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Considerations on VMT and Emissions from New Mobility Systems and Other Technologies

Elliot W. Martin, PhD
Research and Development Engineer

September 26th, 2019
Sacramento, CA
New and Shared Mobility Systems Today

• Main Types
  • Carsharing
  • Bikesharing
  • TNCs
  • Microtransit
  • Micromobility
  • Public transit
US Trends in VMT and VMT per capita

United States
Moving 12-Month Total on ALL Roads - VMT (Billions of Miles)
FHWA Office of Highway Policy Information
January 1971 to June 2019

Source: FHWA Traffic Volume Trends

Vehicle Miles Traveled per Person in the United States
VMT and US Census Population Estimate for July of each Year

Source: FHWA and US Census
How will mobility as a service change VMT?

- Travel behavior changes in public transit, walking, bicycling, other shared or active modes, and personal vehicle driving
- Changes in vehicle ownership
- Changes in fuel type
- System vehicle activity
- System logistical operations
Main Traveler Behavior Components of TNC VMT Change

<table>
<thead>
<tr>
<th>Change in Personal Vehicle Miles Traveled (PVMT)</th>
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</thead>
<tbody>
<tr>
<td>• The substitution of PVMT with TNC activity</td>
</tr>
<tr>
<td>• Deadheading still adds miles, but pooling can reduce them</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Personal Vehicle Shedding</th>
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</thead>
<tbody>
<tr>
<td>• The reduction in household vehicle ownership due to TNCs</td>
</tr>
<tr>
<td>• Some consumer action involved, but results in substantive reductions in VMT</td>
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</table>

<table>
<thead>
<tr>
<th>Personal Vehicle Suppression</th>
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</thead>
<tbody>
<tr>
<td>• The prevention of vehicle ownership from happening in the first place</td>
</tr>
<tr>
<td>• Easy to do and results in considerable reduction in VMT</td>
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<table>
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<tr>
<th>Change in the Use of Other Shared Vehicle Modes</th>
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<tr>
<td>• Changes in the use of taxis, carsharing, and other personal vehicle modes</td>
</tr>
<tr>
<td>• Avoid counting VMT just because it is observed in a TNC without considering the mode substitution.</td>
</tr>
</tbody>
</table>
Main Vehicle Activity Components of TNC VMT Change

Period 0 (Travel to Passenger Market)
• Some share of drivers travel to the markets they serve.

Period 1 (Open to Passengers)
• Vehicles open to passengers, may be circulating, may be stationary.
• Double counting of miles can occur during this period.

Period 2 (Fetching Passengers)
• Passenger assigned, vehicle traveling to it
• Double counting likely ceases at this point.

Period 3 (With Passengers)
• Vehicle is with at least one passenger
How can TNCs work with and complement transit? Are there case studies?

- Numerous studies suggest that TNCs draw from public transit.
- But there are also examples of TNCs complementing public transit through natural activity as well as supportive projects in collaboration with public agencies.
- Building on lessons learned from these studies, TNCs, microtransit, and other forms of shared mobility may better integrate and support public transit systems.
FTA Mobility on Demand (MOD) Sandbox

- Projects are testing new innovations in:
  - Carpooling
  - Public transit connections
  - Trip Planning
  - TNC/Microtransit integrations
  - Paratransit innovations
  - Bikesharing
  - Real-time traveler information

Map of Eleven Selected Projects Across the Country
DART – The First and Last Mile Solution (Dallas)

Project Overview

• Produce an updated version of DART’s existing ticketing app. The new version incorporated shared mobility services, including UberPool, to provide improved FMLM connections to transit stations and allow users to pay for services within the app with Plano and other regions of the Dallas Metropolitan area.

Key Objectives

• Increase DART ridership
• Increase awareness and usage of alternative modes accessing DART, specifically carpooling
• Reduce travel with personal vehicles
• Improve FMLM access to DART for the general population, as well as travelers with disabilities
• Improve customer satisfaction and user perception of the DART brand
Pierce Transit Limited Access Connections (Tacoma)

Project Overview

• A partnership between Pierce Transit and Lyft. Lyft is providing FMLM connections to transit stations and park-and-ride lots with guaranteed rides home after regular service hours.

Objectives

• Increase Pierce Transit ridership
• Improve the quality of transit service through reduced travel and wait times
• Improve access to transit and provide access services more cost effectively
• Improve mobility of wheelchair users and provide paratransit services more cost effectively
• Reduce parking lot use and net VMT
• Increase student enrollment in the program
• Increase transit use and traveler satisfaction among those far away from fixed-route services

Source: Pierce Transit (2019)
LA County and Puget Sound MOD First and Last Mile Partnership

**Project Overview**

- A partnership between LA Metro and Via. Via is providing FMLM connections to transit stations and allow users to pay for rides using the regional TAP card. There is a companion project that is taking place in Seattle that is led by Sound Transit.

**Key Objectives**

- Improve mobility and accessibility across all populations, including travelers with disabilities
- Expand the number of unique public transit users and increase overall ridership for both access and egress trips to transit
- Preserve or enhance the environment
- Reduce congestion from personal vehicles
- Ensure travelers feel safe on public transit and at public transit facilities
- Improve cost efficiency of access and egress trips to transit and level of service per user cost

Source: LA Metro and King County (2019)
Project Overview and Objectives

• Scoop is matching carpoolers and facilitate carpooling trips for passengers going to or leaving from BART stations with guaranteed parking.

Objectives

• Increase carpooling to BART and reduce fraudulent use of carpool parking spaces
• Increase BART ridership and spread out arrival of BART riders over the morning peak commute period
• Reduce VMT and GHG emissions from travel
• Reduce traveler cost and increase BART revenue relative to the operational cost of implementation incurred by BART.
Via in West Sacramento

- Microtransit operator Via has operated a system in West Sacramento.
- The project runs shuttles that provide service within the city of West Sacramento.
GoMonrovia

• TNC integration with public transit through pricing.

• Different flat rates are applied depending on the:
  • Destination
  • Pooling and
  • Connection to public transit

Source: City of Monrovia
Evidence of Impacts from One-way Carsharing

Key Findings:

• Between 2% to 5% of members sold a vehicle due to carsharing across study cities.

• 7% to 10% of respondents did not acquire a vehicle due to car2go.

• Across five cities, car2go took estimated 28,000-plus vehicles off the road (including shedding and suppression) and reduced parking demand

<table>
<thead>
<tr>
<th>City</th>
<th>% Reduction in VMT by Car2go Households</th>
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<tbody>
<tr>
<td>Calgary, AB</td>
<td>-6%</td>
</tr>
<tr>
<td>San Diego, CA</td>
<td>-7%</td>
</tr>
<tr>
<td>Seattle, WA</td>
<td>-10%</td>
</tr>
<tr>
<td>Vancouver, BC</td>
<td>-16%</td>
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<td>Washington, D.C.</td>
<td>-16%</td>
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Martin and Shaheen, 2016
Incentives and Operational Impacts

• Evaluations generally find carsharing reduces GHG emissions.

• Policies supporting carsharing may enable better sustainability over wider areas and with cleaner technologies.

Trends in Overall Trips, Incentive Qualifying Trips, and Incentive Qualifying Users

Indexed Total Customer Trips
Incentive Qualifying Trips
Incentive Qualifying Users

Charging Incentive Period

Shaheen et al. (2018)
Will micromobility impact VMT? If so, how?

• Micromobility travelers may reduce their VMT through mode substitution.

• But the trips they substitute for are generally short.

• EV-based systems require energy input.

• Vehicle activities facilitate vehicle charging and redistribution and add VMT.
Spatial Impacts in Bikesharing

Martin and Shaheen, (2014)

Picture: Elliot Martin
Trends in Taxable Diesel Fuel in California

Source: California Department of Tax and Fee Administration
Technology for Trucks

• Electrification of heavy duty trucks may be in the future.

• The electrification of idling is achievable with contemporary technology.

• Substitution with CNG is possible for long-haul, but can face infrastructure and capital limitations.

• Within California, a sizeable network of stations exist, but key gaps remain on long-haul routes.
THANK YOU, QUESTIONS?