New Perspectives on Travel Demand: *Where Are We Going?*

Highway Information Seminar

2009

*Heather Contrino, FHWA Office of Policy*
*Adella Santos, Cambridge Systematics*
*Nancy McGuckin, Travel Behavior Analyst*
About the data source: 2009 NHTS

- Over 150,000 households
- Over 300,000 people
- Over one-million travel day trips
- 20 State and MPO add-ons
- RDD and CPO sample
- 40 years of travel data—1969 to 2009

For Each Vehicle:
- Make
- Model
- Age (year)
- How long owned
- Odometer readings

For Each Household:
- Number of people
- Number of drivers
- Number of workers
- Number of vehicles
- Income

For Each Person:
- Age
- Sex
- Driver status
- Worker Status
- Annual Miles

Daily Travel Data:
- Origin and Destination address (for add-ons)
- Time trip started and ended
- Distance
- Means of transportation:
  1. vehicle type
  2. if household vehicle, which one
  3. if transit, wait time
  4. if transit, access and egress mode
- Detailed purpose
- Number of passengers on trip:
- Most recent trip for non-travelers (date)
List-assisted RDD sample
Computer-Aided Telephone Interviews
13-month data collection period: April08 through May09
Advance letter with $5 incentive
Household recruitment
Mail-out Dairy packets
Reminder calls
Person level retrieval
2008 NHTS Data Methods

- Collected interviews from HH people ages 5 & older within 7 days of Travel Date
- Collected Proxy interviews
  - 5 – 13 year olds (always)
  - 14 – 15 year olds (unless parent requests in-person)
  - 16+ years old (only after day 3)
- Recruit—10 minutes/Retrieval – 18 minutes per interview
- A complete HH interview required 50% of all adult household members: Non-responding HH members are accounted for in the weights
2008 NHTS Data Coverage

- Weighted to represent one calendar year for annual estimates
- Every sampled HH was assigned a travel day:
  Ensured *balance* across each day of the week and month of the year
  Compare Mondays to Fridays and weekdays to weekend
New data items of interest include:

- Whether Highway or Toll rode was used for the trip
- Whether vehicle is Hybrid/Alt. Fuel
- New section detailing children’s travel to school (Safe Routes to School)
- Internet shopping and deliveries
- Whether non-travelers would like to get out more
A few trends in historic patterns in travel
  • Changes in family structure and vehicle availability
  • Immigration
  • Cost of travel
  • Internet use and travel

Increased emphasis on climate change

The challenges of an aging population
Changes in basic travel demand indicators
For the first time in Census history the majority of households have no children...

- **Families w/ Children**: 33%
- **Families w/o Children**: 35%
- **Single Person > 65 yrs**: 9%
- **Single Person < 65 yrs**: 17%
- **Non-Families > 1 person**: 6%

Base: Decennial Census 2000, US Census Bureau
Vehicle ownership distribution patterns have changed...

Number of Households by Number of Vehicles Owned

- 0 VEHICLES
- 1 VEHICLE
- 2 VEHICLES
- 3+ VEHICLES

Base: Decennial Census 2000, US Census Bureau
The number of households has grown while the average size has dropped...

Source: US Census
Growing diversity will impact travel demand…

Projected Population Growth by Race and Ethnicity
(Percent Growth)

Source: U.S. Census Bureau
And trends in immigration...

Immigrants in the U.S., Number and Percent of Population

Source: Decennial Census for 1990 to 2000, Center for Immigration Studies and Analysis of March 2005 Current Population Survey Data
For example, whites start driving earlier than African-Americans and Hispanics. 

Source: NHTS 2001
And high-income Hispanic men travel more miles per day...

Source: NHTS 2001
Transportation cost is becoming a bigger issue...

Percent of Income Spent on Gasoline in Daily Household Travel, 2001 and 2006

Source: NHTS 2001 and 2006 update
## Raising the value of substitutes like telecommuting...

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of workers in US</td>
<td>145,272,000</td>
</tr>
<tr>
<td>Number of workers who sometimes work at home</td>
<td>10,389,672</td>
</tr>
<tr>
<td>Percent</td>
<td>7.2%</td>
</tr>
<tr>
<td>Average one-way distance to work (vehicle miles) for those workers</td>
<td>17.5</td>
</tr>
<tr>
<td>Vehicle miles saved each work at home day</td>
<td>363,638,520</td>
</tr>
<tr>
<td>Gas saved each work at home day (gallons)*</td>
<td>17,913,228</td>
</tr>
<tr>
<td>CO₂ emissions reduced per day (tons)</td>
<td>72,550</td>
</tr>
</tbody>
</table>

* using fleet average (NHTS/EIA 2006) of 20.3 mpg

Source: NHTS 2001
But telecommuting may not reduce total VMT...

VMT By WORKLOC

Source: NHTS 2001
Internet use may also influence *shopping* behavior...

- 30 percent of adults purchased something over the Internet in the last month

- 3.7 times a month one of those purchases is delivered to the household

- But people who shop on-line travel more miles for shopping trips in real life:

  On average 3.9 miles versus 3.5 miles

Source: NHTS 2009 prelim
But Internet shopping increases deliveries to households...

Rise in VMT by Light-Duty Trucks

Rise in On-line Purchases
Daily travel’s role in global climate change

Source: www.envirolink.org/orgs/edf/sitemap.html
Carbon dioxide (CO₂) accounts for over 80 percent of total GHG emissions in the US...

Green House Gas Emissions

Energy-Related Carbon Dioxide 5,825.5 (82.3%)
Other Carbon Dioxide 108.8 (1.5%)
Methane 605.1 (8.6%)
Nitrous Oxide 378.6 (5.4%)
HFCs, PFCs, and SF₆ 157.6 (2.2%)

Any process that burns fossil fuel releases CO₂ into the air...

Source: Energy Information Agency
“On-Road” sources account for over 80% of all CO₂ from transportation...

Source: Green House Gas Emissions from the US Transportation Sector, 1990-2003
www.epa.gov
Fuels used for transportation vary in the amount of CO₂ impact...

Source: Green House Gas Emissions from the US Transportation Sector, 1990-2003
www.epa.gov
Gasoline ‘tail-pipe’ emissions are about half CO$_2$ and half water vapor...

Note: Tailpipe emissions account for about 60% of lifecycle emissions from vehicle transport, and do not include manuf./tires/maintenance/fuel production, etc. (VTPI)

Source: Alternatives to Traditional Transportation Fuels 1994, Volume 2
Passenger travel is the largest sources of \( \text{CO}_2 \) emissions from mobile sources...

Passenger travel accounts for 82% of VMT and about 75% of \( \text{CO}_2 \)

- **Passenger Travel, 82%**
- **Commercial Drivers, 4%**
  - Comm. Trucks (diesel), 25%
  - Other 2-Axle/4-Tire POVs (mostly gas), 34%
- **Freight, 14%**
- **Other 2-Axle/4-Tire POVs** (mostly gas), 34%

Source: McGuckin’s analysis based on Highway Statistics VM-1 2009. Gasoline=8.8Kg \( \text{CO}_2 \) per gallon, diesel=10.1Kg \( \text{CO}_2 \) per gallon
The mix of vehicles, the amount their driven and the carbon impact varies by region...

Source: NHTS 2001
And by factors such as workers, drivers, density, and distance to transit...

Source: NHTS
Congestion contributes to CO2 emissions from vehicles...

![Graph showing CO2 emissions rates by speed](image)

**CO2 Emissions Rates by Speed**

**Speed profile by time of day**

Source: NHTS

Source: University of California, Riverside, via Alan Pisarski, ITE PPT
And the adoption of new technology may help lower emissions...

Source: NHTS 2009 preliminary
But remember--many common alternate fuels still have CO2 impacts...

Encourage the right alternate fuels:

- Liquefied Petroleum Gas
- Compressed Natural Gas
- Ethanol From Corn
- Methanol From Natural Gas
- Gasoline

Source: Alternatives to Traditional Transportation Fuels 1994, Volume 2
Lower VMT and more alternative fuels have unintended consequences…

Source: McGuckin analysis of HPMS
A New Challenge: Aging Beyond Driving
The population is aging out of high-traveling years…

Percent of Population 20-34 and 65+
As people age they drive fewer miles…

**Annual VMT per Driver by Age Class**


- **Highly Mobile (34-43)**
- **Pre-Retirement (54-58)**
- **Early Retirees (64-68)**
- **Young Old (69-73)**
- **Middle Old (74+)**

Source: NHTS data series
But women drivers aged 65 and older are traveling at historically high rates...

- Men’s vehicle travel seems to be leveling off
- While women’s vehicle travel continues to grow
- Younger cohorts have different travel than current elderly

Source: NHTS data series
While women *drive* fewer miles they travel a bit *more* in multi-occupant trips…

![Bar chart showing miles of travel (billions/year) for men and women.]

<table>
<thead>
<tr>
<th>Miles of Travel (Billions/Year)</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Driver Miles</td>
<td>1411.0</td>
<td>863.8</td>
</tr>
<tr>
<td>Miles in SOV</td>
<td>875.3</td>
<td>536.0</td>
</tr>
<tr>
<td>Miles in MOV</td>
<td>1031.8</td>
<td>1076.3</td>
</tr>
<tr>
<td>Total PMT in Vehicles</td>
<td>1907.2</td>
<td>1612.4</td>
</tr>
</tbody>
</table>

Source: 2009 NHTS, Men and Women 16+
Increasing longevity means many seniors will age past driving...

Driving cessation doubles each decade after age 65, and women cease driving at twice the rates of men.

Source: 2009 NHTS
Of all non-drivers over 65, three-quarters are women ...

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Never Drove</th>
<th>Of All Non-Drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Used to Drive</td>
<td>82.5</td>
<td>17.5</td>
<td>24.9</td>
</tr>
<tr>
<td>Of All Non-Drivers</td>
<td>56.5</td>
<td>43.5</td>
<td>75.2</td>
</tr>
</tbody>
</table>

Source: 2009 NHTS
Trends in travel by non-drivers 65+ show a growing reliance on POV...
Many non-drivers do not have easy access to transit...

Source: 2001 NHTS

Percent of Households with a Non-Driving Women 65+ Located More than 1/2 Mile from Closest Bus line

- White
- African-American
- Asian
- Hisp

Source: 2001 NHTS
And live in less dense areas—3/4 in rural and suburban areas...

Where Non-Driver Live

- Suburban: 58%
- Urban: 26%
- Rural: 16%

Source: 2001 NHTS
To provide transport for non-driving elders is a massive planning challenge...

Source: 2009 NHTS and US Census projections

Cohort Growth in Drivers and Non-Drivers 65+

33 million non-drivers

Source: 2009 NHTS and US Census projections
Just some food for thought...

Share your own thoughts!