Title

Trip-Level Mode Replacements and Daily Activity Patterns Reveal the Sustainability Potential of Micromobility

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POLICY BRIEF

Trip-Level Mode Replacements and Daily Activity Patterns Reveal the Sustainability Potential of Micromobility

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Issue

Micromobility options such as electric bike-share and scooter-share services are a fundamental part of the existing shared mobility landscape. Research has shown that micromobility use can reduce car dependence. This is accomplished through trip-level mode replacement and adjustments in mode-use configurations in daily travel. Understanding the full potential of micromobility services as a car replacement can help cities better plan for the services to meet environmental sustainability goals.

Researchers at the University of California, Davis collected GPS-based travel diary data from individual micromobility users from 48 cities in the US and examined their travel behavior and micromobility use patterns. They found that micromobility services can displace car use. To achieve environmental sustainability goals, cities must pursue options that will deliver benefits, such as micromobility services.

Key Research Findings

Car-owning and non-car-owning micromobility users exhibit similar travel patterns and use micromobility in comparable ways for daily trips. A trip chain (the string of multiple trips in a row starting and stopping at home) level analysis was conducted to better understand how micromobility was integrated into daily activity patterns and mode use configurations. Non-car owners and car owners in this sample were similar in their use of micromobility and travel complexity (number of trips and modes in a trip chain) across work and non-work trip chains. This lack of differentiation suggests car ownership does not necessarily override the utility of micromobility to serve mobility needs. It also suggests that in some contexts using micromobility services is a way to satisfy more complex travel without the need for a car.

Micromobility can form part of a car-free or car-light day of travel for more than two-thirds of car owners. Approximately 79% of car-owning individuals reported leaving their car at home due to their use of micromobility services during the travel diary period. In such cases, individuals performed shorter length chains that mainly consisted of shorter trips. This result suggests that placing micromobility services at locations where individuals can easily access them at the start of their day could be an effective way to enable individuals to regularly perform car-free days of travel.

When people replace car trips with micromobility, they also walk and use transit more. In complex trip chains that start with a car trip, the share of car trips is approximately 50% less in chains with micromobility compared to chains without micromobility. In simple work and simple non-work chains, the share of car trips is 100% less in chains with micromobility compared to chains without micromobility. Not all car trip reductions were made through micromobility as some trips translated to walking and transit use. This result suggests that micromobility use can benefit transit ridership. A collaboration between micromobility operators and transit agencies to offer integrated trip payments and to place micromobility services/stations near transit stops may amplify the effect of micromobility in increasing transit use.

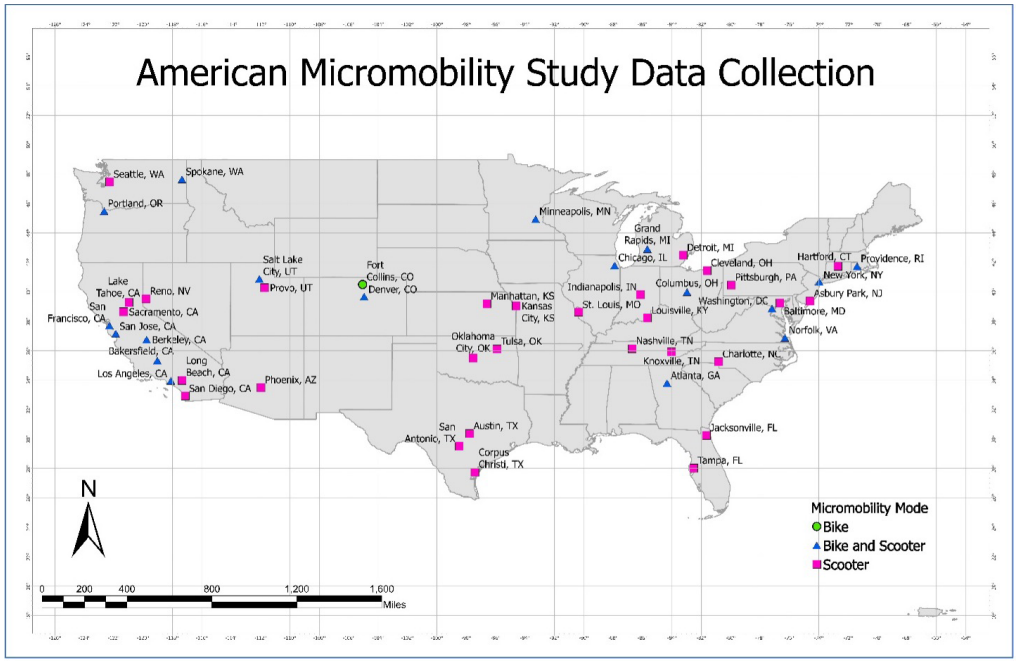

Figure 1. Our Survey was conducted in 48 cities. Here, they are symbolized by type of micromobility services offered.

Micromobility users who use micromobility three times a week or more tend to generate fewer vehicle miles traveled (VMT) compared to less frequent users. Frequent micromobility users rely less on cars for miles traveled than less frequent users. A likely explanation is that micromobility services substituted car trips, leading to decreased car dependence among frequent users. Another plausible explanation is that individuals who frequently used micromobility services tended to live in environments or follow travel patterns with inherently lower car dependency.

The expected VMT reduction per trip varies by micromobility mode and by market area. The median VMT reduced per micromobility trip was estimated to be roughly 0.15 miles for e-scooter share trips and 0.25 miles for bike share trips. Various factors, such as socio-demographics, availability of other transportation modes, and geographic characteristics, affect the use of micromobility. It is important to consider local conditions when estimating VMT reduction from micromobility services.

More Information

This policy brief is drawn from "Is Micromobility Being Used in Place of Car Trips in Daily Travel (or "Trip Chains")?" a report from the UC Institute of Transportation Studies, authored by Hossain Mohiuddin and Dillon Fitch-Polse of the University of California, Davis, and from "American Micromobility Panel (Part 2): Transit Connection, Mode Substitution, and VMT Reduction," a report from the National Center for Sustainable Transportation authored by Tatsuya Fukushige and Dillon Fitch-Polse of the University of California, Davis. The full reports can be found on https://www.ucits.org/research-project/2023-04/ and https://ncst.ucdavis.edu/project/sustainability-micromobility-services-vmt-reduction-and-transit-connection.

For more information about the findings presented in this brief, contact Hossain Mohiuddin at hosmohiuddin@ucdavis.edu and Tatsuya Fukushige at tfukushige@ucdavis.edu.

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