

## 2 Trip Generation Emerging Trends

The COVID-19 pandemic significantly impacted daily travel in North America, and although trip patterns have not fully settled into a consistent post-pandemic routine, several notable trends have emerged. While trip generation data are continually collected, not enough time has passed since the height of the pandemic to fully reflect changes in trip generation rates in the *Trip Generation Manual* (TGM). Nevertheless, ITE and a group of industry experts have identified emerging trends that may ultimately influence TGM. This chapter provides information on trends to consider when developing trip generation estimates for proposed developments.

Several data plots and statistics presented in the TGM are based on data collected prior to the pandemic. ITE recognizes that some TGM data plots and statistics may need to be updated in the future. However, it remains unclear which data plots and statistics will be affected until new study site data are collected and analyzed. ITE has identified several land uses for which measurable changes in trip generation characteristics may occur.

ITE is actively exploring emerging trends in trip generation, particularly as travel behavior continues to evolve in the years following the pandemic. To capture potential shifts in trip patterns, practitioners are encouraged to continue collecting and submitting updated data for the land uses described in this chapter. This is especially important given the regular removal of older data from TGM, which significantly reduces the dataset available for many of ITE's most widely used land uses.

### Industrial (100s)

Industry experts note that the increased reliance on e-commerce and delivery services may result in more trips to and from high-cube warehouses and related facilities. Whether this increased demand is met through additional trips at current sites, an increase in the number of facilities, or some combination thereof, remains to be seen.

### Residential (200s)

Residential trip generation patterns have shifted in recent years, but how they have changed may vary based on the development type and location. Two major drivers of change are the rise of e-commerce and the widespread adoption of hybrid or remote work. E-commerce effects are challenging to quantify, particularly given the limited amount of data shared by e-commerce companies. For example, one delivery driver serves multiple homes in one neighborhood on a single trip, but deliveries to those homes may occur on multiple days each week or through multiple deliveries on the same day. Delivery trips are also likely to occur throughout the day and week, unlike trips to physical stores, which may be more concentrated at certain times.

Research indicates that telecommuting has altered daily travel. A post-pandemic study found that employees with longer commutes, higher incomes, and higher education levels are more likely to continue telecommuting<sup>1</sup>.

<sup>1</sup> Mohammadi, M. (Yalda), Rahimi, E., Davatgari, A., Javadinasr, M., Mohammadian, A. (Kouros), Bhagat-Conway, M. W., Salon, D., Derrible, S., Pendyala, R., and Khoeini, S. (2022). *Examining the persistence of telecommuting after the COVID-19 pandemic*. *Transportation Letters*, 15(6), 608–621. <https://doi.org/10.1080/19427867.2022.2077582>

As a result, traditional AM/PM peak commuting patterns may shift. It has also been reported that telework has led to an increase in home-based trips throughout the day (e.g., errands, picking up lunch, etc.) resulting in time-of-day impacts in and near residential developments.

Location and household composition also play roles. For example, there has been an increase in developments on the periphery of metropolitan regions, such as large, master-planned “bedroom communities,” which may have trip generation rates significantly lower than those of developments located nearer to employment and services. For instance, large residential developments on the outskirts of Tucson, Arizona, have shown daily and peak-hour trip rates more than 30% below TGM averages<sup>2</sup>. Conversely, some areas have experienced an increase in multi-generational households, which may generate more trips, especially if multiple adults work outside the home.

Lastly, the increasing prevalence of short-term rental properties may also affect trip generation, particularly if multiple units are purchased solely for this purpose. These effects are hard to measure, particularly since many short-term rentals are in developments which prohibit them.

## **Recreational (400s)**

During the height of the pandemic, outdoor recreational trips surged, while indoor gym trips declined. Fitness centers have since rebounded, alongside new recreational formats such as boutique fitness studios, axe throwing, golf entertainment complexes, and pickleball courts. While TGM includes data for some of these emerging land uses, transportation professionals should exercise caution when estimating trip generation for these specialized developments, as their characteristics continue to evolve rapidly.

## **Institutional (500s)**

While not exclusively a pandemic impact, more elementary and middle school students are now traveling in personal vehicles instead of by school bus. This may be most pronounced in areas with private, charter, or school-choice options.

At the college level, the pandemic accelerated hybrid and virtual learning. Many colleges and universities already had virtual options, which were generally geared towards out-of-state students and/or those who were working on their education while maintaining a full-time job. While some students have returned to campus, others have remained fully online. At one Southern California two-year college, approximately 1/3 of students now attend virtually—up from less than 5 percent before the pandemic<sup>3</sup>. However, online students may still travel to campus occasionally.

Other travel impacts related to college campuses include shifts in mode choice and interactions with the surrounding areas. For instance, large campuses with substantial student housing may affect trips to nearby retailers and restaurants. This is explicitly captured in mixed-use trip generation models like EPA’s Mixed-Use Development Trip Generation Tool (MXD)<sup>4</sup>. In addition, the increased prevalence of e-bikes and e-scooters (both rental and privately owned) may influence vehicular and/or walking trips, particularly on and near large college campuses.

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<sup>2</sup> Psomas. (2022). *Rocking K South Transportation Infrastructure Master Plan*.

<sup>3</sup> Psomas. (2024). *Parking Inventory and Evaluation for Mt. San Antonio College 2023–2024 School Year*.

<sup>4</sup> U.S. Environmental Protection Agency. (n.d.) *Mixed-Use Trip Generation Model*. Retrieved from <https://www.epa.gov/smartgrowth/mixed-use-trip-generation-model>

## **Medical (600s)**

The medical services landscape was evolving pre-pandemic due to an aging population and an increasing demand for telemedicine. The number of people in the United States who are over 65 is projected to exceed those under 18 years<sup>5</sup>. Recent acceleration of this trend can be attributed to reduced birth rates and improved medicine. While telehealth may reduce in-person visits, the scope of the reduction may not be substantial. Other trends in medical facilities include the growth in large medical campuses and shared medical offices.

## **Office (700s)**

Office trip generation was among the most impacted during the COVID-19 pandemic, with widespread adoption of remote work. As work-from-home and hybrid schedules became the norm, many companies downsized their office spaces and/or began offering shared workspaces. More recently, however, a growing number of employers have required workers to return to the office for at least part of the week. Some companies and agencies have even reversed their once-permanent hybrid policies in favor of a full-time return to office model.

Therefore, although office trip generation decreased in the immediate aftermath of the COVID-19 pandemic, the change may not be permanent. Even under a hybrid policy, most offices are likely to have all or most employees in the office at least one day per week. As a result, while trip generation rates may be significantly lower on days when most staff work remotely, rates on in-office days remain largely consistent with current TGM data.

## **Retail (800s)**

Though e-commerce was on the rise before the pandemic, it has since exploded in popularity. According to U.S. Department of Commerce data from March 2025<sup>6</sup>, retail e-commerce sales were nearly 50% higher in 2024 than in 2019. This growth likely reduced trips to brick-and-mortar stores.

Still, impacts vary by retail type. Anecdotal evidence shows that discount stores have gained in-person customers—possibly due to inflation—and some are expanding to include groceries. Shopping malls are less busy overall but are thriving in relatively affluent areas where dining, drinking, entertainment, and residential uses are co-located. Some malls are repurposing space for other uses to remain viable.

Additionally, grassroots boycotts of specific retailers have affected traffic and revenue at certain stores, although the long-term impact remains to be seen.

## **Services (900s)**

Alongside the growth of hybrid work and e-commerce, the pandemic accelerated the widespread adoption of drive-through, curbside, and delivery options for food purchases. Once concentrated in highly urbanized areas, food delivery services have become common even in suburban settings. Although a meal delivered rather than being picked up or eaten on-site does not change trip generation, the convenience of food delivery services may encourage people to dine out more frequently.

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<sup>5</sup> U.S. Census Bureau. (2019). Demographic Turning Points for the United States: Population Projections from 2020 to 2060.

<sup>6</sup> U.S. Census Bureau. (2025). *Quarterly Retail E-Commerce Sales*, Q4 2024. Retrieved from <https://www.census.gov/retail/ecommerce.html>

More notably in the shorter term, restaurant traffic at drive-throughs may have increased since the pandemic. Some restaurants that previously operated without drive-through service options have added them, which can lead to queue spillback within parking lots or onto adjacent roadways. Again, while the overall trips may remain stable, the expansion of carry-out and drive-through options (or post-pandemic continuation of such options) may shift inbound and outbound volumes during peak periods.

Other services likely significantly affected include banks, due to the rise of online banking, and large travel centers, which are being built as primary destinations.

## Other Considerations

Newer mixed-use developments increasingly integrate residential, commercial, and industrial uses—sometimes beyond the original NCHRP methodology<sup>7</sup> developed in the 2010s to include residential, commercial, and industrial uses. Internal capture rates may also have changed. In addition, there are unintended consequences which may have been observed at mixed-use developments near transit; vehicle use within the site may be lower, but excess parking provides an opportunity for others to use the site as a park-and-ride.

Micromobility is expanding. Once limited to human-powered options, bike and scooter share systems now include e-bikes and e-scooters, extending the distance a person can travel and potentially replacing some vehicular trips.

## Conclusion

The COVID-19 pandemic accelerated some lifestyle changes which were already underway and introduced new ones that were not anticipated. While some trends appear to be here to stay, many others are still in flux. The long-term “new normal” may take years to fully emerge.

During this period of adjustment, ITE recommends caution when applying historical TGM data to post-pandemic conditions. Whether these impacts represent lasting changes or fall within existing variability remains unknown.

When feasible, current local data can be used to supplement TGM data and support decisions on how to best estimate site-generated trips during this evolving period. ITE will continue to document changes for specific land uses based on actual counts and will replace historical data as needed. Users are encouraged to submit current counts when possible. ITE will regularly review and analyze submitted data and provide updated guidance as conditions warrant.

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<sup>7</sup> National Academies of Sciences, Engineering, and Medicine. (2011). *Enhancing Internal Trip Capture Estimation for Mixed-Use Developments*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/14489>.