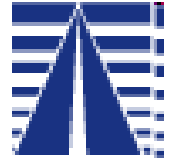


# GPS-Assisted Prompted Recall Household Travel Survey to Support Development of an Advanced Travel Model



## *ITM 2010 – Tempe AZ*

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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**



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# 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)



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# 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



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# 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



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# 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**



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# 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



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# 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



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# 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)**



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# 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



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# JHTS GPS PR – TripBuilder Windows

Select Participant - 1.0.1.25449

ID	First Name	Last Name	Age	Download Date	Number of Places	Number Confirmed	Status	Download GPS	Edit
1									
2									

GeoStats Trip Builder - 1.0.3699.19218

סגור

שמירה

701

בצע שוב

12/02/2010 יום הנסיעות: 1000001 משק בית: 199

סך מקומות: 41 לא מאושר: 41

סוג היום: דסה-לוגו 2 מכוון 1 ממוך 2

לאן הלכת לאחר מכן? [מקום 3] חחה

זמן הגעה למקום: 0713

זמן עזיבה מהמקום: 0733

אמצעי:

איך הגעת למקום הזה?

אוטובוס:

אחר:

או:

פצל למספר אמצעים:

תזמון תוצאות החיפוש:

חיפוש

השתמש

מקום הביקור:

מקום נופץ:

מקום קודם:

מסעדה

מקום אחר:

רוסי מקום חצב מקום... כל המקום התמקד במקום מבט כללי מידע חזו

500 m

m 647134.4, 201196.7

מאושר	מסרה	זמן שהייה	זמן עזיבה	זמן הגעה	אמצעי	מקום	על המפה	מס' מקום
<input type="checkbox"/>		3:24	06:24	03:00			<input checked="" type="checkbox"/>	1
<input type="checkbox"/>		0:27	07:12	06:44			<input checked="" type="checkbox"/>	2
<input checked="" type="checkbox"/>		0:19	07:33	07:13	אוטובוס		<input checked="" type="checkbox"/>	3
<input type="checkbox"/>		0:05	07:42	07:37	אוטובוס		<input checked="" type="checkbox"/>	4
<input type="checkbox"/>		0:05	08:02	07:56	נהג מכוון...		<input checked="" type="checkbox"/>	5
<input type="checkbox"/>		0:00	08:42	08:41			<input checked="" type="checkbox"/>	6
<input type="checkbox"/>		5:26	14:17	08:50	הליכה	צמ"א	<input checked="" type="checkbox"/>	7
<input type="checkbox"/>		1:17	15:35	14:18	הליכה	מסעדה	<input checked="" type="checkbox"/>	8
<input type="checkbox"/>		0:05	16:33	16:27	נהג מכוון...		<input checked="" type="checkbox"/>	9
<input type="checkbox"/>		0:09	16:53	16:44	נהג מכוון...		<input checked="" type="checkbox"/>	10
<input type="checkbox"/>		1:24	18:29	17:04	נהג מכוון...		<input checked="" type="checkbox"/>	11
<input type="checkbox"/>		12:55	07:33	18:38	נהג מכוון...		<input checked="" type="checkbox"/>	12
<input type="checkbox"/>		0:08	07:44	07:35	אוטובוס		<input checked="" type="checkbox"/>	13
<input type="checkbox"/>		0:05	08:07	08:01	נהג מכוון...		<input checked="" type="checkbox"/>	14

הוסף מקום חדש

הסר מקום

השתמש בנסיעה

הסר מסלול שווא

הוסף לפני

הוסף אחרי

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# JHTS Pilot Survey Initial Results

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

Team	Attempted Households	% of Total
North	119	28.20%
South	94	22.30%
Ultra-Orthodox	131	31.00%
Arab	78	18.50%
<b>Total</b>	<b>422</b>	<b>100.00%</b>

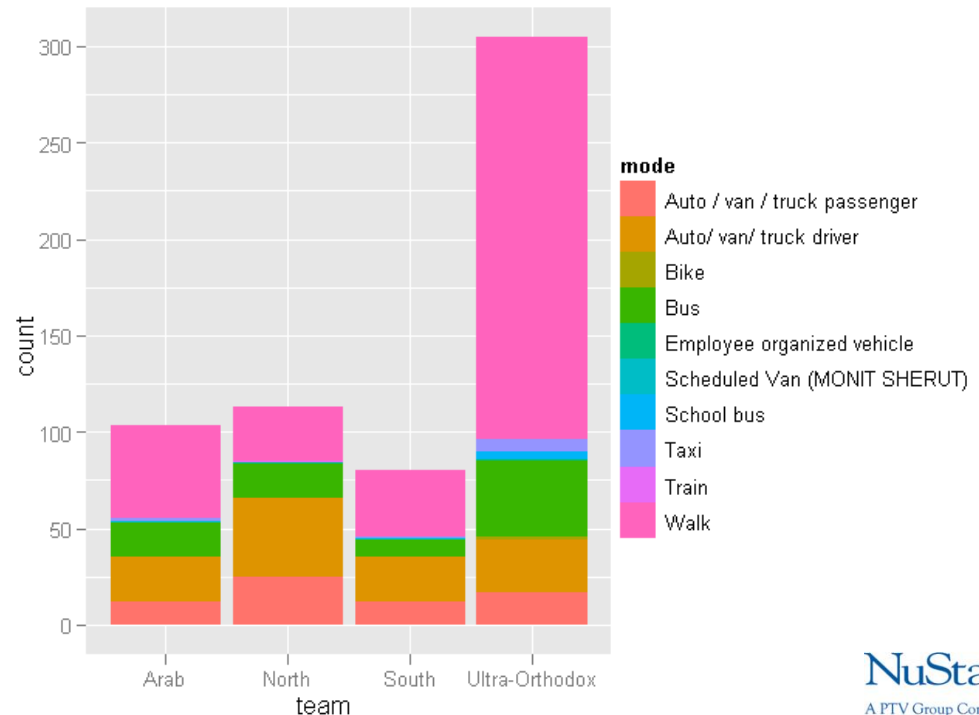
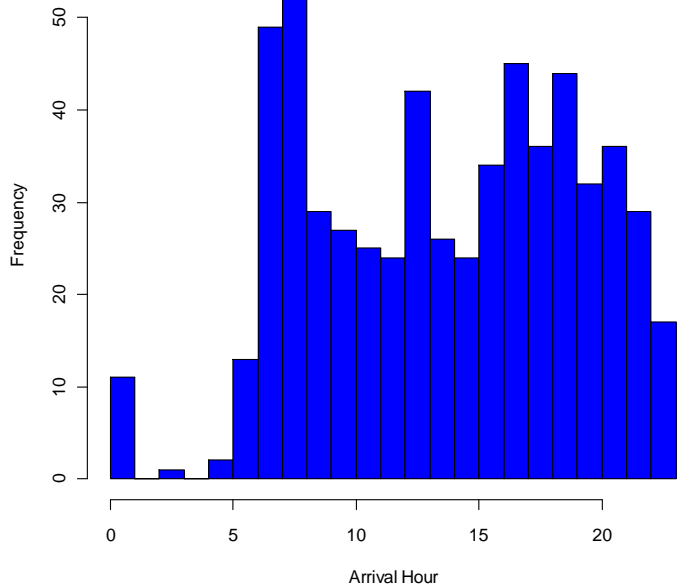


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# JHTS – Pilot GPS Data Summary

- 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



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# 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”



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# 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

Mode	Trips	%
Non-motorized	2197	41.80%
Auto	1990	37.90%
Bus	715	13.60%
Other	350	6.70%
Unknown	1	0.00%

Purpose	Trips	%
Home	1641	31.20%
Work	643	12.20%
School	612	11.70%
Escort	330	6.30%
Change mode	635	12.10%
Other	1306	24.90%
Unknown	86	1.60%



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# 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**



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# Thank You



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# What Next? – NYMTC Household Survey

Person Places - Windows Internet Explorer    Dev02-IE7 - VMware ...    File    VM    Help    X

http://www.regionaltravelsurvey.org/nymtcplottbwj/TripsMap.aspx?data=P38pbj0xMjEmcGyYbm89MSZsYW5nPUVOLUSZTYRDm1hNT03OEI4MTZGMEMSRjc0NTBENZbRRTU2NDW    Live Search

File    Edit    View    Favorites    Tools    Help

Person Places

---

## Record Your Travel

Person: **Michael Thompson (p 1)**  
 Travel on: **Sunday, October 11 2009**  
 From 3:00 am to the next day at 2:59 am

Total Places: **4**   

Places with errors: **0**

---

### Your Online Travel Diary

The places you visited from 3:00 am to the next day at 2:59 am.

View #	Place	Mode	Arrival Time	Departure Time	Duration (hr:min)	
<input checked="" type="radio"/>	1 Home		3:00 AM	7:00 AM	4:00	<input checked="" type="checkbox"/>
<input type="radio"/>	2 Garden Cafe	AUTO (CAR OR...)	7:15 AM	7:45 AM	0:30	<input checked="" type="checkbox"/>
<input type="radio"/>	3 1)4)Rockefeller Plaza	WALK	8:00 AM	1:00 PM	5:00	<input checked="" type="checkbox"/>
<input type="radio"/>	4 Home	WALK	1:30 PM	2:59 AM	13:29	<input checked="" type="checkbox"/>

**Help**

Click **Zoom All** to view all places you've reported.

Click **Zoom to Place** to zoom into the current place.

Click **Set Location** and then click on the map to adjust the place on the map.

You can also drag and drop the selected place to adjust its location.

---

### Where Were You at 3 am? (Place 1)

**What is the location of this place?**

Is it a home, work or school?

Is it a new location?  
[Add New Location](#)

Is it a previously visited location?  
(Places you or others in your household have visited.)

1)4)Rockefeller Plaza (716-726 Degraw St, Brooklyn, NY 1121)  
 Rockefeller Plaza (30 Lafayette Ave)  
 3)Rockefeller Plaza (30 Lafayette Ave)  
 4)Rockefeller Plaza (30 Lafayette Ave)

Location Name:

Address:

Ex. 100 East 42nd Street, New York

Intersection:

Ex. Market & Broad, Newark

**Time**

What time did you arrive here?

What time did you leave this place?

(If this is the last place you visited, set time to 2:59 am.)

**Mode**

How did you travel to this place?

**Other Travelers**

How many other travelers with you?  
 number of other people

---

start    Person Places - Wind...    4:15 PM



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