Trends in Travel Behavior and Transit Ridership

CUTR Webinar
Thursday, March 29, 2018
Steven E. Polzin, PhD.

Outline
- What is going on with travel
- Trends and underlying causes of transit ridership decline
- Implications going forward
### U.S. Context and Travel Trends

As of March 27, 2018

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<tbody>
<tr>
<td>U.S. Population</td>
<td>0.8%</td>
<td>0.5%</td>
<td>0.7%</td>
<td>-</td>
<td>Census</td>
</tr>
<tr>
<td>Total Employment</td>
<td>1.7%</td>
<td>1.7%</td>
<td>1.3%</td>
<td>12</td>
<td>BLS</td>
</tr>
<tr>
<td>Real GDP</td>
<td>2.9%</td>
<td>1.5%</td>
<td>2.3%</td>
<td>12</td>
<td>BEA (1st est.)</td>
</tr>
<tr>
<td>Gas Price</td>
<td>-29.3%</td>
<td>-14.8%</td>
<td>15.1%</td>
<td>12</td>
<td>EIA</td>
</tr>
<tr>
<td>Registered Cars and Light Trucks</td>
<td>2.1%</td>
<td>1.5%</td>
<td>3.0%</td>
<td>12 proj.</td>
<td>Hedges Co.</td>
</tr>
<tr>
<td>Light Vehicle Sales</td>
<td>5.8%</td>
<td>0.1%</td>
<td>-1.8%</td>
<td>12</td>
<td>BEA</td>
</tr>
<tr>
<td>Count of Zero-Vehicle Households</td>
<td>-1.0%</td>
<td>-1.9%</td>
<td>-3.1, -2.6%</td>
<td>9, 12</td>
<td>APTA and NTD</td>
</tr>
<tr>
<td>VMT</td>
<td>2.3%</td>
<td>2.4%</td>
<td>1.2%</td>
<td>12</td>
<td>FHWA</td>
</tr>
<tr>
<td>Public Transit Ridership</td>
<td>-1.0% to -2.2%</td>
<td>-2.3% to -1.6%</td>
<td>-3.1, -2.6%</td>
<td>9, 12</td>
<td>APTA and NTD</td>
</tr>
<tr>
<td>Amtrak Ridership (FY)</td>
<td>-0.3%</td>
<td>1.9%</td>
<td>1.9%</td>
<td>12</td>
<td>Amtrak</td>
</tr>
<tr>
<td>Airline Passengers</td>
<td>5.3%</td>
<td>3.9%</td>
<td>3.5%</td>
<td>11</td>
<td>USDOT, BTS</td>
</tr>
</tbody>
</table>

### National VMT and VMT per Capita Trend,

Moving 12-Month Total, 1992–2016

- **8 year reprieve**
- **VMT per Capita**
Top 40 UZAs by 2016 Transit Ridership, 2014-2016 Change (Millions)

Top 40 urban areas make up 83.9% of U.S. ridership decline from 2014-2016

Source: NTD Monthly Raw Database

Top 10 Agencies in Florida by 2016 Transit Ridership, 2013-2016 Change (Millions)

Top 10 agencies make up 87.7% of Florida ridership from 2013-2016

Source: NTD Monthly Raw Database
Declining Carpooling and Growing Work-at-Home Dominate Trends

Transit Ridership and Service Summary - National
Transit Ridership and Service Summary - Florida

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Florida</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All bus</td>
<td>-18.4%</td>
<td>-20.5%</td>
<td>-7.6%</td>
<td>-5.6%</td>
</tr>
<tr>
<td>Light rail</td>
<td>-50.0%</td>
<td>2.5%</td>
<td>-4.1%</td>
<td>2.7%</td>
</tr>
<tr>
<td>Commuter rail</td>
<td>22.4%</td>
<td>-2.4%</td>
<td>2.0%</td>
<td>6.5%</td>
</tr>
<tr>
<td>Heavy rail</td>
<td>15.3%</td>
<td>-9.4%</td>
<td>-6.7%</td>
<td>-3.8%</td>
</tr>
<tr>
<td>Demand Response</td>
<td>-0.2%</td>
<td>6.6%</td>
<td>4.3%</td>
<td>6.4%</td>
</tr>
<tr>
<td>Total</td>
<td>-15.1%</td>
<td>-18.6%</td>
<td>-7.0%</td>
<td>-4.9%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Service miles</th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>All bus</td>
<td>-4.6%</td>
<td>1.2%</td>
<td>-0.8%</td>
<td>-1.9%</td>
</tr>
<tr>
<td>Light rail</td>
<td>-20.2%</td>
<td>2.4%</td>
<td>-1.7%</td>
<td>-16.6%</td>
</tr>
<tr>
<td>Commuter rail</td>
<td>270.2%</td>
<td>1.9%</td>
<td>1.1%</td>
<td>7.7%</td>
</tr>
<tr>
<td>Heavy rail</td>
<td>-9.0%</td>
<td>-7.5%</td>
<td>-8.9%</td>
<td>-18.8%</td>
</tr>
<tr>
<td>Demand Response</td>
<td>9.1%</td>
<td>17.1%</td>
<td>5.8%</td>
<td>5.7%</td>
</tr>
<tr>
<td>Total</td>
<td>0.8%</td>
<td>5.7%</td>
<td>1.0%</td>
<td>5.7%</td>
</tr>
</tbody>
</table>

Where are We Headed?

2012-2014
Transit ridership near 60 year high
Millennials are different
We passed peak VMT
We are urbanizing and CBD’s are thriving
Developers embrace transit
Strong referendum success
TNC’s address first-mile/last-mile issue

2015-2017
Transit ridership loss accelerates in 3rd year of decline
Growth and migration resume historic patterns
VMT and VMT/Capita continue growth
Millennials buy cars and move to suburbs
System conditions, reliability, health care costs, etc. plague transit operators
How much will that subway cost? When will Hawaii’s rail system open? How is that new streetcar doing?
TNC’s can cannibalize transit ridership

2018 → 2018
Why do we need transit with CAV?
Framework for Understanding Changes in Transit Ridership

1. Demographics and Land-Use
   - Demand

2. Transit Service Quality
   - Supply

3. Competition
   - How much of ridership’s change is explained by these factors?

Framework used in Metro analysis
Considers agency control
Framework for Understanding Changes in Transit Ridership

1. Demographics and Land-Use
   - Age
   - Geographic Distribution across Metros – Migration and Growth Trends, International Migration Trends
   - Geographic Distribution within Metros (within proximity of service?/gentrification)
   - Income
   - Licensure Levels
   - Auto Ownership
   - Poverty Levels (SNAP enrollment)
   - Unemployment
   - Reduced College Student Ridership (APTA report)
   - Core Values

Aging Population has a Negative Impact on Ridership
Migration and Growth are Higher in Low Transit Use Areas

Top 10 Largest-Gaining Counties (Numeric Change): July 1, 2015 to July 1, 2016

<table>
<thead>
<tr>
<th>County</th>
<th>Population</th>
<th>Numeric Change</th>
<th>Percent Change</th>
<th>Transit Commute Share 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maricopa County, Arizona</td>
<td>4,242,997</td>
<td>81,360</td>
<td>1.95</td>
<td>2.3%</td>
</tr>
<tr>
<td>Harris County, Texas</td>
<td>4,589,928</td>
<td>56,587</td>
<td>1.25</td>
<td>2.8%</td>
</tr>
<tr>
<td>Clark County, Nevada</td>
<td>2,155,684</td>
<td>46,375</td>
<td>2.2</td>
<td>4.2%</td>
</tr>
<tr>
<td>King County, Washington</td>
<td>2,149,970</td>
<td>35,714</td>
<td>1.69</td>
<td>12.6%</td>
</tr>
<tr>
<td>Tarrant County, Texas</td>
<td>2,016,872</td>
<td>35,462</td>
<td>1.79</td>
<td>0.6%</td>
</tr>
<tr>
<td>Riverside County, California</td>
<td>2,387,741</td>
<td>34,849</td>
<td>1.48</td>
<td>1.4%</td>
</tr>
<tr>
<td>Bexar County, Texas</td>
<td>1,928,680</td>
<td>33,198</td>
<td>1.75</td>
<td>2.6%</td>
</tr>
<tr>
<td>Orange County, Florida</td>
<td>1,314,367</td>
<td>29,503</td>
<td>2.3</td>
<td>3.2%</td>
</tr>
<tr>
<td>Dallas County, Texas</td>
<td>2,574,984</td>
<td>29,209</td>
<td>1.15</td>
<td>2.9%</td>
</tr>
<tr>
<td>Hillsborough County, Florida</td>
<td>1,376,238</td>
<td>29,161</td>
<td>2.16</td>
<td>1.7%</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td></td>
<td>39,356</td>
<td>1.95</td>
<td>2.8%</td>
</tr>
</tbody>
</table>

Largest-Declining Counties or County Equivalents (Numeric Change): July 1, 2015 to July 1, 2016

<table>
<thead>
<tr>
<th>County</th>
<th>Population</th>
<th>Numeric Change</th>
<th>Percent Change</th>
<th>Transit Commute Share 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cook County, Illinois</td>
<td>5,203,499</td>
<td>-21,324</td>
<td>-0.41</td>
<td>2.5%</td>
</tr>
<tr>
<td>Wayne County, Michigan</td>
<td>1,749,366</td>
<td>-7,696</td>
<td>-0.44</td>
<td>18.8%</td>
</tr>
<tr>
<td>Baltimore city, Maryland</td>
<td>614,864</td>
<td>-6,738</td>
<td>-1.08</td>
<td>19.6%</td>
</tr>
<tr>
<td>Cuyahoga County, Ohio</td>
<td>1,249,352</td>
<td>-5,673</td>
<td>-0.45</td>
<td>5.1%</td>
</tr>
<tr>
<td>Suffolk County, New York</td>
<td>1,492,583</td>
<td>-5,320</td>
<td>-0.36</td>
<td>6.8%</td>
</tr>
<tr>
<td>Milwaukee County, Wisconsin</td>
<td>951,448</td>
<td>-4,866</td>
<td>-0.51</td>
<td>6.2%</td>
</tr>
<tr>
<td>Alleghany County, Pennsylvania</td>
<td>1,225,365</td>
<td>-3,933</td>
<td>-0.32</td>
<td>9.1%</td>
</tr>
<tr>
<td>San Juan County, New Mexico</td>
<td>115,079</td>
<td>-3,622</td>
<td>-3.05</td>
<td>0.3%</td>
</tr>
<tr>
<td>St. Louis City, Missouri</td>
<td>311,404</td>
<td>-3,471</td>
<td>-1.1</td>
<td>9.7%</td>
</tr>
<tr>
<td>Jefferson County, New York</td>
<td>114,006</td>
<td>-3,254</td>
<td>-2.78</td>
<td>0.0%</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td></td>
<td>-3,844</td>
<td>-0.46</td>
<td>8.0%</td>
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</tbody>
</table>

Improving Vehicle Availability Coincides with Declining Transit Ridership

Percent Change in Transit Ridership and Zero-Vehicle Households from 2005

- Ridership Percent Change from 2005
- Percent Change Zero-Vehicle Households from 2005

1.3 million fewer persons lived in zero vehicle households in 2016 than in 2014.
Impact of Greater Auto Availability

Each Fewer Resident in a Zero-Vehicle Household is Estimated to Reduce Annual Transit Trips by 191

<table>
<thead>
<tr>
<th>Vehicles in Household</th>
<th>0</th>
<th>1</th>
<th>2+</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in Population</td>
<td>-1.094 million</td>
<td>-1.440 million</td>
<td>+5.360 million</td>
<td>+4.265 million</td>
</tr>
<tr>
<td>(5 and up), 2014-2016</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Estimated Transit Trip</td>
<td>-251 million</td>
<td>-55 million</td>
<td>+67 million</td>
<td>-239 million</td>
</tr>
<tr>
<td>Change</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Population</td>
<td>19.036 million</td>
<td>73.889 million</td>
<td>221.115 million</td>
<td>295.004 million</td>
</tr>
<tr>
<td>(5 and up), 2016</td>
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Note: Fixed-route transit ridership was 10,331 million in 2014 and 9,881 million in 2016, declining 449 million trips.

Transit trip rates based on 2009 National Household Travel Survey and Census data suggest 240 million, or 53%, of the decline is explained by changes in vehicle availability.

Zero-Vehicle Household Trend

- Nearly half of all transit trips are made by residents of zero-vehicle households – 44.6% in 2001 NHTS, 48.1% in 2009 NHTS, 43.0% in 2017 NHTS
- We do not know what share of zero-vehicle households are zero-vehicle by choice, law, physical/medical condition, or income
- The share of zero-vehicle households ranges from 4% in Utah to 12.6% in Massachusetts then 29% in New York and 37.3% in DC

Income (8.7%)
Choice (8.7%)
Legal (8.7%)
Medical (8.7%)
Transit Use Correlates with Need-Based Program Participation

Percent Change U.S. Transit Ridership and SNAP Enrollment

Other Hypothesized Demographic Factors

- Resumption of suburban growth trend
- International immigrants may have a different demographic profile than in the past
- International immigrants may be arriving at, or moving to, less transit intensive areas
- Undocumented immigrant drivers license authorization may be spurring auto ownership
Are Core Values that Impact Travel Changing?

- Do we value autonomy, privacy, flexibility, convenience, etc. more than in the past?

Framework for Understanding Changes in Transit Ridership

2. Transit Service Quality

- Fares (levels, convenience, ease of use)
- Level of Service (coverage, frequency, hours of operation)
- Speed (access, wait, in vehicle, transfer, egress) (tolerance for waiting in our immediate gratification culture)
- Reliability
- Safety/Security
  - Accident Safety, In-Vehicle/Facility Crime
- Image
  - Cleanliness
  - Interpersonal Compatibility - Increased homeless/mentally ill ridership (APTA report)
  - Status/Persona
- Environmental Impacts
- Awareness/Marketing (trip planning, real time information, digital fare payment, etc.)
- Amenities (Wi-Fi, shelter, convenience retail, etc.)
Average Fare Revenue per Passenger Trip and Passenger Mile (2017 Dollars)

Pre 2014 data from APTA Fact Book, Post 2014 data from NTD

Service Supply

12-Month Rolling Average of U.S. Transit Ridership and Service, Fixed Route
Service Supply

12-Month Rolling Average of U.S. Transit Ridership and Service, **Metro Bus**

Service Supply

12-Month Rolling Average of U.S. Transit Ridership and Service, **Light Rail**
Service Supply

12-Month Rolling Average of U.S. Transit Ridership and Service, **Heavy Rail**

Service Supply

12-Month Rolling Average of U.S. Transit Ridership and Service, **Commuter Rail**
Framework for Understanding Changes in Transit Ridership

3. Competition
- Communication Substitution for Travel
- Trip making levels (telecommuting, e-commerce, distant learning, online banking etc.)
- TNC availability/LOS/price
- Bike/Bikeshare
- Auto Cost
  - Fuel Cost
  - Purchase/Lease/Finance Cost
  - Parking Cost/Other Auto Costs
- Roadway Congestion/Speed

Gas Prices and Transit Ridership, 1994-2016

Key Issues – Travel Behavior

- Ridership trends are context specific and vary significantly across geography.
- The reasons for soft ridership differ across contexts with telecommuting, TNC’s, service reliability, auto ownership trends, fares, and other factors having different impacts in different markets.
- Transit has historically had the lowest mode loyalty (mode of last resort).
- Declining fare revenues and/or dampened public willingness to increase subsidies resulting from soft ridership could contribute to continuing declines in ridership.

Influences on Transit Choice (Hypothesized)
Wild Guess as to Attribution of Causes of Ridership Decline

Key Issues – Travel Behavior

- Strong employment growth and growing real income could continue to undermine transit dependency and jeopardize ridership.
- Urban civility may influence future ridership trends.
- Demographic trends in proximity to transit services (TOD) will influence future ridership.
- Increasing roadway congestion could favor premium transit services but undermine mixed traffic transit operations.
- System condition and quality of industry execution may influence ridership.
Key Issues – Strategic

- Is there an inflection point where service becomes more attractive to choice travelers?
- What transit quality of service is required to make it attractive?
- What transit service concepts are sustainable in low to moderate density dispersed activity environments?

What do These Curves Really Look Like?

- Better Service attracts travelers but capacity overwhelms market size and resources unless densely developed and well funded.
- Transit expansion fails to attract many new travelers?
Research on Ridership Trends

- FDOT, Understanding Ridership Trends in Transit – in progress

Pending:
- TCRP A-43, “Recent Decline in Public Transportation Ridership: Analysis, Causes, Responses,” $400,000.
- TCRP H-56, “Reinventing Transit Networks for a New Mobility Future,” $300,000.

How Should Stakeholders Respond?
Key goals

1. Mobility
2. Resource efficiency
3. Economic competitiveness

May be best addressed with multiple

1. Technologies and services
2. Mixes of public and private providers
3. Different pricing and funding strategies
Today’s modal silos will disappear

We won’t worry about the future of transit but instead worry about the future of mobility

Upcoming seminar

CUTR Webcast Series Presents:

Understanding the Effects of Demographic and Socio-Economic Factors on Public Transit Ridership Trends

April 12th · 12pm-1pm

Kurt Lehmann
Graduate Research Assistant
CUTR · USF

• You may find the new book of interest. I was the principal author of Chapter 5, Upgrading Transit for the Twenty-First Century, of the recently released text, *Three Revolutions Steering Automated, Shared, and Electric Vehicles to a Better Future*. [https://islandpress.org/book/three-revolutions](https://islandpress.org/book/three-revolutions)

• If you’d like to purchase a copy of the book from *Island Press*, use the code 4SPERLING, which is good for a 20% discount. You can also order it from *Amazon*, *Barnes and Noble*, and your local independent bookseller.

### The Future of Public Transportation

[http://scholarcommons.usf.edu/jpt/vol21/iss1/](http://scholarcommons.usf.edu/jpt/vol21/iss1/)

- Joel Volinski: Prologue, Reflections on the Future of Public Transportation
- Dan Boyle: The Future of Transit
- Ralph Buehler: Can Public Transportation Compete with Automated and Connected Cars?
- Graham Currie: Lies, Damned Lies, AVs, Shared Mobility, and Urban Transit Futures
- Jill Hough and Ali Rahim Taleqani: Future of Rural Transit
- Steven E. Polzin: Just Around the Corner: The Future of U.S. Public Transportation
- Kari Watkins: Does the Future of Mobility Depend on Public Transportation?
- Carol Schweiger: Improved Mobility through Blurred Lines
- Susan Shaheen and Adam Cohen: Is It Time for a Public Transit Renaissance?: Navigating Travel Behavior, Technology, and Business Model Shifts in a Brave New World
- Eric Schreffler: Better Integrating Travel Choices into Future Urban Mobility Systems: The Day the Highways Stood Still
- Jerome Lutin: Not If, but When: Autonomous Driving and the Future of Transit
- Michael Manville, Brian D. Taylor, and Evelyn Blumenberg: Transit in the 2000s: Where Does It Stand and Where Is It Headed?
- Jarrett Walker: To Predict with Confidence, Plan for Freedom
Thank You!

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