast Florida region. Attendees included executives of major employers, including American Airlines, TD Bank, Florida Blue, Baptist Health, and others, as well as leaders of government and non-profit organizations, including Miami-Dade County Public Schools, Florida International University, and FDOT D6. The key takeaways from the meeting were:

- **Digital Divide: Demographics and Infrastructure Needs.** Roundtable attendees noted disparate access to internet and telecommuting options along sociodemographic lines.

- **10% Trip Reduction: Major Congestion Impacts.** As will be shown later in this document, a comparatively small reduction in traffic volumes has resulted in tangible reductions in congestion.
- **Maintaining a Secure Virtual Environment.** Deployment of dedicated equipment like routers and other software and hardware can mitigate security concerns.
- **Small Business Impacts: Equipment Deployment & Maintenance Costs.** Telecommunications and cybersecurity devices are costly and could be burdensome to smaller businesses.
- **Adjusting Digital Trends in Telehealth.** These trends are making doctor visits more convenient, thus reducing associated car trips.

In addition, relevant quotes from some of the attendees included:

- Even though it is a small decrease, the 10% reduction in travel has made a big difference in terms of congestion. Jim Wolfe (FDOT D6)
- [FDOT's approach will be to] find those places where telecommute works best and encourage it. Jim Wolfe (FDOT D6)
- Having an additional two to three hours of productive time in their [working women's] days has made a huge difference in their daily lives and their families'. Irene White (FPL)
- Although there are still some challenges telemedicine is showing a lot more potential than people envisioned before the pandemic. Penny Shaffer (Florida Blue)
- 30% of American Airlines employees live in Broward County, so regional transit services are key. Juan C Liscano (AA)

The roundtable participants also shared valuable insights regarding the role of transit in the region, the cybersecurity challenges that come with telecommuting, and the different approaches major companies and organizations in the region had taken as they transitioned to telecommuting.

Another challenge that must be addressed for broader telecommuting adoption was the presence of "telecommunication deserts," where the internet is not readily available. Organizations like Miami-Dade Public Schools have taken steps to overcome it in the short term (e.g., handing out hotspots), but long-term solutions must be developed in partnership with the telecommunication industry. Unsurprisingly, these telecommunication deserts are correlated with low-income and minority populations. Looking ahead, the rapid migration to 5G may enable greater coverage of Wi-Fi-equivalent internet service without the need to ubiquitously expand the physical telecommunications infrastructure.

2.3 Employment and Economic Indicators

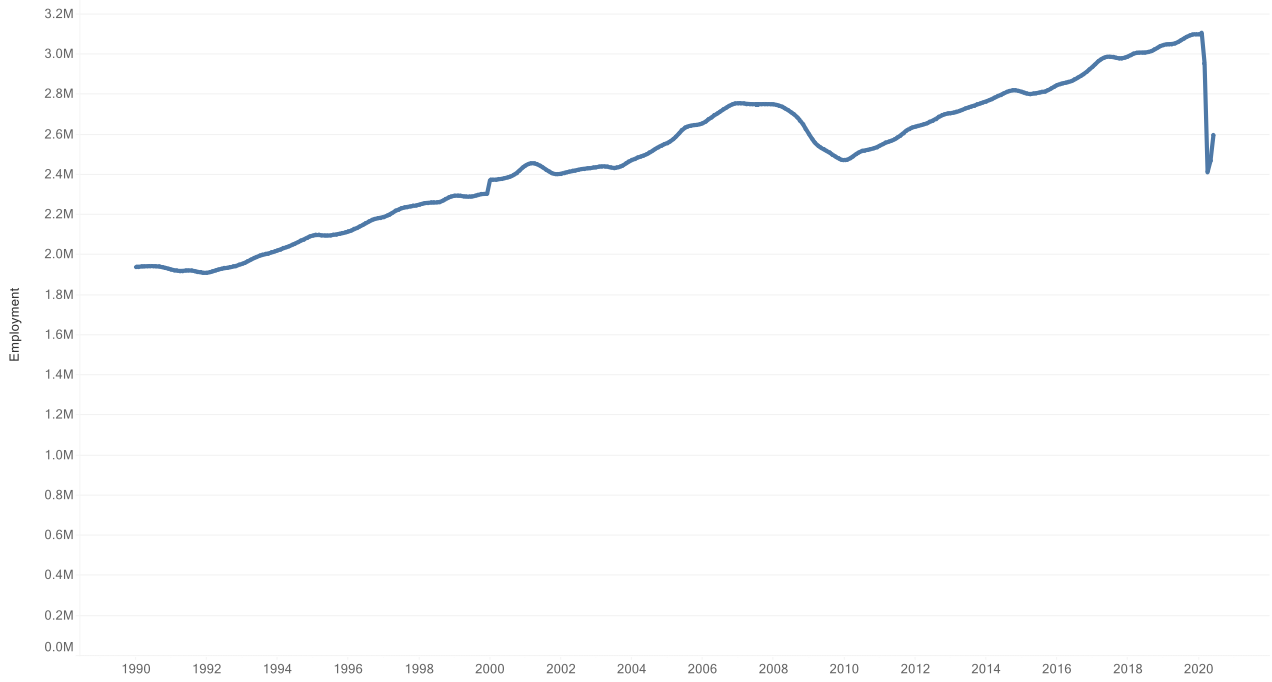
Employment and commute travel are closely linked to peak period travel demand resulting in higher levels of congestion. All else being equal, higher employment numbers translate to higher demand for peak period travel and higher levels of traffic congestion during peak periods. This section explores employment trends and other economic indicators that could be partially responsible for fewer commute trips during the COVID-19 pandemic. This section is divided into two subsections: (1) traditional survey-based sources such as those used by many federal agencies, and (2) real-time indicators from private and public sources that are publicly available.

2.3.1 SURVEY-BASED INDICATORS

2.3.1.1 Bureau of Labor Statistics

The Bureau of Labor Statistics (BLS) publishes monthly statistics on employment at the metropolitan area level. The seasonally adjusted historical time series through June 2020 was obtained from the BLS for the purpose of this analysis. **Figure 13** presents the employment trend in Southeast Florida, defined as Palm Beach County, Broward County, and Miami-Dade County, region since 1990. The COVID-19 pandemic reduced employment to its lowest point since the peak of the 2008-2010 recession, from 3.1 million in February 2020 to 2.4 million in April 2020. In real numbers, within a span of a few months, the number of jobs in Southeast Florida dropped by about 700,000 jobs. Employment has since recovered some of those losses, gaining approximately 250,000 jobs since the lowest point during the pandemic. While a significant recovery, employment in June 2020 still was 16 percent lower than in February, before the pandemic impacted employment.

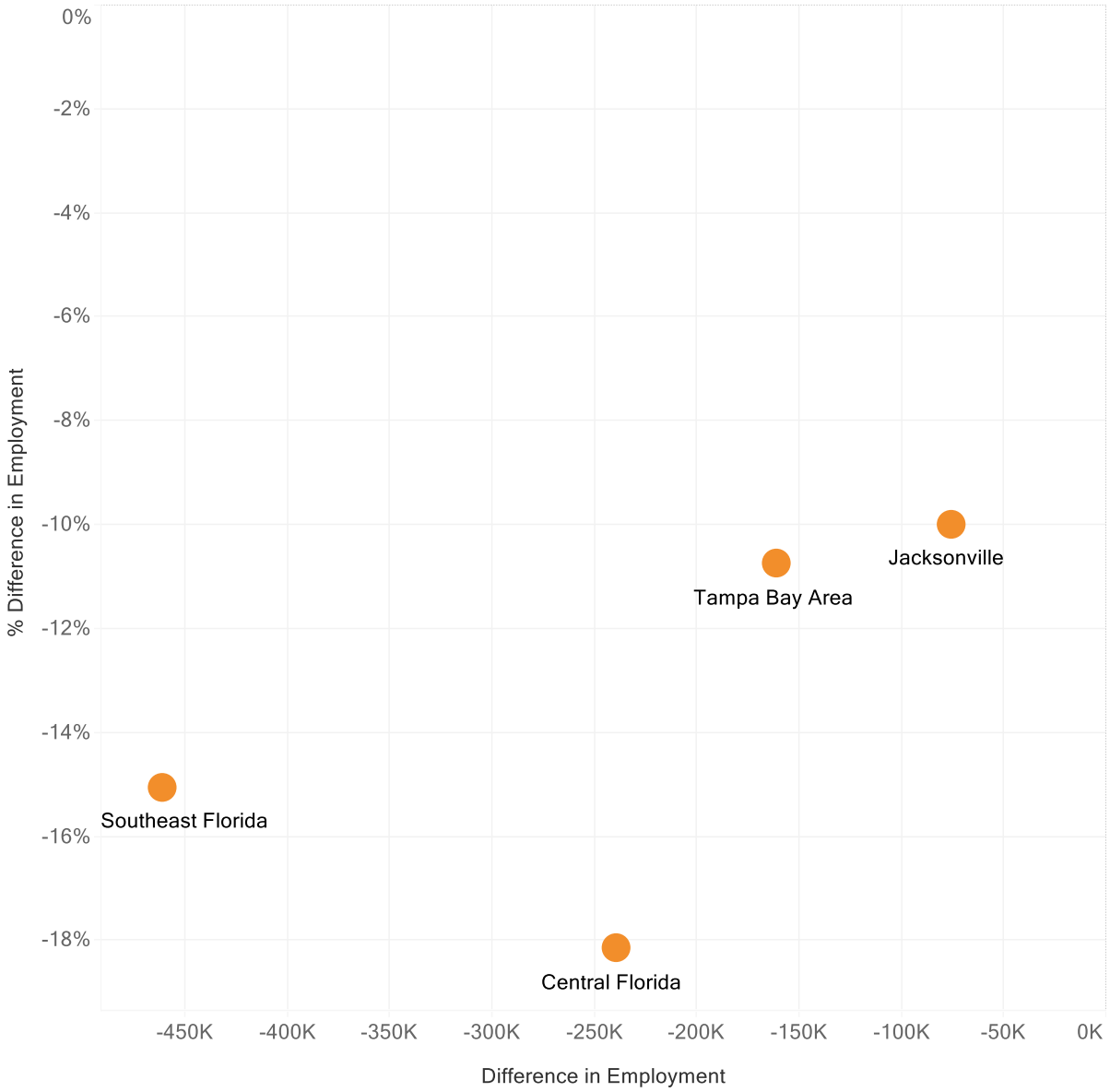
Figure 13. Employment in Southeast Florida from 1990-2020



Source: Bureau of Labor Statistics Table 1. Civilian labor force and unemployment by metropolitan area, seasonally adjusted (June 2020)

The four largest metropolitan areas in Florida were selected for a comparison of employment statistics between June 2020 and June 2019, as shown in **Figure 14**. The Southeast Florida region shed the most jobs year-over-year, losing almost 500,000 jobs. In percentage terms, Southeast Florida is second only to the Central Florida region in percent reduction (15 percent vs. 18 percent, respectively). A reduction of 15 percent in employed workers is likely to have a roughly commensurate effect on peak period congestion.

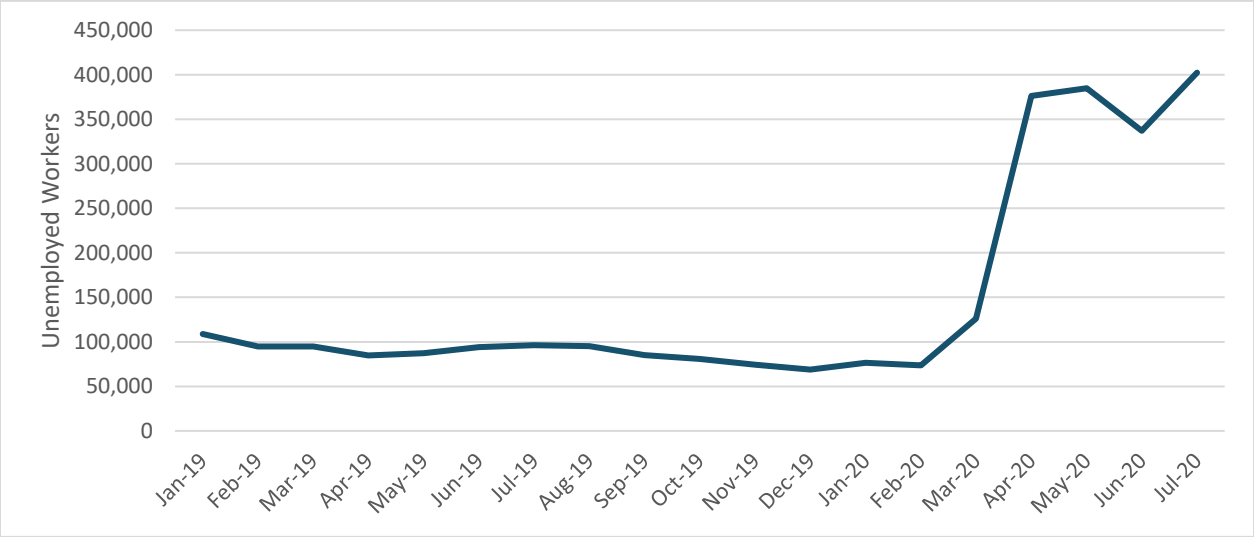
Figure 14. June 2020 vs. June 2019 Employment



Source: Bureau of Labor Statistics Table 1. Civilian labor force and unemployment by metropolitan area, seasonally adjusted (June 2020)

Figure 15 highlights the rapid rise in unemployment in Southeast Florida since March 2020, when the COVID-19 pandemic began to take effect. From January 2019 to February 2020, unemployment decreased slightly. In March 2020, the unemployment numbers began to rise and spiked in April 2020. The unemployment data shows that between February 2020 and April 2020, roughly 300,000 people became unemployed. The difference between the 500,000 -700,000 drop in employment and the 300,000 increase in unemployment is indicative of a large number of people who were recently employed but are not looking for work currently. Although individual situations vary, concerns about contracting the coronavirus, additional responsibilities at home (e.g., caring for others), or early retirements are likely to account for a sizable portion of this difference.

Figure 15. Unemployment in Southeast Florida (January 2019-July 2020)



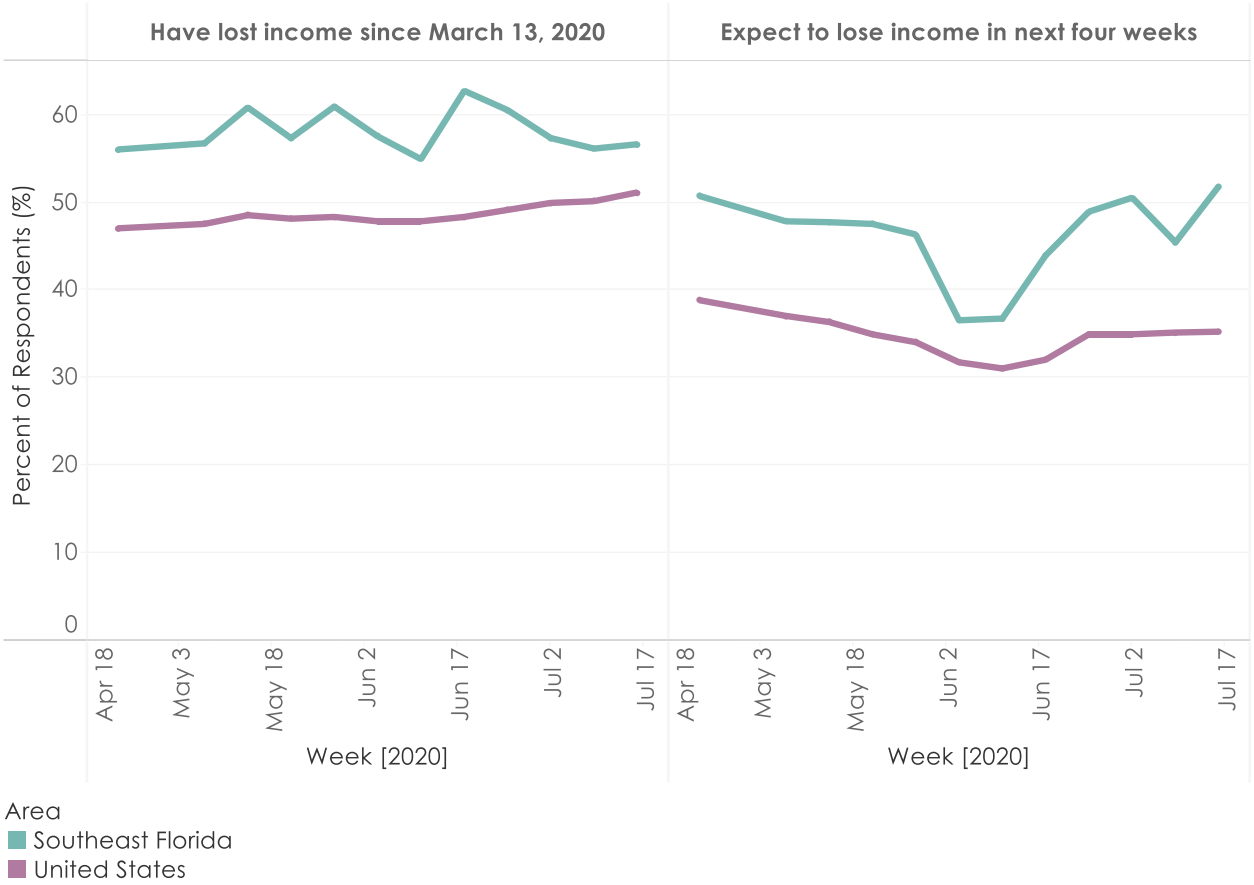
Source: BLS (2020)

Household Pulse Survey

The U.S. Census Bureau, in collaboration with multiple federal agencies, reported data on the social and economic effects of COVID-19 on American households from April 23, 2020 through July 21, 2020 using the Household Pulse Survey. The Household Pulse Survey was designed to quickly collect data to measure household experiences during the COVID-19 pandemic. Data was disseminated in near real-time to inform federal and state response and recovery planning. Phase 2 of the Household Pulse Survey is currently under consideration.

Figure 16 presents a summary of income-related questions in the Household Pulse Survey for the Southeast Florida region—defined as Miami-Dade, Broward, and Palm Beach counties. The left side of the figure shows that the percentage of adults whose households have experienced a loss of income since the pandemic started is greater in Southeast Florida than in the US as a whole. At the end of the Household Pulse Survey in July 2020, 57 percent of Southeast Florida adults had lost income since the start of the pandemic, compared with 51 percent of American adults. The right side of the chart shows a sharp increase in the share of Southeast Florida adults expecting a loss of income in the next four weeks from the time they were surveyed, compared with the relatively steady outlook across all American adults.

Figure 16. Income Loss in Household Pulse Survey

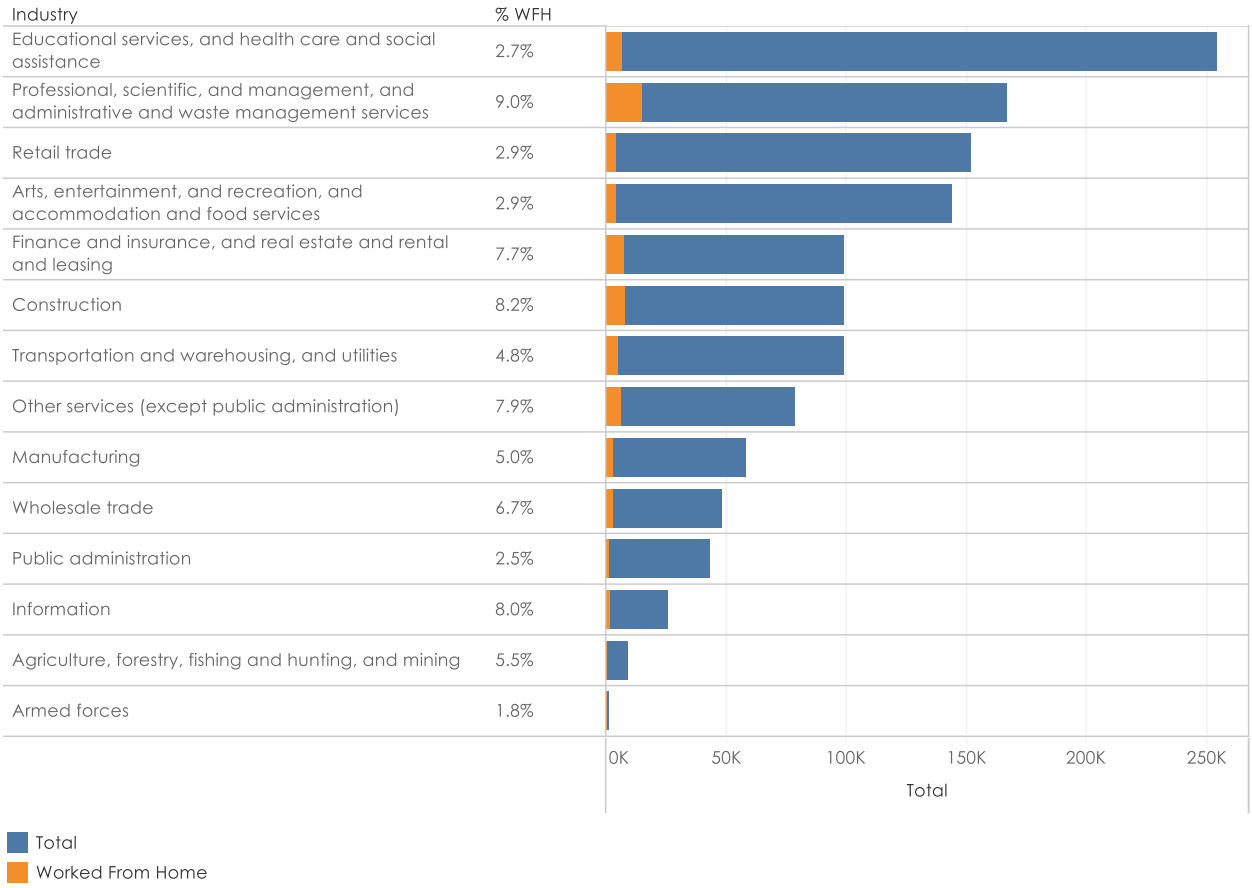


Source: US Census Household Pulse Survey (2020)

2.3.1.2 American Community Survey

The US Census' American Community Survey (ACS) contains valuable pre-COVID-19 data on employment by industry in Miami-Dade County. The ACS also reports mode of travel for work commute trips, including working at home. Between 2014 and 2018, approximately five percent of Miami-Dade County workers over 16 years of age responded that they worked at home, although that percentage was nearly double that for certain industries. **Figure 17** summarizes this information for high-level industry types. Additional discussion on this topic is included in the *2.9.2 Target Industries and Job* Functions section later in this document.

Figure 17. Miami-Dade County Workers by Industry and Work from Home Commute Share



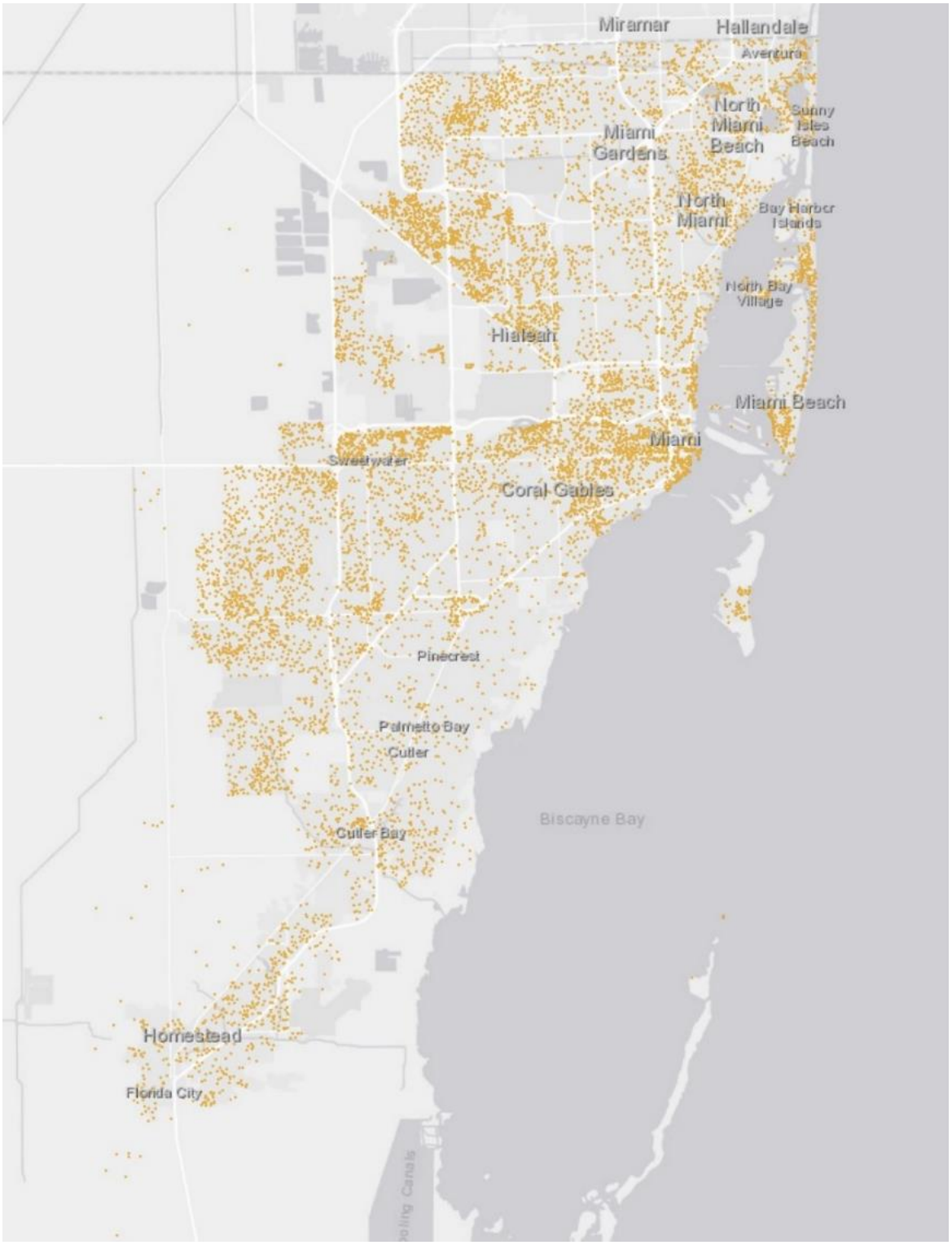
Source: American Community Survey 2014-2018 Table B08126

A map showing how workers in the top telecommuting industries (by rate) are distributed in Miami-Dade County is presented in **Figure 18**. The top telecommuting industries were defined as those with a work from home percentage greater than 7 percent. For Miami-Dade County, the top work from home industries are the following:

- Professional, scientific, and management, and administrative and waste management services
- Construction
- Information
- Other services (except public administration)
- Finance and insurance, and real estate and rental leasing

As seen in **Figure 18**, the highest number of workers in telecommuting-prone industries are in Coral Gables, downtown Miami, Miami Beach, Hialeah, and Sweetwater.

Figure 18. Number of Jobs in Top Telecommuting Industries



Source: American Community Survey 2014-2018, OnTheMap |Note 1 dot equals 20 jobs.

2.3.2 REAL-TIME Indicators

Although the survey-based indicators by the US Census and other government agencies are the official statistics on employment and the economy, they generally lag several weeks or months as data has to be collected, processed, and published. To complement the findings from these surveys, real-time data was obtained from private and public sources to help understand recent economic trends in more detail.

The Opportunity Insights Economic Tracker combines anonymized data from private companies—including credit card processors and payroll firms—to provide a real-time picture of indicators such as employment rates, consumer spending, and job postings across counties, industries, and income groups. **Figure 19** highlights two metrics available from Opportunity Insights that track closely with transportation demand: consumer spending and small businesses open.

The Southeast Florida region experienced a deep contraction in consumer spending through March and April 2020, bottoming out at about 45 percent lower than January 2020—compared with 30 percent lower for the United States as a whole. Consumer spending in Southeast Florida has since recovered and in mid-August 2020 was only 13 percent lower than in January 2020. On the other hand, the recovery of small businesses appears to have stalled or reversed both for Southeast Florida and the United States as a whole.

Figure 19. Consumer Spending and Small Businesses Open

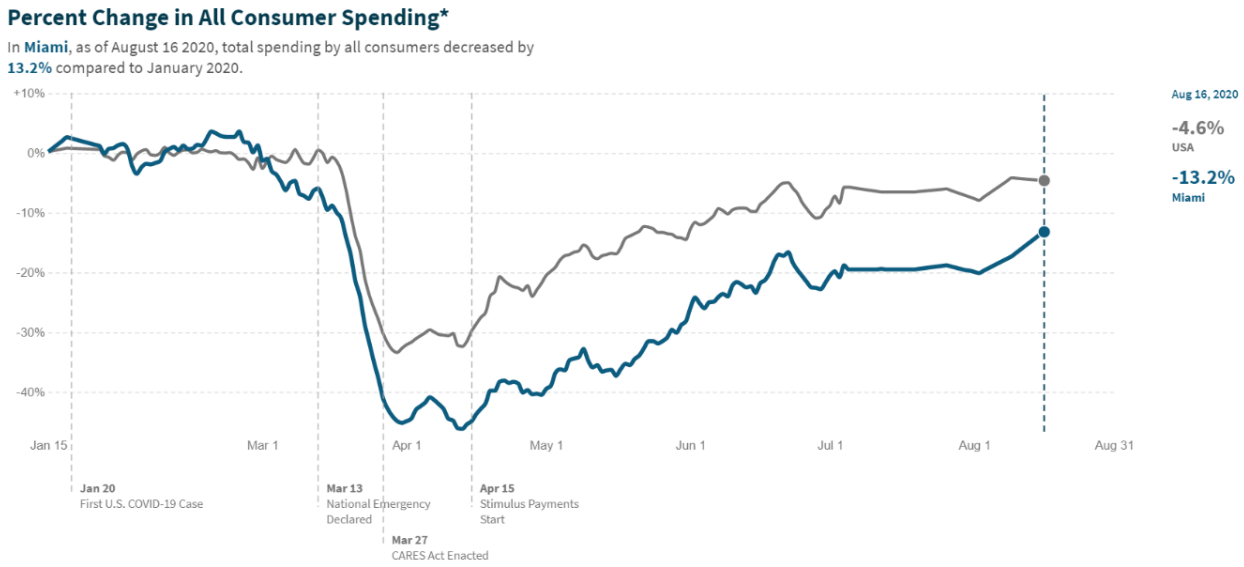
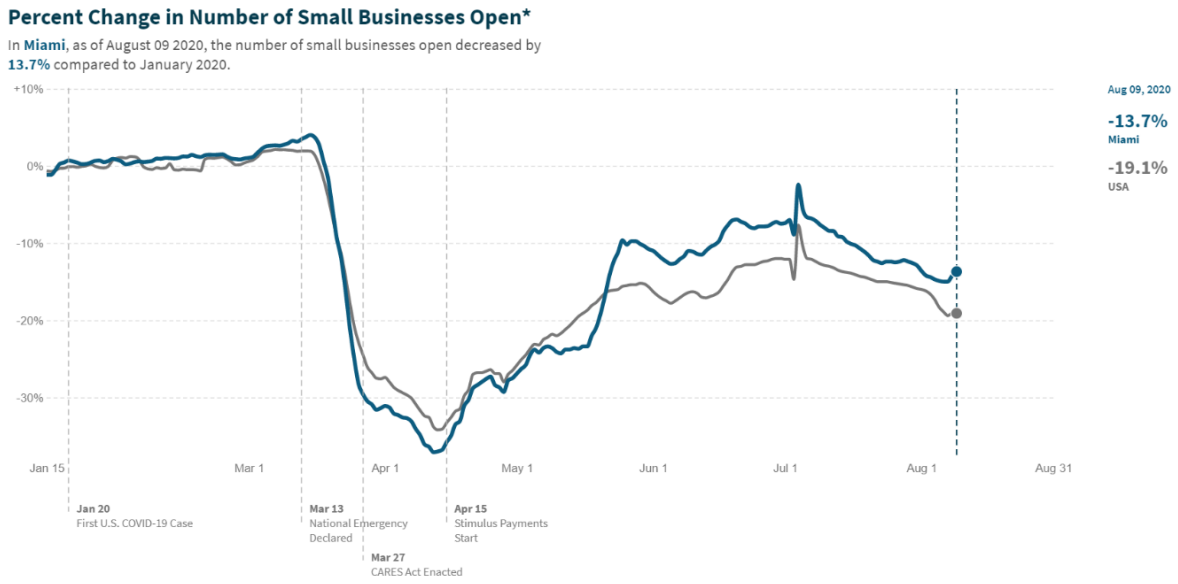


Figure 19.Consumer Spending and Small Businesses Open continued

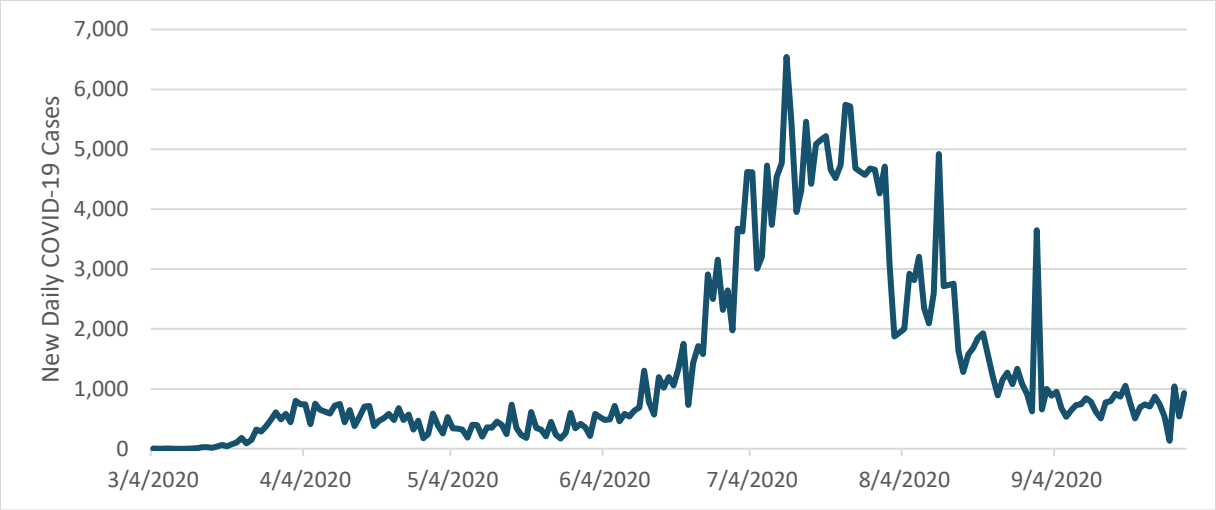


Source: Chetty, Friedman, Hendren, Stepner, and the OI Team (2020)

2.4 COVID-19 Case Data

While telecommuting is not a new concept or trend, it has been expanded necessarily as a result of the COVID-19 pandemic. The first positive confirmed case of COVID-19 in Miami-Dade County occurred on March 4th, and by March 19th, all non-essential businesses were ordered to close in the County. On May 15th, some businesses were allowed to reopen, following CDC guidelines. Whether the reopening of businesses or the Memorial Day holiday weekend significantly contributed to an increase in COVID-19 cases in Southeast Florida is uncertain; however, daily cases began to increase in mid-June. On June 15th, daily cases in Southeast Florida (Miami-Dade, Palm Beach, and Broward counties) were over 1,000 for the first time, and by July 11th, cases peaked at 6,500 cases registered in one day. **Figure 20** depicts the daily COVID-19 cases in Southeast Florida, and **Figure 21** depicts the cumulative number of COVID-19 cases. From March through May, COVID-19 cases in Southeast Florida remained relatively low and never topped 1,000 cases a day.

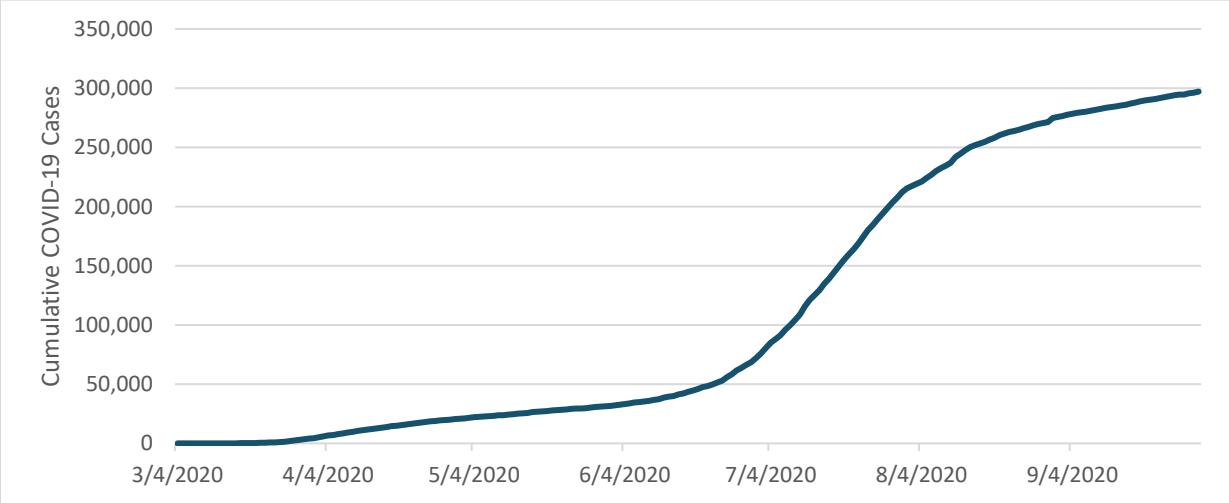
Figure 20. Southeast Florida Daily COVID-19 Cases



Source: Florida Department of Health

As depicted in **Figure 21**, there was a drastic increase in the slope of cumulative cases from the middle of June to the middle of August, which shows the rapid and sizable increase in COVID-19 cases in Southeast Florida. Miami-Dade County's responses to this peak included limiting restaurant capacity, requiring some businesses such as movie theaters to close, establishing a countywide curfew, and requiring masks to be worn in public at all times. By September, the cases in Southeast Florida dropped below 1,000 daily cases for the first time since June.

Figure 21.Cumulative Southeast Florida COVID-19 Cases



Source: Florida Department of Health

Overall, the COVID-19 case shows how the pandemic has impacted policy, which in turn can impact business and traffic metrics such as unemployment and traffic volume. Additionally, the pandemic has affected people's individual travel choices and comfort as well.

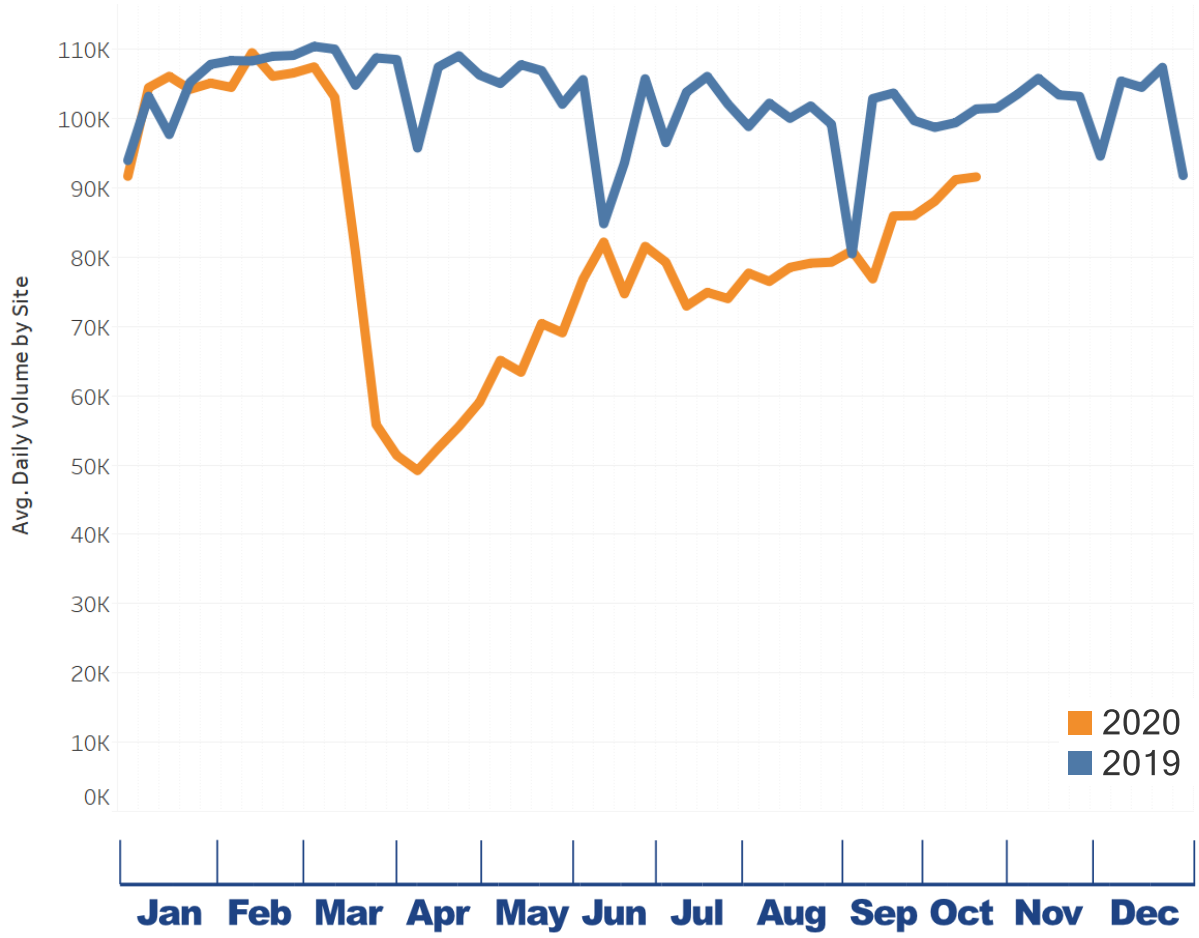
2.5 Traffic Volumes

The traffic trends during the pandemic tell an interesting story about the impact of the virus on telecommuting, unemployment, and other factors related to the reductions in travel. The overall trend clearly points to a reduction in traffic, although, as pandemic-related policy has shifted and businesses have reopened, the ensuing recovery has resulted in increased traffic, although not yet to pre-pandemic levels. This section describes trends in traffic volumes from in-road counters and mobile device data.

2.5.1 IN-ROAD COUNTERS

FDOT's Traffic Engineering and Operations Office maintains an interactive dashboard showing near-real-time traffic counts from in-road counters on major roads across the state. **Figure 22** presents the average daily traffic across count sites on major freeways in Miami-Dade County. Following a steep dive in March 2020, traffic volumes have recovered and are now only about 15 percent lower than at the same time during 2019—compared with 50 percent lower in early April 2020. The temporary dips in traffic in May and September of 2019 are the result of isolated events and likely do not bear a direct relationship to 2020 traffic. The sharp downturn in in September 2019, for example, corresponded to the effects of Hurricane Dorian.

Figure 22. Weekday Traffic Volumes on Major Freeways in Miami-Dade County

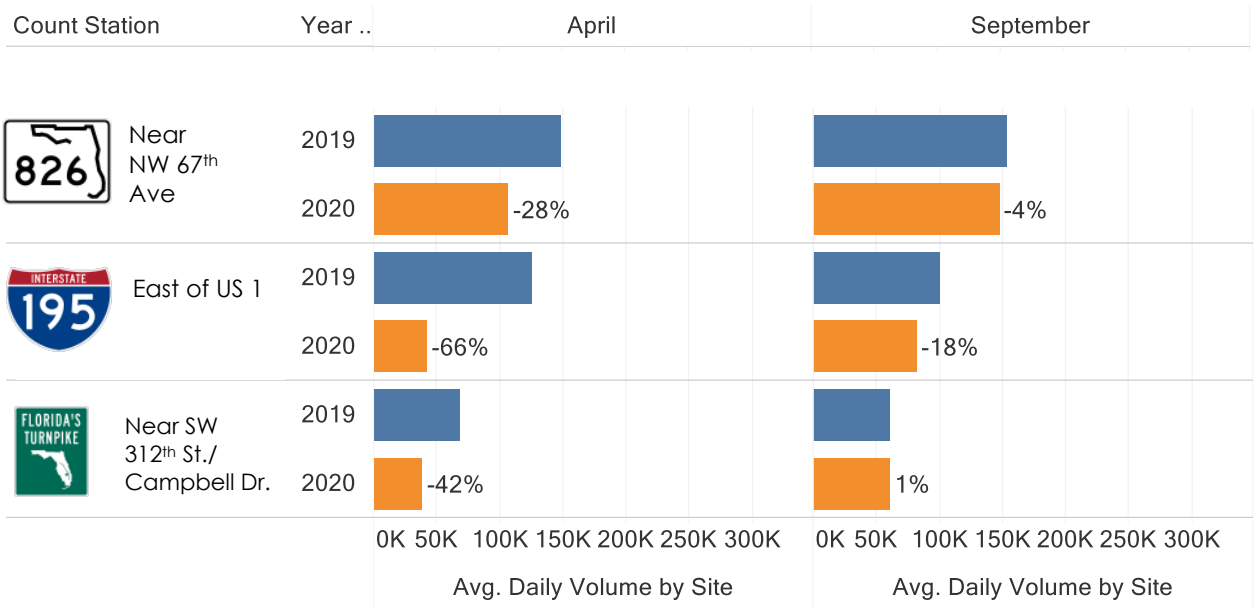


Source: FDOT continuous counters.

In addition to the average volumes across all freeways, the same dataset was evaluated on a facility basis to compare 2019 and 2020 levels for facilities in Miami-Dade County. **Figure 23** provides this breakdown,

comparing average daily volumes in April and September of 2019 and 2020. Traffic on some facilities have almost recovered to 2019 levels, but facilities like SR 878—which connect the suburbs to the urban centers—are still significantly below 2019 levels. This may be because the users of these facilities are more telecommute oriented in terms of types of employment.

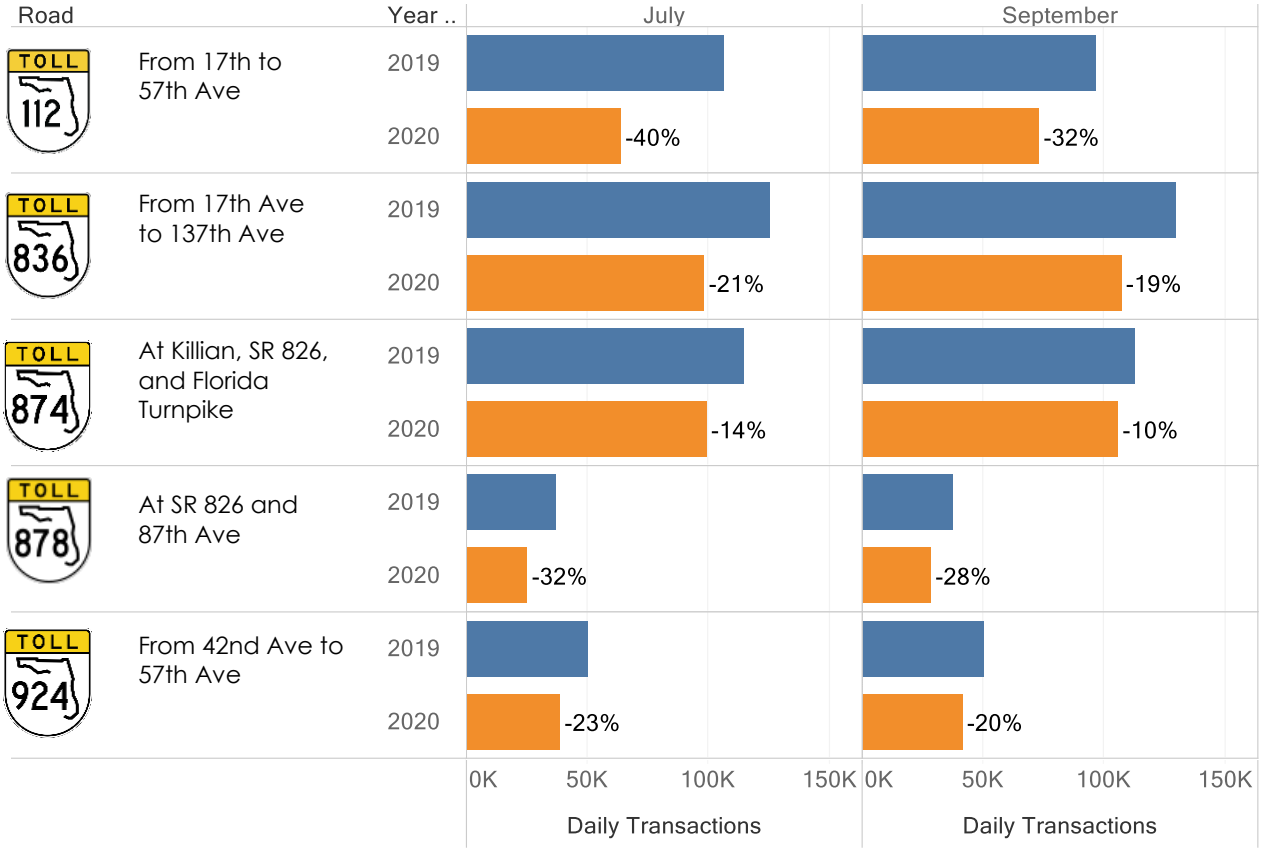
Figure 23. Weekday Traffic Volumes on Major Freeways in Miami-Dade County - By Facility



Source: FDOT continuous counters.

In addition to FDOT data, toll transaction data was obtained for five Miami Dade Expressway (MDX) facilities. **Figure 24** illustrates the changes in the number of daily transactions across five MDX facilities in July and September of 2019 and 2020. As with the FDOT counts, the largest decreases involve roadways that connect directly to major job clusters: SR 112 carried 32 percent fewer users in September 2020 as compared to September 2019, while SR 878 carried 28 percent fewer users in the same timeframe.

Figure 24. Daily Transactions on MDX Roadways - By Facility

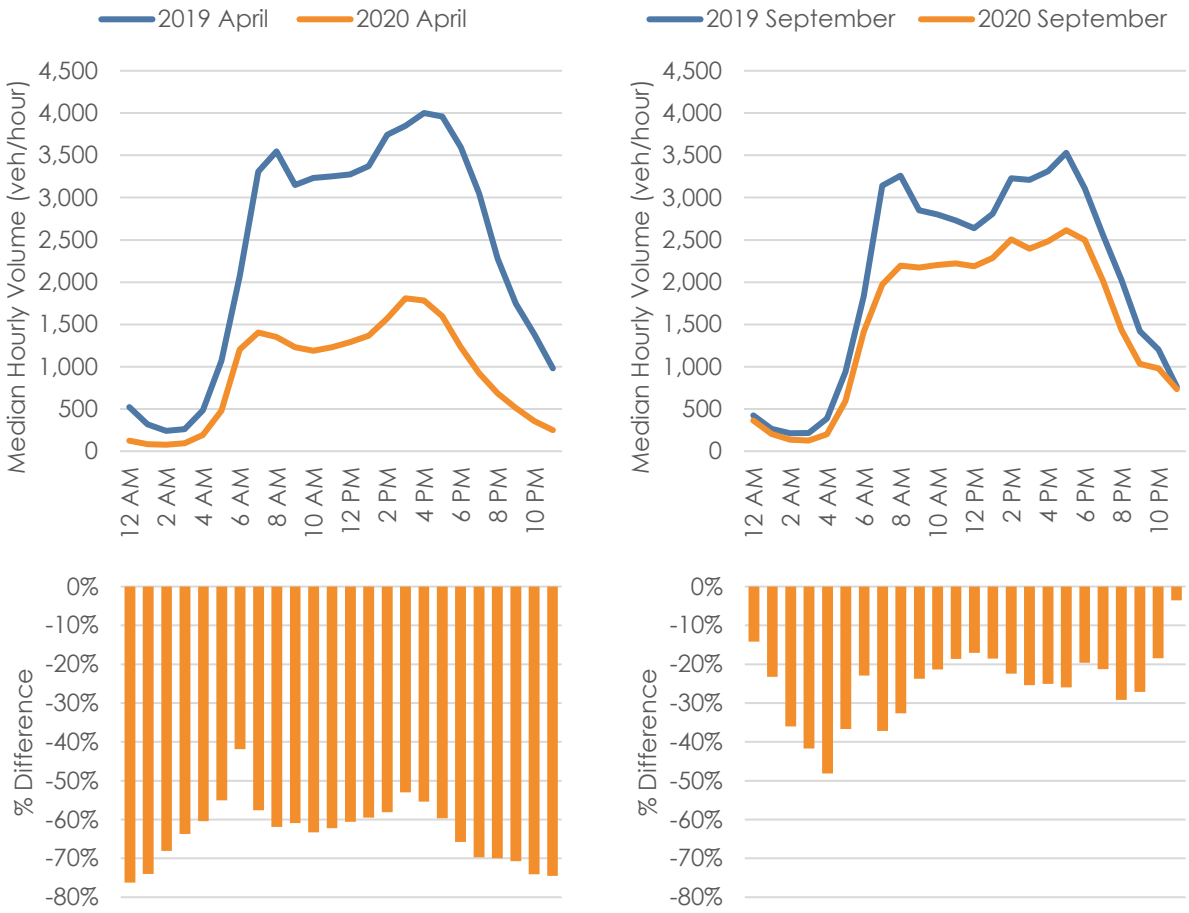


Source: MDX FY 20-21 toll transaction data.

Figure 25 shows the breakdown of the FDOT continuous counter data, in Miami-Dade County, by time-of-day in April and September of 2019 and 2020. The April data shows steep reductions in traffic volumes, up to 75 percent in certain hours. In September, volumes had partially recovered, and no hour was more than 50 percent lower than in 2019.

The analysis of percentage differences between 2019 and 2020 shows that there are also differences in time-of-day patterns between the two months. The smallest differences (i.e., highest volumes) in April 2020 corresponded to the AM and PM peak periods, and the largest differences (i.e., lowest volumes) in nighttime and early morning hours. In September, the situation is almost reversed: the smallest differences are at midday, late-night, and early morning, and the largest ones in the AM and PM peak periods. Instead of the typical dual peak patterns observed in September 2019, September 2020 resembled a typical weekend pattern. These findings may be indicative of a "bounce back" effect as telecommuters increase their non-work travel.

Figure 25. Weekday Traffic Volumes on Major Freeways in Miami-Dade County –By Hour



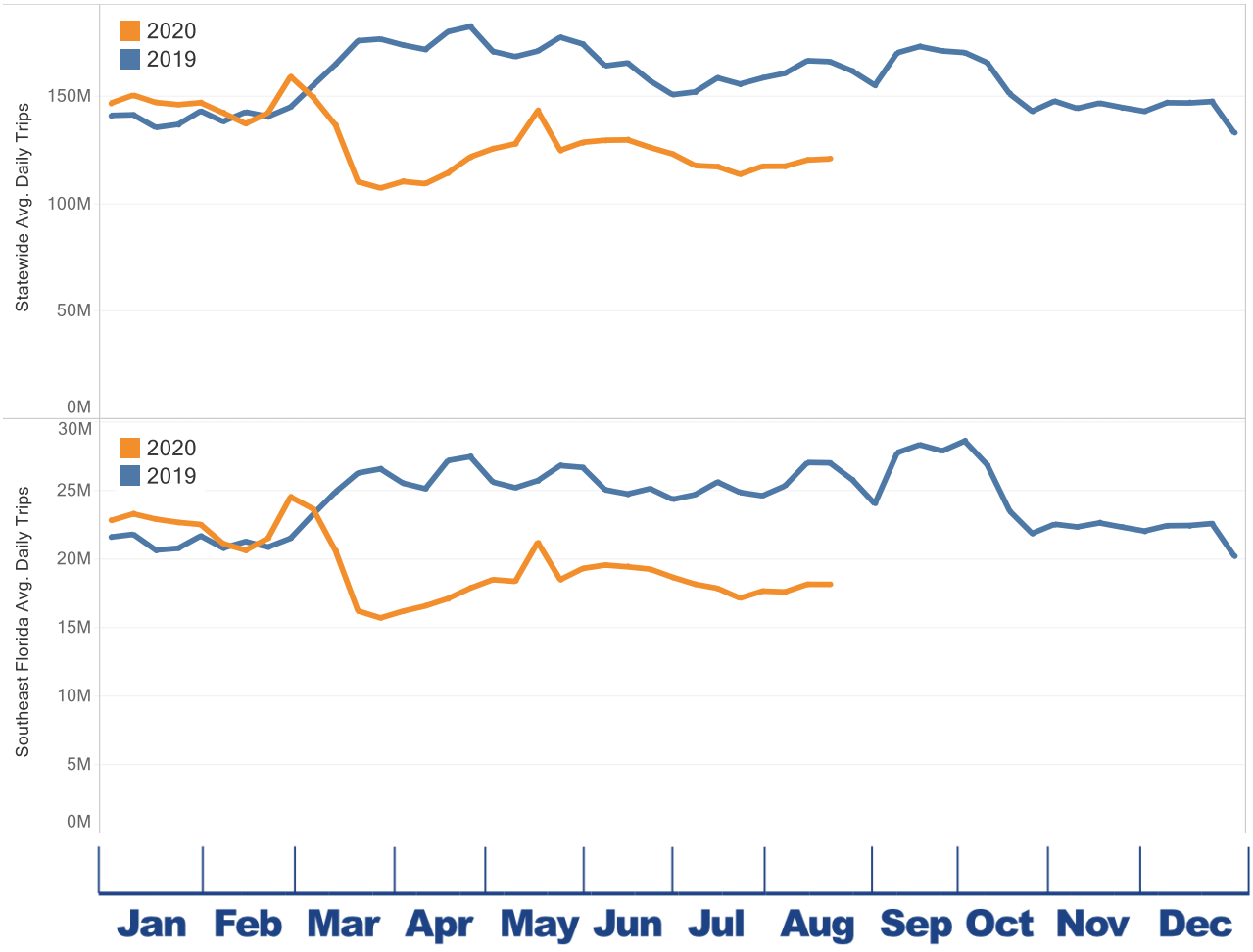
Source: FDOT continuous counters in Miami-Dade County

2.5.2 MOBILE DEVICE DATA

The Bureau of Transportation Statistics at the United States Department of Transportation (USDOT) published a dataset containing nationwide daily trips and trip length distributions from mobile device location data. The dataset contains daily figures for each county in the United States from 2019 through the present.

Figure 26 presents the average number of daily trips taken in Florida (top half) and Southeast Florida (bottom half). Both trendlines show a sudden decrease in trip making in March, which promptly began to recover but has flattened out in July and August 2020. The spike in the 21st week of 2020 (May 17-23, 2020) likely corresponds to Memorial Day travel.

Figure 26. Number of Daily Trips (Statewide vs. Southeast Florida)

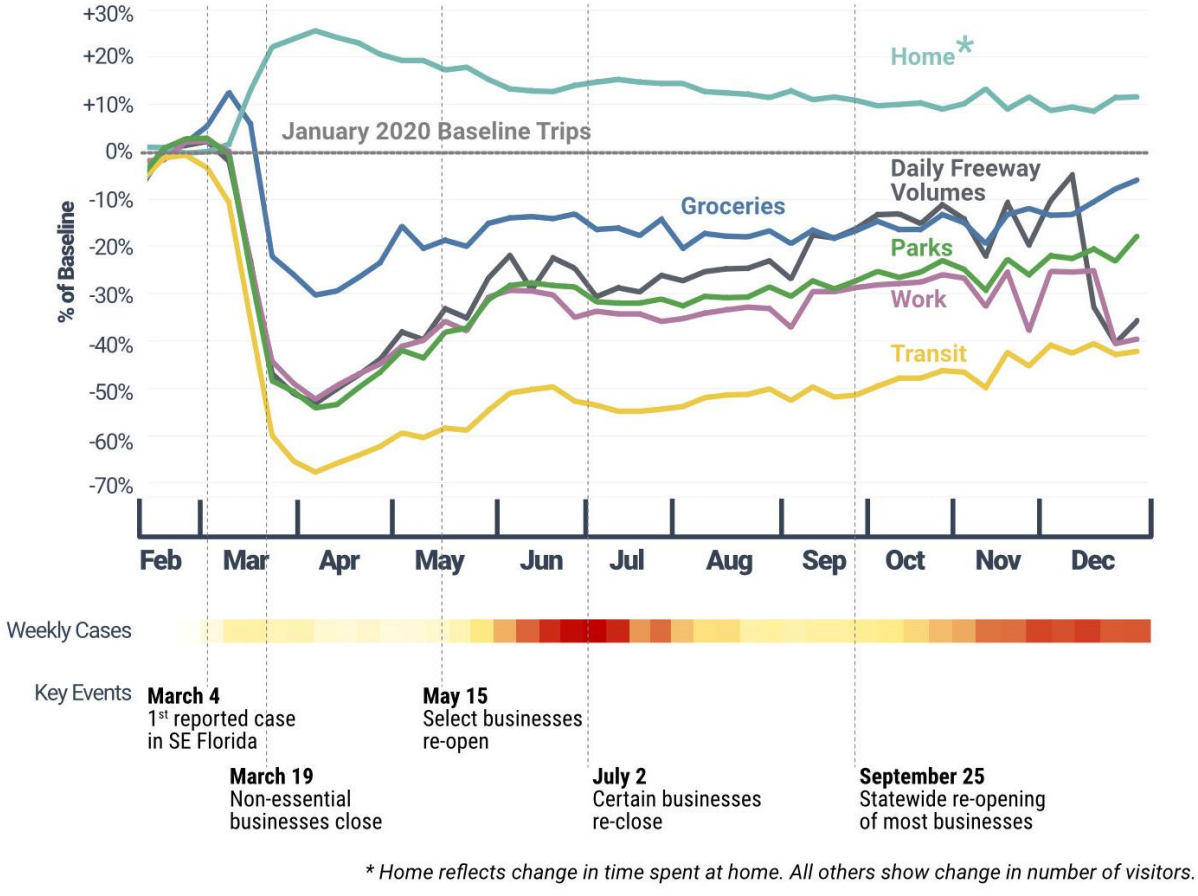


Source: USDOT Bureau of Transportation Statistics (2020)

In addition to the overall number of trips, mobile device data can also inform how trip making to different place types (e.g., grocery stores, workplaces, parks, etc.) is changing throughout the pandemic. **Figure 27** plots data from Google showing the percent reduction in trips in Miami-Dade County from a January 2020 baseline. To provide context, the daily volumes shown in **Figure 27** were normalized and included in the chart as a gray line. Similarly, weekly Southeast Florida COVID-19 case data and policy milestones were obtained from the Florida Department of Health and included in the chart.

The data from Google shows that transit stations have experienced the largest drop in trips over the course of the pandemic. On the other hand, the number of trips to grocery stores and related businesses (including pharmacies) increased in early March before dropping to about 30 percent lower than usual in April. The June-July increase in the number of weekly COVID-19 cases aligns with an interruption in the upward trajectory of all non-home place types. The September data shows a return to an upward trajectory, especially for work trips. The resurgence of weekly COVID cases in November-December coincided with another decline in work trips and freeway traffic, while shopping and park trips seem to have continued to grow.

Figure 27. Change in Number of Trips by Place Type in Miami-Dade County



** Home reflects change in time spent at home. All others show change in number of visitors.*

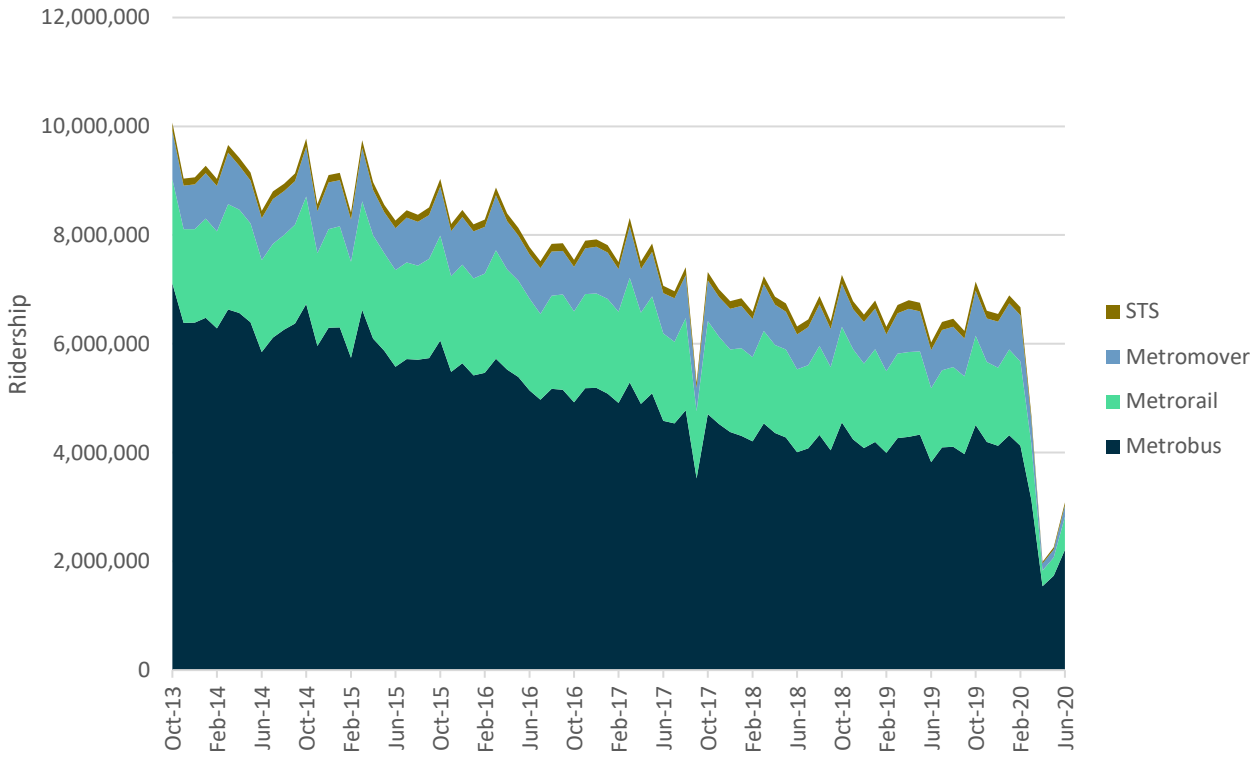
Source: Google Community Mobility Reports (2020-10-8) | ****Home uses time spent at home, not trips***
FDOT continuous counters in Miami-Dade (for traffic volumes)
Florida Department of Health (for weekly cases)

2.6 Transit Ridership

Monthly transit ridership was obtained from the Miami-Dade Department of Transportation and Public Works (DTPW) up to June 2020. **Figure 28** presents the monthly transit ridership in Miami-Dade County. Since 2013, transit ridership has declined from 10 million users per month in October 2013 to less than 7 million users per month at the beginning of 2020. The emergence of Transportation Network Companies (TNCs) such as Uber and Lyft likely have contributed to the decrease in transit ridership over this time period. In some cases, TNCs have directly replaced transit drips during off-peak times. If this trend continues after the pandemic, TNCs could absorb an increasing share of commuters.

The COVID-19 pandemic resulted in a large sudden drop in transit ridership, which dropped to around 2 million users in April and May 2020 before recovering to just over 3 million users in June 2020. June 2020's transit ridership was roughly 50 percent down from the pre-pandemic average in January and February 2020.

Figure 28. Monthly Transit Ridership in Miami-Dade County



Source: Miami-Dade County Transportation and Public Works Ridership Technical Report (January 2018 - June 2020)

2.7 Telecommunications Infrastructure

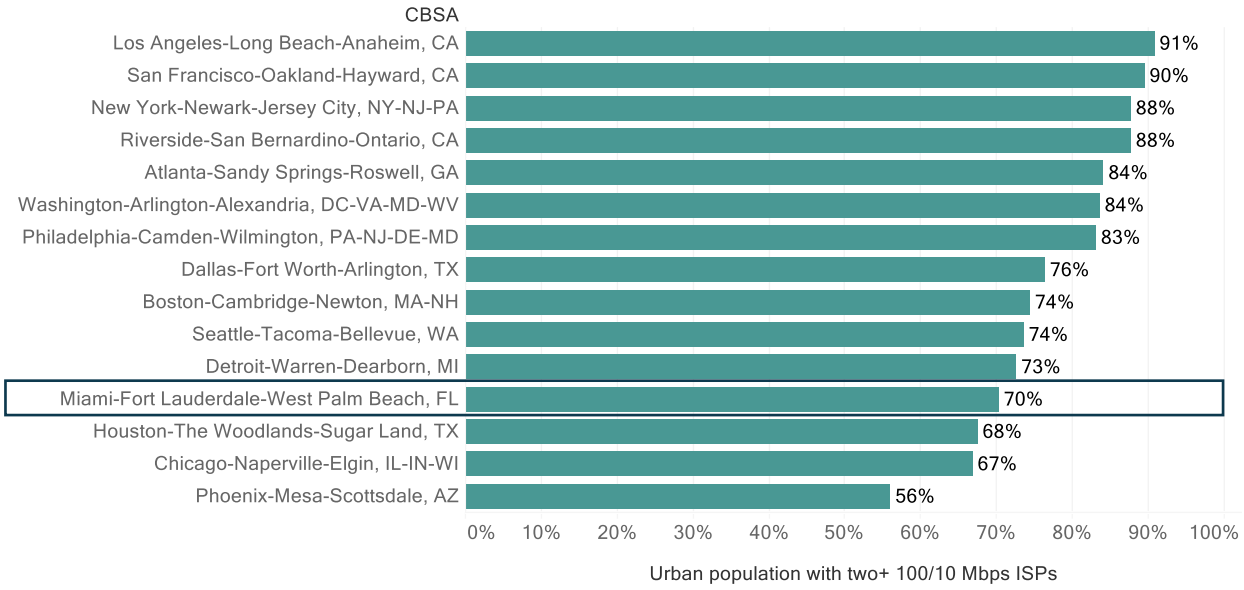
While telecommuting is not dependent on transportation infrastructure, it does require broadband internet infrastructure to be effective. The Federal Communications Commission (FCC) maintains the Fixed Broadband Deployment database to track the quality and access of internet service across the country. The FCC categorizes internet quality by type (e.g., broadband, satellite, etc.) and speed. The following speed categories—in megabits per second (Mbps) for download and upload— are available for selection in the FCC database:

- ≥ 0.2/0.2 Mbps (download/upload)
- ≥ 4/1
- ≥ 10/1
- ≥ 25/3
- ≥ 100/10
- ≥ 250/25
- ≥ 1000/100

In consultation with information technology experts, 100/10 Mbps was considered as the minimum speed that would allow full functionality of telecommuting software, including video calls, VPN, and cloud-based software licenses. While 25/3 Mbps may be sufficient for basic functionality, it would struggle when accessing large files, especially if the bandwidth is shared with multiple devices.

The March 2020 edition of the FCC Fixed Broadband Deployment database was obtained to benchmark the availability of telecommuting-capable internet in the Southeast Florida region. As shown in **Figure 29**, out of the 15 most populous metropolitan areas in the United States, Southeast Florida ranks 12th in the percent of its urban population that is covered by at least two internet service providers. In theory, when people have more providers to choose from, they receive better service and lower prices.

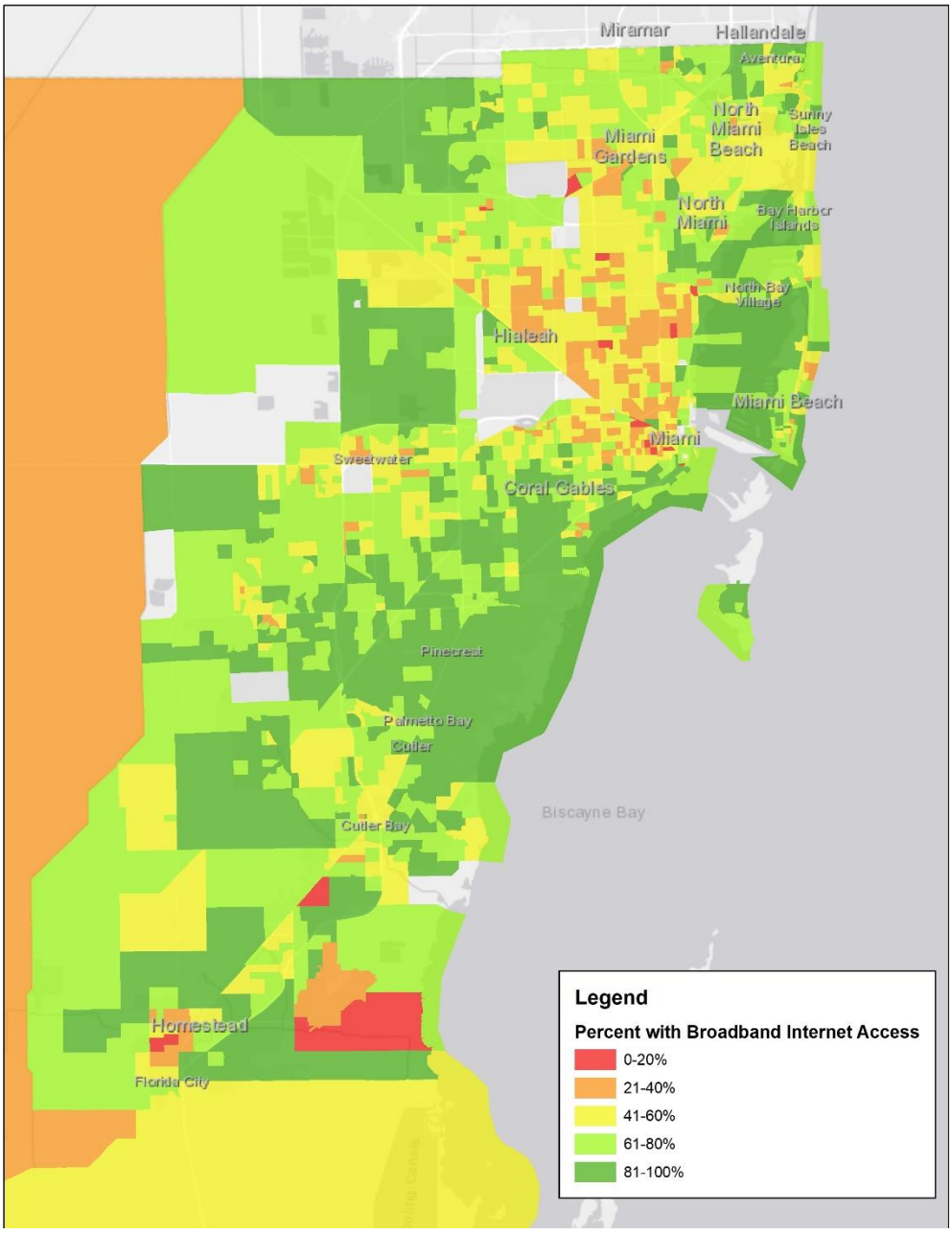
Figure 29. Percent of Urban Population with Two or More Providers of Telecommuting-Capable Internet



Source: FCC Fixed Broadband Deployment (March 2020)

The American Community Survey (ACS) administered by the US Census Bureau asks a question about broadband internet access and summarizes the results by census block group. **Figure 30** depicts the percentage of households reporting that they have broadband internet by census block-group. For the areas in gray, no data was available from the ACS for percentage with broadband internet access.

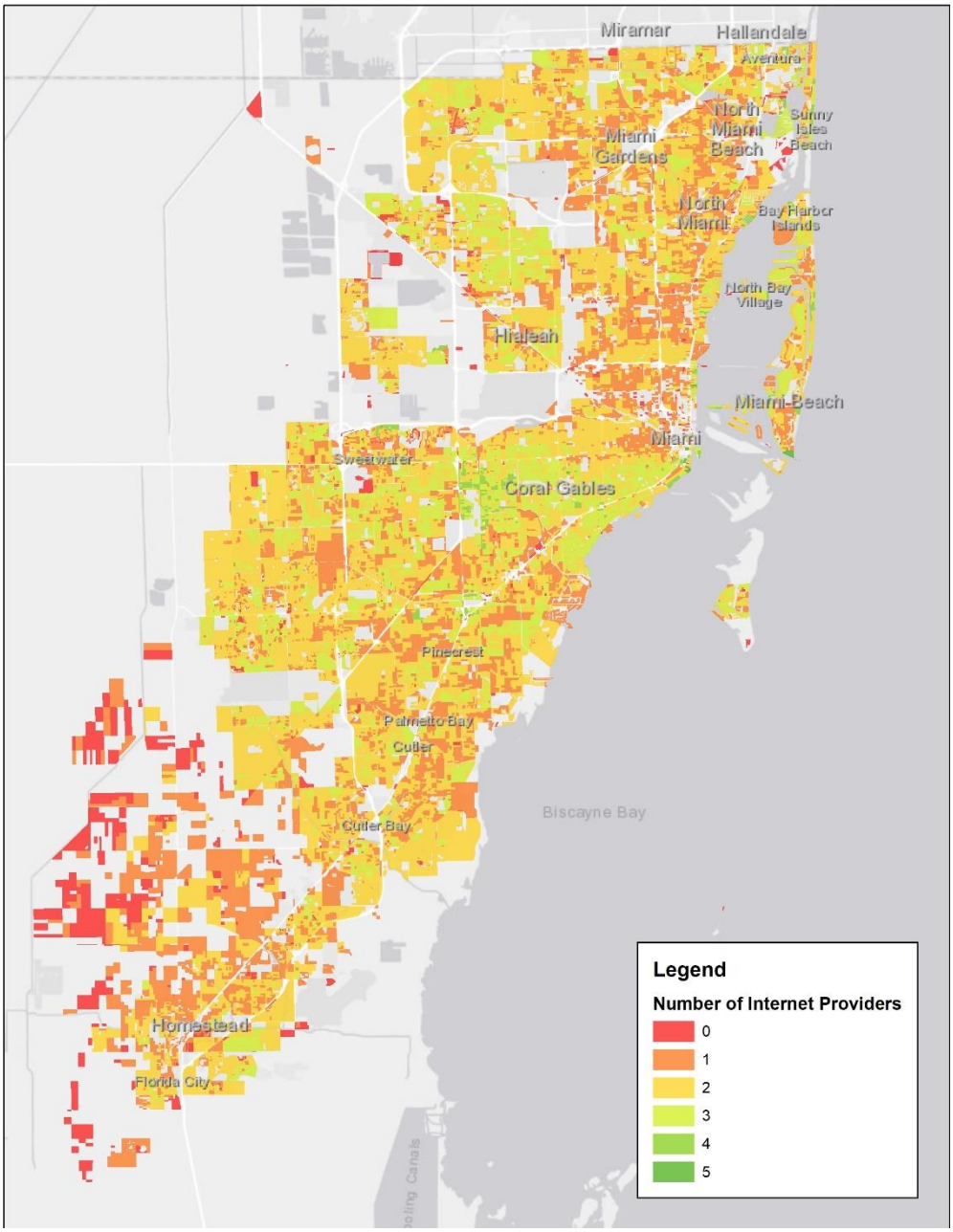
Figure 30. Broadband Internet Access by Census Block-Group



Source: American Community Survey 2014-2018 | Note: areas in gray do not have data available.

Using the FCC data discussed above, the number of internet providers with a minimum internet speed threshold by census block was mapped in **Figure 31**. The analysis was completed using a minimum population density of 100 people per square mile. Census blocks that did not meet this threshold were excluded from the map and are shown in gray. In Miami-Dade County, most census blocks only have one or two internet providers that can provide adequate telecommuting internet speeds (at least 100/10 Mbps).

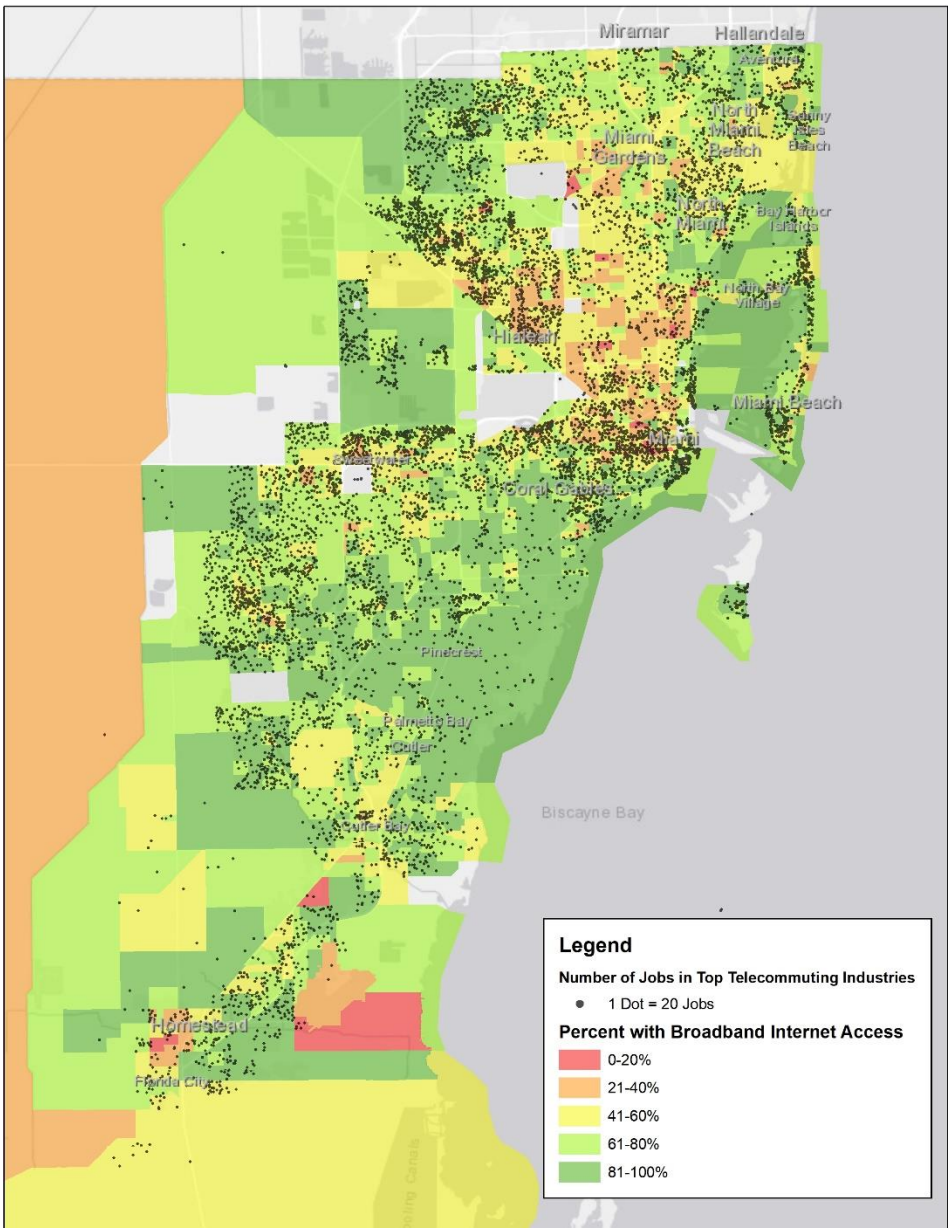
Figure 31. Number of Internet Providers with a Minimum Speed of 100/10 Mbps



Source: FCC, Miami-Dade TPO | Note: areas in gray do not have a population density greater than 100 people per square mile and are excluded from the figure.

Figure 32 depicts where workers live in relation to concentrations of jobs conducive to telecommuting and the overall broadband internet access, indicating relatively good broadband access in the areas most conducive to telecommuting.

Figure 32. Number of Telecommuting Jobs and Broadband Internet Access



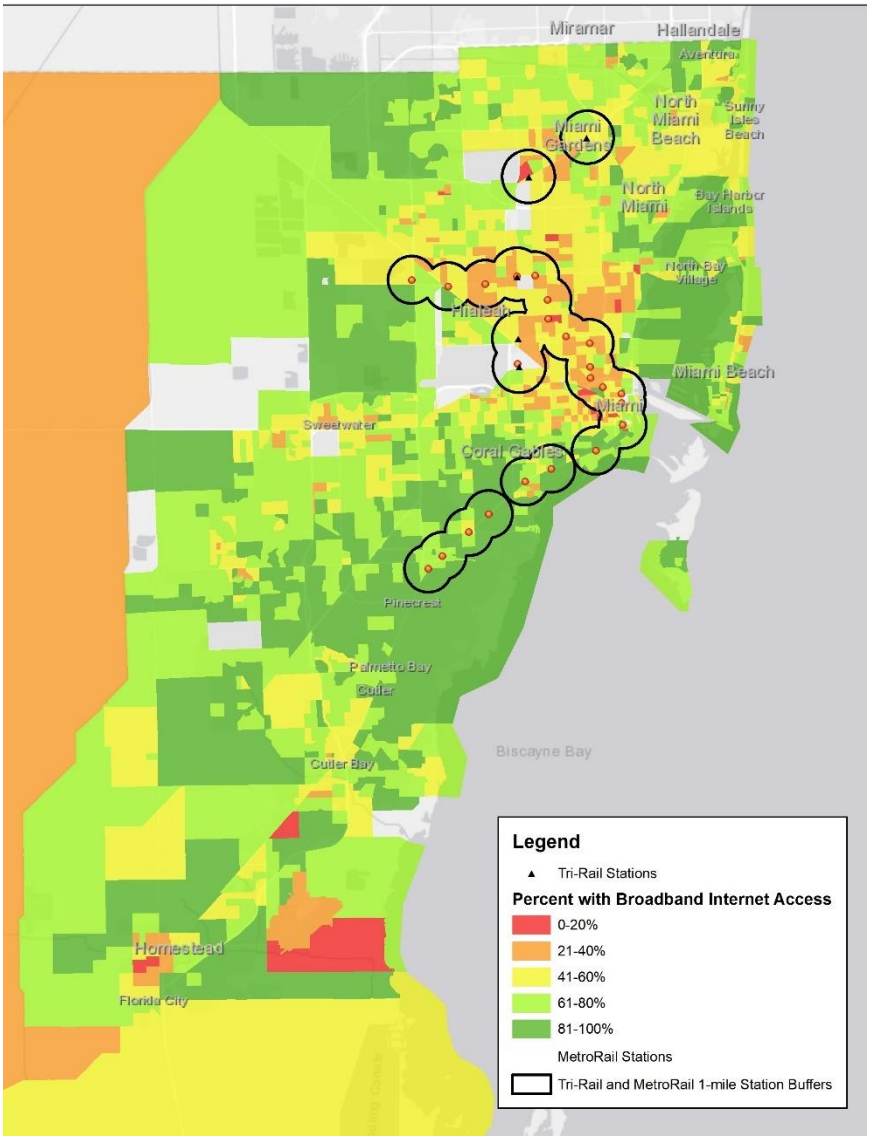
Source: American Community Survey 2014-2018, OnTheMap

2.8 Transportation Infrastructure

The potential complementary effects of telecommuting and continued investment in the County's premium transit system are explored in the policy recommendations technical memorandum, including leveraging transit-oriented communities (TOC) to support a range of mobility strategies. One of the advantages of strategically planned TOC is the potential for increased non-motorized mode share for both work travel and non-work travel like shopping, health care, and recreation. Another potential strategy is to facilitate telecommuting centers at transit station areas to increase telecommuting percentage and decrease overall VMT.

An analysis of existing Tri-Rail and Metrorail station areas in Miami-Dade County relative to broadband internet access reveals relatively low access to broadband internet and few internet providers in roughly half of the station areas, as shown in **Figure 33**.

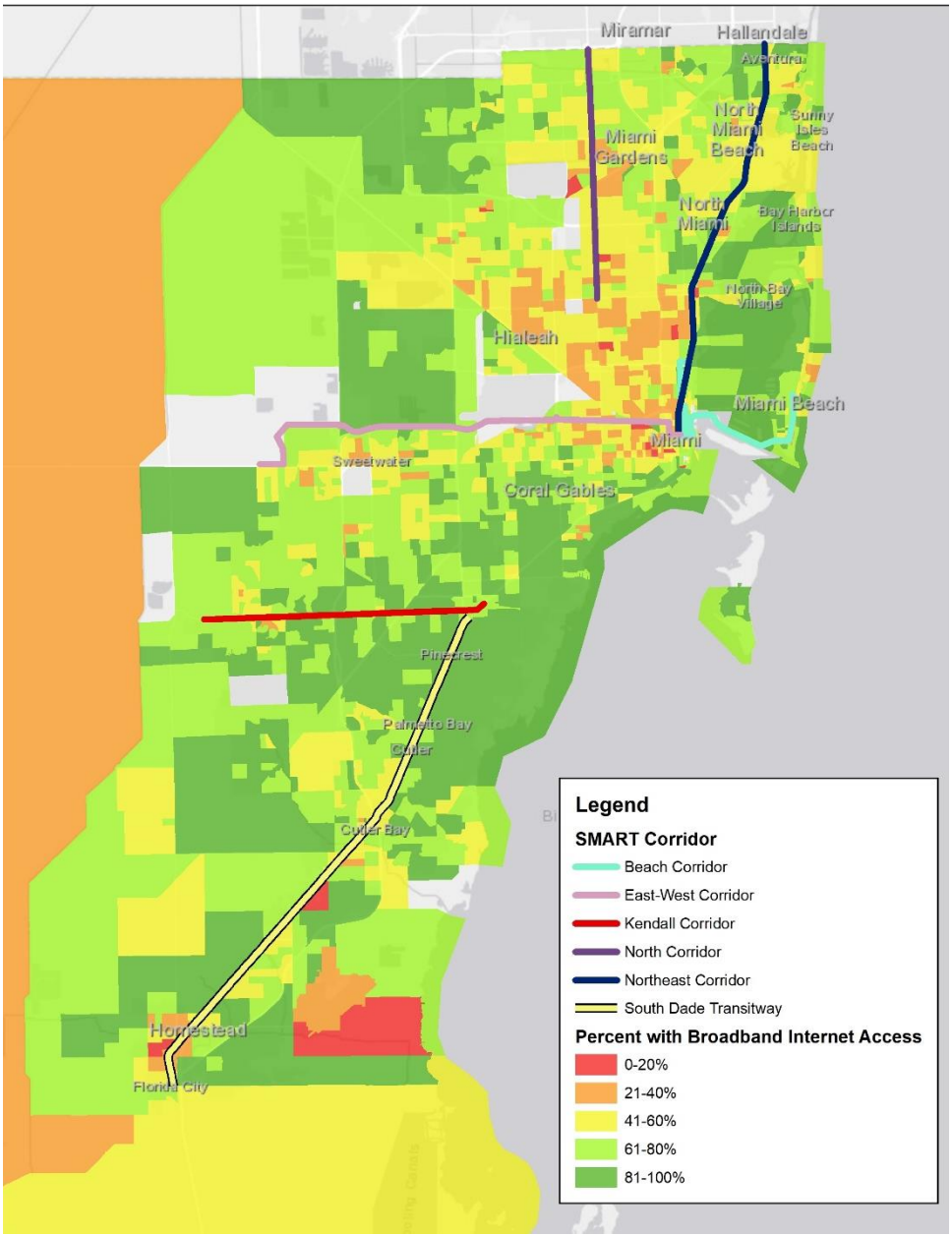
Figure 33. Percent Broadband Access with Transit Stations



Source: American Community Survey 2014-2018 | Note: areas in gray do not have data available.

The Miami-Dade TPO, through the SMART Plan, has identified six corridors for rapid transit service. By overlaying these corridors with existing internet access, it is possible to gauge the potential co-location of telecommuting centers in TOC areas. **Figure 34** below shows the SMART corridors and broadband internet access. From **Figure 34**, there is potential along the North, Northeast, and South Dade corridors to expand internet access.

Figure 34. SMART Corridors and Percent with Broadband Internet Access

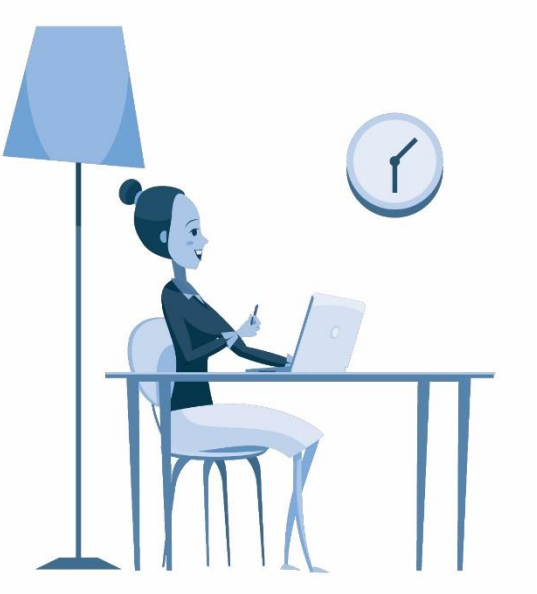


Source: ACS, Miami-Dade TPO | Note: areas in gray do not have data available.

In Miami-Dade County, the identified SMART Plan corridors provide an opportunity to develop telecommuting centers around new Transit Oriented Community (TOC) development. Existing Tri-Rail and MetroRail station areas north of the Miami River have less internet access and fewer internet providers compared to stations south of the Miami River. Additional TOC developments in existing station areas could provide an opportunity for telecommuting centers and internet access expansion as well.

2.9 Telecommuting Assessment

Analysis of the data presented in this section of the report reveals both challenges and opportunities associated with a sustained telecommuting trend in Miami-Dade County and provides insights to inform potential telecommuting policy recommendations. A balanced assessment of input provided by the working public, parents of school children, school teachers, and university students; traffic and transit ridership data; telecommunications infrastructure data; and employment data is summarized in this section. This section summarizes the findings of *Task 3: Telecommuting Assessment*, which interprets the data presented above and sets the stage for upcoming recommendations as part of *Task 4: Development of Recommendations and Roadmap to Implementation.*



2.9.1 PUBLIC AND STAKEHOLDER INPUT

The range of input types and groups represented in the telecommuting assessment provides a comprehensive accounting of the public, student body, business, health care, and institutional viewpoints on the topic. Based on the feedback received through the FDOT D6/FIU survey, other surveys, the literature review, and the executive roundtable discussion, primary advantages and disadvantages of telecommuting were identified and summarized below.

2.9.1.1 Advantages

The primary advantages of telecommuting, in order of how frequently they were selected in the various surveys, are presented below:

1. **Reduced commuting time.** Unsurprisingly, the main benefit reported by telecommuters is the elimination or reduction of commuting time. According to the US Census, the average Miami metropolitan area worker spends one hour to commute to/from work every day. Workers commuting into downtown Miami during peak hours likely experience even longer commutes. Survey and stakeholder feedback received as part of this study has emphasized the importance of even one additional hour of productive awake time.
2. **Additional flexibility.** Telecommuting enables students, employees, and employers to have a more flexible work schedule. Survey respondents indicated that this flexibility enhanced their work/life balance. The ability to work from home has been especially appreciated by employees who care for others, such as young children or elderly relatives. Although school closures and constraints at nursing homes will ease once COVID-19 is no longer a threat, the appeal of a flexible work schedule is likely to endure.
3. **Cost savings.** Employers responding to the FDOT D6/FIU survey cited cost savings as one of the top benefits of telecommuting. Organizations that promote telecommuting claim that employers can save an average of $11,000 per year for each employee that telecommutes. The Kittelson survey

found that under a telecommuting-friendly policy, employers in the engineering and consulting industry could reduce their office space by about a third and still have the same square footage per employee physically present on any given day. On the employee side, telecommuting can result in lower transportation, restaurant, and clothing expenses, although it may increase spending on utilities and groceries.

2.9.1.2 Disadvantages

The main disadvantages, in order of how frequently they were selected in the various surveys, are presented below:

1. **Lack of equipment and uncomfortable workspaces.** Given the sudden nature of the COVID-19 pandemic and the resulting adoption of telecommuting policies, a lack of equipment and comfortable workspaces was to be expected. Many people were forced to bring their work into their living spaces with little notice. This was particularly challenging for people living in small spaces, sharing rooms or apartments, or with poor internet connections at home. Companies that were not set up to work remotely had to undergo a rapid and disruptive period of adaptation to keep their workflows going. To further exacerbate these issues, a crunch in the supply chain for office equipment—especially laptops, webcams, headsets, and similar—made it even harder to attempt to replicate the office experience at home.
2. **Difficulty in communications and lack of socializing.** Despite marked improvements in communications software over the past ten years, most employees, employers, and students feel that the virtual environment is not a full substitute for in-person interaction. While some people have telecommuted for years and manage to be fully engaged in their jobs, it takes an added degree of effort, organization, and coordination to make it happen. In-person interaction is more spontaneous, richer, and, for some respondents, necessary to feel satisfied with their work-life. Virtual conferences are a prime example of this phenomenon. They may be a more efficient way to divulge information, but they lack the social component that most conference attendees experience in hallway conversations, lunch breaks, or evening receptions.
3. **Distractions at home.** Some survey respondents noted that working at home involved more distractions than working at an office. Beyond the limitations in equipment and workspace discussed above, working at home could be subject to more distractions—particularly for those who care for others or share limited workspaces. Regardless of particular situations, it appears that distractions become more likely when people use the same space for living and working.
4. **Increased cybersecurity risks**. During the executive roundtable, the challenge of increased cybersecurity risks was brought up as a disadvantage to telecommuting, especially for smaller businesses. Companies may need to spend more upfront to mitigate cybersecurity risks across multiple internet connection points and for both work and personal devices.

2.9.2 TARGET INDUSTRIES AND JOB FUNCTIONS

A review of telecommuting literature, including the experiences, policies, and strategies documented in other metropolitan areas, found that telecommuting policies have traditionally targeted high-wage professionals in a relatively narrow range of industries. However, the broad transition to teleworking resulting from the COVID-19 pandemic has shown that a much larger percentage of workers may be able to telecommute at least occasionally.

The analysis of telecommuting by industry in Miami-Dade County shows that working from home was already possible in most industries before the COVID-19 pandemic, although certain functions within each industry may not be doable from a remote setting. According to the US Census' ACS, the industries with the most remote workers in Miami-Dade County prior to COVID-19 were:

- Professional, scientific, and management (15,100 teleworkers, making up 9.0% of its workforce)
- Construction (8,100 teleworkers, 8.2%)
- Finance and insurance, and real estate and rental and leasing (7,700 teleworkers, 7.7%)
- Educational services, and health care and social assistance (6,900 teleworkers, 2.7%)

Despite having a high *percentage* of teleworkers (8.0%), the information sector (e.g., software, analytics, technology, etc.) lags behind other larger industries in Miami-Dade County, such as retail and hospitality, in terms of total number of teleworkers.

As to specific job functions within each industry that may be receptive to telecommuting, the literature review found that functions that primarily involve reading, writing, data entry, or analysis and that require little or no specialized equipment, were most easily transitioned to a remote environment. **Table 3** was used by the County of Santa Clara (CA) to assess the feasibility of remote work by employee function. The more rows that are selected as "Always", the higher the potential for successful telework.

Table 3: Telecommuting Assessment Tool

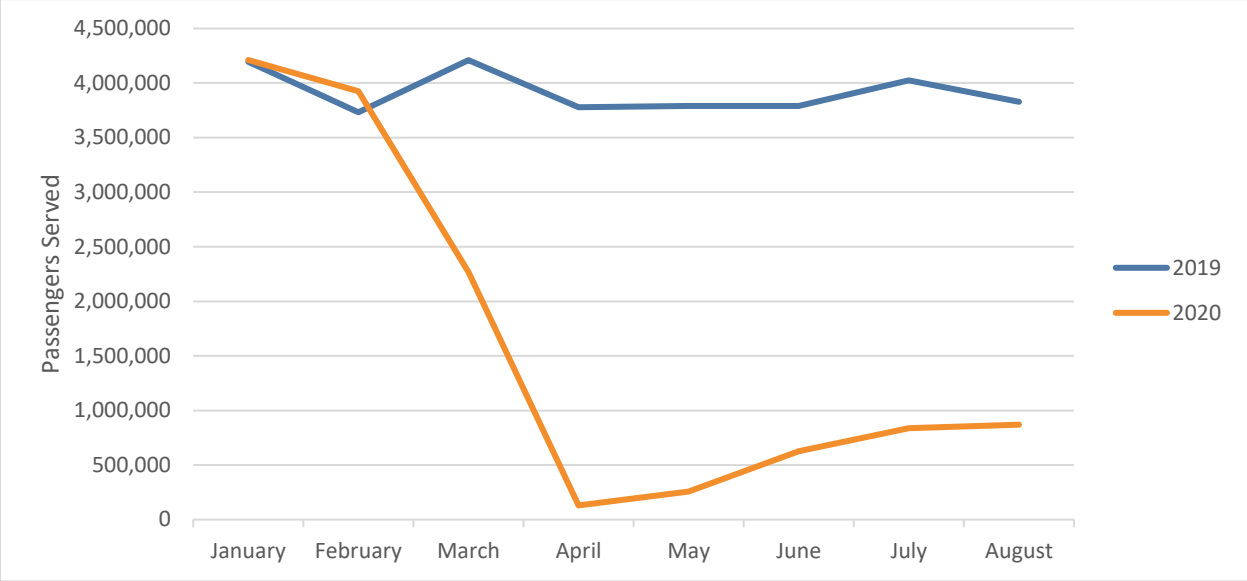
JOB FUNCTION	ALWAYS	SOMETIMES	NEVER
Tasks or functions can be independently performed	☐	☐	☐
Primary tasks require large blocks of time that involve analysis, planning, data entry, reading, writing, programming	☐	☐	☐
Clearly defined tasks and projects with measurable objectives	☐	☐	☐
Work can be scheduled/time controlled	☐	☐	☐
Other employee functions are minimally affected	☐	☐	☐
Need for specialized material or equipment is minimal	☐	☐	☐
Access to proprietary systems is minimal	☐	☐	☐
Access to proprietary data is minimal	☐	☐	☐
Need for face-to-face interaction is minimal; telephone or email is sufficient	☐	☐	☐

Source: County of Santa Clara Telework Assessment Tool

2.9.3 TOURISM IMPACTS

Despite the increase in telecommuting during the pandemic and its potential to continue above pre-COVID-19 levels for the next few years, it is noted that not all of the reduction in congestion described in previous sections is attributable to telecommuting. COVID-19 has significantly impacted tourism in Florida and Miami-Dade County. **Figure 35** compares the monthly number of passengers in Miami International Airport from 2019 to 2020. Since March 2020, passengers have dramatically decreased compared to 2019 numbers. While the number of passengers has slightly increased from April to August, the total number of passengers from January to August passengers is down 58 percent compared to 2019 levels.

Figure 35. Monthly Passengers for Miami International Airport



Source: Miami International Airport Statistics

In addition to the airline industry, the cruise industry has also been significantly impacted by COVID-19. From September 2018 to September 2019, the Port of Miami served 6.82 million passengers which equates to just over 560,000 monthly passengers. Since March 2020, the cruise industry has been completely shut down, resulting in a cumulative reduction of approximately 3.4 million passengers over the 6-month period from March to August. Combining the airline and cruise industries, almost 22 million fewer passengers were served from March to August 2020 compared to 2019. This dramatic decrease in tourism due to COVID-19 has a significant impact on the traffic volumes in Miami-Dade County.

2.9.4 WORKPLACE POLICIES

Project Working Group and study team members agreed that there is no one-size-fits-all set of policies that businesses can apply to accommodate teleworking. Organizations generally customize their telecommuting strategies according to staff needs and functions, clients, and available resources. However, some workplace actions that are common and well-received could form the basis for a telecommuting policy blueprint to broaden the adoption of telecommuting in the future. Such policies include:

- **Digital and cloud-based software:** The adoption of digital and cloud-based solutions had been strong in the information sector prior to the pandemic, yet COVID-19 further accelerated and broadened this trend. The ability to securely access work tools, data, and communications from a web browser connected to the public internet is a key component of successful telecommuting. When not possible, companies may use remote desktop connections to enable employees to access specialized, on-premises equipment or software from a remote location. As mentioned above, companies will need to step up cybersecurity protocols when expanding telecommuting options.
- **Flexible schedules:** Working from home can mean additional responsibilities for staff (e.g., housekeeping, running errands, caring for others, etc.). By having flexible work schedules, employees have the freedom to complete their work at a time that is convenient and fits well with their personal lives.
- **Providing equipment to staff:** Miami-Dade County's Information Technology department developed an "office in a box" kit with the basic requirements for teleworking, including laptop, webcam, headset, and more. This provides employees a technical resource enabling them to replicate their work environment at home. Some private businesses allowed staff to borrow office equipment, such as monitors, ergonomic chairs, and desks, to use at home during the pandemic.
- **Satellite offices.** Due to uncertainty about filling large offices, some employers decided to forgo new long-term leases and focus on small private offices for employees who desired to work from an office as opposed to working from home. This is also an acceleration of pre-COVID-19 trends exemplified by the growing popularity of coworking spaces offering social interaction, business networking, and affordable monthly leases.

On the topic of incentives, respondents to the FDOT D6/FIU survey provided their opinion on several incentives that may increase business and employee adoption of telecommuting. The most common responses are summarized below:

- **Countywide Wi-Fi.** Respondents were receptive to the idea of countywide Wi-Fi. Although deploying a fast and reliable Wi-Fi network across a large area like Miami-Dade County is a significant logistical challenge, Miami-Dade County leaders could work with the private sector to increase the availability and affordability of high-speed broadband internet, especially in communities of concern. Project Working Group members also pointed to the ongoing deployment of 5G as a solution that would require less infrastructure than traditional fiber installations.
- **Financial incentives.** Most responses on the topic of incentives pointed to financial incentives to businesses, including tax breaks and lower development fees. Direct incentives to employees, such as the $5 per day of telework offered by the Georgia Clean Commutes program, offer a different model of financial incentive.
- **Transit and parking fee discounts.** Current parking and transit fee structures are built around daily or monthly rates. While this makes sense for visitors and workers who commute every day, it does not fit the partial telecommuting schedule that most people selected as their preferred option in the

Kittelson stated preference survey. Discounts or additional products (e.g., flexible passes) may be created to better serve this demand.

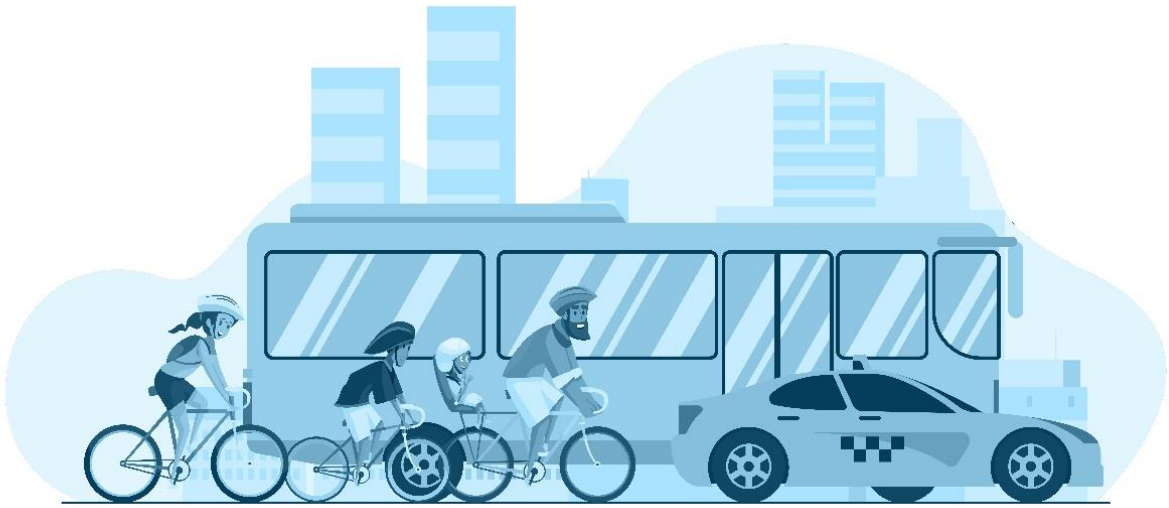
2.9.5 ENVIRONMENTAL EFFECTS FOR MIAMI-DADE COUNTY

There are significant environmental benefits in addition to the quality of life and economic benefits of reduced traffic congestion resulting from telecommuting. Every telecommute, on average, can save more than 16 miles traveled on a daily basis, according to the 2019 Global Public Transport Report prepared by mobility-as-a-service company Moovit, which found an average work trip commute in Miami-Dade County is just under 8.5 miles. With well over one million employees or working-age adults, residing in Miami-Dade County, even a five percent reduction in commuting to work could result in up to two million fewer miles of work commuting on an annual basis. Programs that promote telecommuting, then, can advance sustainability initiatives. The sustainability goals of the Miami-Dade County *GreenPrint* plan can likewise be achieved through telecommuting initiatives addressing the plan's three pillars: Economically and Financially Viable, Environmentally Sound, and Socially Responsible. The conclusions regarding using telecommuting to benefit the environment are as follows:

- Upward trends in population, income, and licensed drivers cause vehicle miles traveled (VMT) to increase, and this trend will continue. However, telecommuting can decrease VMT and, likewise, emissions from vehicles on the road, thus supporting the Environmental, Social, and Economic pillars of the County's *GreenPrint* plan.

- The literature does not conclusively relate telecommuting on its own to significant greenhouse gas reductions, partly because of concurrent increases in non-work-related travel for those who telecommute for work. Because figures from different publications provide both positive and negative changes in VMT from telecommute programs, telecommuting should be considered part of a broader sustainability improvement strategy.

- Other complementary strategies can include more conventional actions designed to facilitate a reduction in non-work travel by automobile include walking- and bicycling-supportive land uses and associated multimodal infrastructure improvements. In addition to implementing a telecommuting program, Miami-Dade TPO could look at incentivizing the reduction of emissions directly to market a sustainability goal alongside the program.



Telecommuting programs also can directly address the goals set by *GreenPrint*, the Resilient305 strategy, and plans to mitigate climate change-based sea level rise.

- Miami-Dade County began a community-based process for sustainability planning in 2009 following its selection as a pilot community for the ICLEI-Local Governments for Sustainability program (ICLEI). The resulting sustainability plan, ***GreenPrint***, emphasizes in its section "Land Use and Transportation" that, for Miami-Dade County, the "efficient movement of goods and people into and out of ports is essential to maintaining economic and environmental sustainability". Telecommuting could reduce VMT and congestion on roadways to support these freight-based goals.
- *GreenPrint* also mentions a continued pursuit of traffic demand management solutions, including telecommuting, to promote economic sustainability while reducing congestion. From a social standpoint, a successful telecommute program should reach transportation disadvantaged communities. As with the Socially Responsible pillar of the *GreenPrint* plan, telecommuting can be marketed to businesses and individuals with limited access to the worksite due to location, disability, etc. to appeal to the plan's social sustainability goals.
- The One Community One Goal Plan out of the **Resilient305** strategy prioritizes inclusive and diverse opportunities. In the plan, one of the four priorities is to support small business growth using outreach opportunities, networking, and technology. Assisting businesses with technology that promotes work-life balance, more flexibility for employees, and work accessibility for more employee demographics would further this One Community One Goal Plan.
- Sensitivity to changes in sea-level rise makes Miami-Dade **vulnerable to climate change** and, therefore a stakeholder in emissions reduction initiatives. Looking at the holistic view of the transportation system, including modes like aviation, can prevent telecommuting from furthering environmental degradation by inadvertently creating new long-distance trips, and rather make Miami-Dade County a contributor to a net decrease in greenhouse gas emissions.

2.10 Infrastructure Impacts

2.10.1 TELECOMMUTING EFFECTS

The broad and rapid transition to telecommuting carried significant effects to the roadway, transit, and telecommunications networks in Miami-Dade County. Those effects included rapid changes in demand as well as uncertainty about future trends. Some of the effects observed in the data described in previous sections of this report include traffic, transit ridership, and telecommunication infrastructure impacts, as summarized below:

- Daily **traffic volumes** on some major freeways of Miami-Dade County declined to about 50 percent of normal levels in late March to early April 2020. Traffic recovered sharply to about 25 percent lower than normal by late May/early June 2020. Since then, the recovery of traffic volumes has been slower—by late September they stood at about 10 lower than normal levels.
- **Changes in traffic volumes** on major regional roadways (see **Figures 24 and 25**) show that roadways leading into major employment centers or tourist destinations are seeing the sharpest reductions in traffic volumes. This includes SR 112 (32 percent lower), SR 878/Snapper Creek Expressway (28 percent lower), and the I-195 causeway to/from Miami Beach (18 percent lower).
- **Transit ridership** data compiled by the Miami-Dade County Department of Transportation and Public Works shows a steep reduction in all transit modes at the onset of the pandemic. At its lowest point in April 2020, Metrorail, Metromover, and Special Transportation Service (STS) were carrying 80 percent fewer riders than at the same point in 2019. Metrobus ridership fell by about 60 percent from 2019 levels and by June 2020 it had recovered to levels 40 percent lower than June 2019.
- The **telecommunication infrastructure** was generally able to handle the spike in demand resulting from additional telecommuting. In a recent publication by the World Bank, it was noted that "no extended period of interruption was reported by [telecommunication providers], who are generally confident about continuing normal service levels and operational performance" (World Bank IFC, 2020). Most telecommunication providers design their networks to meet peak demand, which occurs in the evening period when many customers stream high-definition video to their TVs or mobile screens. In general, telecommuting consumption is not as taxing to the telecommunications networks as high-definition video streaming. However, there is evidence that organizations that relied heavily on VPN connections for their remote workers experienced overloaded servers as most of their workforce tried to use VPN simultaneously. Similarly, households that share a "basic" internet connection across several users and devices have experienced strained bandwidth through the pandemic.

2.10.2 NEEDS FOR LONG-TERM CONGESTION REDUCTION

The reduction in traffic volumes resulting from telecommuting and lower employment and tourism have resulted in less traffic congestion in Miami-Dade County. As employment recovers to its pre-COVID-19 levels over the near- to mid-term future, how can Miami-Dade County maintain some of the congestion benefits of the past six months? In other words, could telecommuting "flatten the congestion curve" in a sustained way?

At a fundamental level, congestion results when the demand for driving exceeds the vehicular throughput capacity of a roadway or system of roadways. The demand for driving is influenced by many factors, including employment, disposable income, fuel prices, and—perhaps most importantly—the competitiveness of auto travel times versus the alternatives, including transit, bicycling, walking, or simply not making the trip. For example, in locations where non-motorized accessibility to jobs and essential destinations is high, travel times by modes other than driving are most competitive.

Currently, congestion in Miami-Dade County is lower than usual, parking spaces are more abundant, and fuel prices are low. Despite all this, daily traffic volumes on major freeways are 10 percent lower than in 2019. Some of this can be attributed to lower employment, continuing social distancing restrictions, and concerns about contracting the coronavirus. However, the number of daily trips made by Miami-Dade County residents—per the USDOT dataset from cell phone location data shown in **Figure 26**—is 30 percent lower now than in 2019, which is a much steeper reduction than the reduction in traffic volumes. This could be due to shifts from non-auto modes to auto modes, to longer trips —going to a warehouse club instead of the neighborhood grocery store—or to making multiple one-destination trips which in the past would have been chained—going to a fast-food restaurant and back when in the past it would have been chained with a work or shopping trip. The insight behind this comparison is that there is evidence already that, on a per-trip basis, people are driving more during the pandemic than before.

A reduction in extreme congestion during peak hours may be attainable as people generally regard work commutes as worth the extra travel time, relative to other types of trips. If a significant portion of employers and employees in Miami-Dade County decide that work commutes can be replaced permanently by teleworking or a shorter commute to a satellite office, then it follows that peak period congestion can in fact be reduced by this trend.

3. RECOMMENDATIONS AND ROADMAP TO IMPLEMENTATION

The findings of the telecommuting study indicate that the shift to telecommuting associated with the COVID-19 pandemic lowered peak period traffic and reduced congestion. Those pandemic-induced shifts illustrated the potential effectiveness of telecommuting as a travel option. The unknown question is the extent to which travel patterns will shift back to pre-COVID conditions once the pandemic is over and the extent to which the TPO and public and private partners can promote telecommuting as a viable commute option.

Recognizing the potential of telecommuting as a means of 'flattening the congestion curve,' and other benefits outlined in the previous section, the following policy recommendations include specific steps the TPO, in partnership with other planning and transportation implementation agencies, can take to strengthen telecommuting over the long term. Through this study, the TPO has already begun collaborating with partner agencies, including the development of a pilot program in coordination with the South Florida Commuter Services.

3.1 Policy Recommendations

The specific telecommuting policy recommendations will guide the TPO and partners, including South Florida Commuter Services, the Florida Department of Transportation, and Miami-Dade County, among others, in recognizing telecommuting as a unique travel mode and in implementing programs and projects that can increase and/or sustain the number of telecommuters. The following section outlines the specific policy objectives and recommendations in each of the four broad areas.

3.1.1 EDUCATION AND OUTREACH POLICY

Education and Outreach Policy: Roll out a regional telecommuting program via the South Florida Commuter Services to maximize telecommuting opportunities in South Florida.

- **Objective 1:** Assign $50,000 in funding allocated to the Pilot in the first 12 months.
- **Objective 2:** Assess the success of the Pilot to determine the next steps.
- **Objective 3**: Develop a comprehensive telecommuting program that provides training, transition support, marketing, and technical assistance services, including:
  - Website accessible training for employees/employers,
  - Consulting services for workforce transition to telecommuting,
  - Marketing telecommuting benefits to employees/employers, and
  - Outreach programs.
- **Objective 4:** Establish a monitoring system for developing a telecommuting baseline and tracking success by using metrics such as:
  - Benefits/Cost Analysis
  - Before/After Evaluations
  - Environmental Impacts

3.1.2 GENERAL TELECOMMUTING POLICY

General Telecommuting Policy: Adopt telecommuting as a long-term policy to 'flatten the congestion curve' in South Florida by planning for and investing in telecommuting programs and projects that:

- **Objective 1:** Increase the percentage of telecommuting to reduce peak-hour traffic congestion.
- **Objective 2:** Promote economic development by optimizing telecommuting access to jobs.

3.1.3 TELECOMMUTER MODE OF TRAVEL POLICY

Telecommuter Mode of Travel Policy: Designate telecommuters as a recognized commuter group in TPO and Miami-Dade County transportation and land use plans and promote the designation in state and federal plans and policies.

- **Objective 1:** Develop telecommuting elements in TPO and County systemwide plans.
- **Objective 2:** Encourage Florida Department of Transportation (FDOT) and US Department of Transportation (USDOT) to recognize telecommuting as a travel mode and develop telecommuting elements in state and federal plans.
- **Objective 3:** Identify and support the development of regional locations for telecommuting work centers, office sharing spaces and 'Smart Hubs'.

3.1.4 INFRASTRUCTURE INVESTMENT POLICY

Infrastructure Investment Policy: Plan for and advance broadband infrastructure, including hardware and software, that optimizes access to and the quality of telecommuting information available to the teleworker 'commuter group.'

- **Objective 1:** Coordinate with broadband initiatives undertaken by Miami-Dade County, such as County resolution R-876-20, and others.
- **Objective 2:** Inventory existing public and private telecommuting assets in Miami-Dade County.
- **Objective 3:** Explore public funding options and partnerships with FDOT and USDOT to fund telecommunications infrastructure.
- **Objective 4:** Plan for and fund broadband hardware and infrastructure to support telecommuting by utilizing existing and future transit and traffic operations infrastructure.

3.2 Feasibility Steps[46]

The following telecommunication implementation feasibility steps developed by Michigan State University serve as a guide to the Miami-Dade TPO and partners. Italicized notes in the steps indicate the TPO's current progress on each step.

3.2.1 STEP 1: ASSESS THE COMMUNITY TO DETERMINE TELEWORKING NEEDS AND READINESS

(Most of this step has been completed as part of this Telecommuting Study).

To overcome potential barriers to teleworking, a community should start off the planning process by fully researching and assessing their current economic needs, workforce, employer compliance, broadband access, and potential employees' digital skillsets. By identifying potential areas of weakness or resistance to teleworking, a community can work to address the issues and move forward with a coworking plan that fits their specific community's needs.

- **Determine the type of community**
  - Identify the area as urban, rural, tourism-dependent, etc.
  - Determine if workers are commonly leaving the community to find employment and identify the locations and the employers for which they work.
  - Identify community partners, (e.g., educational institutions, chambers of commerce, economic development, local government, employers, business associations, entrepreneur groups, etc.).
  - Pinpoint communities that house educational institutions such as universities or vocational schools to potentially target the next generation of high-skilled, technical workers.

- **Aggregate demand**
  - Research businesses to determine if they are friendly to the idea of allowing employees to telecommute, particularly those located outside the community where residents are traveling to work.
  - Assess residents'/employees' motivation to work from a coworking space.
  - Determine if the town has a large number of tourists who need to work from a professional space while visiting the community by consulting local chambers of commerce and visitors bureaus.

[46] Conrad, Lindsay, et al, Publicly Operated Telework Facilities, Michigan State University Center for Community and Economic Development, 2015.

- **Determine home broadband access and adoption rates**
  - Research the community's broadband speeds, coverage, technology types, and providers to determine if access is widespread in the community.
  - Assess the community's broadband adoption and use. Identify if citizens are using the technology that is available by purchasing service at their homes or by visiting community institutions, such as libraries, for computer usage. For those citizens not adopting broadband, is the issue costs for service, a perceived lack of relevancy, or digital literacy. Once businesses are on board with allowing employees to telework, the concept should be marketed to their employees. By educating the workforce on how teleworking can benefit their quality of life and alleviating any concerns such as loss of opportunity for on-the-job training or promotion, employers and the community can move forward with the coworking center logistics.
  - Provide training opportunities for those concerned about digital literacy.
  - Develop information, training, and possibly incentives to enable employees to take advantage of the telework option.

3.2.2 STEP 2: DEFINE THE PLAN AND DEVELOP PARTNERSHIPS

(The Telecommuting Study's policy recommendations address much of the guidance provided in this step).

With clear planning, a defined set of expectations can be molded to best suit the needs of the community. By evaluating the community's expectations and how the center can meet its needs, a coworking space can be created that positively impacts the economic development and quality of life of an area.

- Set a clear, realistic, and consistent set of goals and objectives to guide project development. (The policy recommendations in this report set those goals and objectives.)
- Provide a standard against which telework center success or failure can be measured. (The policy recommendations in this report set those goals and objectives.)
- Determine if the program or project will be a long-term or short-term initiative. When the long-term viability of the center is an objective, as opposed to short-term market research or demonstration, secure long-term financial commitments upfront. Funding over five to seven years, with a business plan to achieve self-sufficiency before the end of that period, is desirable. (This step will be implemented under the planning and partnering for telecommuter and the broadband infrastructure policies.)
- Determine project scope and partners. In less dense areas of Miami-Dade County, a facility that can support multiple uses will likely be more successful. For example, a facility that serves as a small business incubator and drop-in shared office space with maker-related equipment for entrepreneurs will likely appeal to a wider audience in a less dense community where the needs for any one of these types of uses alone may be too low to support a single-use facility. *(This will be implemented under the telecommuting center and Smart Hub policies)*.

3.2.3 STEP 3: MARKET THE PLAN TO EMPLOYERS

(This step is addressed by the Education and Outreach policy and partnership with SFCS).

One of the most important pieces of a successful coworking space is ensuring the employers nearby are willing to let their employees telecommute. The teleworking space plan should be marketed to major

employers outside of the community that will be losing the physical presence of employees if they allow teleworking. *(This will be addressed by implementing the commuter program policy.)*

- Identify businesses outside of the community that employs the community's residents.
- Ensure these businesses will allow their employees to telecommute.
- Educate businesses on the benefits/incentives of telecommuting.
- Share case studies of successful coworking spaces in less dense communties and tourism-driven communities.

3.2.4 STEP 4: MARKET THE PLAN TO EMPLOYEES

(This step is addressed by the Education and Outreach policy and partnership with SFCS).

Once businesses are on board with allowing employees to telework, the concept should be marketed to their employees. By educating the workforce on how teleworking can benefit their quality of life and alleviating any concerns such as loss of opportunity for on-the-job training or promotion, employers and the community can move forward with the coworking center logistics. *(This will be addressed by implementing the commuter program policy.)*

- Provide training opportunities for those concerned about digital literacy.
- Develop information, training, and possibly incentives to enable employees to take advantage of the telework option.

3.2.5 STEP 5: DETERMINE AND SECURE FUNDING, LOCATIONS, MATERIALS, AND STAFFING

(Steps have already been taken to secure $50,000 to fund a pilot project. Once the success of the pilot is assessed, other resources will be evaluated.)

Once the community, employers, and employee's commitment to the plan has been set in motion, logistics regarding funding, infrastructure, and staffing can be discussed. The benefits of a public-private partnership in this step are great as the center looks to obtain the initial capital for launching the center. The overhead needs of the center will be very specific to the community's needs and demand for teleworking space, so options such as sharing a space with another organization should be explored as necessary. *(This step will be implemented under the planning and partnering for telecommuter and the commuter program policies.)*

- Evaluate the resources available through a public-private partnership.
- Determine the coworking center needs from infrastructure and overhead perspective.
- Identify sources of funding and locations for the center; site selection criteria should be in accordance with the center goals and objectives and should seek to balance high-quality center features and nearby amenities with cost considerations. Additionally, in communities without sufficient demand to justify a center dedicated to teleworking, other organizations can fill this role until a critical mass is achieved. Examples of such locations include those that are already "closely coordinated with the delivery of public services and placed in already actively used premises, such as libraries, schools, or community centers" (Vitola, et al., September 2013). Other options include business support centers, start-up incubators, and entrepreneurial hubs.

- Private offices should be provided for permanent, security-minded tenant-employers. Semiprivate workspaces should be acceptable to drop-in users since they will take their work home with them at the end of the day.
- Consider the hiring of a full-time, on-site manager to handle administrative issues, technical support, and promotional activities for the center.

3.2.6 STEP 6: DETERMINE METHODS FOR SELF-RELIANCE AND SUSTAINABILITY WITHOUT THE ASSISTANCE OF FUTURE PUBLIC DOLLARS.

(It should be noted that the Miami-Dade County telecommuter initiative will be a public private partnership (PPP), relying both on public and private funding over the long term.)

Centers should consider what other services they can offer to increase their income and self-reliance.

- Identify other sources of revenue for the center other than space rental such as educational training workshops, business services to tourists, networking events, and other opportunities.

3.2.7 STEP 7: EVALUATE THE PROJECT

(This is included in Objective 4 of the Education and Outreach policy.)

By setting benchmarks and expectations for success, a community can determine how the coworking space is benefiting the citizens and the economic development of the area. This knowledge can allow the teleworking plan to be shaped and adapted to best meet the community's needs moving forward. *(This step will be implemented under the telecommuting monitoring system policy.)*

- Document and evaluate each new generation of telework center demonstrations. Much has been learned, but much remains to be discovered regarding the successful implementation of multiple employer telework centers. It is important to determine what factors are important to all center operations and which are key only in certain situations and under certain circumstances.

APPENDIX A. FDOT SURVEY REPORT - EVALUATING THE PROPENSITY TOWARD TELECOMMUTING

Technical Memorandum

FDOT Master University Agreement BDV29-630-01

Evaluating the Propensity toward Telecommuting

Final Report

Prepared For

Planning and Environmental Management Office

Florida Department of Transportation - District 6

Prepared By

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Date

December 2020

DISCLAIMER

The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the State of Florida Department of Transportation or the U.S. Department of Transportation.

Prepared in cooperation with the State of Florida Department of Transportation and the U.S. Department of Transportation.

METRIC CONVERSION CHART

APPROXIMATE CONVERSIONS TO SI UNITS

SYMBOL	WHEN YOU KNOW	MULTIPLY BY	TO FIND	SYMBOL
LENGTH				
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
AREA				
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yards	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
VOLUME				
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
NOTE: Volumes greater than 1000 L shall be shown in m^3				
MASS				
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or metric ton)	Mg (or t)
TEMPERATURE (exact degrees)				
°F	Fahrenheit	5 (F−32)/9 or (F−32)/1.8	Celsius	°C
ILLUMINATION				
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	candela/m^2	cd/m^2
FORCE and PRESSURE or STRESS				
lbf	pound force	4.45	newton	N
lbf/in^2	pound force per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS TO SI UNITS

SYMBOL	WHEN YOU KNOW	MULTIPLY BY	TO FIND	SYMBOL
LENGTH				
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
AREA				
mm^2	square millimeters	0.0016	square inches	in^2
m^2	square meters	10.764	square feet	ft^2
m^2	square meters	1.195	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	square kilometers	0.386	square miles	mi^2
VOLUME				
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	cubic meters	35.314	cubic feet	ft^3
m^3	cubic meters	1.307	cubic yards	yd^3
MASS				
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or t)	mega grams (or metric ton)	1.103	short tons (2000 lb)	T
TEMPERATURE (exact degrees)				
°C	Celsius	1.8C+32	Fahrenheit	**°**F
ILLUMINATION				
lx	lux	0.0929	foot-candles	fc
cd/m^2	candela/m^2	0.2919	foot-Lamberts	fl
FORCE and PRESSURE or STRESS				
N	newton	0.225	pound force	lbf
kPa	kilopascals	0.145	pound force per square inch	lbf/in^2

*SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380. (Revised March 2003)

TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle Evaluating the Propensity toward Telecommuting		5. Report Date December 2020 6. Performing Organization Code
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16. Abstract

The challenges COVID-19 creates provide an opportunity to analyze the behavior of people as they switch from in person to remote working and learning. To measure the effect of COVID-19 on telecommuting behavior, a survey was conducted among employees, employers and college students in south Florida. The survey asked respondents of their experiences with telecommuting, the challenges and benefits of working from home, and their expectations for future telecommuting programs. Although the long-lasting effects of this transition are debatable, the impact this experience has had on people is pertinent to transportation planners as they think forward to the future. The survey showed that more employees, employers, and students are using telecommuting now than ever before. About 14% of the employees prefer to go back to the normal arrangement, while more than 77% prefer to telecommute more frequently than before the pandemic. There were more employees that felt higher productivity and effectiveness than those who indicated lower productivity and effectiveness during COVID-19, which is consistent with the employers' responses as well. This indicates great potentials to implement telecommuting programs in the long run. Convenience was a common theme among respondents as employees, employers, and students all reported it as a positive aspect of telecommuting. On the other hand, the lack of interpersonal interactions at work/school was a potential barrier. Other major challenges included lack of workspace or equipment at home. The findings from this study provide useful insights for planners and policy-makers when developing and promoting telecommuting programs in the future. The study also provides a better understanding of the potentials of telecommuting which would help planners better estimate future impacts on commute reduction.

17. Key Words	18. Distribution Statement		
Telecommuting, working from home, policy	No restrictions		
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EXECUTIVE SUMMARY

Telecommuting has been drawing attention from policy-makers and researchers due to the potential benefits in alleviating congestion, reducing emissions, and enhancing quality life. The challenges of COVID-19 provide an opportunity to analyze the behavior of people as they switch from in person to remote working and learning. To measure the effect of COVID-19 on telecommuting behavior, a survey was conducted among employees, employers, and college students in south Florida. The survey asked respondents about their experiences with telecommuting, the challenges and benefits of working from home, and their expectations for future telecommuting programs. Although the long-lasting effects of this transition are debatable, the impact this experience has had on people is pertinent to transportation planners as they think forward to the future.

The survey was conducted on the Qualtrics platform, and targeted people working and learning in south Florida. The sampling plan was developed based on the American Community Survey (ACS) 2018 5-year data. The employee and employer samples were based on industry type and targeted knowledge (white-collar) workers. The quotas for college students were based on gender and age, and targeted both undergraduate and graduate students. The survey collected 1,364 complete responses in total, including 417 employers, 503 employees, and 444 college students. Additionally, a few of the surveys were distributed through the Transportation Planning Organization (TPO), where quotas were not enforced.

The survey clearly shows how telecommuting has been accelerated by COVID-19, more employees, employers, and students are using telecommuting now than ever before. About 14% of the employees prefer to go back to the normal arrangement, while more than 77% prefer to telecommute more frequently than before the pandemic. There were more employees that felt higher productivity and effectiveness than those who indicated lower productivity and effectiveness during COVID-19, which is consistent with the employers' response as well. The findings show a great potential to implement long-term telecommuting programs in the future.

Convenience and better work/life balance were common themes among respondents as employees, employers, and students all reported it as positive aspects of telecommuting. On the other hand, the lack of interpersonal interactions at work/school was a potential barrier. Other major challenges included lack of workspace or equipment at home.

The findings from this study provide useful insights for planners and policy-makers when developing and promoting telecommuting programs in the future. The study also provides a better understanding of the potentials of telecommuting which would help planners better estimate future impacts on commute reduction.

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1. INTRODUCTION

Telecommuting, as a transportation demand management tool, has been of interest to transportation planners and policy-makers in the past decades. There is an extensive body of research which focused on the potential positive impacts of telecommuting to help reduce travel, mitigate congestion, reduce vehicle emissions, and improve air quality. There are also benefits for employers in terms of savings in office space rentals and maintenance costs.

Despite the promising benefits of telecommuting, it had not been widely utilized until the recent pandemic event, most likely attributed to institutional constraints, cultural barriers, security concerns, or other reasons. The overnight transition of most of the nation (or the world) to remote work or learning due to the COVID 19 outbreak provided a unique opportunity to study and understand the opportunities and obstacles of full-scale telecommuting and remote learning. Although it is unlikely that the deployment of telecommuting and remote learning at the current state will remain at full scale when COVID-19 is no longer a threat, the pandemic essentially fast-forwarded the adoption and acceptance of telecommuting and remote learning across all fields.

This project aims to provide a comprehensive evaluation of the potentials and concerns relating to telecommuting and remote learning. Specifically, an online survey was conducted to understand:

1) Employees' and students' experiences, challenges, attitudes, and preferences toward telecommuting and remote learning; and
2) Employers' perceptions, expectations, and concerns in developing and implementing telecommuting programs.

The next section describes the survey design considerations, followed by the survey implementation process. The last section summarizes the data collected through the survey effort.

2. SURVEY DESIGN

Three separate survey questionnaires were designed targeting college students, employees (white-collar), and employers (represented by directors/HR managers). The three surveys share common questions related to demographic attributes and mobility profiles, they also have unique questions focusing on telecommuting and remote learning experiences.

2.1 Employee Survey

This survey focuses on worker experiences through COVID-19. Questions were developed to understand the extent to which employees switched to telecommuting, the impacts on trip reduction, and overall employee experiences, attitudes, preferences, and expectations toward telecommuting. The questionnaire includes the following major sections:

1. **Work status questions** – Determines who is eligible for the survey, only those who currently full-time workers are eligible. Also shows how many jobs were affected.
2. **Pre-condition** – Collects information on industry type, position type, level of flexibility and telecommuting conditions before COVID-19. Also, some commute information (distance, time, mode) to establish a general context.
3. **Current situation** – Collects information on current working situation, frequency and duration of telecommuting activities, commute frequency.
4. **Telecommuting experience** – Focuses only on those who have telecommuted, on their perception of their productivity while working from home, the positive and negative factors affecting their productivity, how often they expect and prefer to telecommute after COVID-19 is no longer a threat. The respondents were also asked to rank the benefits and concerns/barriers they experienced and potential policies/incentives they think that would promote telecommuting.
5. **Travel information** – Collects trip frequency before, during and after (helping estimate the impacts on traffic reduction), mode usage before and during (helping understand the impacts by mode).
6. **Attitudes** – Includes general attitude questions to understand how employees view technology in general and telecommunication technologies, their views toward mobility, and lifestyle preferences. This is important to understand the potentials of adopting telecommuting and personal preferences and expectations.
7. **Demographic questions** – Collects information on age, gender, income, ethnicity, race, education, and household composition.

The sampling plan for the employee survey was designed with the following considerations as shown in Table 1 and Table 2:

- Targeting knowledge workers (white-collar workers)

- Sampling by industry type based on the 2018 5-year American Community Survey (ACS) survey data, shown in Table 1 below
- Sampling by gender (56% male and 44% female)
- Also monitor worker class (Table 2) to have a minimal of 10 sample in each category, but exact percentage is not required

Table 1 Sampling Plan by Industry Type for Employee Survey

#	Industry Type	2018 ACS	Quota
6	Information	2%	**18**
4	Wholesale trade	3%	**19**
11	Other services, except public administration	5%	**27**
12	Public administration	5%	**33**
2	Manufacturing	6%	**37**
3	Transportation and warehousing, and utilities	6%	**36**
1	Construction	8%	**48**
7	Finance and insurance, and real estate and rental and leasing	9%	**53**
10	Arts, entertainment, and recreation, and accommodation and food services	9%	**57**
5	Retail trade	11%	**66**
8	Professional, scientific, and management, and administrative and waste management services	13%	**81**
9	Educational services, and health care and social assistance	21%	**126**
	Total	100%	**600**

Table 2 Sampling Plan by Worker Class for Employee Survey

	2018 ACS	Sample Target
Federal government workers	2.5%	**15**
State government workers	3.2%	**19**
Self-employed in own not incorporated business workers	4.4%	**26**
Private not-for-profit wage and salary workers	6.2%	**37**
Local government workers	7.3%	**44**
Private for-profit wage and salary workers	76.4%	**458**
Total	100%	**600**

2.2 Employer Survey

This survey focuses on employers' perspectives on telecommuting during COVID-19. Questions were developed to understand the extent to which employers implemented telecommuting policies, their experience with employees' productivity and their attitudes toward telecommuting. The questionnaire has the following major sections:

1. **Work position** – Determines who is eligible for the survey, only the three types of individuals (directors, HR directors, project managers) are eligible.

2. **Pre-condition –** Asks whether there were official telecommuting policies/programs in the company, percentage of workers adopting telecommuting on a regular basis, the reasons to adopt telecommuting, etc. Establishes a baseline for telecommuting before COVID-19.

3. **Current situation –** Asks what telecommuting measures were adopted currently during COVID-19, percentage of workers that are telecommuting now on what frequency, what percentage of workers are not telecommuting and for what reasons, etc. Helps to understand the maximum level of magnitude of telecommuting.

4. **Telecommuting experiences –** Focuses on manager/employer experiences, such as how they feel about the productivity of the employees working from home compared to working in the office, any concerns and drawbacks, potential constraints and limitations of implementing telecommuting, what they wish they could have to facilitate companywide telecommuting programs, their plans for future regarding telecommuting policies, etc. Estimates the potential changes toward implementing telecommuting at large scale in the future, also barriers and concerns, and resources needed.

5. **Attitudes –** Considers employer attitudes toward technology and telecommunication technologies from both personal perspective and company policy perspective.

6. **Background information –** Collects information about the companies, number of employees, industry type, etc.

Table 3 Sampling Plan by Industry Type for Employer Survey

Industry Type		2018 ACS	2018 ACS	Quota	Minimal Sample
1	Construction	8%	**20%**	**60**	**10**
2	Manufacturing	6%			**10**
3	Transportation and warehousing, and utilities:	6%			**10**
4	Wholesale trade	3%	**14%**	**42**	**10**
5	Retail trade	11%			**10**
6	Information	2%	**25%**	**75**	**10**
7	Finance and insurance, and real estate and rental and leasing:	9%			**10**
8	Professional, scientific, and management, and administrative and waste management services:	13%			**10**
9	Educational services, and health care and social assistance:	21%	**21%**	**63**	**10**
10	Arts, entertainment, and recreation, and accommodation and food services:	9%	**20%**	**60**	**10**
11	Other services, except public administration	5%			**10**
12	Public administration	5%			**10**
	Total	100%	**100%**	**300**	

The sampling plan for the employer survey was designed with the following considerations as shown in Table 3:

- Targeting three types of higher-level managers: directors & above (100), HR managers (100), and project managers (100)
- Sampling by 5 industry categories based on ACS 2018 5-year data (Table S2404, Full-time, year-round civilian employed population 16 years and over, Florida), as shown in Table 3, highlighted in grey
- A minimal of 10 sample by the 12 categories
- Also with sample distributed by Director/HR/PM across the 5 categories

2.3 College Student Survey

This survey focuses on college students' experiences with remote learning and how they may expect to continue their education in the future. The questionnaire has the following major sections:

1. **Student status questions –** Determines who is eligible for the survey, only students who are currently enrolled are eligible with a focus on full-time students and those who have taken online classes.
2. **Current situation –** Collects information on how students' classes have been affected.
3. **Remote learning experience –** Focuses only on students who have taken online classes, their experiences, the positive and negative factors affecting their productivity, and how often they expect/prefer to do remote learning after COVID-19 is no longer a threat.
4. **Travel information –** Collects trip frequency before, during and after (helps estimate the impacts on traffic reduction), mode usage before and during (helps understand the impacts by mode).
5. **Attitudes –** Asks general attitude questions to understand how students view telecommunication technologies, their opinions on mobility, and their lifestyle preferences. This is important for understanding the potential benefits and challenges of adopting telecommuting and personal preferences and expectations.
6. **Demographic questions –** Collects information on age, gender, income, ethnicity, race, education, and household composition.

The sampling plan for the student survey was designed with the following considerations as shown in Table 4:

- Targeting college or graduate students
- Sampling plan by gender by age shown in Table 4 below, based on ACS 2018 5-year data table B14004 college and graduate school enrollment for Florida

Table 4 Sampling Plan by Age and Gender for Student Survey

	2018 ACS		Quota	
	Male	Female	**Male**	**Female**
18 to 24 years	25%	29%	**149**	**175**
25 to 34 years	11%	14%	**69**	**85**
35 years and over	8%	12%	**48**	**74**
Total	44%	56%	**266**	**334**

All three surveys were also translated into Spanish through the survey platform, with manual corrections. The complete survey questionnaires are presented in the appendix.

3. SURVEY IMPLEMENTATION

The surveys were created and administered using the Qualtrics platform. Survey links were distributed to their preselected group of respondents (market research panels), who were selected based on quotas specified according to the sampling plans developed in the previous section. The Qualtrics surveys were launched on August 21 and ended on September 2, 2020. The survey was also distributed through TPO (Transportation Planning Organization) newsletters between August 17 and September 3, 2020. No sampling quotas were enforced for the self-distribution survey.

During survey implementation, as we continuously monitored the sample distribution by the specified quotas, some adjustments were made to the sampling plan, mainly for two reasons:

- Due to the constraints in Florida, the employer sample was heavily overrepresented by the Information industry (more than 30% vs. 2% in ACS).
- Due to higher response rates from women and the younger age group (18-24) these quotas were filled quicker. Getting responses from male and older respondents was more difficult.

To address the above issues, given the tight schedule to finish the survey, the following adjustments were implemented:

- The project team reduced the worker and student sample sizes and increased the target sample size for directors and HR managers. These additional samples can help correct the employer sample to the best extent possible.
- The project team also relaxed the geographic constraints in Florida and expanded the survey to national audience to enforce the quotas by industry group.
- The project team also relaxed the age constraints and eventually gender constraints for the student survey.

Table 5 below summarizes the final total complete responses collected through the surveys:

Table 5 Final Sample Sizes

	Qualtrics					TPO Distribution		
	Employer (417)			Employee	Student	Employer	Employee	Student
	Director or Above	HR Manager	Project Manager					
Sample Size	219	98	100	503	444	423	514	7
Total	1,364					944		

Detailed sample distribution by key attributes are presented in Table 6, Table 7, Table 8, and Table 9.

Employee Survey

- The worker sample was well represented by all 12 industry types, as shown in Table 6.
- The sample was also well distributed among the various worker classes (Table 7).

Table 6 Employee Sample Distribution by Industry

#	Industry	2018 ACS	Worker Sample	
4	Wholesale trade	3%	6	1.2%
10	Arts, entertainment, and recreation, and accommodation and food services:	9%	14	2.8%
6	Information	3%	18	3.6%
11	Other services, except public administration	5%	26	5.2%
12	Public administration	5%	26	5.2%
3	Transportation and warehousing, and utilities:	6%	36	7.2%
2	Manufacturing	6%	37	7.4%
8	Professional, scientific, and management, and administrative and waste management services:	13%	47	9.3%
1	Construction	8%	48	9.5%
7	Finance and insurance, and real estate and rental and leasing:	9%	53	10.5%
5	Retail trade	11%	66	13.1%
9	Educational services, and health care and social assistance:	21%	126	25.0%
	Total		503	100.0%

Table 7 Employee Sample Distribution by Worker Class

	2018 ACS	Worker Sample	
University or research agency		10	2.0%
Federal government	2.5%	11	2.2%
Other, please specify		21	4.2%
Self-employed in own not incorporated	4.4%	23	4.6%
State government	3.2%	31	6.2%
Local government (city, county, etc.)	7.3%	40	8.0%
Private not-for-profit wage and salary	6.2%	42	8.3%
Private for-profit wage and salary	76.4%	325	64.6%
Total		503	100.0%

Employer Survey

- Looking at the five general industry groups, the employer sample were well represented (Table 8).

- There was representation of directors, HR managers, and project managers across all industry types.
- There was a minimal of 9 samples in each industry category.

Table 8 Employer Sample Distribution by Industry

	2018 ACS		Employer			Director	HR	PM
Construction	8%	20%	36	8.6%	20.1%	20	8	8
Manufacturing	6%		36	8.6%		19	4	13
Transportation and warehousing, and utilities:	6%		12	2.9%		8	2	2
Wholesale trade	3%	14%	9	2.2%	10.6%	4	4	1
Retail trade	11%		35	8.4%		22	6	7
Information	3%	25%	67	16.1%	28.8%	22	22	23
Finance and insurance, and real estate and rental and leasing:	9%		22	5.3%		12	3	7
Professional, scientific, and management, and administrative and waste management services:	13%		31	7.4%		16	5	10
Educational services, and health care and social assistance:	21%	21%	59	14.1%	14.1%	35	14	10
Arts, entertainment, and recreation, and accommodation and food services:	9%	19%	19	4.6%	12.3%	13	5	1
Other services, except public administration	5%		19	4.6%		10	4	5
Public administration	5%		13	3.1%		4	8	1
Others			59	14.1%		34	13	12
Total			417	100.0%	100.0%	219	98	100

College Student Survey

- The college student sample sufficiently represent the student population by gender and age group, with slightly higher portions of female and younger students (Table 9).

Table 9 Student Sample Distribution by Age and Gender

	2018 ACS		Survey Sample		Survey %	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**
Total	44%	56%	164	280	37%	63%
18 to 24 years	25%	29%	134	222	30%	50%
25 to 34 years	11%	14%	23	34	5%	8%
35 years and over	8%	12%	7	24	2%	5%

4. EMPLOYEE SAMPLE DATA SUMMARY

The data from our employee survey provides good insights into the behaviors, experiences, and expectations of employees in relation to telecommuting during the COVID-19 Pandemic.

4.1 Telecommute Behaviors

The survey respondents were asked to rate the frequency with which they telecommuted to work before and after COVID-19, and how often they expect to telecommute post COVID-19. COVID-19 caused a major increase (8% to 28%) of employees that reported telecommuting every day (Table 10). More people (13%) also expect to telecommute a few times per month post COVID-19 than they did before COVID-19 (6%). Figure 1 shows a visual representation of the changes in telecommute behavior.

Table 10 Self-Reported Telecommute Behavior Before, During, and Expected Post COVID-19

	Before COVID-19		During COVID-19		Expected post COVID-19	
	Frequency	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
Never	345	69%	213	42%	274	54%
A few times per year	33	7%	23	5%	51	10%
A few times per month	29	6%	30	6%	65	13%
A few times per week	55	11%	95	19%	65	13%
Every day	41	8%	142	28%	48	10%
Total	503	100%	503	100%	503	100%

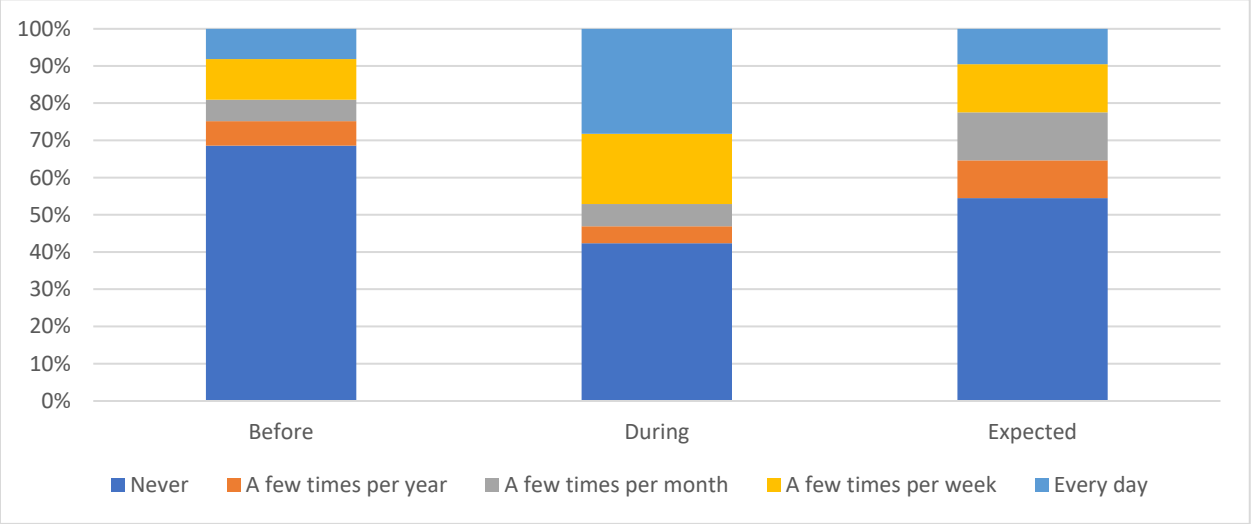

Figure 1 Self-Reported Telecommute Behavior Before, During, and Expected Post COVID-19

Similarly, survey respondents were asked the frequency with which they physically commuted to work before and during COVID-19. The number of employees who reported commuting every day to their place of employment decreased from 65% to 43% (Table 11). Correspondingly, the number of people that reported never commuting to work almost tripled, increasing from 7% to 20%. Figure 2 displays the changes in commute behaviors.

Table 11 Self-Reported Commute Behavior Before, and During COVID-19

	Before COVID-19		During COVID-19	
	Frequency	Percent	Frequency	Percent
Never	35	7%	100	20%
A few times per year	20	4%	16	3%
A few times per month	23	5%	37	7%
A few times per week	100	20%	134	27%
Every day	325	65%	216	43%
Total	503	100%	503	100%

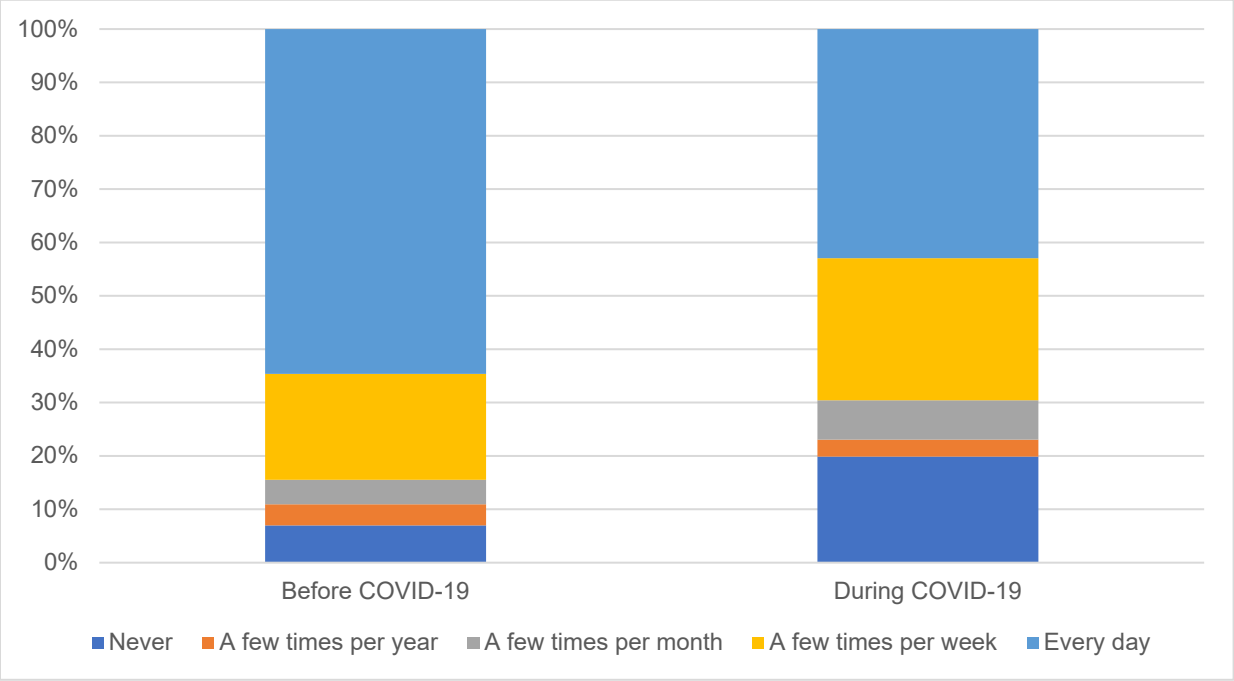

Figure 2 Self-Reported Commute Behavior Before, and During COVID-19

To assess how employees feel about work from home, survey respondents were asked: "After COVID-19 is no longer a threat, how often do you prefer to continue working from home, if you have the option to do so?" In general, workers prefer more time working from home. As shown in Table 12, more than half of the respondents reported wanting to work at home as frequently or more frequently than they currently are with COVID-19. Only 14% wanted to return to the same frequency of work from home as before COVID-19 and 9% wanted to work from home less frequently than before COVID-19. The pie chart in Figure 3 displays employees' preferences for working from home.

Table 12 Work from Home Preferences After COVID-19

Answer	%	Count
I prefer to work from home, even more often than now	25.50%	76
I prefer to work from home as frequent as now	26.85%	80
I prefer to work from home less frequent than now, yet more frequent than the normal conditions before the COVID-19 outbreak	24.83%	74
I prefer to work from home as frequent as the normal conditions before the COVID-19 outbreak	14.09%	42
I prefer to work from home less frequent than the normal conditions before the COVID-19 outbreak	8.72%	26
Total	100%	298

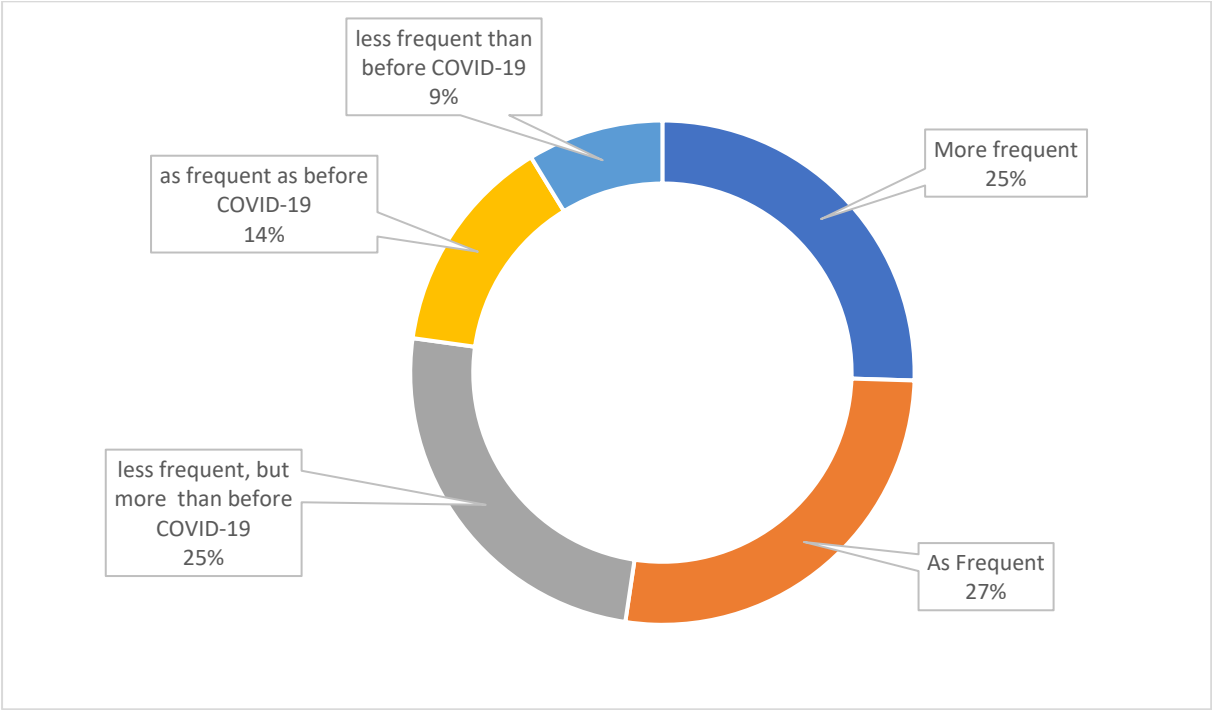

Figure 3 Work from home preferences after COVID-19

4.2 Benefits and Challenges Faced with Telecommuting

Survey respondents were asked to select the benefits and challenges they faced with telecommuting. The greatest challenge that employees reported facing with telecommuting was more distractions at home with 24% of respondents reporting this (Table 13). The challenge that was least reported was care of other/elder dependent care, at less than 3% of respondents. A few other challenges that many reported were: Difficulty in communicating with co-workers; Lack of comfortable workspace; and Childcare. The overall distribution of challenges can be seen in **Figure 4**.

Table 13 Self-Reported Challenges Faced with Telecommuting

Challenge	% of survey respondents that selected this challenge	Count
More distractions at home	24.45%	123
Difficult to communicate with co-workers	18.29%	92
Lack of comfortable workspace	16.90%	85
Childcare	14.12%	71
Have to do more housekeeping	13.52%	68
Need equipment or technology not available at home	13.12%	66
None	10.54%	53
Need to care for sick family member	6.16%	31
Have to share workspace with another worker	5.96%	30
Other/elder dependent care	2.98%	15
Other (Please specify)	1.59%	8
Total	100%	642

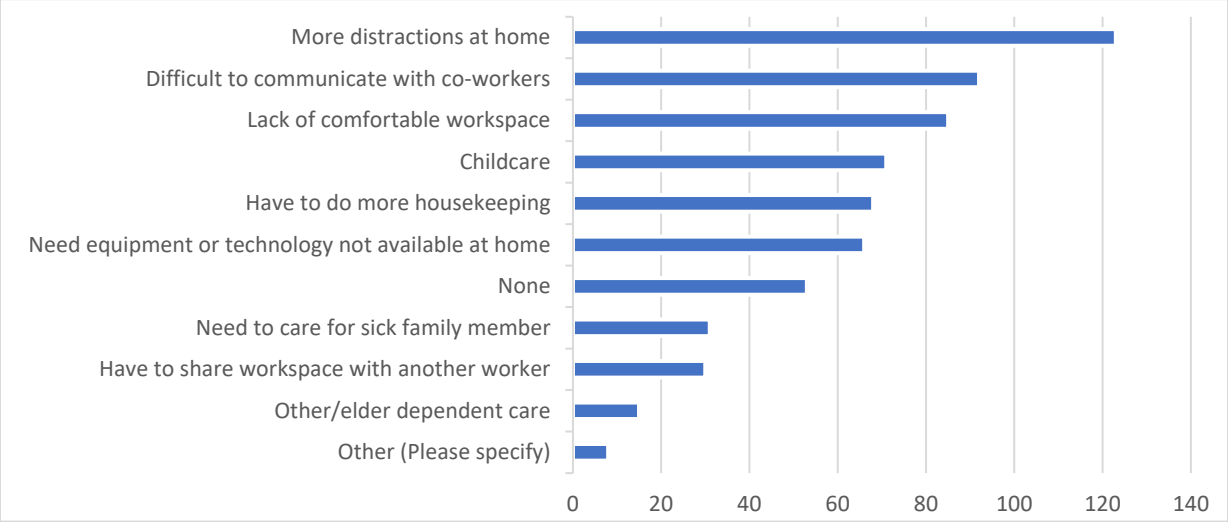

Figure 4 Self-Reported Challenges Faced with Telecommuting

The greatest benefit that employees reported with telecommuting was spending less time in traffic, with 19% of respondents reporting this benefit (Table 14). The benefit that was least reported was a more energetic environment at home at 4% of respondents. A few other benefits that many survey respondents reported experiencing were: Spending less time in traffic; More casual environment at home; Better work/life balance; and More comfortable workspace at home. Figure 5 shows the reported benefits from telecommuting graphically.

Table 14 Self-Reported Benefits from Telecommuting

Answer	%	Count
Spending less time in traffic	18.74%	197
More casual environment at home	15.41%	162
Better work/life balance	13.32%	140
More comfortable workspace at home	12.08%	127
More efficient resting times at home	11.99%	126
More efficient time management at home	9.51%	100
Fewer distractions at home	7.04%	74
I'm able to focus better in crisis situations	6.28%	66
More energetic environment at home	4.00%	42
None	1.14%	12
Other (Please specify)	0.48%	5
Total		1051

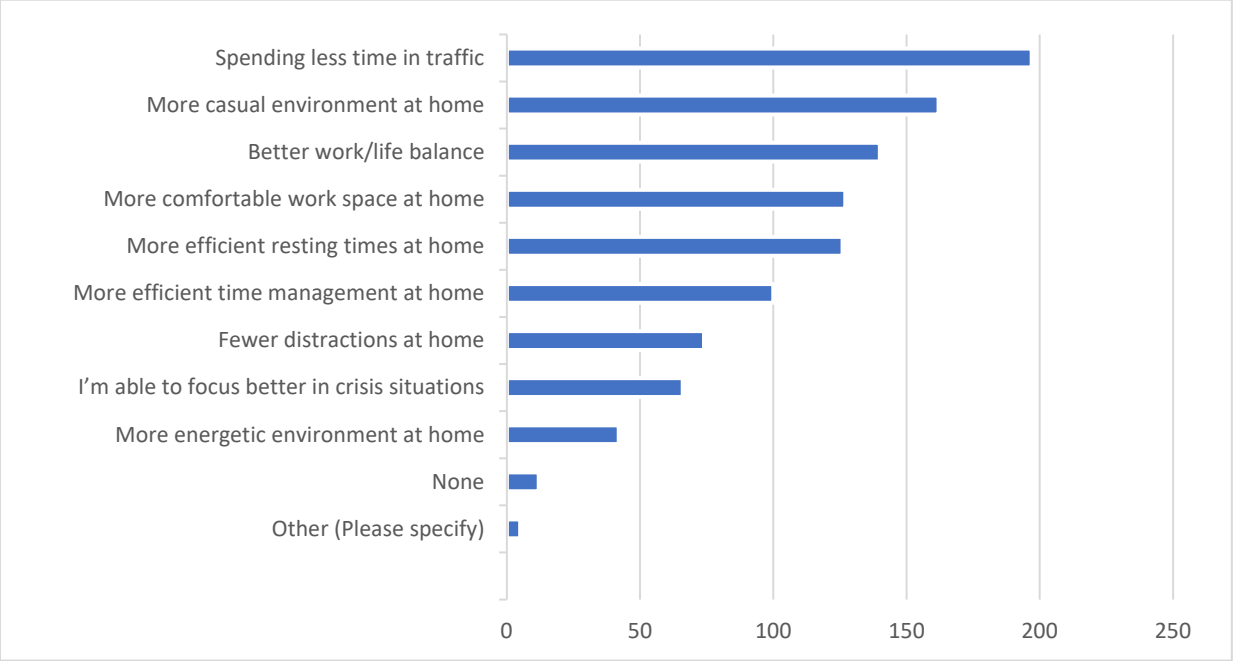

Figure 5 Self-Reported Benefits from Telecommuting

4.3 Experience with Telecommuting

To understand workers experience with telecommuting survey respondents were asked:

> "Consider your experience with telecommuting during the COVID-19 outbreak, and indicate: How do you compare your work experience now (working from home) to your experience before the outbreak while working at your office/workplace in the following categories?"

As Table 15 shows 37% of survey respondents reported convenience as being much higher now compared to working in person. Work interactions was most frequently reported (by 17% of respondents) as being lower now than before COVID-19. Only 21% of respondents reported any lowering of their overall work experience during COVID-19. Figure 6 shows how the different experiences ranked among workers.

Table 15 Experience comparing working from home to in person

	1	2	3	4	5
Question	Productivity	Effectiveness	Convenience	Interactions	Overall
Much higher	17.45%	14.43%	36.58%	9.73%	16.78%
	52	43	109	29	50
Somewhat higher	18.46%	22.82%	23.15%	14.77%	25.84%
	55	68	69	44	77
About the same	39.26%	37.92%	26.85%	30.87%	35.91%
	117	113	80	92	107
Somewhat lower	18.79%	20.13%	9.40%	27.18%	15.77%
	56	60	28	81	47
Much lower	6.04%	4.70%	4.03%	17.45%	5.70%
	18	14	12	52	17
Total	298	298	298	298	298

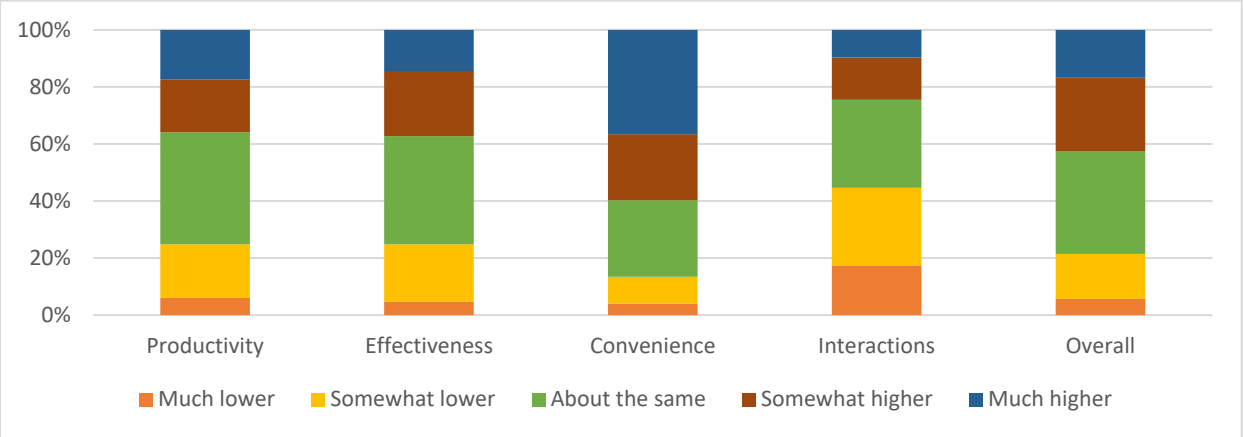

Figure 6 Experience comparing working from home to in person

Survey respondents were asked to what extent they agreed or disagreed with certain statements about telecommuting, work from home, technology, and lifestyle. The responses are summarized in Table 16 -Table 19, and show some interesting phenomena that people experienced.

A large majority (68%) of survey respondents agreed that telecommuting is more convenient, and convenience was seen as the most positive aspect of telecommuting (Table 16). The telecommute experience that most people disagreed with was that "telecommuting meets my work needs" with 30% of respondents saying they disagree. Figure 7 displays employee telecommuting experience.

Table 16 Experience with telecommuting

Question	Strongly disagree		Somewhat disagree		Neither agree nor disagree		Somewhat agree		Strongly agree		Total
Telecommuting is more convenient	4%	22	8%	42	19%	98	33%	167	35%	174	503
Telecommuting is more efficient	5%	25	12%	61	26%	132	32%	159	25%	126	503
Telecommuting meets my work needs	17%	85	13%	63	18%	90	27%	138	25%	127	503
Transitioning to telecommuting requires a minimal amount of mental effort	8%	42	16%	82	28%	141	29%	148	18%	90	503
The interactions through telecommunication technologies with colleagues and clients are sufficient and easy to manage	7%	34	14%	72	27%	134	31%	154	22%	109	503
The support provided by my company for telecommuting is sufficient and reasonable	8%	38	11%	57	30%	152	28%	140	23%	116	503

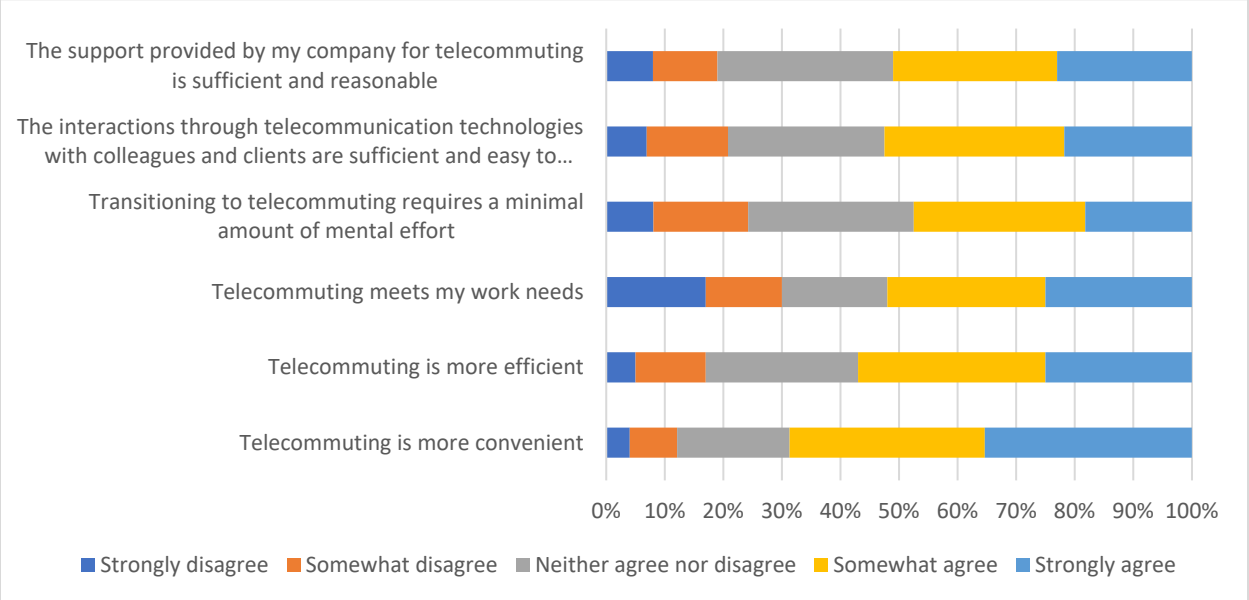

Figure 7 Experiences with Telecommuting

An overwhelming 75% of respondents said they enjoy the social interactions found at a conventional workplace and 71% like to work on a team (Table 17). A significant number of respondents, 65%, agreed that they enjoy trying new and different technologies. Figure 8 gives an overview of employees' attitude toward working from home.

Table 17 Experiences with Work From home

Question	Strongly disagree		Somewhat disagree		Neither agree nor disagree		Somewhat agree		Strongly agree		Total
I like to work on a team	5%	27	10%	50	14%	72	40%	199	31%	155	503
Working at home may increase family conflicts	18%	93	18%	91	23%	115	26%	131	15%	73	503
I enjoy the social interaction found at a conventional workplace	3%	17	6%	32	15%	75	44%	222	31%	157	503
It is hard to get motivated to work away from the main office	19%	96	19%	96	22%	112	25%	126	15%	73	503
I like working from home	10%	52	11%	54	24%	121	26%	130	29%	146	503
Learning how to use new technologies is often frustrating	19%	95	20%	100	18%	93	27%	137	16%	78	503
I often purchase new technology products, even though they are expensive	16%	79	19%	96	23%	115	29%	145	14%	68	503
I like trying new and different technologies	5%	23	9%	47	21%	105	37%	187	28%	141	503

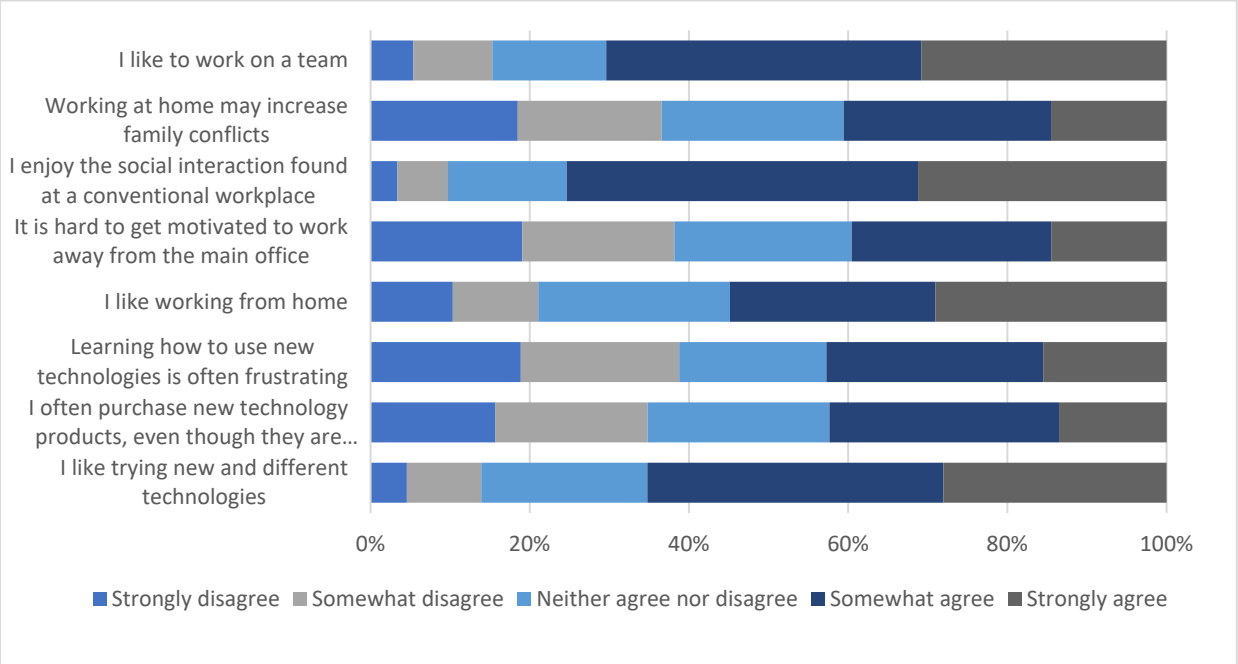

Figure 8 Experiences with Work From home

Regarding their experience with technology, most respondents (77%) agreed that "Video calling is a good alternative to in-person business meetings" (Table 18). Respondents did not like the idea that online learning is an alternative to classroom instruction, as 34% of respondents disagreed with this sentiment. Respondents also did not believe that internet and communication technologies can be a substitute for personal travel, 34% of respondents again disagreed with this sentiment. The overall experiences with technology for employees can be observed in Figure 9.

Table 18 Experiences with technology

Question	Strongly disagree		Somewhat disagree		Neither agree nor disagree		Somewhat agree		Strongly agree		Total
Video calling is a good alternative to in-person business meetings	5%	24	5%	24	13%	64	44%	223	33%	168	503
Video calling is a good alternative to visiting friends and family	9%	44	20%	99	16%	80	35%	174	21%	106	503
Online learning is a good alternative to college-level classroom instruction	9%	44	12%	58	22%	113	33%	167	24%	121	503
Online learning is a good alternative to high school and elementary-level classroom instruction	15%	73	19%	94	21%	105	29%	144	17%	87	503
Online learning is a good alternative to extra-curricular activity instruction	12%	62	18%	88	24%	119	27%	137	19%	97	503
Internet & Communication Technologies can substitute personal need for travel	18%	91	16%	81	19%	94	28%	140	19%	97	503

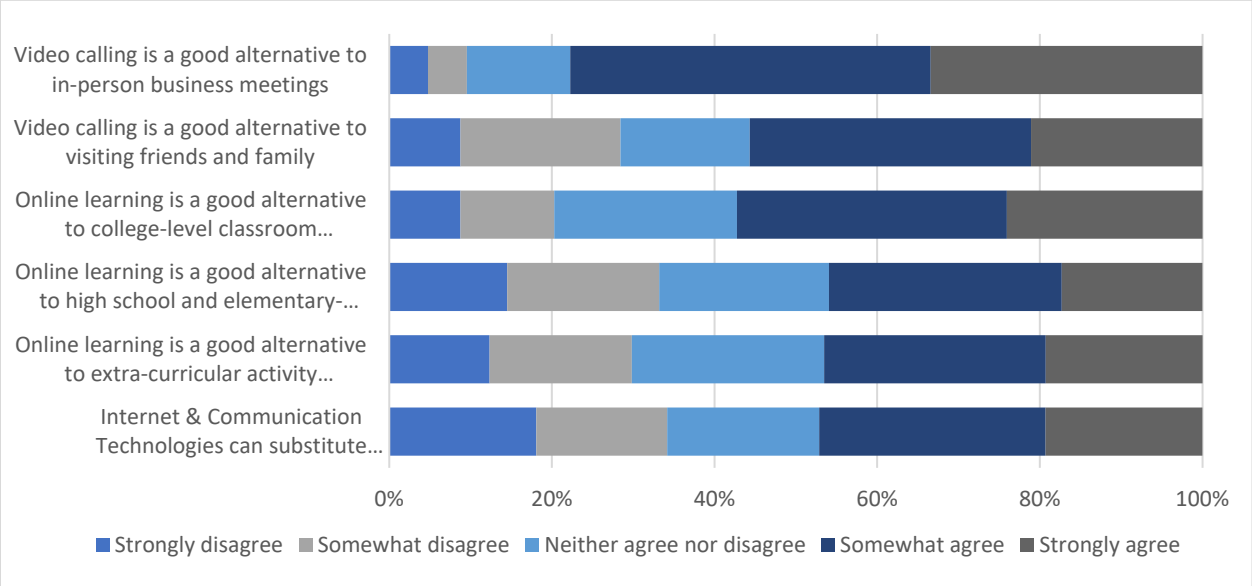

Figure 9 Experiences with technology

The lifestyle experience that most respondents (80%) agreed with was that "I enjoy spending time with the people I live with" (Table 19). A total of 38% of respondents said they would not relocate if they were allowed to continue telework (Table 19). Figure 10 summarizes employees' lifestyle attitudes. The figure shows that people value staying close to home, and do not plan to relocate from their current neighborhoods.

Table 19 Lifestyle Experiences

Question	Strongly disagree		Somewhat disagree		Neither agree nor disagree		Somewhat agree		Strongly agree		Total
The time spent traveling to places provides a useful transition between activities	4%	21	10%	48	23%	118	43%	216	20%	100	503
I like to stay close to home	3%	13	9%	45	16%	81	42%	212	30%	152	503
Having shops and services within walking distance of my home is important to me	6%	30	15%	74	22%	113	34%	169	23%	117	503
I like seeing people and having other people around me	2%	12	8%	40	21%	107	44%	220	25%	124	503
I'm pretty much a workaholic	10%	52	21%	107	23%	114	24%	121	22%	109	503
I enjoy spending time with the people I live with	3%	13	3%	14	15%	75	37%	186	43%	215	503
If I can continue to work from home after the COVID-19, I will relocate to other areas (e.g. for less congestion, more affordable housing, etc.)	24%	121	14%	69	27%	136	21%	104	15%	73	503
I already planned to relocate to another area	36%	182	17%	84	18%	92	17%	83	12%	62	503

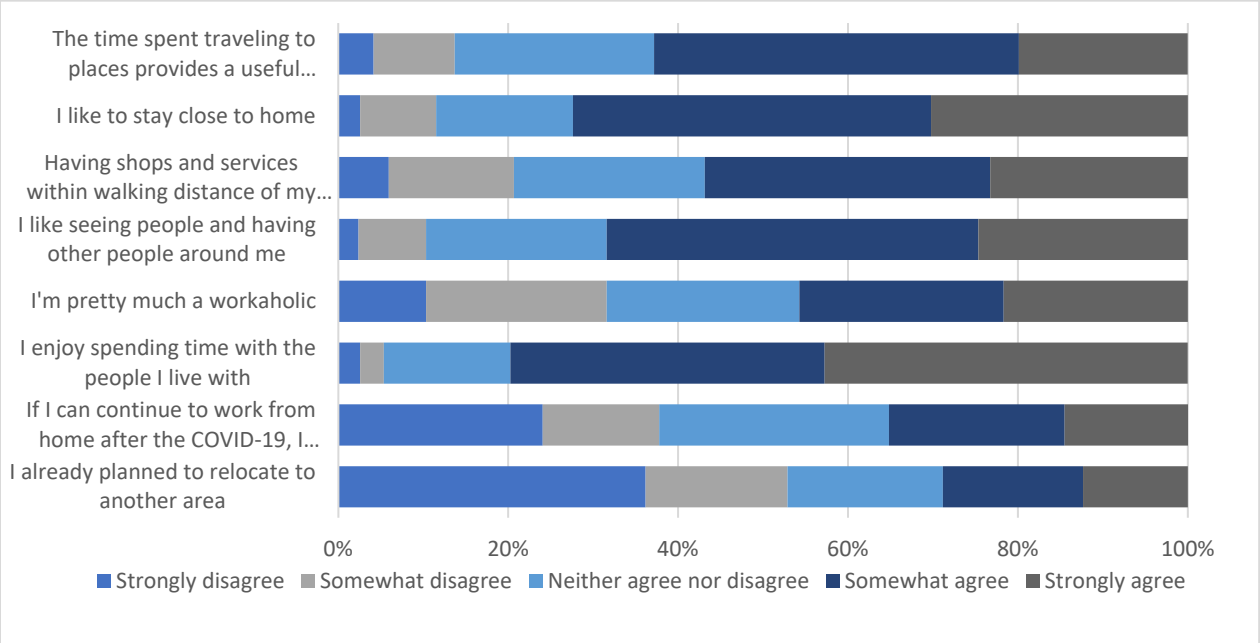

Figure 10 Lifestyle Experiences

4.4 Incentives for Telecommuting

Finally, employees were asked what kind of incentives government agencies and private businesses could implement to encourage telecommuting as a long-term strategy to reduce traffic congestion. The highest priority incentives were countrywide Wi-Fi access (38% of respondents) and company bonuses for equipment upgrades (30% of respondents) (Table 20). The incentive that employees least liked was getting a discounted transit pass or parking fee as an incentive for telecommuting, with only 8% of respondents. Figure 11 shows the distribution of how respondents ranked the various telecommuting incentives. The 6th rank was excluded from the figure, and the "Other" category was also excluded for simplicity.

Table 20 Telecommuting Incentives

Ranking	1		2		3		4		5		6		Total
Countywide Wi-Fi access	38%	113	23%	69	21%	64	11%	32	7%	20	0%	0	298
Discounted employee parking fee and transit pass for telecommuting workforce	8%	24	21%	64	22%	65	23%	69	23%	70	2%	6	298
Company bonus/stipend for telecommunication/equipment upgrades	30%	89	25%	73	22%	67	12%	36	11%	32	0%	1	298
Office-sharing/work centers closer to home	10%	31	13%	40	17%	50	34%	102	23%	70	2%	5	298
Offer employer training to implement telecommuting	13%	38	17%	50	17%	51	19%	56	34%	102	0%	1	298
Other, please specify	1%	3	1%	2	0%	1	1%	3	1%	4	96%	285	298

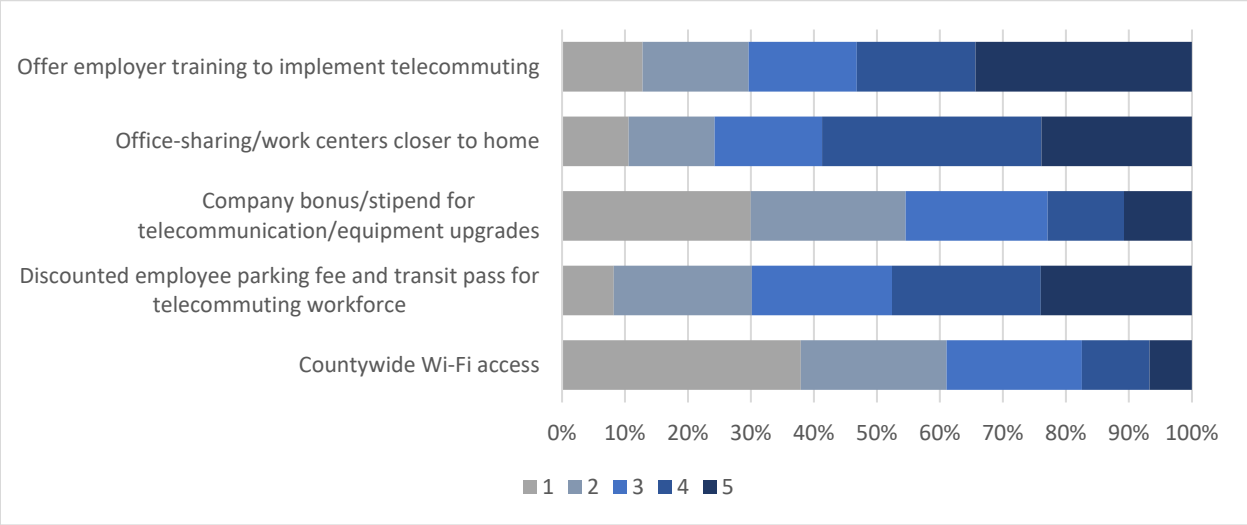

Figure 11 Telecommuting Incentives

5. EMPLOYER SAMPLE DATA SUMMARY

The data from our employer survey provides insights into the behaviors, experiences, and expectations in relation to employer policies during COVID-19.

5.1 Telecommuting Policies and Effects

Employers were asked about their current telecommuting policy and were also asked whether they expect their policy to change after COVID-19 is no longer a threat. Most employers (76%) reported having a current policy regarding telecommuting, whereas 84% of employers said they might change their policy after COVID-19 is no longer a threat (Table 21). Employers in general have official polices and plan to update their polices once COVID-19 is no longer a threat, as can be seen in Figure 12.

Table 21 Employer policy on COVID-19

	Current Policy			Policy Change		
Answer	%	Count		**Answer**	%	Count
Yes, official policy	60.91%	254		**Yes**	47.48%	198
Yes, unofficial policy	14.87%	62		**Maybe**	36.45%	152
No	24.22%	101		**No**	16.07%	67
Total	100%	417		**Total**	100%	417

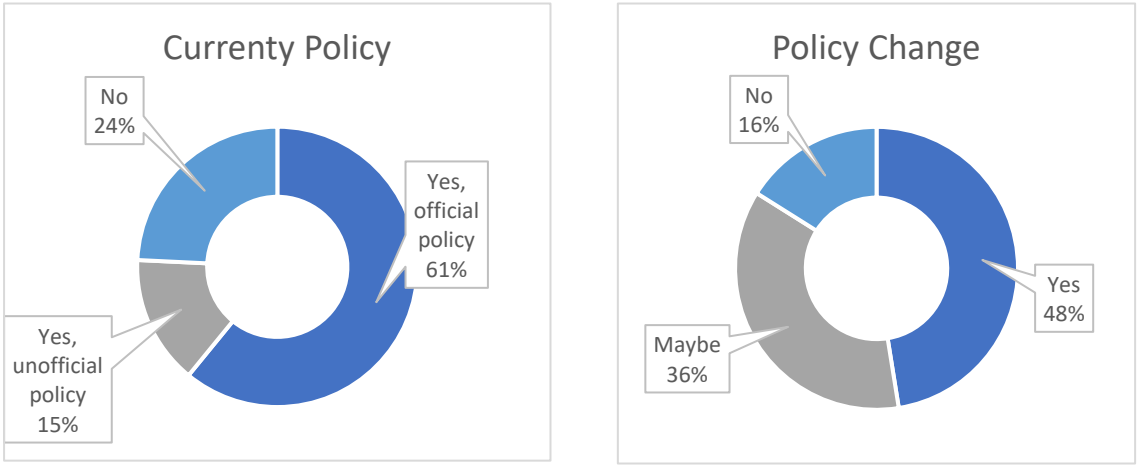

Figure 12 Employer policy on COVID-19

Employers were asked "How do you compare your employees' work experience now (working from home) to before COVID-19 while working at the office/workplace in the following categories?" For most categories, the employers' responses fall into a normal distribution (Table 22) indicating that productivity, convenience, and workplace interactions were about the same for employers before and after COVID-19. A notable exception is for convenience where 60% of employers said that working from home brought their employees more convenience. Figure 13 shows how employers experienced COVID-19 in terms of productivity, effectiveness, convenience, and interactions.

Table 22 Employers work experience now compared to before COVID-19

Question	Much lower		Somewhat lower		About the same		Somewhat higher		Much higher		Total
Productivity	7%	30	20%	84	34%	141	22%	90	17%	72	417
Effectiveness	5%	19	19%	78	38%	160	25%	103	14%	57	417
Convenience	4%	18	15%	62	21%	89	33%	137	27%	111	417
Interactions	9%	38	24%	99	30%	124	22%	93	15%	63	417
Overall	4%	15	17%	71	34%	142	27%	111	19%	78	417

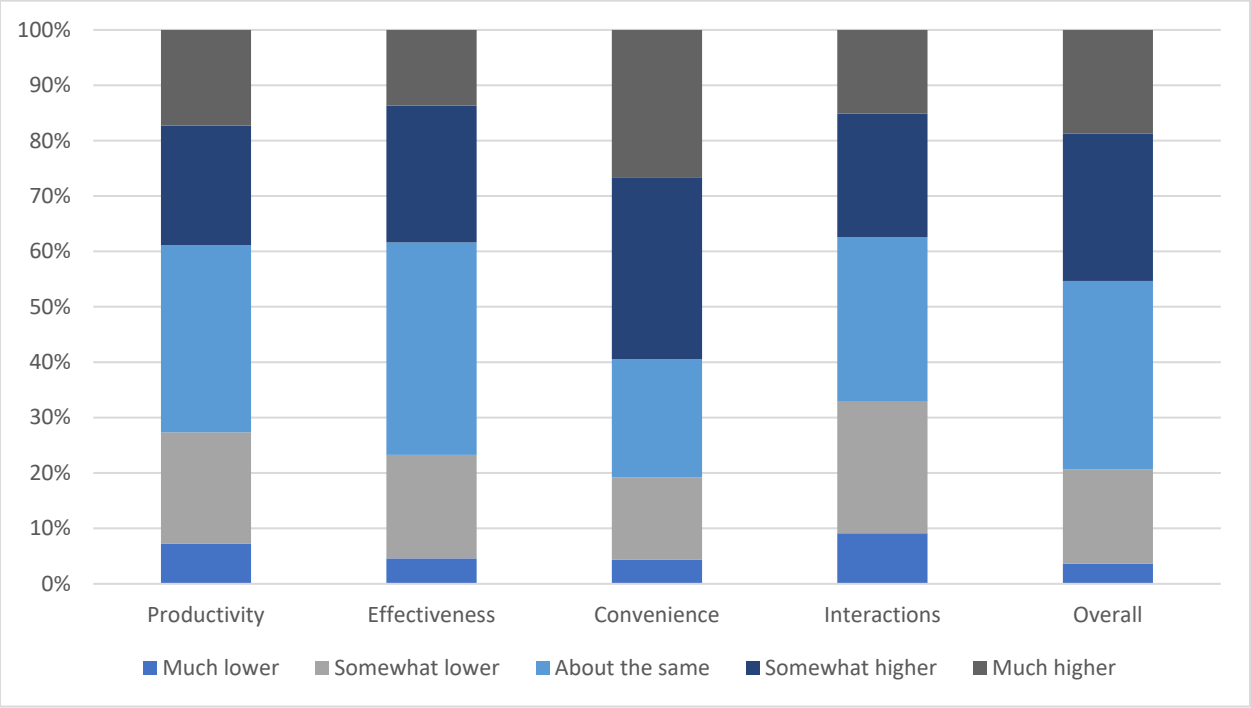

Figure 13 Employee work experience now compared to before COVID-19

5.2 Benefits and Challenges of Telecommuting

Employers were asked to rank the potential challenges of telecommuting. The challenge that was ranked number 1 by the most employers was "Lower work productivity" at 29%. The challenge

that was ranked the lowest was "Lack of telecommuting guidelines" at just 1% (Table 23). Figure 14 shows the challenges of telecommuting that employers experienced, as well as how employers ranked those challenges. One interesting thing to note is the variation among responses on ranking telecommuting challenges, as compared to ranking the benefits. This indicates that there was less consensus among the challenges of telecommuting, with many employers reporting no challenges associated with telecommuting.

Table 23 Challenges of Telecommuting

Question \ Ranking:	1		2		3		4		5		6		7		8		9		10		Total
Lower work productivity	29%	121	20%	85	12%	48	9%	39	9%	38	10%	40	6%	23	4%	16	2%	7	0%	0	417
Difficult to communicate with colleagues	17%	72	22%	90	22%	93	16%	65	13%	54	5%	19	4%	17	1%	3	1%	3	0%	1	417
Higher cyber security risks	15%	63	10%	42	9%	37	9%	39	12%	48	22%	93	15%	62	7%	28	1%	4	0%	1	417
Difficult to supervise or monitor work progress	11%	45	22%	92	22%	90	23%	94	10%	41	8%	34	1%	5	3%	14	0%	2	0%	0	417
Lack of social interaction opportunities	9%	39	10%	42	10%	43	13%	56	20%	82	23%	96	10%	41	4%	15	0%	2	0%	1	417
None	7%	31	1%	5	2%	7	1%	4	1%	3	2%	8	28%	117	10%	42	41%	169	7%	31	417
Lack of equipment or facilities to facilitate telecommuting	6%	25	9%	39	16%	65	22%	90	23%	97	15%	62	6%	25	3%	11	0%	1	0%	2	417
Management resistance and culture issues	4%	16	3%	13	5%	19	3%	11	6%	23	7%	27	10%	40	21%	87	41%	167	1%	4	417
Lack of telecommuting guidelines	1%	5	2%	8	4%	15	5%	19	8%	31	9%	38	21%	85	45%	185	5%	21	0%	0	417
Others, please specify	0%	0	0%	1	0%	0	0%	0	0%	0	0%	0	0%	2	4%	16	7%	31	88%	367	417

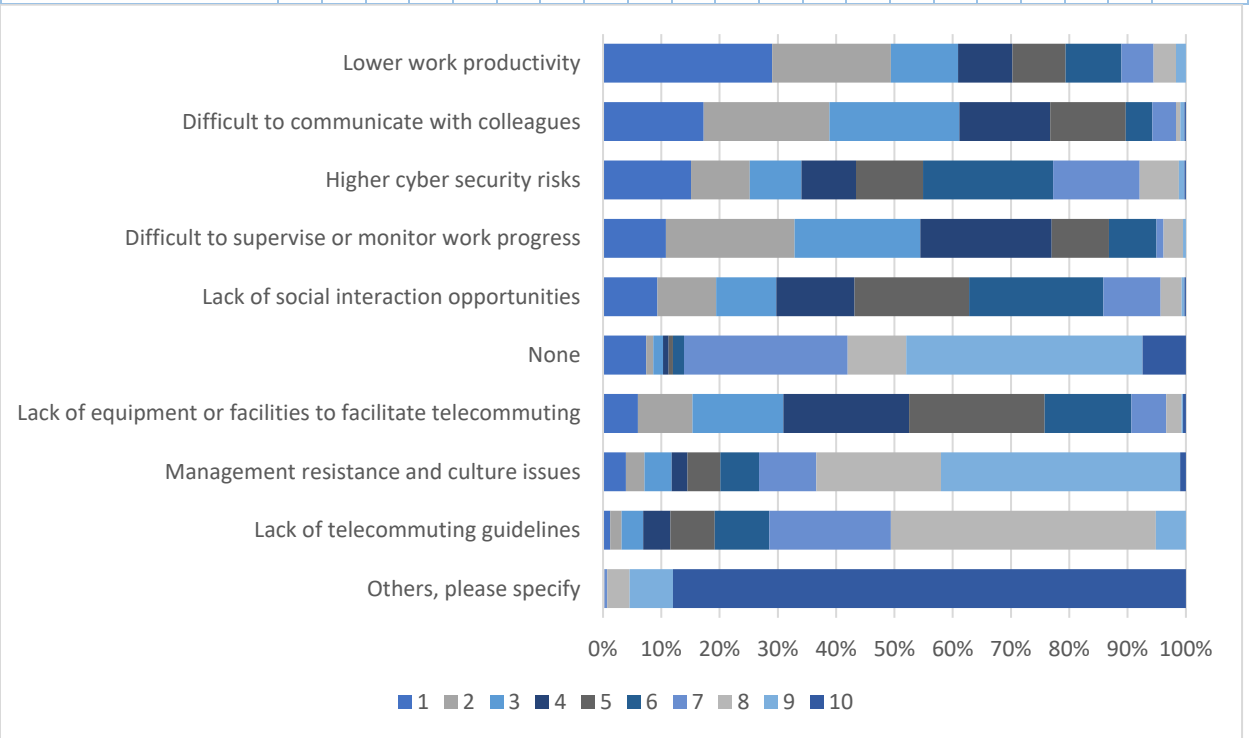

Figure 14 Challenges of Telecommuting

Employers were asked to rank the potential benefits of telecommuting. The benefit that was ranked number 1 by the most employers was "Cost savings on office space and equipment" at 35%. The benefit that was ranked lowest was "better work efficiency and management" at just 6%(Table 24). Figure 15 shows the benefits of telecommuting and how employers ranked them in importance, showing how cost savings and work flexibility were significant benefits.

Table 24 Benefits of telecommuting

Question \ Ranking:	1		2		3		4		5		6		7		8		Total
Cost savings on office space and equipment	35%	146	23%	94	14%	58	11%	45	9%	38	7%	31	1%	4	0%	1	417
Work flexibility as a benefit keeps us competitive and attracts quality workers	16%	65	18%	77	15%	64	12%	48	23%	95	16%	65	0%	2	0%	1	417
Increased work productivity	15%	63	22%	91	22%	90	17%	71	13%	55	9%	39	2%	8	0%	0	417
Enhanced moral among workers due to better work/life balance	13%	53	13%	55	15%	61	26%	110	18%	73	13%	56	2%	9	0%	0	417
Better communication between colleagues	9%	39	11%	47	16%	66	20%	82	23%	97	20%	82	0%	1	1%	3	417
Better work efficiency and management (without location constraints)	6%	25	11%	47	17%	71	14%	58	13%	54	31%	131	7%	29	0%	2	417
None	6%	25	1%	4	1%	5	1%	3	1%	5	2%	7	83%	347	5%	21	417
Others, please specify	0%	1	0%	2	0%	2	0%	0	0%	0	1%	6	4%	17	93%	389	417

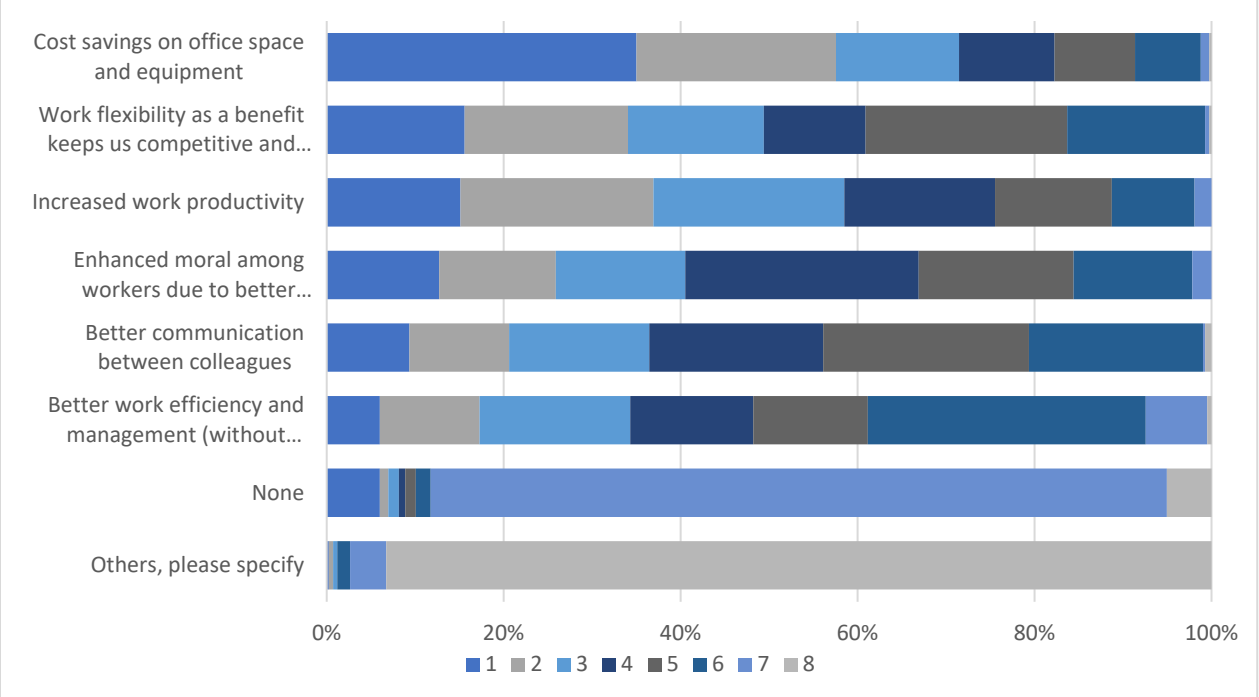

Figure 15 Benefits of Telecommuting

5.3 Experience with Telecommuting

Survey respondents were asked to what extent they agreed or disagreed with certain statements about telecommuting, work from home, technology, and lifestyle. The responses are summarized in Table 25 – Table 28, and show some interesting phenomena that people experienced.

Most employers (81% of respondents) agree that they like to work on a team. The statement that employers disagreed with the most (36% of respondents) in relation to their experience with working from home, is that "learning how to use new technologies is often frustrating" (Table 25). Figure 16 displays employers' attitudes toward working from home.

Table 25 Experience with Working from Home

Question	Strongly disagree		Somewhat disagree		Neither agree nor disagree		Somewhat agree		Strongly agree		Total
I like to work on a team	6%	23	5%	19	8%	35	38%	159	43%	181	417
Working at home may increase family conflicts	13%	55	17%	70	21%	89	31%	129	18%	74	417
I enjoy the social interaction found at a conventional workplace	3%	11	6%	23	16%	68	39%	164	36%	151	417
It is hard to get motivated to work away from the main office	16%	65	18%	75	15%	63	30%	127	21%	87	417
I like working from home	5%	20	8%	32	16%	67	32%	133	40%	165	417
Learning how to use new technologies is often frustrating	17%	70	19%	81	18%	75	25%	104	21%	87	417
I often purchase new technology products, even though they are expensive	6%	27	14%	57	17%	70	35%	147	28%	116	417
I like trying new and different technologies	3%	12	6%	26	14%	59	38%	157	39%	163	417

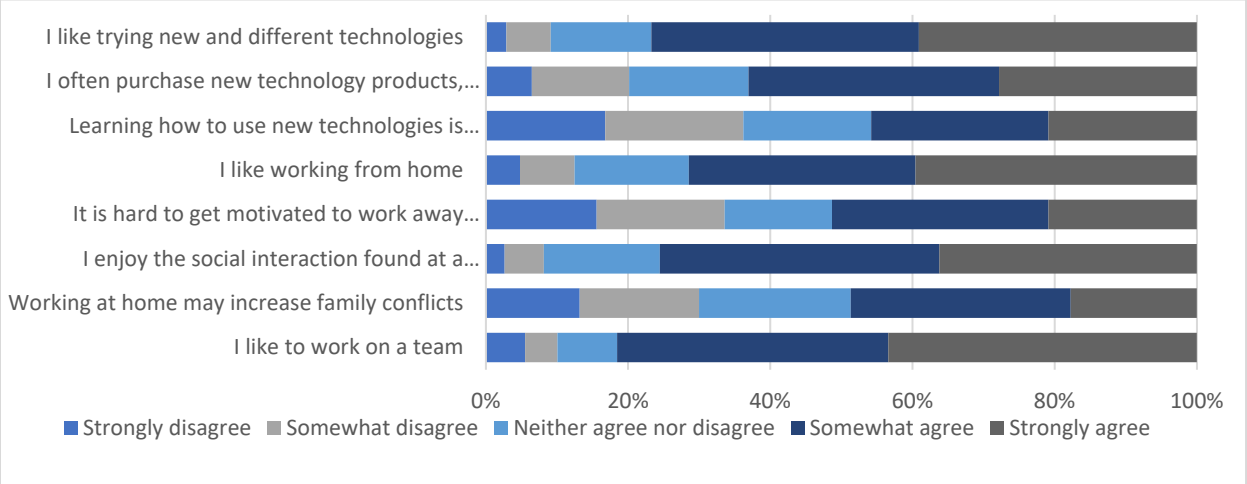

Figure 16 Experience with Working from Home

A significant majority (82% of respondents) of employers agreed that "video calling is a good alternative to in-person business meetings." The statement that employers disagreed with the most (28% of respondents) was that "Internet and communication technologies can substitute personal need for travel" (Table 26). Figure 17 shows some interesting patterns, such as the fact that video calling is an outlier in how positively regarded it is compared to the rest of the experiences. However, all the experiences with technology were mostly positively regarded.

Table 26 Experiences with technology

Question	Strongly disagree		Somewhat disagree		Neither agree nor disagree		Somewhat agree		Strongly agree		Total
Video calling is a good alternative to in-person business meetings	5%	19	5%	22	7%	31	38%	160	44%	185	417
Video calling is a good alternative to visiting friends and family	5%	20	15%	61	13%	53	36%	152	31%	131	417
Online learning is a good alternative to college-level classroom instruction	5%	21	10%	41	16%	68	38%	158	31%	129	417
Online learning is a good alternative to high school and elementary-level classroom instruction	9%	39	12%	51	17%	69	35%	145	27%	113	417
Online learning is a good alternative to extra-curricular activity instruction	10%	41	15%	63.0	14%	60	28%	115	33%	138	417
Internet & Communication Technologies can substitute personal need for travel	15%	61	13%	55	13%	55	28%	116	31%	130	417

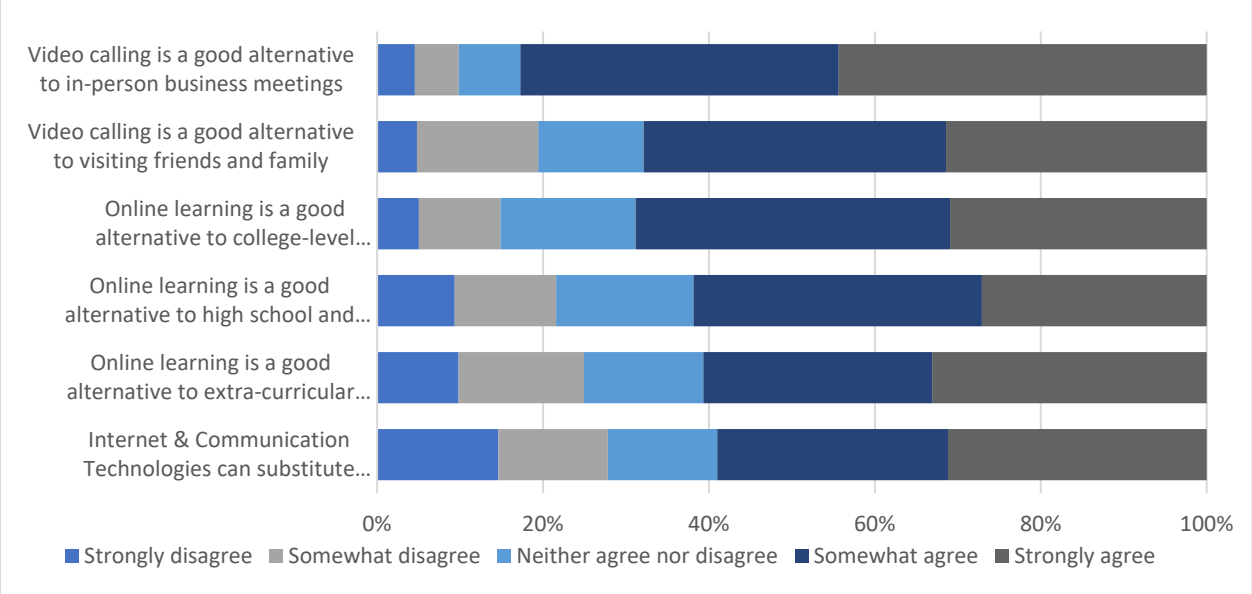

Figure 17 Experiences with technology

The statement employers agreed with the most (85% of respondents) regarding lifestyle experiences was, "I enjoy spending time with the people I live with." The statement that employers most disagreed with was (42% of respondents) was, "I already planned to relocate to another area" (Table 27). A key takeaway from Figure 18 is that many employers do not plan to relocate to another area and that they enjoy spending time with people in their households.

Table 27 Lifestyle Experiences

Question	Strongly disagree		Somewhat disagree		Neither agree nor disagree		Somewhat agree		Strongly agree		Total
The time spent traveling to places provides a useful transition between activities	4%	16	7%	31	18%	75	38%	159	33%	136	417
I like to stay close to home	3%	13	7%	29	18%	73	40%	167	32%	135	417
Having shops and services within walking distance of my home is important to me	6%	25	11%	44	18%	75	31%	131	34%	142	417
I like seeing people and having other people around me	3%	14	5%	19	13%	56	44%	184	35%	144	417
I'm pretty much a workaholic	5%	21	15%	61	17%	69	37%	155	27%	111	417
I enjoy spending time with the people I live with	2%	7	3%	12	11%	46	37%	153	48%	199	417
If I can continue to work from home after the COVID-19, I will relocate to other areas	15%	62	16%	66	21%	86	26%	108	23%	95	417
I already planned to relocate to another area	27%	113	15%	63	15%	64	24%	99	19%	78	417

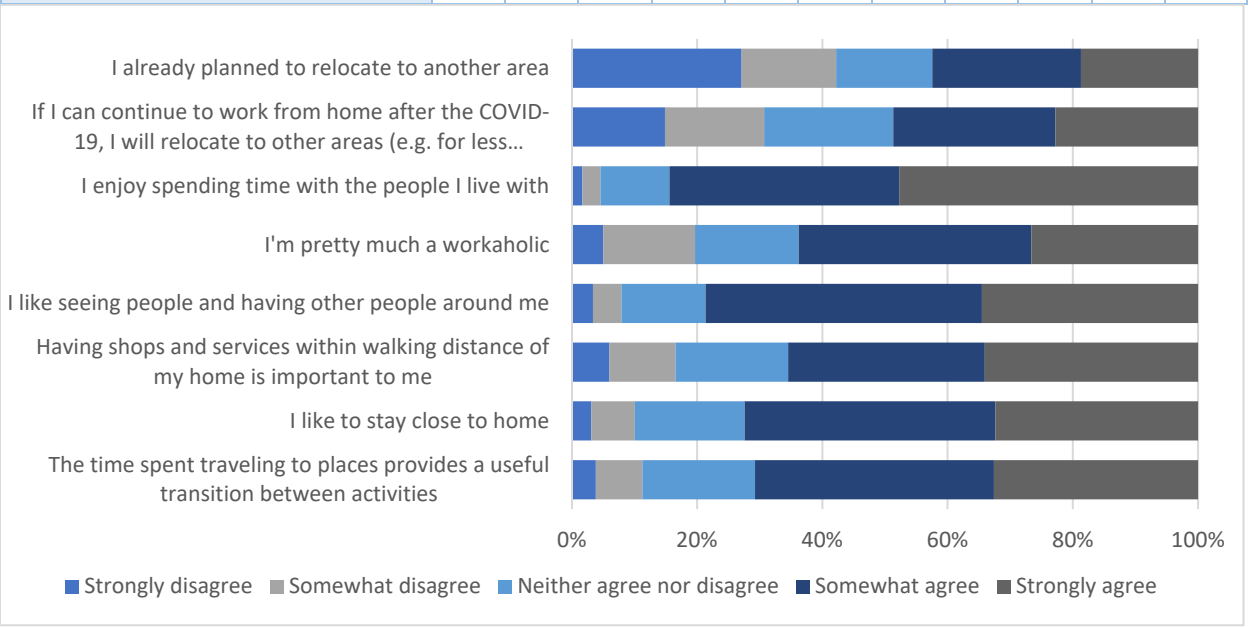

Figure 18 Lifestyle Experiences

Finally, employers rated their overall experiences with telecommuting with 79% agreeing that telecommuting is more convenient (Table 28). Employers disagreed the most with the idea that transitioning to telecommute requires minimal mental effort, with 19% disagreeing. This means that employers had a tough time with telecommuting but acknowledging that there is a higher level of convenience as well. Figure 19 shows how in general employers' opinions on their experience with telecommuting was similar for all the different questions presented to them.

Table 28 Experience with telecommuting

Question	Strongly disagree		Somewhat disagree		Neither agree nor disagree		Somewhat agree		Strongly agree		Total
Telecommuting is more convenient	4%	15	6%	23	11%	46	32%	135	47%	198	417
Telecommuting is more efficient	4%	18	9%	36	19%	79	33%	137	35%	147	417
Telecommuting meets my work needs	5%	22	10%	40	14%	57	35%	145	37%	153	417
Transitioning to telecommuting requires a minimal amount of mental effort	6%	25	13%	54	17%	72	34%	142	30%	124	417
The interactions through telecommunication technologies with colleagues and clients are sufficient and easy to manage	4%	17	10%	43	17%	69	36%	151	33%	137	417
The support provided by my company for telecommuting is sufficient and reasonable	3%	12	5%	20	15%	61	40%	165	38%	159	417

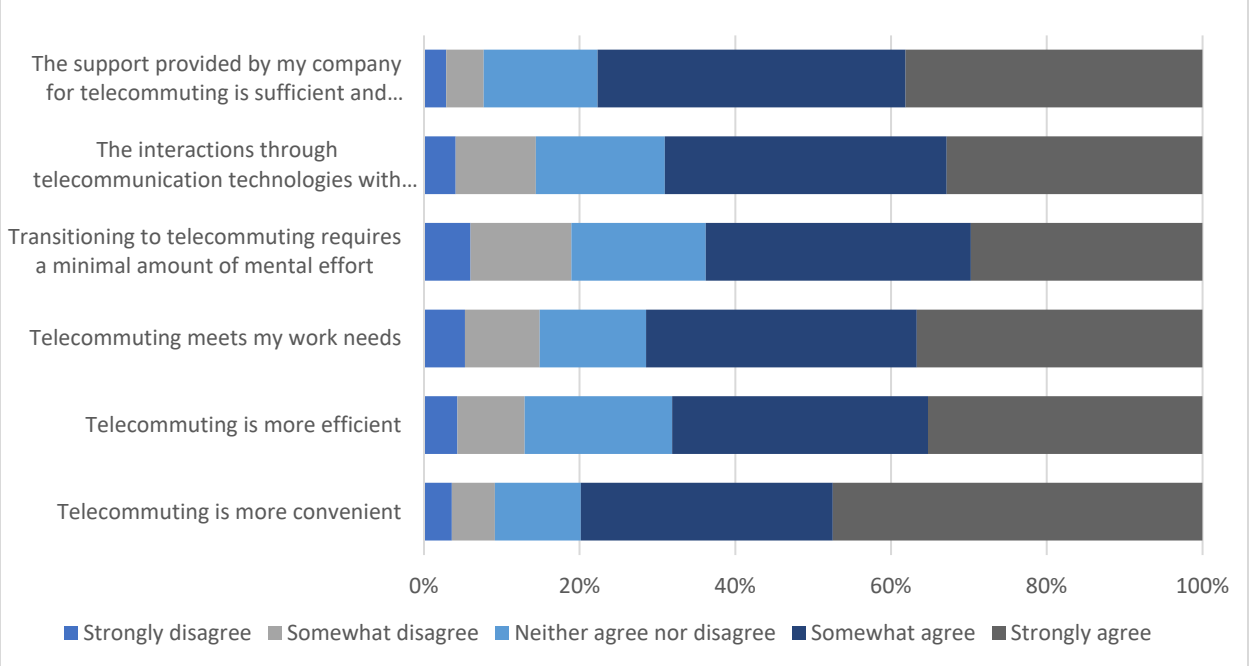

Figure 19 Experience with telecommuting

6. COLLEGE STUDENT DATA SUMMARY

The data from our student survey provides insights into the behaviors, experiences, and expectations from students for their universities and classes during COVID-19.

6.1 Telecommute Behaviors

Students were asked about their commute behaviors before COVID 19. Most students traveled to school driving a car alone (24%) and the fewest students (4%) did not commute to school at all (Table 29). It is also important to note that combining those that travel in a car alone, car driving others, and passenger in a car we get the total percent of students that travel by car at 60%.

Table 29 Travel mode to school before COVID-19

Answer	%	Count
Bicycle	5.60%	45
Walking	16.79%	135
Transit	10.82%	87
Car alone	24.13%	194
Car driving others	14.55%	117
Passenger in a car	22.14%	178
Something else (please specify)	1.87%	15
I do not travel to school	4.10%	33
Total	100%	804

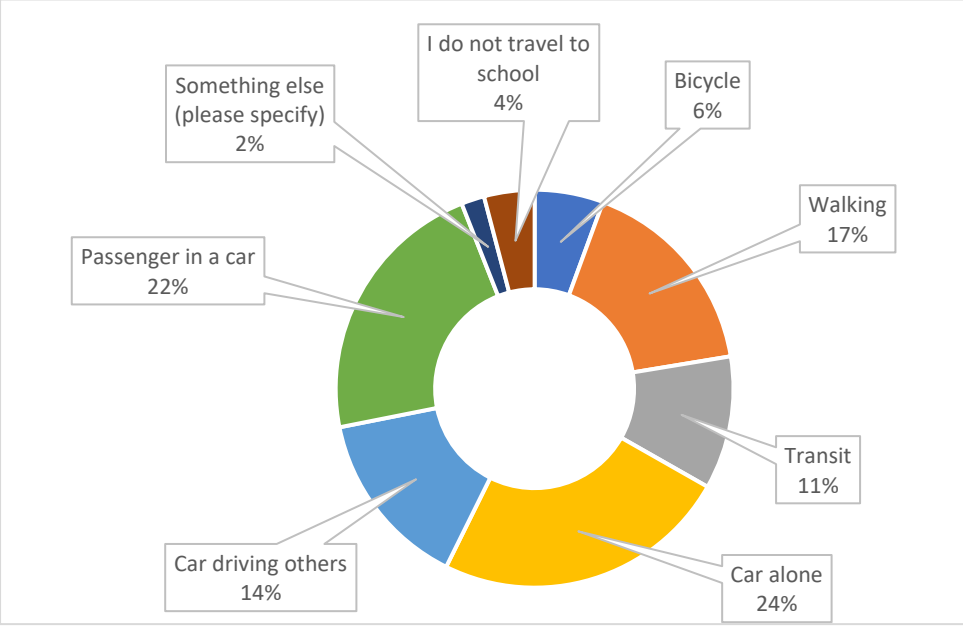

Figure 20 Travel mode to school before COVID-19

Students were asked whether they had taken an online class before, during, or after COVID-19. Most students (69%) reported having taken at least one online class before COVID-19. The majority (70%) of students also reported having their class schedule moved entirely online. Thirty percent of students said they prefer to return to having online classes less frequently after COVID-19, but the responses show an even distribution with a majority of students (52%) wanting to take online classes more frequently than normal after COVID-19 (Table 30). Figure 21 provides a good overview of the students' use of online classes and provides a comparison between before, during, and after COVID-19 online class participation.

Table 30 Online class participation Before, During and After COVID-19

Online classes Before COVID-19		
Answer	%	Count
Yes	69%	306
No	31%	138
Total	100%	444

Effect on class schedule		
Answer	%	Count
some canceled	4%	16
all canceled	3%	15
some moved online	13%	60
all online	70%	318
already online	6%	28
not taking classes	1%	4
not affected by COVID for other reasons	1%	6
other	2%	7
Total	100%	454

Frequency preference of online classes after COVID-19		
Answer	%	Count
more often than now	18%	72
as frequent as now	12%	49
less frequent than now more frequent than before	22%	88
as frequent as normal	18%	70
less frequent than normal	30%	118
Total	100%	397

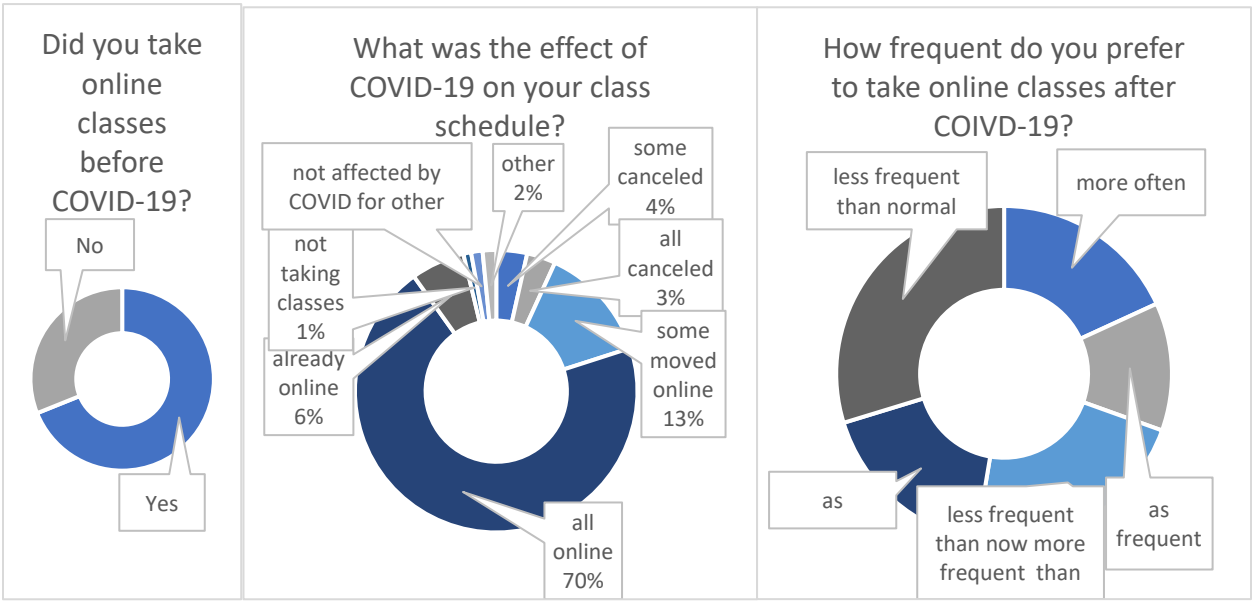

Figure 21 Online class participation Before, During and After COVID-19

6.2 Benefits and Challenges Faced with Telecommuting

Survey respondents were also asked to select the benefits and challenges they faced while telecommuting. Table 31 shows the challenges that students faced with telecommuting. The greatest challenge that students reported facing with telecommuting was more distractions at home, with 18% of respondents reporting this challenge (Table 31). The challenge that was least reported (1% of respondents) was other/elder dependent care. A few other challenges that many reported were: Boredom from sitting in front of a computer; Difficulty communicating with professors; and Difficulty communicating with other students (Figure 22).

Table 31 Self-Reported Challenges Faced with Telecommuting

Answer	%	Count
More distractions at home	18.20%	265
Sitting in front of a computer for extended periods is too boring and monotonous	17.17%	250
Difficult to communicate with professors	14.49%	211
Difficult to communicate with other students	14.08%	205
Lack of comfortable study space	12.36%	180
Have to do more housekeeping	7.42%	108
Need equipment or technology not available at home	5.15%	75
Increased expenses/added cost	3.98%	58
Childcare	2.20%	32
Need to care for sick family member	1.79%	26
None	1.37%	20
Other/elder dependent care	1.24%	18
Other (Please specify)	0.55%	8
Total	100%	1456

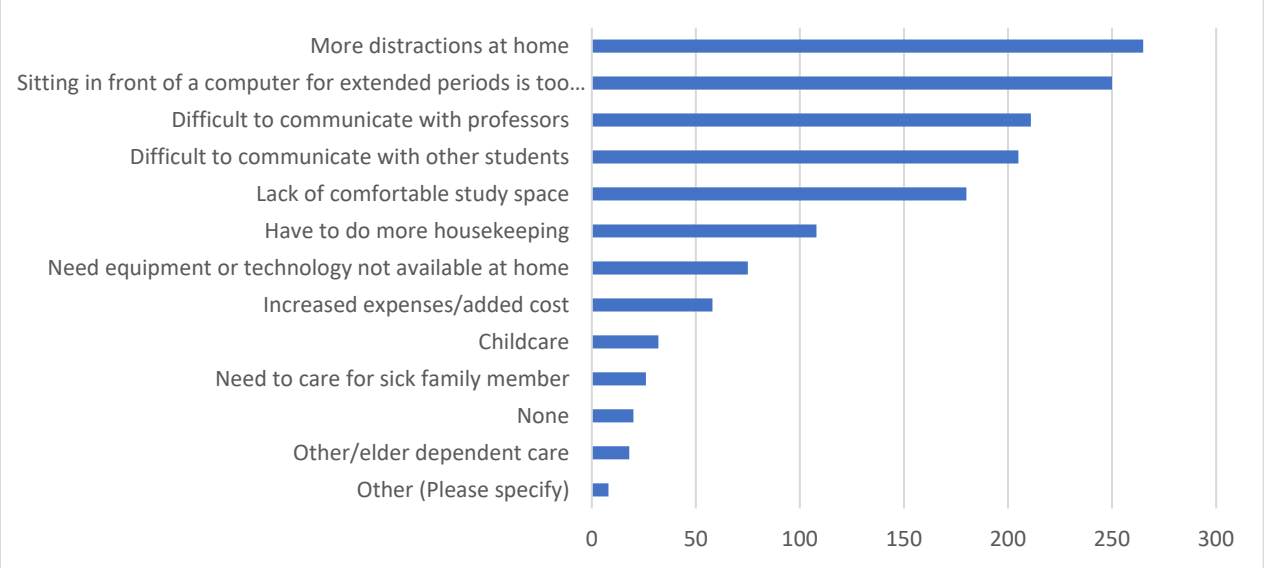

Figure 22 Self-Reported Challenges Faced with Telecommuting

The greatest benefit that students reported with telecommuting was, "No commute time," with 17% of respondents reporting this benefit. The benefit that was least reported (3% of respondents) was, "Fewer distractions at home." A few other benefits that many survey respondents reported were: More casual environment at home; More flexibility with course scheduling; and More efficient resting time. Overall, respondents valued benefits that involved time savings resulting from telecommuting, as shown in Figure 23.

Table 32 Self-Reported Benefits from Telecommuting

Answer	%	Count
No commuting time	16.69%	223
More casual environment at home	16.39%	219
More flexibility with course scheduling	15.79%	211
More efficient resting times at home	15.34%	205
More comfortable study space at home	10.03%	134
More efficient time management at home	6.81%	91
Decreased expenses/cost	6.81%	91
More energetic environment at home	3.89%	52
I'm able to focus better in crisis situations	3.67%	49
Fewer distractions at home	2.84%	38
None	1.57%	21
Other (Please specify)	0.15%	2
Total	100%	1336

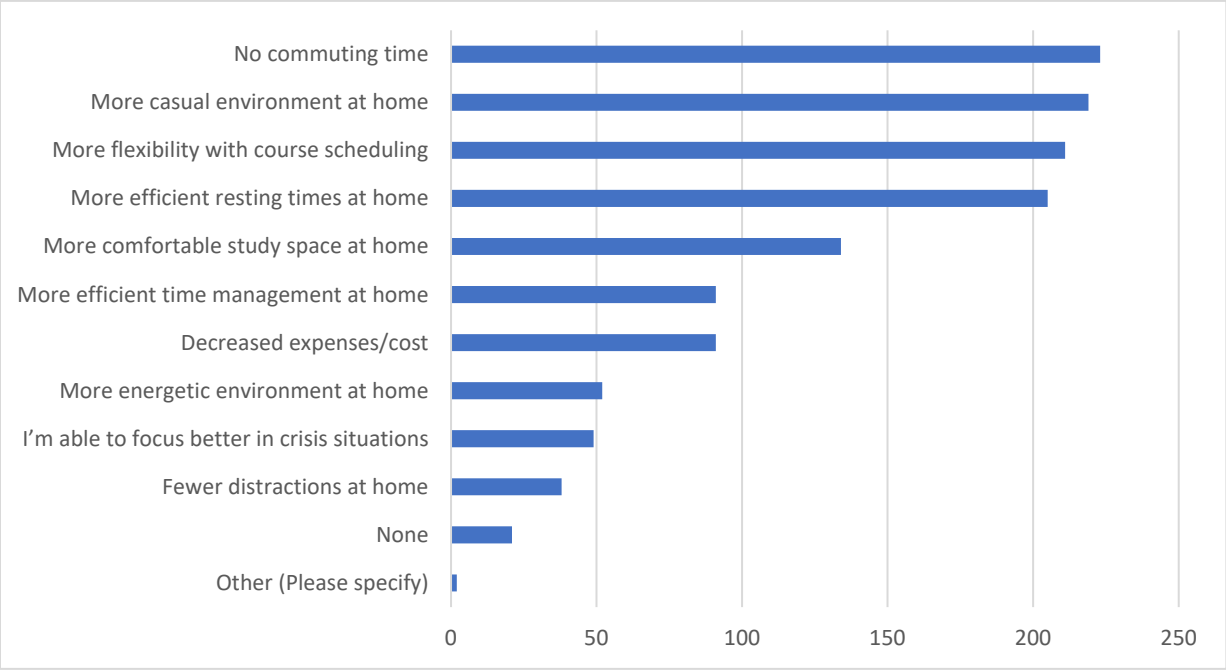

Figure 23 Self-Reported Benefits from Telecommuting

Students were asked, "How do you compare your learning in online classes with those offered before (with the traditional approaches) in the following categories?" Overall, students seemed to be dissatisfied with their experiences with online learning, with many of the categories being rated as somewhat worse, notably the interactions had higher number of respondents say it was much worse (25%) and the quality of the lesson had the most respondents say it was somewhat worse (45%) (Table 33). A notable exception is for convenience where 53% of students said that working from home was more convenient. This pattern of students having an overall negative experience can be seen most clearly in Figure 24, where the largest bars are either somewhat worse or about the same.

Table 33 Experiences with online classes during COVID-19

Question	Much worse		Somewhat worse		About the same		Somewhat better		Much better		Total
Quality of the lesson	14%	54	45%	179	29%	115	9%	34	4%	15	397
Productivity	21%	85	32%	126	30%	121	11%	45	5%	20	397
Effectiveness	15%	58	34%	136	36%	142	10%	39	6%	22	397
Convenience	10%	39	13%	52	23%	92	31%	122	23%	92	397
Tuition cost and other expenses	10%	38	12%	47	62%	246	9%	35	8%	31	397
Interactions	25%	101	38%	150	23%	90	11%	44	3%	12	397
Overall	14%	55	38%	152	28%	111	14%	55	6%	24	397

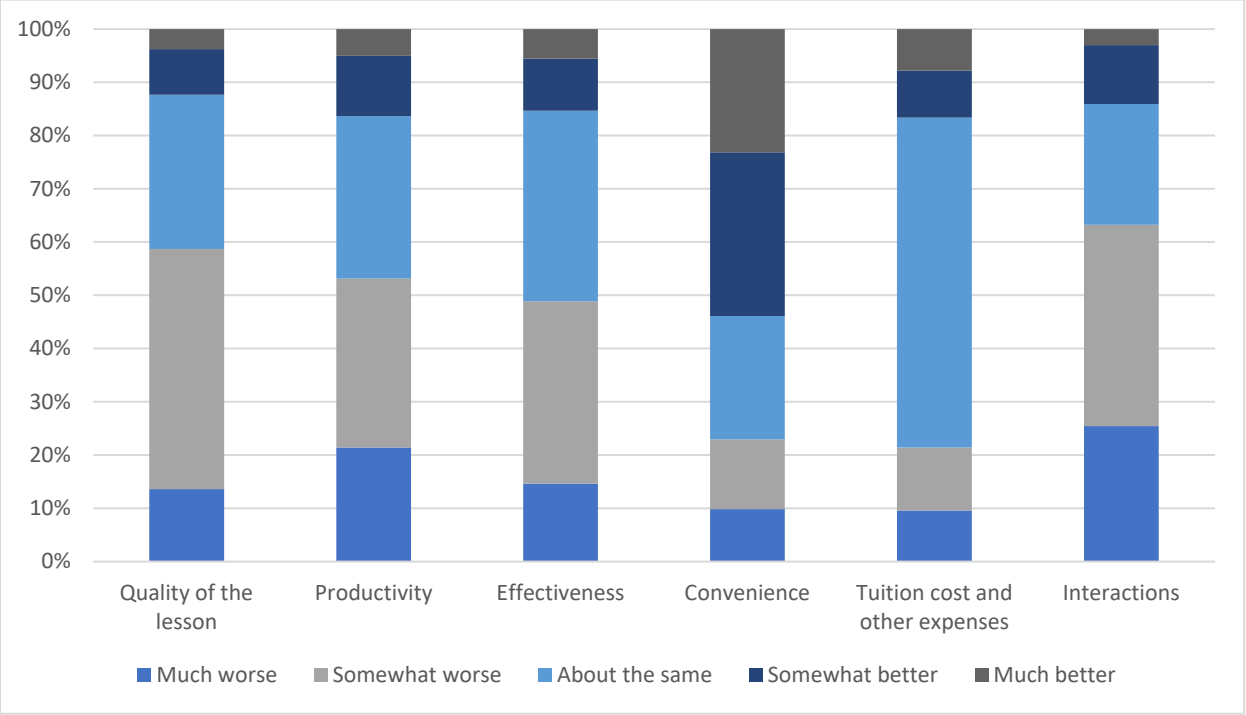

Figure 24 Experiences with online classes during COVID-19

6.3 Experience with Telecommuting

Students were asked to what extent they agreed or disagreed with certain statements about telecommuting, work from home, technology, and lifestyle. The responses are summarized in Table 34 - Table 37 and show some interesting phenomena that students experienced in relation to telecommuting.

In terms of their experience with remote learning, students mostly agree that they enjoy the social interaction at school (72%) and they like trying new and different technologies (66%). Overall, many students reported that they did not like studying from home, with 45% disagreeing with the statement, "I like studying from home." Students seem to enjoy the technology used for remote learning, but miss the social interaction and find it hard to get motivated (Figure 25).

Table 34 Experience with remote learning

Question	Strongly disagree		Somewhat disagree		Neither agree nor disagree		Somewhat agree		Strongly agree		Total
I like to work on a team	5%	19	14%	57	19%	77	36%	144	25%	100	397
Studying at home may increase family conflicts	14%	54	14%	54	23%	92	29%	114	21%	83	397
I enjoy the social interaction at school	7%	26	5%	18	17%	67	26%	103	46%	183	397
It is hard to get motivated to study away from the university	8%	31	12%	47	18%	72	30%	118	32%	129	397
I like studying from home	16%	62	19%	77	24%	96	23%	93	17%	69	397
Learning how to use new technologies is often frustrating	16%	65	25%	100	19%	77	24%	96	15%	59	397
I often purchase new technology products, even though they are expensive	21%	84	21%	83	22%	89	24%	95	12%	46	397
I like trying new and different technologies	5%	18	11%	44	19%	76	38%	149	28%	110	397

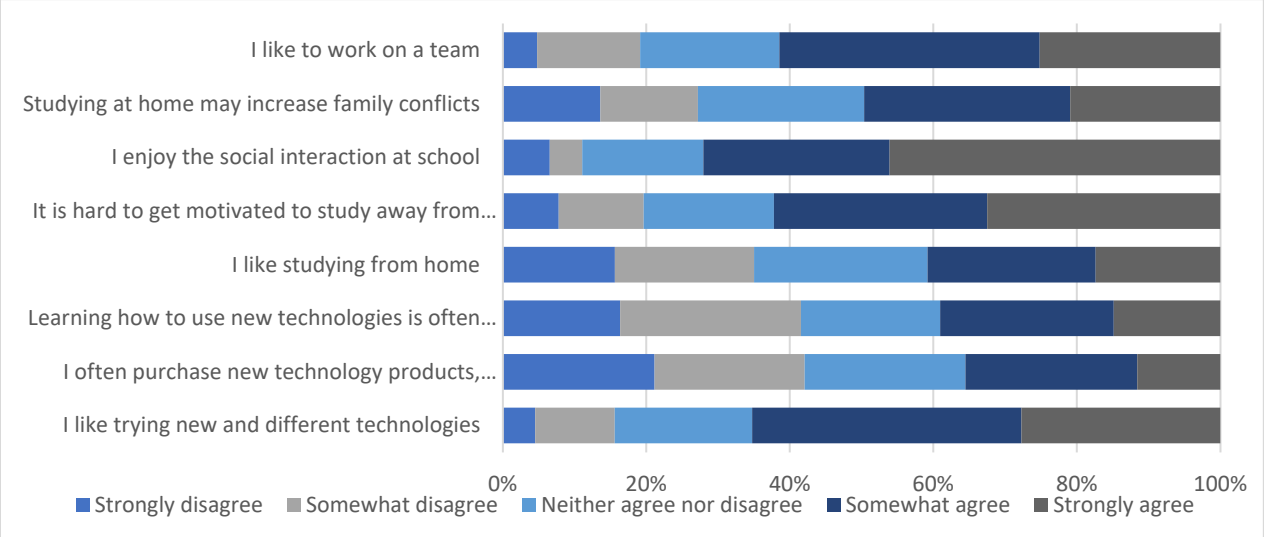

Figure 25 Experience with remote learning.

In terms of lifestyle, the statement that students most agreed with (66%) was, "I like seeing people and having other people around me." The lifestyle statement that was least popular was, "I already plan to relocate to another area, " with 47% disliking it (Table 35). Many of the respondents also stated that they were not workaholics and most had positive regards for the statements given in the lifestyle experiences. In general, students seemed reluctant to move away from home and have positive regards for their experiences with people (Figure 26).

Table 35 Lifestyle Experiences

Question	Strongly disagree		Somewhat disagree		Neither agree nor disagree		Somewhat agree		Strongly agree		Total
The time spent traveling to places provides a useful transition between activities	5%	21	14%	55	34%	133	31%	125	16%	63	397
I like to stay close to home	7%	28	18%	70	20%	81	29%	116	26%	102	397
Having shops and services within walking distance of my home is important to me	4%	15	12%	47	31%	122	28%	110	26%	103	397
I like seeing people and having other people around me	6%	22	8%	32	21%	83	34%	134	32%	126	397
I'm pretty much a workaholic	16%	62	25%	101	25%	98	21%	83	13%	53	397
I enjoy spending time with the people I live with	6%	25	9%	36	23%	92	33%	131	28%	113	397
If I can continue to do remote learning after the COVID-19, I will relocate to other areas (e.g. for less congestion, more affordable housing, etc.)	20%	79	18%	70	31%	123	19%	77	12%	48	397
I already planned to relocate to another area	30%	120	17%	68	26%	103	13%	51	14%	55	397

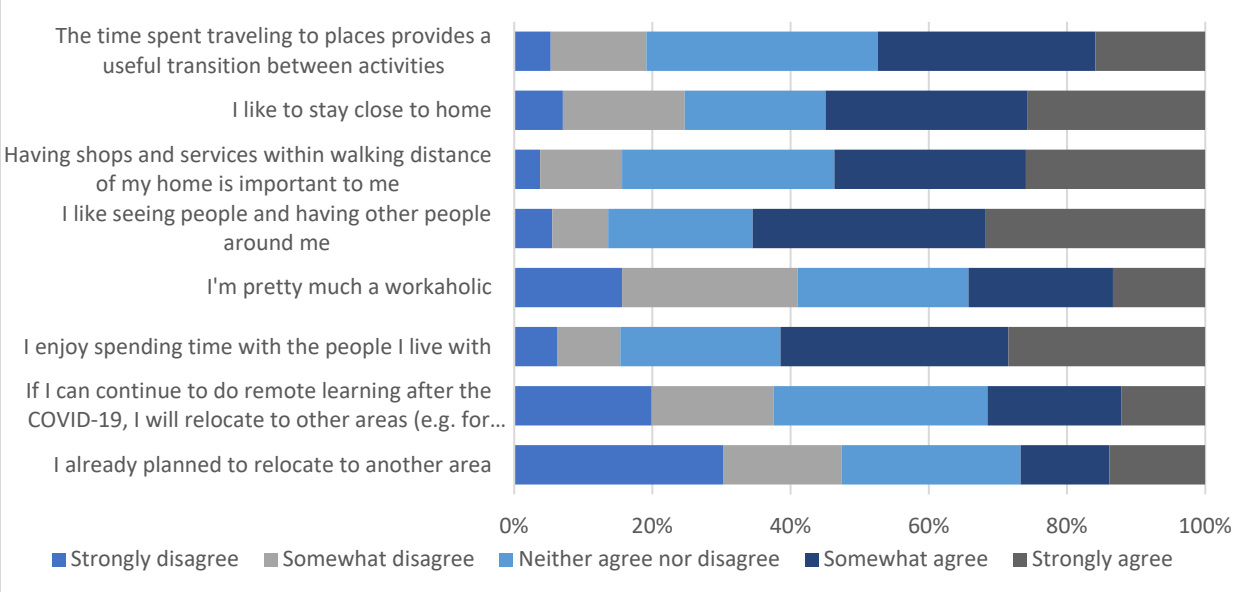

Figure 26 Lifestyle Experiences

In relation to their experiences with technology, the statement student most agreed with (56%) was, "video calling is a good alternative to in-person busines meetings." The statement that students disagreed with the most was, "Internet and communication technologies can substitute personal need for travel." with 44% of disliking it. Overall, students had a mix of negative and positive experiences with technology (Table 36). The responses were more negative when talking about technology as a replacement for in school activities and were more positive when referring to other types of in person activities.

Table 36 Experiences with Technology

Question	Strongly disagree		Somewhat disagree		Neither agree nor disagree		Somewhat agree		Strongly agree		Total
Video calling is a good alternative to in-person business meetings	9%	37	14%	57	20%	78	33%	132	23%	93	397
Video calling is a good alternative to visiting friends and family	17%	66	24%	94	18%	71	24%	96	18%	70	397
Online learning is a good alternative to college-level classroom instruction	16%	64	23%	91	24%	97	22%	87	15%	58	397
Online learning is a good alternative to high school and elementary-level classroom instruction	22%	87	24%	97	21%	84	19%	77	13%	52	397
Online learning is a good alternative to extra-curricular activity instruction	26%	102	21%	82	24%	95	18%	70	12%	48	397
Internet & communication technologies can substitute personal need for travel	22%	87	20%	80	24%	94	23%	90	12%	46	397

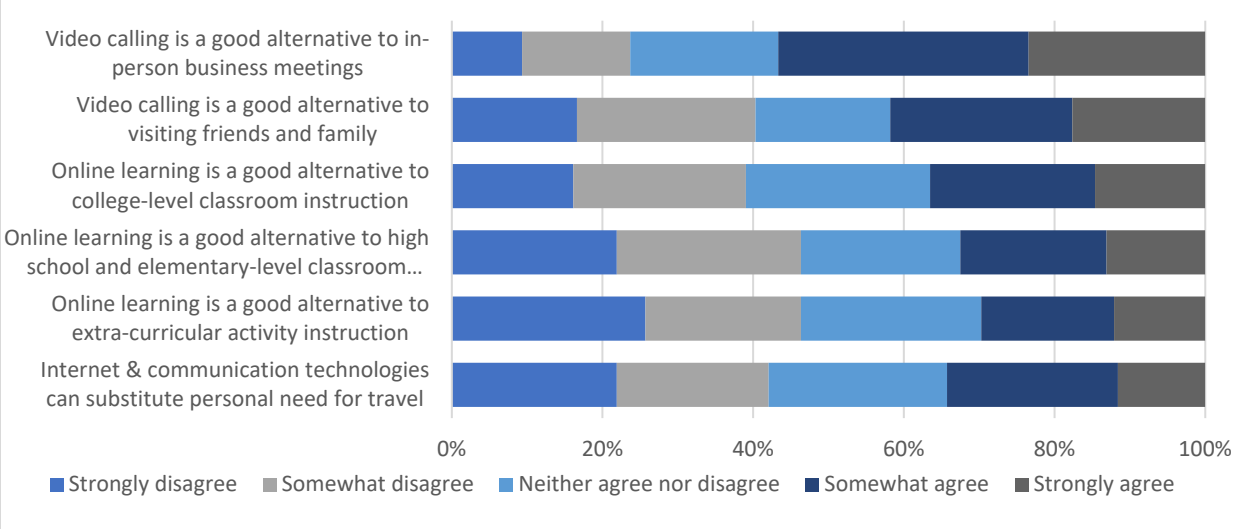

Figure 27 Experiences with Technology

Students' reported experience with online learning was very mixed. The category that students most agreed with (49%) was that online learning is convenient. The statement that most students disagreed with (45%) was, "Transitioning to online classes requires a minimal amount of mental effort" (Table 37). Students also reported that online learning does not meet their educational needs, but generally did not have a problem with online learning software itself (Figure 28).

Table 37 Experiences with online learning

Question	Strongly disagree		Somewhat disagree		Neither agree nor disagree		Somewhat agree		Strongly agree		Total
Online learning is more convenient	13%	51	17%	69	20%	80	28%	112	21%	85	397
Online learning is more efficient	15%	61	25%	100	28%	113	21%	83	10%	40	397
Online learning meets my education needs	20%	81	22%	86	23%	91	22%	89	13%	50	397
Transitioning to online classes requires a minimal amount of mental effort	21%	82	24%	96	21%	85	23%	92	11%	42	397
The interaction with the online class websites or software is, overall, easy and understandable	8%	30	21%	82	25%	99	31%	125	15%	61	397
If I have a problem with the online class platforms, I can easily get the support I need from the instructor or staff to resolve the issue	10%	40	19%	76	26%	104	30%	120	14%	57	397

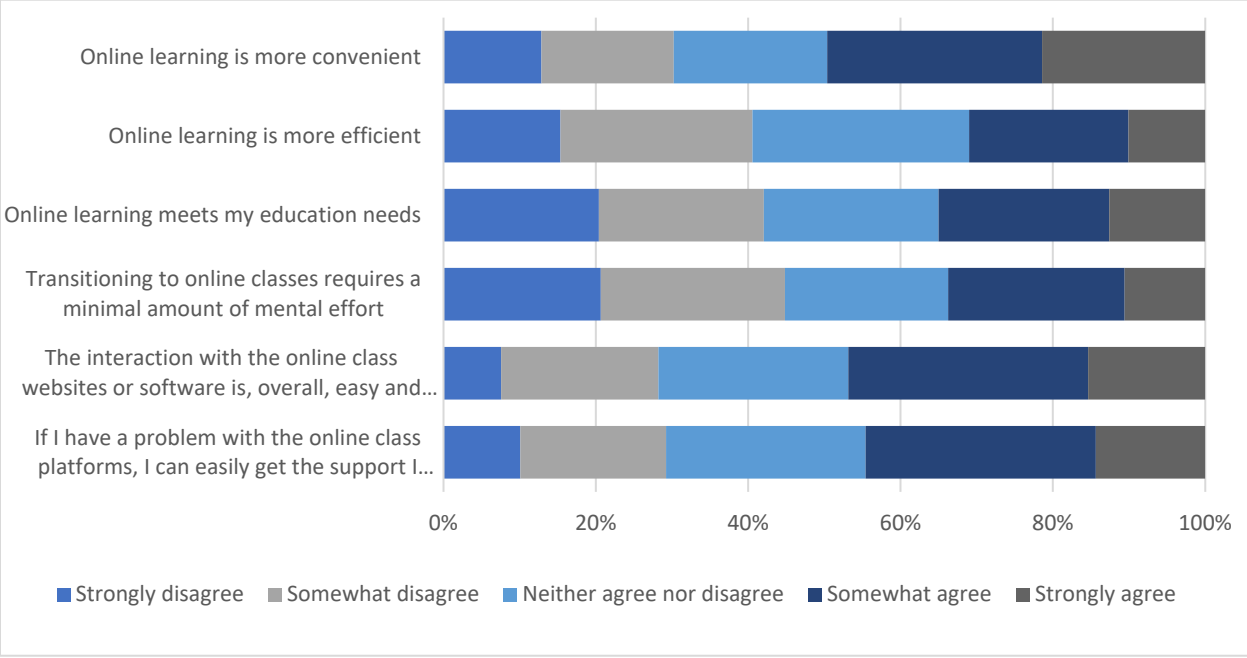

Figure 28 Experiences with online learning

7. SUMMARY

The goal of this study was to measure the effect COVID-19 had on telecommuting for employees, employers, and college students living in south Florida. Another goal of the study was to measure changes in commute behavior, experiences with telecommuting, challenges/benefits of working from home, and expectations for the future of telecommuting after COVID-19 is no longer a threat. This was done by conducting a survey using the Qualtrics platform to find survey respondents that fit the quotas necessary for a representative sample.

The survey clearly shows how telecommuting has absolutely been accelerated by COVID-19, with more employees, employers, and students using telecommuting now than ever before. The number of employees that telecommuted to work every day jumped from 8% to 28% (Table 10), 76% of employers said they had a telecommuting policy (Table 21), and 70% of students said they were taking all their classes online (Table 29).

In terms of the challenges and benefits of telecommuting, survey respondents said the greatest challenge was more distractions at home and the greatest benefit was spending less time in traffic. Twenty-four percent of employees reported having trouble with distractions at home (Table 13) and 18% of students reported the same (Table 31). Another big challenge for employees and students was communication, with 14% of students and 18% of employees reporting difficulties. Spending less time in traffic was reported as a benefit by 19% of employees and 17% of students.

Employers were asked about challenges and benefits of telecommuting when it comes to workplace operations rather than personal experiences. The biggest challenge of telecommuting according to employers was lower employee productivity, which was ranked as the biggest challenge by 29% of employers (Table 23) and the greatest benefit was the reduced expenses on office space and equipment (Table 24).

The survey respondents were also asked about their attitudes toward working from home, telecommuting, technology, and lifestyle preferences. Most respondents stated that they liked the social interactions they had at the conventional workplace/school. When asked about their attitudes toward telecommuting/online learning, respondents agreed that it was more convenient with 50% of students (Table 37) and 80% of employers agreeing (Table 28).

Respondents overall agreed that video calling is a good alternative to in person business meetings, with 56% of students (Table 36) and around 80% of employers and employees agreeing (Table 18). Employers and employees both said they enjoyed spending time with the people they live with at around 80% agreeing (Table 27), however, students differed as 66% (Table 35) agreed that they liked seeing people, but not necessarily those they live with.

Overall, respondents seemed to think that telecommuting was more convenient, but were frustrated with the lack of social interaction. The change they have undergone in their work habits is significant as many switched to remote work. They benefited from the fact that they did not need to commute to work every day but were challenged by the difficulties in communicating

with their coworkers. The effects of this dramatic shift in the way people work and learn will be seen over time. The permanence of these changes in telecommuting will be more apparent when COVID-19 is no longer a threat.