GPS-Assisted Prompted Recall Household Travel Survey to Support Development of an Advanced Travel Model

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Presentation Outline

- Typical survey HTS
- Jerusalem Travel Habits Survey (JTHS) Design
- Custom CAPI Platform for GPS PR + Retrieval
- Preliminary Pilot Review Results
- Summary
Typical Survey HTS Method

- Probability samples of households
- Telephone interviews for recruitment of households
- Mailed diaries for recording travel and activities
- Capture of the travel data by telephone, Web, or mail

- GPS integrated (audit → prompted recall)
- SP extensions (follow-up → real-time)
JTHS Challenges

- Increased demand from models for better data
  - Completeness of individual daily patterns (GPS + PR)
  - Intra-person time-space consistency (GPS + PR)
  - Inter-person intra-household consistency (GPS + PR)
  - Rich set of behavioral responses including new projects, transportation technologies, and policies (SPs based on GPS + PR Data)

- Demographics
  - Increased diversity, co-existing religious, multicultural, multilingual communities
  - Large household size

- Lifestyles
  - Busier and more active lives
  - Consumer technologies enabling people to control access to their households
JTHS Survey Design Solution

- 100% GPS assisted + Prompted Recall
- Customized computer-assisted personal interviewing (CAPI) tools for recruitment and retrieval
- Electronic geocoding with real-time respondent verification
- Continuous processing for quality assurance
- Incentive for completion
- Stated preference extensions
JTHS Schedule

- Design and develop software: October 2009 – January 2010
- Pilot: February – March 2010
- Revisions: April – May 2010
- Main survey: June 2010 – November 2010
- Subsequent cross-sectional surveys: Every year for three years
JTHS Key Design Features

- **100% GPS Assisted**
  - All HH members age 15+
  - <15, non-mobile, and persons refusing GPS report by travel log

- **24-Hour Travel Report**
  - Travel days (M, T, W)
  - Fieldwork days (S, M, T, W, TH)
  - Excluding holidays

- **Travel Report Eligibility**
  - All persons who share same dwelling most days of week, and have shared food expenditure budget
  - Separate report for all 8+ years
  - Report by proxy to complete parent/guardian trips for <8 years

- **Definition of Out-of-Home Activities**
  - Change of address/place
JTHS Sampling

- **Sample Size Goal**
  - Base (2009-2010) = 5,000 households (model-useable data records)
  - Subsequent cross-sectional Surveys (Years 2-4) = 800 HHs each year
  - Total JTHS = 7,400 HHs

- **Design**
  - Probability sample of dwelling units
  - Property tax file to be used as a sampling frame (plus aerial photography for East Jerusalem – sample by building)
  - Geographical cluster sampling

- **Coverage**
  - Entire urban and non-urban populations in Jerusalem modeled area, consisting of 315K households
  - Regions: North, South, Ultra-Orthodox, Arab
  - Exceptions – some non-household populations
JHTS Customized CAPI Software System

- Using COTS as basis then added custom components
  - VOXCO CAPI + GeoStats TripBuilder (GPS Trips Engine)
- Centralized field control for sample management, progress monitoring, interviewer productivity
- Real-time data validation, edit and consistency checking
- Map-based, incorporating GPS traces
- Keeping it simple, interactive and engaging (support for Undo/Redo)
JHTS Customized CAPI Software System

- Dealing with legacy support for extended character sets in survey software
  - Single-byte vs. Multiple byte text encoding

- Supporting multiple languages + RTL orientation (map data in Hebrew!)

- Fuzzy string searches and geocoding in Hebrew

-Disconnected operation using laptops
  - Integration with CAPI platform
  - Integrated GPS download
  - Support for data synchronization and aggregation
JHTS GPS PR – TripBuilder Windows
JHTS Pilot Survey Initial Results

- Total of 422 Household Attempts
- Team of 30 Surveyors
  - Four geographic zones
- 17 Travel Dates (Feb – Mar 2010)

<table>
<thead>
<tr>
<th>Team</th>
<th>Attempted Households</th>
<th>% of Total</th>
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<tbody>
<tr>
<td>North</td>
<td>119</td>
<td>28.20%</td>
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<tr>
<td>South</td>
<td>94</td>
<td>22.30%</td>
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<tr>
<td>Ultra-Orthodox</td>
<td>131</td>
<td>31.00%</td>
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<tr>
<td>Arab</td>
<td>78</td>
<td>18.50%</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>422</strong></td>
<td><strong>100.00%</strong></td>
</tr>
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JHTS – Pilot GPS Data Summary

- GPS data for 689 participants from the 288 complete households, 1,727,524 points
- Average logging frequency approx. four seconds
- 601 places with no GPS data (missed) out of 3,754
JHTS – Pilot GPS Data Summary

- Review of edits performed by surveyors showed that better training may be necessary
- Problems in the software’s time validation logic + UI let problems records into the dataset
- Surveyors used GPS traces and times as guidance, but would often edit data heavily (more research on this is underway)
- Very flexible retrieval procedures posed challenges to keeping things “sane”
JHTS – Preliminary Pilot Trip Data Review

- HH trip rate is 18.2 for all trips and 10.6 for motorized trips.
- Logical mode distribution
- Logical purpose distribution
- 39% of trips are joined, of these 28% are with

<table>
<thead>
<tr>
<th>Mode</th>
<th>Trips</th>
<th>%</th>
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<tbody>
<tr>
<td>Non-motorized</td>
<td>2197</td>
<td>41.80%</td>
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<tr>
<td>Auto</td>
<td>1990</td>
<td>37.90%</td>
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<tr>
<td>Bus</td>
<td>715</td>
<td>13.60%</td>
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<tr>
<td>Other</td>
<td>350</td>
<td>6.70%</td>
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<tr>
<td>Unknown</td>
<td>1</td>
<td>0.00%</td>
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</table>

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Trips</th>
<th>%</th>
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<tbody>
<tr>
<td>Home</td>
<td>1641</td>
<td>31.20%</td>
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<tr>
<td>Work</td>
<td>643</td>
<td>12.20%</td>
</tr>
<tr>
<td>School</td>
<td>612</td>
<td>11.70%</td>
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<tr>
<td>Escort</td>
<td>330</td>
<td>6.30%</td>
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<tr>
<td>Change mode</td>
<td>635</td>
<td>12.10%</td>
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<tr>
<td>Other</td>
<td>1306</td>
<td>24.90%</td>
</tr>
<tr>
<td>Unknown</td>
<td>86</td>
<td>1.60%</td>
</tr>
</tbody>
</table>
Summary

- Growing demands for more/better data and growing challenges facing data collection work
- High response rates can be achieved in 100% GPS surveys
- GPS Prompted Recall has the potential of improving data quality (more consistency in the data)
- Challenges in managing and review data quality are still present

- Allow yourself lots of time to deal with translations and display of non-Western languages
Thank You
What Next? – NYMTC Household Survey