



Waco MPO White Paper Travel Pattern Impacts from COVID-19 Shelter in Place Restrictions for Texas Metropolitan Areas

May 27, 2020

Abstract

With unprecedented restrictions in travel brought about by the need to socially isolate as a result of COVID-19, travel patterns within the State of Texas and the Waco Region have changed in ways not previously observed. Until recently, no platform was publicly available to provide empirical data quantifying the impacts of these changes. In March, 2020, the Maryland Transportation Institute (MTI) provided a web based platform to quantify changes in travel patterns, and calculated a social distancing index to measure the extent to which social distancing was practiced.

Waco MPO staff utilized the MTI platform to document three indicators of COVID-19 travel impacts (social distancing index, percent of population staying at home, and per person miles of travel) for each MPO region within Texas by week between March 1, 2020 and May 2, 2020. The observed impacts were immediate and significant with per person miles of travel decreasing 17% to 24% within one week of the first shelter in place orders. In terms of social distancing efforts, most regions in Texas were moderately practiced in social distancing with maximum social index scores between 45 and 58 (out of 100). Nevertheless, these scores were generally several points higher than those calculated for other states within the southern US.

Trends for the Waco Region were consistent with those observed for small MPO regions in Texas for both miles of travel and population percentage staying home. Using the social distancing index developed by MTI, McLennan County practiced social distancing more than other small MPO regions in Texas with index scores 3 to 7 points higher on average.

Of concern is that by the month of April, every metric tracked by the MTI platform began to observe a decrease in social distancing, a decrease in persons staying at home and an increase of per person miles of travel. These trends were observed for not only McLennan County, but also for every level of geography within Texas and for the nation. Several plausible theories have been suggested for these trends, the more significant may either be 'Social Distancing/Quarantine Fatigue' where individuals no longer desire to socially isolate after being confined at home for several weeks or the perception that there never was or is no longer any threat from COVID-19 due to relatively low numbers of positive test results being reported.

MPO staff will continue monitoring data to assess any long-term shifts in travel patterns that may require a reassessment of project priorities for both the Metropolitan Transportation Plan and Transportation Improvement Program.

Purpose and Methodology

In February, 2020, the United States experienced the first documented impacts from citizen exposure to the novel coronavirus (SARS-CoV-2) and the subsequent disease referred to COVID-19. In order to avoid a potentially dire circumstance of overwhelming medical services and their ability to adequately treat victims of the virus, communities and states implemented shelter in place restrictions. A consequence of these shelter in place orders was a significant reduction in traffic volumes and travel due to the closure of many non-essential businesses, services and industries, and a significant increase in the number of employees working remotely at home. While there has been much anecdotal evidence of the impacts, such as pictures of normally busy streets with only 1 or 2 vehicles, there has been little empirical data or analysis to quantify these impacts, much less specifically for the Waco Region. Despite the lack of data or analysis, MPO staff has received numerous requests for some method to document the transportation impacts of COVID-19 restrictions.

In March, 2020, the Maryland Transportation Institute (MTI) from the University of Maryland began collecting data from various web based travel platforms (e.g. Google or Inrix) to assess changes in travel patterns resulting from COVID-19 restrictions. This data was then disaggregated down to state and county levels thus providing MPOs and the general public the ability to assess metropolitan scale impacts. Researchers at MTI also developed a social distancing index to give community leaders an estimate of the extent to which social distancing strategies were practiced within their regions. The index incorporates and weights the following variables: percent of persons staying home, trips per person, percent of out of county trips and per person miles of travel. The index uses a scale of 1 to 100 with a score of 100 indicating that all residents are staying at home and no visitors are entering the county, and a score of 1 being no observable social distancing. From a practical perspective, the baseline index score is between 14 and 16. Access to the MTI data and analysis was provided through the web based COVID-19 Impact Analysis Platform. The methodology used by MTI can be found via the following link: <http://data.covid.umd.edu/about/index.html>

MPO staff utilized the MTI COVID-19 impact analysis platform to document three indicators of COVID-19 travel impacts (social distancing index, percent of population staying at home, and per person miles of travel), for each MPO region within Texas by week between March 1, 2020 and May 2, 2020. For MPO regions with a jurisdiction covering a partial county, MPO analysis utilized the entire county. MPO staff utilized the week of March 1st to represent a baseline condition, as the first COVID-19 restrictions were not implemented by any community in Texas until the week of March 8th. The analysis then aggregated data into the MPO size classes identified in Table 1. The urbanized area population for the Waco MPO is estimated to be 186,000 as of 2018 and is therefore classified as a small MPO.

Table 1 – MPO Size Classes Used for Analysis

MPO Size Category	Urbanized Area Population
Small	Less than 200,000
Medium*	200,000 to 750,000
Large	Greater than 750,000

*For purposes of this analysis, the Midland-Odessa and Beaumont-Port Arthur MPOs were defined as medium sized.

Data, Results and Analysis

Persons Staying and Home and Per Person Miles of Travel

Most metropolitan communities within Texas implemented some form of travel restrictions the week of March 15th with more restrictive shelter in place orders the following week. This included both the City of Waco and McLennan County. Many shelter in place orders were partially lifted on May 1st with Governor Abbott's declaration permitting certain businesses to open at reduced capacity on that date.

The impacts of these restrictions were immediate and significant with one in four Texas residents staying home the week of March 15th, increasing to nearly one in three the week of March 22nd. The large percentage of persons staying at home resulted in a decrease in per person miles of travel of 17% to 24% compared to baseline conditions during the week of March 15th. Additional travel mileage decreases between 16% and 23% were observed the following week. At its peak, the week of March 29th, one-third of Texans were staying home and per persons miles of travel had decreased by 43% statewide. Of note, per person travel and percent of persons staying at home were opposite images of each other having a strong negative association. In other words, as more persons stayed home, per person travel decreased proportionally and vice-versa. See Tables 2 and 3 for a comparison between MPO size categories, McLennan County, and the State of Texas.

Table 2 – Peak Percentage of Persons Staying at Home (Week of March 29 – April 4)

MPO Size Category	Percent Staying at Home
Small	28%
Medium	30%
Large	35%
McLennan County	30%
State of Texas	33%

Table 3 – Maximum Decrease in Per Person Miles of Travel Relative to Baseline

MPO Size Category	Baseline Miles of Travel per Person	Max Decrease in Miles of Travel	Week of Minimum Travel
Small	37.2	-16.3	April 5 – 11
Medium	44.1	-17.4	April 5 – 11
Large	39.1	-17.7	April 5 – 11
McLennan County	39.9	-17.1	April 5 – 11
State of Texas	41.6	-17.9	March 29 – April 4

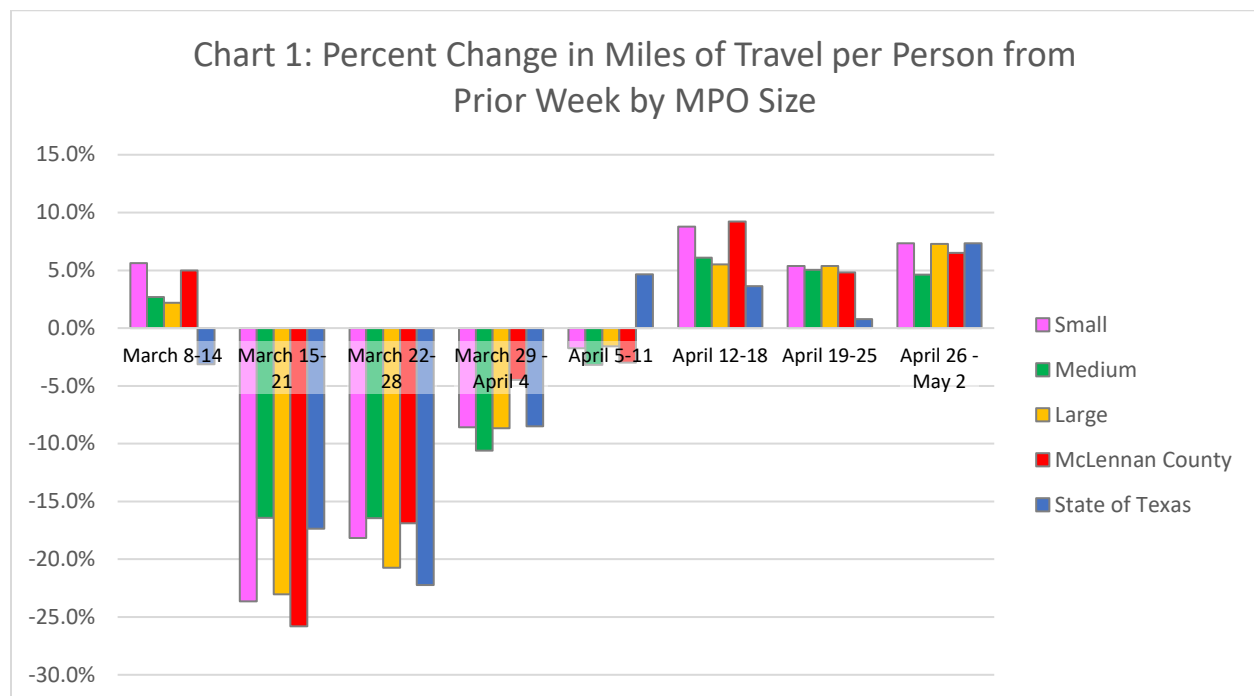
Travel and stay-at-home trends for McLennan County closely mirrored that of the State and other metropolitan regions within Texas. McLennan County trends, however, were closer to that of medium sized MPOs than those within the small MPO category (within which the Waco MPO is currently grouped). This may be an indication that the Waco MPO region is approaching a designation status of Transportation Management Area (urbanized area population of over 200,000) after the 2020 Census.

During the week of April 5-11, travel within McLennan County reached a minimum of 22.8 miles per person representing a 43% decrease relative to baseline. This decrease is likely underrepresenting the true travel decrease of residents as it also includes freight travel. In a separate report produced by INRIX¹, freight travel nationally decreased only 13% compared to a 46% decrease for personal travel during the period between March 14th and April 17th. As approximately 39% of regional vehicle miles of travel are represented by the main lanes of IH-35, and approximately 30 percent of this VMT are from heavy trucks², the maximum decrease in personal miles of travel for the Waco Region was likely closer to 50% relative to baseline.

While the week of April 5th observed a minimum in travel and a maximum in persons staying home, these trends started reversing the following week. This trend was gradual, approximately a 5% to 7% week-to-week increase. This trend continued through the month of April and was observed across all levels of geography, including nationally. These reversals were occurring despite no official relaxing of shelter in place orders until May 1st in Texas.

¹INRIX North America: COVID-19's Impact on Freight: An Analysis of Long-Haul Freight Movement During a Pandemic: Bob Pishue, Transportation Analyst; April 28, 2020

²Connections 2045: The Waco Metropolitan Transportation Plan; Table 4.2



Maryland Transportation Institute (2020). University of Maryland COVID-19 Impact Analysis Platform, <https://data.covid.umd.edu>, accessed on May 21, 2020, University of Maryland, College Park, USA

Chart 2: Change in Miles of Travel per Person by MPO Size

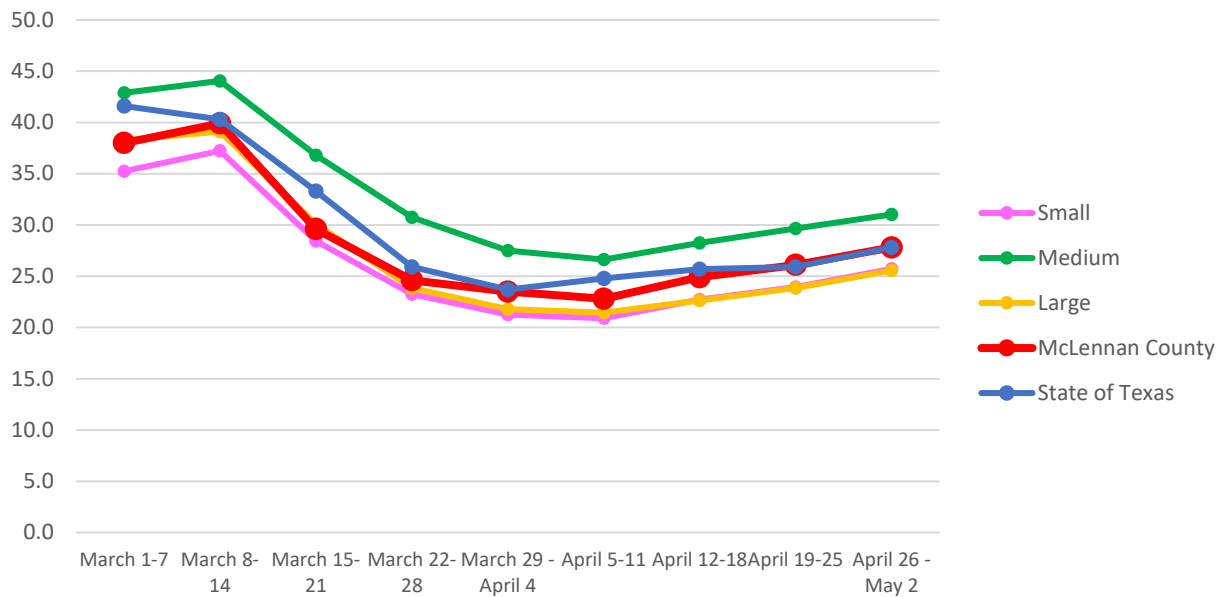
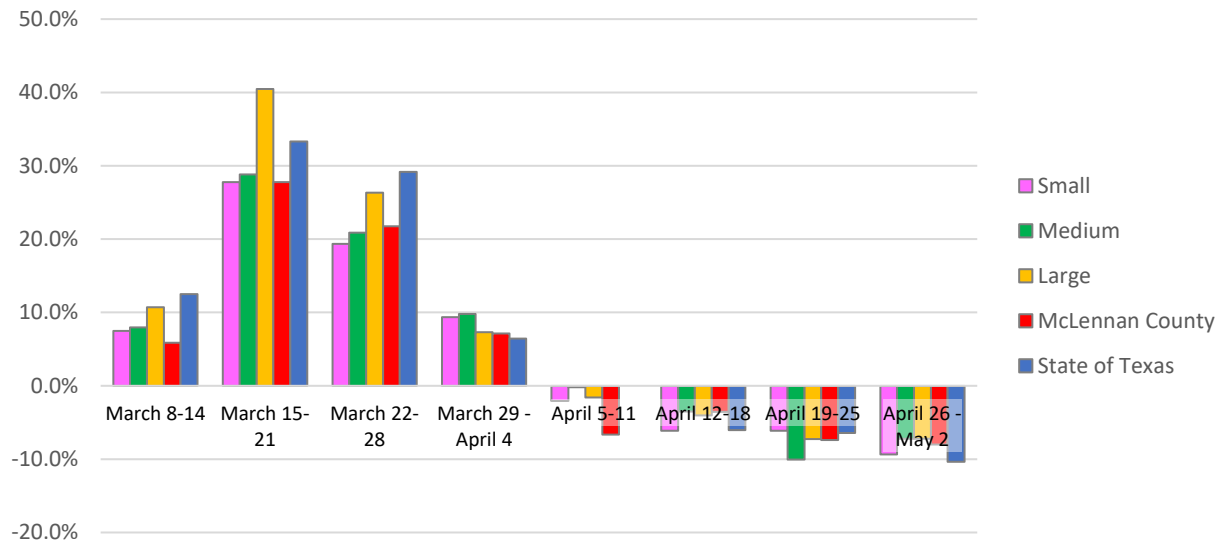
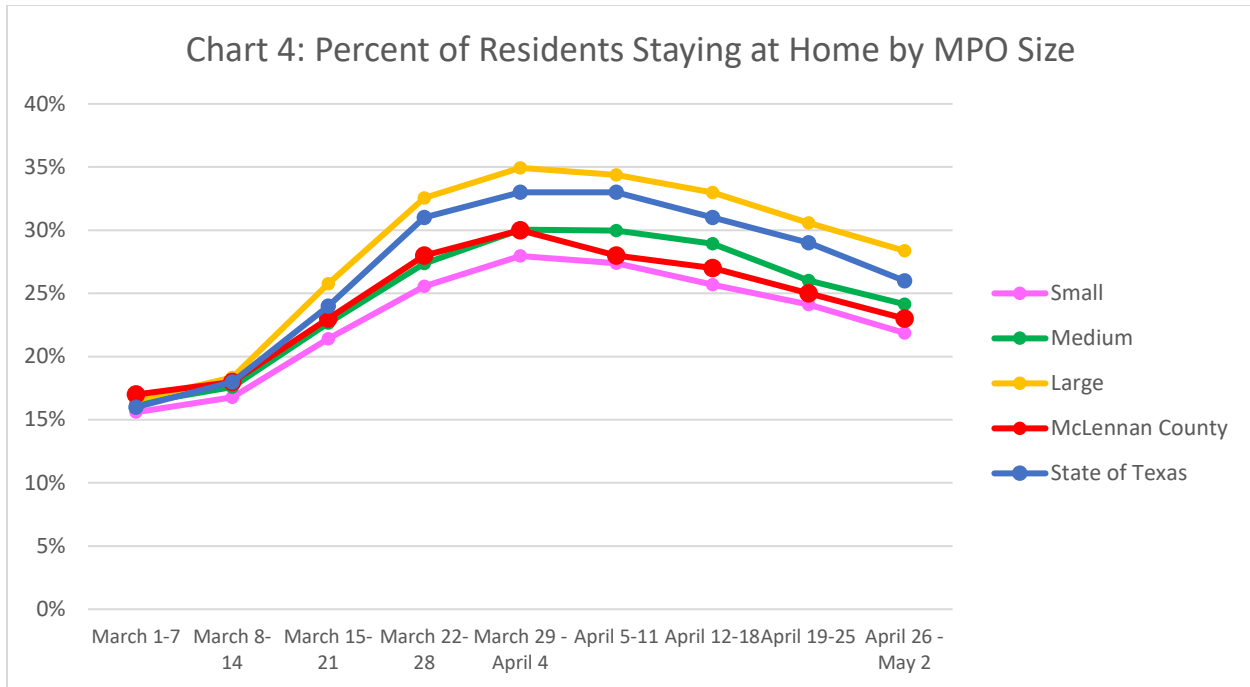


Chart 3: Percent Change of Residents Staying at Home from Prior Week by MPO Size



Maryland Transportation Institute (2020). University of Maryland COVID-19 Impact Analysis Platform, <https://data.covid.umd.edu>, accessed on May 21, 2020, University of Maryland, College Park, USA



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Social Distancing Index

Texas’ efforts at social distancing during the shelter in place period (March 22 to April 18) were in the middle of the pack relative to other states with a score of 53. New York State practiced the most social distancing with a score of 71 and Wyoming practiced the least social distancing with a score of 37. Relative to other states within the Southeastern US, Texans practiced somewhat more social distancing during the same period with the Southeastern average score being 47.9.

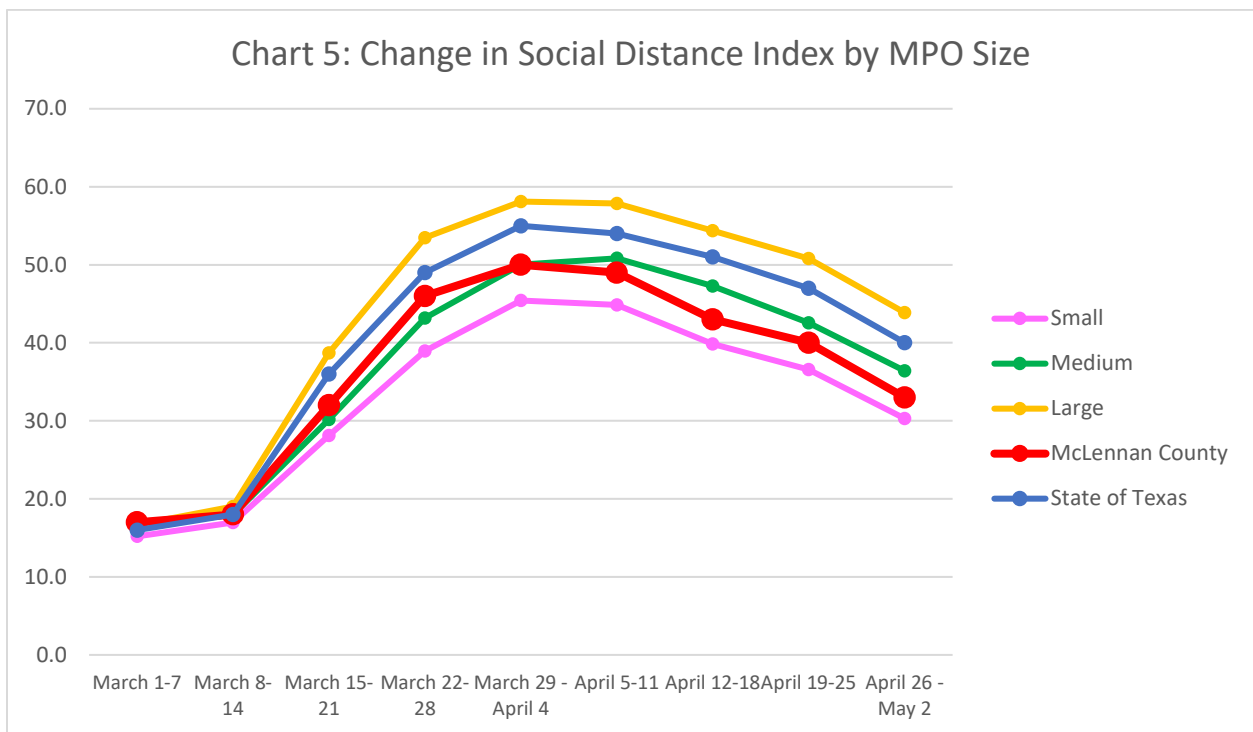
On a metropolitan scale McLennan County’s effort more closely resembled medium sized MPOs and practiced somewhat more social distancing than small MPO regions. Compared to the state, the Waco Region average and maximum scores were both slightly less. See Table 4 for a comparison of social distance index scores.

Table 4 - Average and Maximum Social Distance Index (SDI) Scores during Shelter in Place Orders

MPO Size Category	Average SDI Score March 22 to April 18	Max SDI Score Week of March 29 th
Small	42	45.4
Medium	48	50.0
Large	56	58.1
McLennan County	47	50.0
State of Texas	53	55.0

Of note, the social distance index can be influenced by the types of industries and major employers present in small or medium sized regions such as the Waco region. For example, a small number of 'essential' industries or services with significant employment can serve to significantly reduce the number of persons staying home and increase the number of trips or persons commuting from neighboring counties relative to larger regions with more diversified economies. Each of these variables are important components in the social distance index.

The Waco Region has 2 large medical centers and several manufacturing and food preparation industries all of which were deemed essential. As a result, the presence of these employers in the region may have decreased the social distance index score. On the other hand, Waco has 3 institutions of higher education which were all closed and likely offset these decreases. Thus, a middle score of 50 and an average score slightly higher than peer regions was expected and observed.



Maryland Transportation Institute (2020). University of Maryland COVID-19 Impact Analysis Platform, <https://data.covid.umd.edu>, accessed on May 21, 2020, University of Maryland, College Park, USA

Chart 6: Change in Social Distance Index Score from Prior Week by MPO Size

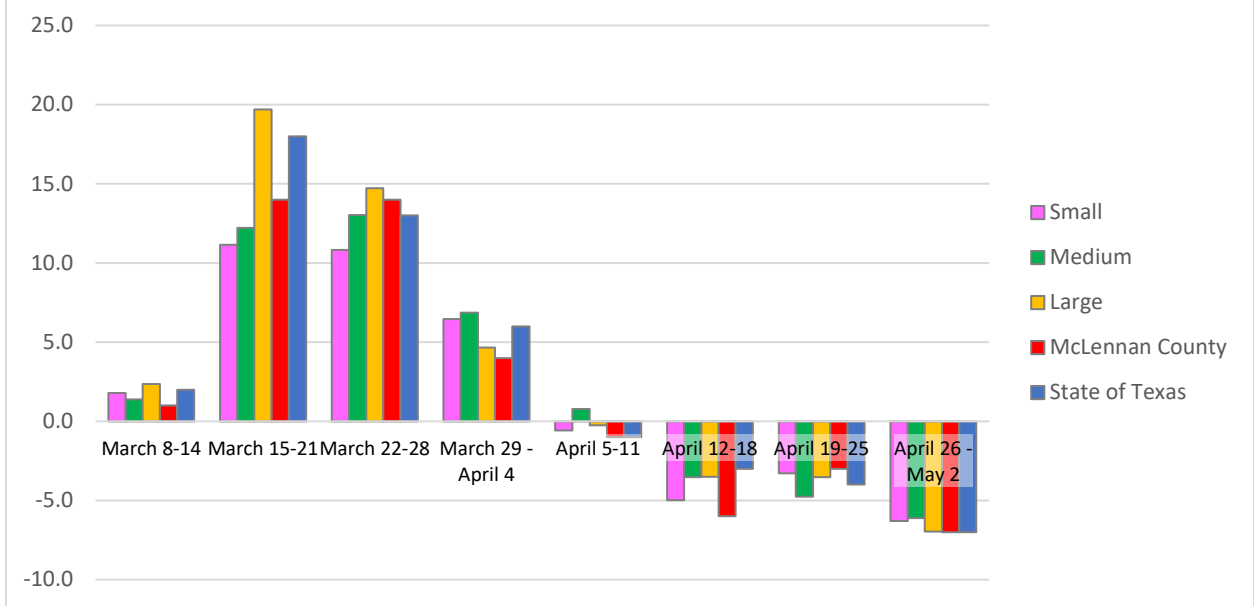
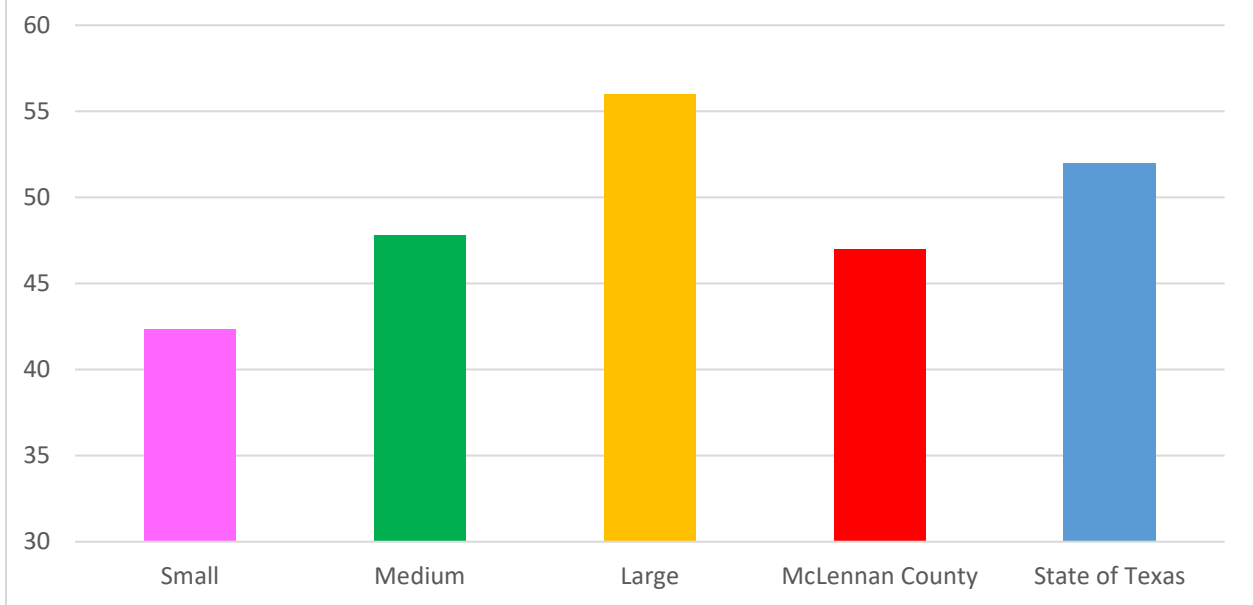


Chart 7: Average Social Distance Index Score for the period of March 22 to April 18, 2020 by MPO Size



Maryland Transportation Institute (2020). University of Maryland COVID-19 Impact Analysis Platform, <https://data.covid.umd.edu>, accessed on May 21, 2020, University of Maryland, College Park, USA

Future Research

There are five important questions that MPO staff will evaluate over the next 12 to 24 months:

1. Was there a significant reduction in total crashes observed during the shelter in place order?
2. Were the crashes observed during shelter in place order more severe than pre-Covid-19 levels?
3. In the short term, how much will miles of travel increase within the next 6 to 12 months and what will be the rate of increase?
4. In the long term, will traffic volumes recover to pre-Covid-19 levels and when?
5. Will there be permanent changes to travel patterns and how might that impact future transportation project priorities?

Question 3 will be greatly impacted by the rate at which communities and/or the State of Texas reopen significant sectors of the economy. Other factors that may have a significant impact but are unknown include any secondary spikes in COVID-19 infections and the rate at which the overall US and State economy recover.

Longer term questions concern when or if traffic volumes return to pre-COVID-19 levels and whether fundamental changes to the economy will take place or have already occurred. There are 2 theories that MPO staff will be evaluating over the next 2 to 4 years. The first theorizes that a significant amount of retail activity has shifted to online platforms during the COVID-19 crisis and will not return to brick and mortar retailers. The second is that a significant number of service sector employees currently working from home will not return to their offices and from this point forward will continue to work remotely.

Both theories, if shown to be even partly correct, would result in significant changes to travel pattern, especially to AM peak, PM peak and Saturday volumes. Related to this change are additional increases in home delivery of goods including very heavy or bulky items. These deliveries can significantly decrease the state of good repair of residential or neighborhood streets as these facilities generally have not been designed to accommodate the increased weight of vehicles required for heavy or bulky deliveries nor the increased volume of these vehicles. Note that with few exceptions, residential or neighborhood streets are not eligible for state or federal highway dollars.

In addition to travel changes, property values for retail and office land uses could also be impacted which in turn may lead to the question of whether zoning or land use plans should be modified. With possible major changes in traffic volumes and patterns, this may require a reevaluation of the mix of transportation projects identified within the Metropolitan Transportation Plan and those being delivered in the Transportation Improvement Program.

At the moment, significant changes to the MTP, TIP, land use plans or comprehensive plans would be considered premature. MPO staff will be working with our member governments, Chambers of Commerce, and the academic community to better understand how the economy and private sector is changing and adapting to the post-COVID-19 environment and how that may impact demand for regional mobility.