Use of US Census Data for Transportation Modeling and Planning

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Outline

- Overview of Census Products
- Examples of Applying Census Data for Modeling/Planning
  - Census Transportation Planning Product (CTPP) from American Community Survey (ACS)
  - Longitudinal Employer-Household Dynamics (LEHD)
- New Developments for Census Data
- Update on South Florida Residence Job Linkage (SFRJL) Tool
Census Data and Modeling/Planning

- Census data used in all aspects of modeling and planning
  - Socioeconomic input data
  - Cross classification trip generation model
  - Trip distribution model
  - Mode Choice model
  - Auto availability model
  - Destination choice model
  - Performance measurements
  - Transit market analysis
Census Products

- Sources of Data
  - Decennial Census
  - The American Community Survey (ACS)
  - National Household Travel Survey (NHTS)

- Summary Data
  - Census Transportation Planning Products (CTPP)
  - Longitudinal Employer–Household Dynamics (LEHD) Data

- Micro Data
  - Public Use Micro Samples (PUMS)
NPTS/NHTS – Historical Background

- Started in 1969
- Eight (8) Surveys
  - Nationwide Personal Transportation Survey (NPTS)
  - National Household Travel Survey (NHTS)
- The core data in the NPTS/NHTS series:
  - Information collected about all trips made by household members over a 24-hour period
<table>
<thead>
<tr>
<th>Survey year</th>
<th>Sample size</th>
<th>Sample selection</th>
<th>Interview method(s)</th>
<th>Travel day data</th>
<th>Response rate</th>
<th>Add-Ons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1969 NPTS</td>
<td>15,000</td>
<td>235 primary sampling units outgoing panels of Census’ Quarterly Housing Survey</td>
<td>in-home interviews with some telephone follow-up</td>
<td>from memory</td>
<td>Not available</td>
<td>none</td>
</tr>
<tr>
<td>1977 NPTS</td>
<td>18,000</td>
<td>376 primary sampling units – outgoing panels of Census’ Current Population Survey</td>
<td>in-home interviews with some telephone follow-up</td>
<td>from memory</td>
<td>85.30%</td>
<td>none</td>
</tr>
<tr>
<td>1983 NPTS</td>
<td>6,500</td>
<td>376 primary sampling units – outgoing panels of Census’ Current Population Survey</td>
<td>in-home interviews with some telephone follow-up</td>
<td>from memory</td>
<td>94.00%</td>
<td>none</td>
</tr>
<tr>
<td>1990 NPTS</td>
<td>22,317 (18,000 national and 4,300 add-ons)</td>
<td>- RDD sample - Stratified by 34 geographic units</td>
<td>telephone interviews</td>
<td>from memory</td>
<td>73.10%</td>
<td>New York, Connecticut, Indianapolis MPO</td>
</tr>
<tr>
<td>1995 NPTS</td>
<td>42,031 (21,000 national and 21,031 add-ons)</td>
<td>- RDD Sample - Stratified by 70 geographic units</td>
<td>telephone interviews</td>
<td>Travel Diary</td>
<td>37.20%</td>
<td>New York, Massachusetts, Oklahoma City, OK, Tulsa, OK</td>
</tr>
<tr>
<td>2001 NHTS</td>
<td>26,038 national and approx. 40,000 add-ons</td>
<td>RDD sample</td>
<td>telephone interviews</td>
<td>Travel Diary</td>
<td>41.00%</td>
<td>Baltimore MPO, Des Moines MPO, Hawaii, Kentucky (4 counties), Lancaster, PA MPO, New York, Oahu (Honolulu MPO), Texas, Wisconsin</td>
</tr>
<tr>
<td>2009 NHTS</td>
<td>150,147 (25,510 national and 124,637 add-ons)</td>
<td>RDD Sample</td>
<td>telephone interviews</td>
<td>Travel Diary</td>
<td>19.80%</td>
<td>California, Cedar Rapids, IA, Florida, Georgia, Iowa, Indiana, North Carolina, New York, Omaha, NE, Phoenix, AZ, Piedmont, NC, South Carolina, South Dakota, Tennessee, Texas, Tucson, AZ, Virginia, Chittenden County, VT, Vermont, Wisconsin</td>
</tr>
<tr>
<td>2017 NHTS</td>
<td>129,696 (26,099 national and 103,597 add-ons)</td>
<td>Random sample of residential addresses selected from the US Postal Service formed an Address Based Sample (ABS)</td>
<td>Mail-back (recruit survey), Web and telephone for both recruit and retrieval surveys</td>
<td>Travel Log</td>
<td>15.60%</td>
<td>Arizona, California, Dallas-Forth Worth, TX, Des Moines, IA, Georgia, Maryland, North Carolina, New York, South Carolina, Tulsa, OK, Texas, Waterloo, IA, Wisconsin</td>
</tr>
</tbody>
</table>

The CTPP is a set of special tabulations

- From 1970 to 2000, the CTPP /Urban Transportation Planning Package (UTPP), was based decennial census long form
- The decennial census long form has now been replaced with a continuous survey called the American Community Survey (ACS)

Include three-parts:

- Part 1: Residence-based tabulations summarizing worker and household characteristics
- Part 2: Workplace-based tabulations summarizing worker characteristics
- Part 3: Worker flows between home and work, including travel mode
ACS/CTPP Data

- **Release Frequencies**
  - 3-year average at county level with population > 20,000
  - 5-year average at TAZ level with more variables

- **Large amount of Information**
  - Means of Transportation
  - Age Groups
  - Industry Sectors
  - Race
  - Time left for work
  - Travel time to work
Miami-Dade County Work Flows

Residents (1,082,360)

Palm Beach
3,590 (0.3%)

Broward
996,435 (92.1%)

Miami-Dade
12,471 (1.1%)

Monroe
6,355 (0.6%)

Workers (1,145,501)

Palm Beach
8,225 (0.7%)

Broward
127,220 (11.1%)

Miami-Dade
996,435 (87.0%)

Monroe
1,150 (0.1%)

ACS/CTPP Online Tool (2006-2010 5-Year CTPP)
ACS/CTPP Online Tool Available Information
CTPP Usage – Ridership Forecasting with STOPS Model

- Initially using 2000 CTPP, now ACS/CTPP 2006-2010
- Large sample data
- Available for all areas and no new data collection is needed
- Represents “true” O-D travel patterns for automobile, transit, and non-motorized travel
- Used as direct input for the model
  - Home-based-work: 50% of transit market (CTPP)
  - Home-based-other: 40% of transit market (derived by scaling factors)
  - Non-home-based: 10% of transit market (derived by scaling factors)
  - Used with local on-board survey data
2012-2016 5-Year CTPP Data

- To be released in March 2019
- Will have the same structure: Residence, Workplace, and JTW
- Will no longer include data at TAZ or TAD level
- Instead, data will be tabulated at Census Block Group level
- In conjunction with 2020 Decennial Survey
  - Review the relationship between model TAZ and Census geography (block, block groups, or tracts)
  - Familiarize with the Participant Statistical Areas Program (PSAP)
    - Agency review and modify select statistical boundaries
    - Use free software Geographic Update Partnership Software (GUPS)
    - Joint efforts between Census Bureau and local agencies
Longitudinal Employer-Household Dynamics

- A Program Conducted by the US Census Bureau
- Combines Three Major Data Sources
  - State – Unemployment Insurance (UI) earnings data
    - Individual wages and employment
  - Federal – Census Administrative Records
    - Demographic Information (age, gender, and place of residence)
    - Information on employers (e.g., industry, employment, revenues)
- Creates a Longitudinal (Annual) Linked Employer-Employee Dataset
LEHD Origin-Destination Employment Statistics (LODES) Data

- Residence Place
- Workplace
- Total Number of Jobs
  - Number of Jobs by Age Groups
    - 29 or younger; 30-54; 55 or older
  - Number of Jobs by Monthly Earning Groups
    - $1250 or less; $1250 to $3333; $3333 or more
  - Number of Jobs by Industry Sectors
    - Goods producing; Trade/Transportation/utilities; Other Services
- Available at Census Block Level from 2002 to 2015
OnTheMap Online Tool
## Comparison of CTPP, LEHD, and NHTS Data

<table>
<thead>
<tr>
<th>Data Type</th>
<th>CTPP (ACS)</th>
<th>LODES (LEHD)</th>
<th>NHTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Source</td>
<td>American Community Survey (ACS)</td>
<td>Administrative records.</td>
<td>Household Surveys</td>
</tr>
<tr>
<td>Sample Size</td>
<td>2006–2010 5-year estimates (approximately 10% of U.S. HHs).</td>
<td>Administrative records from 50 states via UI program and Office of Personnel.</td>
<td>2017 NHTS surveyed roughly 129,696 households</td>
</tr>
<tr>
<td>Data Coverage</td>
<td>Entire US</td>
<td>Participating States (most)</td>
<td>Representative Simple from US</td>
</tr>
<tr>
<td>Update Frequency</td>
<td>5-year data appr. every 5 years.</td>
<td>Annually from 2012 to 2015</td>
<td>Every 5-8 years</td>
</tr>
<tr>
<td>Workplace Information</td>
<td>Include 115 workplace-based tables for over 200,000 geographies. Standard tables include workplace location, commute mode, departure time from home, arrival time to work, travel time (minutes), sex, age, race, ethnicity, language spoken, earnings, poverty status, occupation, industry, class of worker, hours worked each week, weeks worked in the past 12 months, earnings, number of vehicles available, household size, number of workers.</td>
<td>Provides workplace characteristics (i.e., firm size, firm age, NAICS industry sector, work location) and worker characteristics (i.e., primary, secondary job, earnings, education, age, gender, ethnicity, house location). The dataset does not include travel mode or travel time information.</td>
<td>Provides detailed location information of origin and destination address. The main data files includes characteristics for each household, person, worker, vehicle, and daily travel data. For each worker, NHTS provides information on full/part-time, number of jobs, job types, workplace location, usual mode, distance, and arrival time to work, mode of transportation, and flexibility in work arrival time.</td>
</tr>
<tr>
<td>Smallest geographic unit</td>
<td>TAZs</td>
<td>Census blocks</td>
<td>Latitude and longitude of trip ends</td>
</tr>
<tr>
<td>Who is included in the survey?</td>
<td>Collects employment characteristics from workers of 16 years and over including telework and noninstitutional group quarters (i.e., college dormitories and military barracks). Does not capture secondary job and excludes workers living in group quarters such as prisoners and nursing homes.</td>
<td>Includes all ages of workers. It includes all jobs under state UI law, which is 95% of private sector wage and salary employment. Also, it covers most of civilian federal employment using records from the Office of Personnel. Does not cover self-employment, military, the U.S. Postal Service, and informal employment.</td>
<td>Includes US population 5 years and older.</td>
</tr>
</tbody>
</table>

Source: Transportation Research Circular E-233
ACS PUMS Data

- Public Use Microdata Sample
  - Individual Responses (raw data)
  - At PUMA (100K+ Population) level only

- Why PUMS Data
  - Not available from standard tables
  - More sophisticated statistical analysis
  - Create new measures

- Availability – 2 PUMS files every year
  - 1-year PUMS (e.g.: 2016 1-year PUMS)
  - 5-year PUMS (e.g.: 2012-2016 5-year PUMS)
The South Florida Residence Job Linkage (SFRJL) Tool

- Make LEHD/CTPP Simple and Easy-to-Use
- Focus on Cities/Census Designated Places (CDP) in Seven South Florida Counties
  - Indian River, St. Lucie, Martin (TCRPM Model Area)
  - Palm Beach, Broward, Miami-Dade (SERPM Area)
  - Monroe
- Included five (5) Urbanized Areas (UA) in Florida
  - Tampa, Orlando, Jacksonville, Tallahassee, Pensacola
- Display Data in Tabular and Graphic Format
- Export Reports in Different Formats
SFRJL Tool (http://sfrjl2.visualdatacenter.net)
SFRJL – Accordion Menu and User Login Interface
SFRJL – Including LEHD and ACS/CTPP Data
SFRJL – Predefined Report at County/City/CDP Levels
SFRJL – User Defined Areas
SFRJL Report (From Weston to Miami – 2015 LEHD)
### SFRJL Report (From Weston to Miami – MOT – CTPP)

#### Means of Transportation

<table>
<thead>
<tr>
<th>From City</th>
<th>To City</th>
<th>Drove alone</th>
<th>2-person carpool</th>
<th>3+ Person Carpool</th>
<th>Bus</th>
<th>Rail</th>
<th>Bike and Ped</th>
<th>Other modes</th>
<th>Worked at home</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weston city, Broward</td>
<td>Miami city, Miami-Dade</td>
<td>1,415</td>
<td>87.35%</td>
<td>160</td>
<td>9.88%</td>
<td>25</td>
<td>1.54%</td>
<td>15</td>
<td>0.93%</td>
<td>1,620</td>
</tr>
</tbody>
</table>

#### Number of Workers by Means of Transportation

- Drove alone: 1,415 (87.35%)
- 2-person carpool: 160 (9.88%)
- 3+ Person Carpool: 25 (1.54%)
- Bus: 15 (0.93%)

#### Percent of Total Workers by Means of Transportation

- Drove alone: 100%
- 2-person carpool: 100%
- 3+ Person Carpool: 100%
- Bus: 100%
### SFRJL Report (From Weston to Miami – Time Left for Work)

<table>
<thead>
<tr>
<th>From City</th>
<th>To City</th>
<th>Time Left for Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weston, Broward</td>
<td>Miami City, Miami-Dade</td>
<td>5:00am - 5:29am: 60 (3.73%)</td>
</tr>
</tbody>
</table>

#### Graphs:

1. **Number of workers by Time left home for work**
2. **Percent of Total Workers by Time left home for work**
Questions and Comments