

2024 CATMA Transportation Summit

UVM Transportation Research Center Student Research Posters

Silver Maple Ballroom (all day)

The poster session will profile student-led research from the UVM Transportation Research Center (TRC). Posters highlight findings from the TRC's policy-oriented research on building sustainable and equitable transportation systems in the Vermont context.

1. Title: Advancing equitable electric vehicle adoption: Addressing home charging barriers and costs

Authors: Parsa Pezeshknejad, Lilac Damon, Sarah Grajdura, Dana Rowangould

Abstract:

Policymakers are pursuing vehicle electrification to reduce greenhouse gas. In order to equitably and effectively decarbonize transportation, we must address context-specific barriers to EV adoption, especially among disadvantaged populations. Prior research shows that EV owners are currently more likely to be high income and white when compared with other vehicle owners, reflecting barriers to adoption for vulnerable populations and signaling their diminished ability to adapt to a clean energy transition. A critical obstacle faced by many with fewer economic resources is a lack of access to home charging, which brings benefits in terms of convenience and cost. People living in multifamily and attached homes, older homes, and renters face unique barriers to installing home chargers, although little is known about the effects of these home charging barriers on EV adoption. In this study we evaluate the relationships between EV adoption and housing characteristics as well as the costs of installing home charging for homes of different types in the City of Burlington, Vermont. Our results indicate that home charger installation costs are higher in multifamily homes and homes zoned as mixed use when controlling for other home attributes. Increasing a home's overall electrical capacity is the most expensive type of upgrade. EV ownership is also tied to home characteristics, with properties with inadequate on-site parking, older homes, rental units, and homes zoned as mixed use showing lower odds of EV ownership when controlling for other attributes.

2. Title: "I lost it all. The water destroyed everything": Transportation Resilience, Housing, and Displacement of Rural Homeless Communities in Vermont

Authors: Sarah Grajdura, Julia LanzDuret-Hernandez, Nat Robtoy, Dana Rowangould

Abstract:

Floods and other natural disasters are increasing in frequency and intensity with climate change. These events can be disastrous for infrastructure systems that people rely on to get where they need to go. The most vulnerable in a population are often the most strongly impacted by these events, especially people experiencing homelessness. In this research, we explore the effects of a major flood event on the mobility and housing security of people experiencing homelessness in Vermont in the wake of the July 2023 flood event. This research combines quantitative post-

disaster survey data with qualitative data from the unhoused community and a community advisory board. This unique dataset sheds light on important linkages between transportation resilience and housing for unhoused populations. We find important connections between mobility, housing, and mental health. Newly unhoused people were more likely to report decreased mobility in the short and long terms. We find vehicle access and housing status to be statistically related to worse mobility outcomes in the short term. These findings provide important insights for policymakers and planners seeking to improve flood resilience and recovery for unhoused people, particularly in rural and small community contexts.

3. Title: The Impact of Transferring Trip Generation Rates from Literature to Truck Activity Modeling: Insights from Chittenden County

Authors: Meg Fay and Gregory Rowangould

Abstract:

This study examines the role of truck trip generation modeling in metropolitan planning organizations (MPOs) across the United States. Truck activity significantly impacts economic, infrastructural, and environmental systems, necessitating accurate modeling for effective transportation planning. Our research evaluates various trip generation models, emphasizing the use of literature-based rates from sources like the Quick Response Freight Manual (QRFM). These models, while accessible and cost-effective, pose challenges to accuracy and regional applicability. Large MPOs use varying methodologies for estimating trip generation, including hybrid approaches that integrate local data with literature-based rates. The effect of literature-based rates on truck modeling is currently unknown. Our study applies three different trip-generation rate frameworks from the QRFM to a single study area — Chittenden County, Vermont. We evaluate the impact of literature rates on trip production for this study area including trip volume, driving economic activity, and spatial distribution. Results vary widely by total trips, driving industries, and spatial distribution; and highlight the need for MPOs to select or adapt trip generation rates carefully to reflect local economic conditions and dominant industries, prioritizing primary data collection to improve modeling accuracy and validation. By understanding and accounting for these factors, MPOs can improve the reliability of freight modeling, leading to more effective traffic management, reduced environmental impacts, and better public health outcomes. This work advocates for a nuanced approach that balances the convenience of literature-based rates with the necessity of locally tailored data, advancing the precision and applicability of truck trip generation models in urban planning contexts.

4. Title: Evaluating Cumulative Emissions Exposure and Equity Outcomes of Different Transition Pathways to an Electric Vehicle Fleet

Authors: Meg Fay and Gregory Rowangould

Abstract:

The electrification of the transportation sector provides an unprecedented opportunity to reduce criteria air pollutant exposure. An effective and equitable transition to electric vehicles (EVs) is challenged by population growth, increased traffic, and existing disparities in roadway emissions exposure. In this study, we develop high-resolution traffic and criteria air pollutant emission forecasts for every U.S. census block through the year 2050. We base these projections on two EV adoption and population growth scenarios, a reference case and an “optimistic case” where aggressive electrification occurs for the entire vehicle fleet. We use these forecasts to assess the change in exposure to criteria air pollutant emissions from on-road vehicle traffic as the nation moves towards full electrification of the vehicle fleet, quantify the cumulative exposure impacts during the transition period for different EV adoption scenarios, and identify disproportionate exposure impacts on communities, including currently overburdened communities. We use U.S. Census block emission density estimates as a novel surrogate for emission exposure that enables insights into localized impacts across the U.S. The high spatial resolution allows for the examination of community-level emission changes caused by EV transition scenarios. The temporal dimension of these projections enhances our understanding of how different EV adoption rates may affect cumulative exposures and health outcomes. With this comprehensive approach, we aim to better understand the air quality, health, and equity impacts of delays in the transition to a zero-emission vehicle fleet which can be used to evaluate the costs and benefits of policies focused on increasing EV adoption.

5. Title: Taking a Hard Look: Do Active Transportation Projects Get a Fair Evaluation in Long-Range Regional Transportation Planning?

Authors: Emma Dreyer and Gregory Rowangould

Abstract:

Active travel provides a wide range of environmental, public health, and social benefits with relatively little cost; however, only a small share of trips in the U.S. use active travel modes. Research suggests that active transportation requires infrastructure that supports both actual and perceived safety and that more active travel occurs where there are more investments in active travel infrastructure. The relatively small share of overall surface transportation funding invested in active transportation infrastructure in the U.S. could be part of the reason for the small share of trips made using active travel. One, among many, reasons for the potential underinvestment in active travel infrastructure may be the lack of robust methods for evaluating active transportation investment outcomes. In the U.S., metropolitan planning organizations (MPOs) use regional travel demand models (TDMs) to forecast investment outcomes, but prior studies suggest that many of

them may be using models that have little sensitivity to active travel projects and produce inaccurate results. In this study we evaluate the long-range plans and TDMs used to inform them from 60 randomly selected MPOs to understand barriers posed by TDM limitations. We find that while all MPOs considered active travel in their planning process, most lack methods to evaluate the potential benefits of active travel investments. We identify opportunities and examples for how to address these limitations, which are largely an issue of resource availability rather than technical know-how.

6. Title: Land Use and Travel Behavior: A Panel Study Using Relocated Households in Vermont to Assess Land Use Elasticities

Authors: Clare Nelson and Gregory Rowangould

Abstract: Understanding the relationship between land use and travel behavior is vital for providing clear guidance to policy makers about effective strategies for increasing accessibility, managing travel demand, decreasing car-dependency, improving public health, and reducing greenhouse gas emissions. However, existing research findings on the connections between land use and travel behavior range widely and frequently offer contradictory results. Our study responds to calls from the literature to use more robust, longitudinal, and disaggregated data sets to address a range of methodological and data issues that impact most prior studies. We create a longitudinal, disaggregated panel data set containing vehicle mileage derived from Vermont vehicle inspection odometer recordings and location information from street addresses obtained from Vermont vehicle registration records. We then identify households that relocated between 2018 and 2023 using these data and observe how changes in mileage correspond with changes in neighborhood land use characteristics including population density, land use mix, and distance to services. We find land use elasticities that are comparable to prior meta-analyses of land use-travel behavior studies, with small and inelastic effect sizes. Our findings present a reproducible methodology for states with inspection records and contribute to the literature on land use and travel behavior while offering suggestions for future research.