



# Innovative Methodologies in Regional Travel Surveys: An Examination of the Middle Tennessee Transportation and Health Study

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# ACKNOWLEDGEMENTS

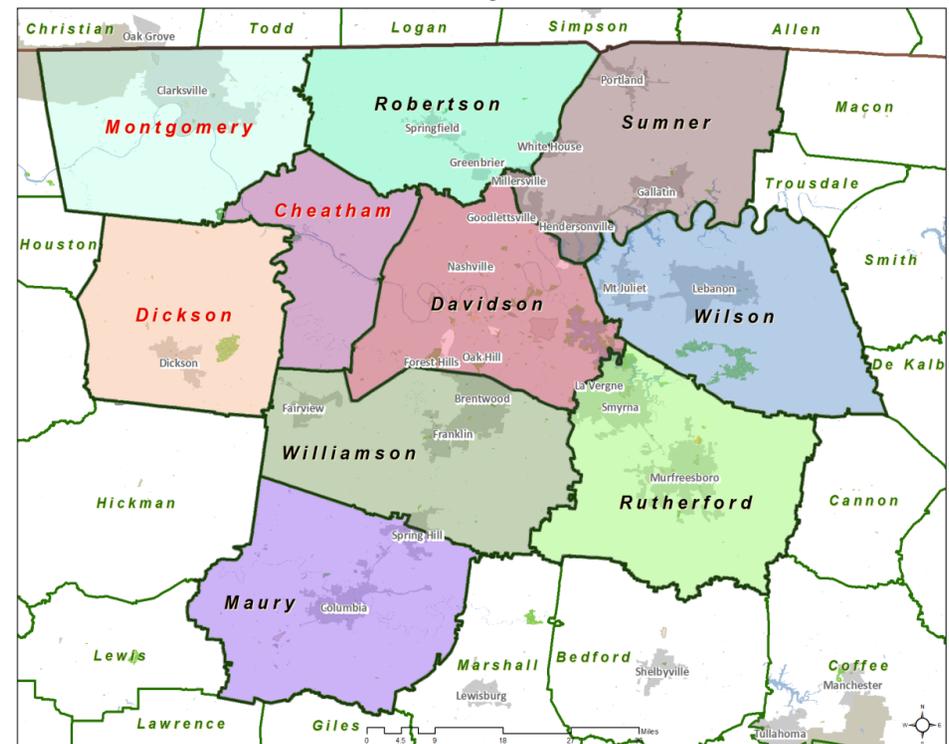
## ■ The Sponsors

- Nashville Area Metropolitan Planning Organization
- Clarksville Urbanized Area MPO
- Tennessee Department of Transportation

## ■ The Team

- Westat
- Parsons Brinckerhoff
- Dr. Daniel Rodriguez

The Study Area



# HISTORY – HOUSEHOLD TRAVEL SURVEYS

- Household travel surveys are conducted in most major U.S. cities about every 10 years
  - Diary only (one day, self-report)
  - GPS subsample to estimate trip underreporting
    - Combined with diary
    - Prompted recall
  - GPS only to replace diary / log self-report
- Nashville is just the second region to integrate a health component
  - Health Questions
  - GPS Devices
  - Physical Activity Monitors
  - Health Survey

# DESIGN AND SAMPLING

## Designing a Transportation and Health Study

### Middle Tennessee Transportation and Health Study



### The Household Travel Survey

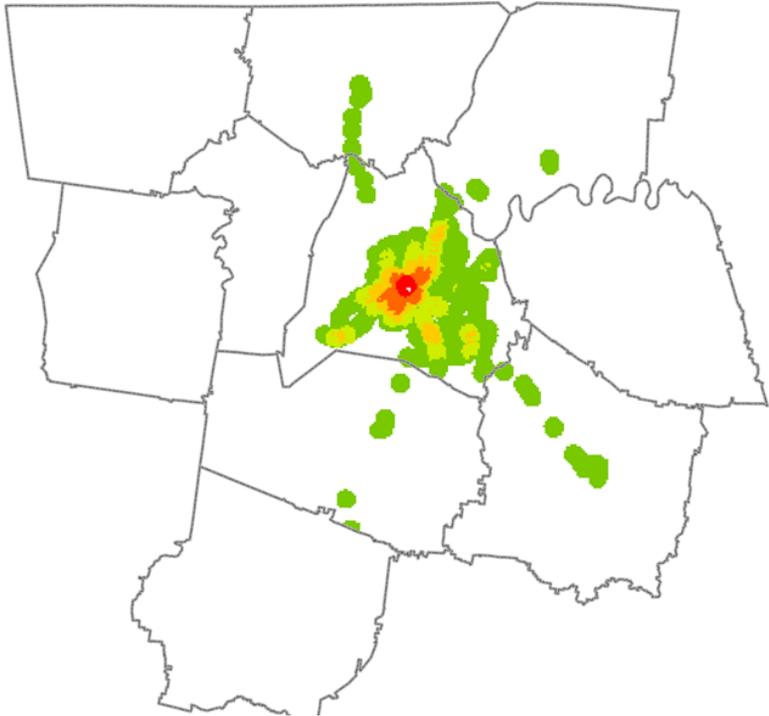
- 6,000 Households
- Split data collection (Spring & Fall 2012)
- Address-Based Sample frame
- Stratified by county
- Collect one day travel behavior data (age 5+)
- Collect basic self-report health information

# DESIGN AND SAMPLING

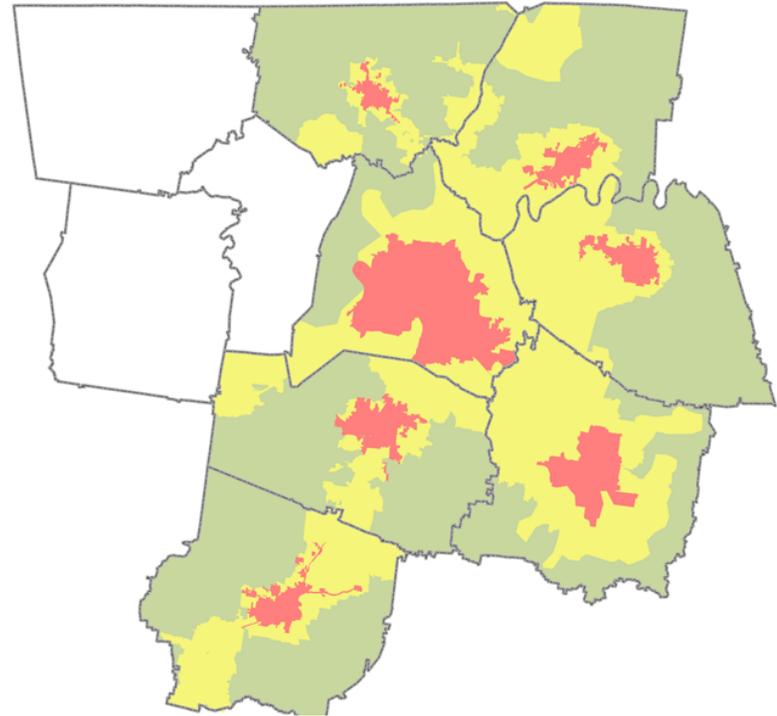
## The Health and Physical Activity Study

- 600 Household Subsample
- Stratified by Urbanicity
- Collect four days of GPS data (all adults 16-75)
- Collect four days of PA data (accelerometer)
- HPA participant completed Health Survey

# SAMPLING



Transit Oversampling  
(All Households)

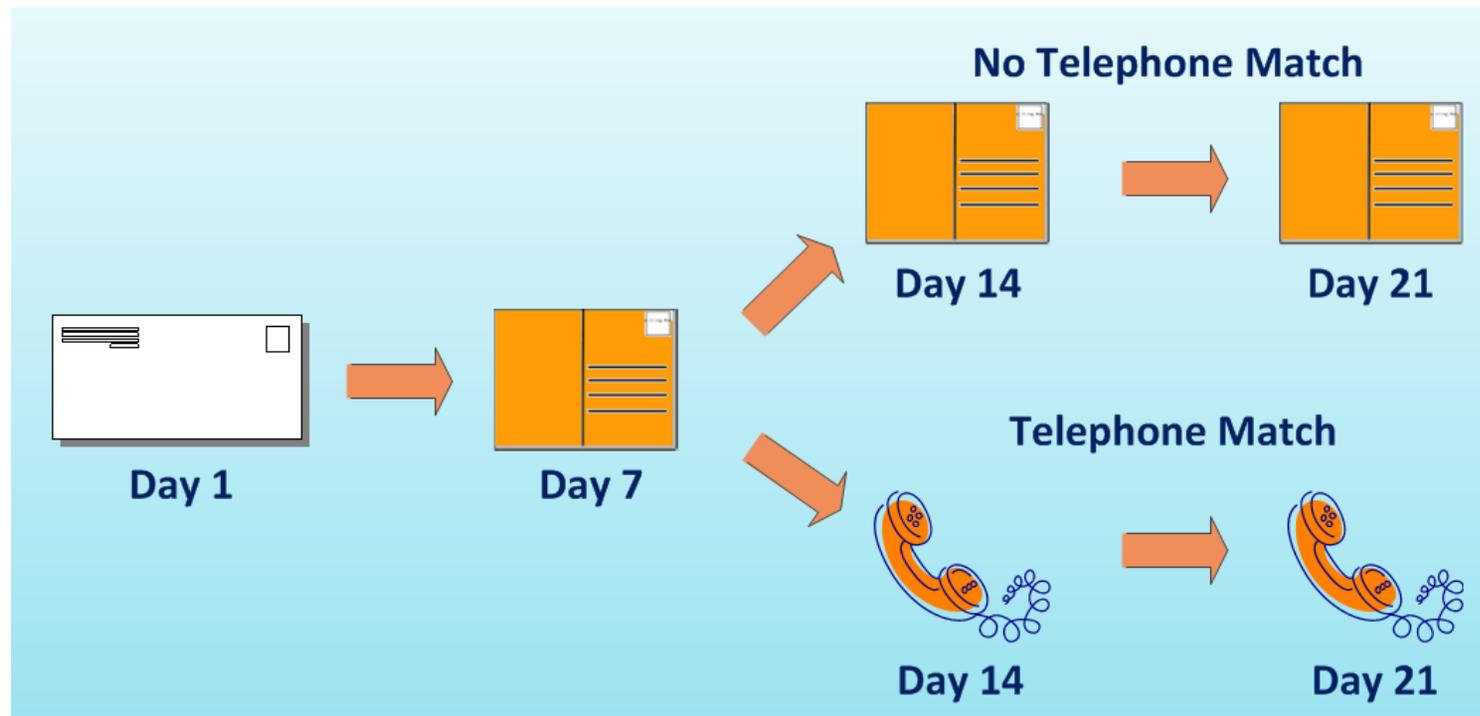


Area Type Stratification  
(HPA households only)

# DATA COLLECTION PROCESS / METHODOLOGY

## Recruitment

- Invitation to participate by mail
- Encouraged web recruitment (CASI)
- Telephone recruitment (CATI) also utilized



# PROJECT WEBSITE

## Middle Tennessee Transportation and Health Study



Welcome About the Study Invited to Join? Report Travel FAQs Materials Contact Us

[Ver en español](#)

### Step 1

Invited to join? Complete a Household Questionnaire.

[Start Here](#)

### Step 2

Record your travel on your assigned day using your travel log.

[Learn More...](#)

### Step 3

After your travel date, please report your travel information.

[Report Travel](#)

### Step 4

If selected, complete the additional Health Survey.

[Take Health Survey](#)

**Welcome!** The Middle Tennessee Transportation and Health Study is sponsored by the **Nashville Metropolitan Planning Organization**, the **Clarksville Urbanized Area Metropolitan Planning Organization**, and the **Tennessee Department of Transportation**. If you have received a participation letter, please [Start Here](#) to begin the survey.



Every day, thousands of people move through the middle Tennessee region—in cars, on buses, by foot, on bikes. To plan for the projects of *tomorrow*, we need to understand how you travel *today*. Your participation in this important survey will help improve the future of transportation for all of us.

# DATA COLLECTION PROCESS / METHODOLOGY

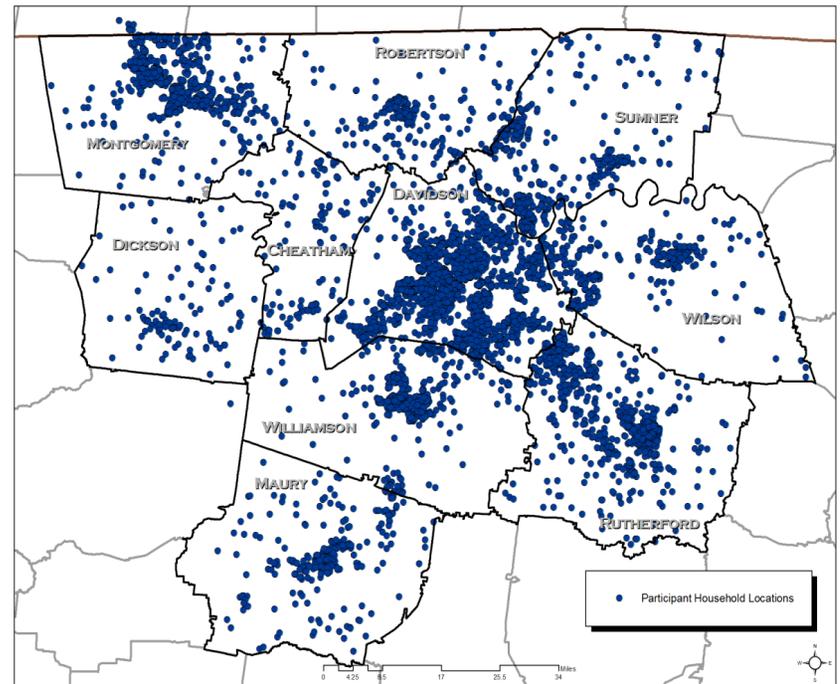
- Materials Mailed to Households
  - Travel logs
  - GPS, Accelerometer and travel logs
- Reminders
  - Recruit – mail and phone
  - Retrieval – phone, email, text
- Retrieval
  - Travel behavior data (Diary & GPS)
  - Both CASI and CATI options available
- Health Survey
- Incentives offered

# DATA COLLECTION SUMMARY

Data were collected from 6,324 households

- 11,574 Persons
- 13,722 Vehicles
- 61,019 Trips

County	Unweighted		Weighted	
	Frequency	Percentage	Frequency	Percentage
Davidson	2,231	35%	259,499	37%
Maury	316	5%	31,663	5%
Robertson	240	4%	24,197	3%
Rutherford	883	14%	96,232	14%
Sumner	522	8%	60,975	9%
Williamson	596	9%	64,886	9%
Wilson	376	6%	42,563	6%
Montgomery	862	14%	84,902	12%
Christian (KY)	68	1%	4,915	1%
Cheatham	124	2%	14,520	2%
Dickson	106	2%	19,107	3%
<b>Total</b>	<b>6,324</b>	<b>100%</b>	<b>703,459</b>	<b>100%</b>



# DUAL RECRUITMENT AND RETRIEVAL METHODOLOGY

## Recruitment Mode (CATI & WEB)

County	Recruit	
	Phone	Web
Davidson	55%	45%
Maury	59%	41%
Robertson	65%	35%
Rutherford	64%	36%
Sumner	63%	37%
Williamson	52%	48%
Wilson	57%	43%
Montgomery	56%	44%
Cheatham	53%	47%
Dickson	53%	47%
	56%	44%

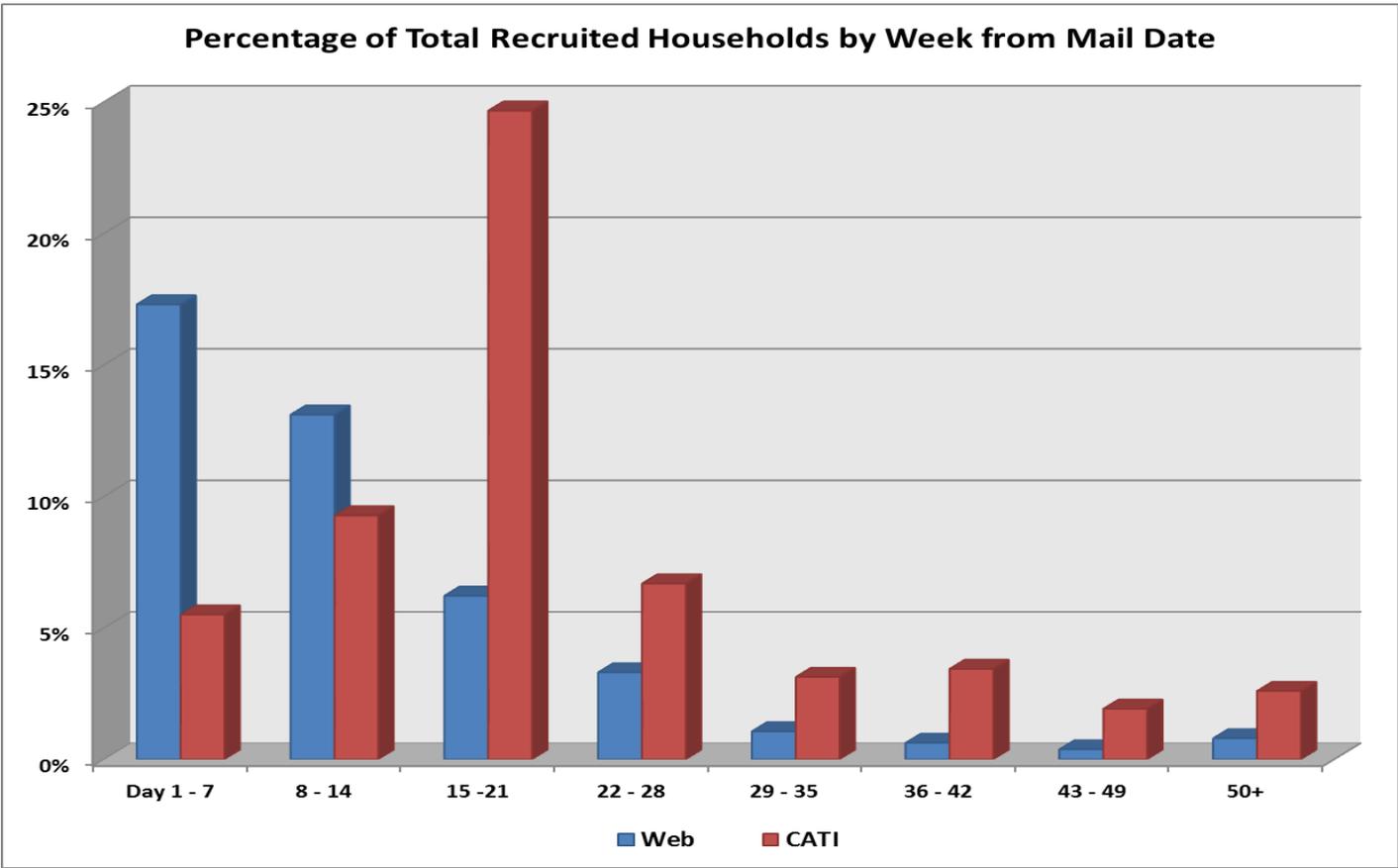
## Retrieval Mode (CATI & WEB)

County	Retrieval	
	Phone	Web
Davidson	47%	53%
Maury	52%	48%
Robertson	58%	42%
Rutherford	51%	49%
Sumner	54%	46%
Williamson	45%	55%
Wilson	45%	55%
Montgomery	44%	56%
Cheatham	42%	58%
Dickson	49%	51%
	47%	53%

# RECRUITMENT RESULTS

45% of all HHs recruited in first 2 weeks

75% in first 3 weeks



# DEMOGRAPHIC RESULTS: 7-COUNTY MPO AREA

Household Size (Unweighted and Weighted)

Household Size	Unweighted		Weighted		ACS Data
	Frequency	Percentage	Frequency	Percentage	Percentage
1	1,725	33%	160,579	28%	27%
2	2,007	39%	193,084	33%	33%
3	688	13%	95,057	16%	17%
4+	744	14%	131,295	23%	23%
<b>Total</b>	<b>5,164</b>	<b>100%</b>	<b>580,015</b>	<b>100%</b>	<b>100%</b>

Household Number of Vehicles (Unweighted and Weighted)

# of Vehicles	Unweighted		Weighted		ACS Data
	Frequency	Percentage	Frequency	Percentage	Percentage
0	296	6%	35,441	6%	5%
1	1,841	36%	186,948	32%	32%
2	2,021	39%	230,464	40%	40%
3	702	14%	91,254	16%	16%
4+	304	6%	35,908	6%	6%
<b>Total</b>	<b>5,164</b>	<b>100%</b>	<b>580,015</b>	<b>100%</b>	<b>100%</b>

Number of Household Workers (Unweighted and Weighted)

# of Workers	Unweighted		Weighted		ACS Data
	Frequency	Percentage	Frequency	Percentage	Percentage
0	1,437	28%	125,178	22%	22%
1	1,991	39%	248,211	43%	43%
2	1,553	30%	177,075	31%	30%
3+	183	4%	29,551	5%	5%
<b>Total</b>	<b>5,164</b>	<b>100%</b>	<b>580,015</b>	<b>100%</b>	

# DEMOGRAPHIC RESULTS: 7-COUNTY MPO AREA

Trip Rates by Household Income (Unweighted and Weighted)

	Unweighted Trip Rate	Weighted Trip Rate
Less than \$10,000	6.53	7.53
\$10,000 – \$19,999	6.22	6.43
\$20,000 – \$29,999	6.78	7.11
\$30,000 – \$49,999	7.52	8
\$50,000 – \$59,999	8.26	8.59
\$60,000 – \$74,999	9.02	10.14
\$75,000 – \$99,999	9.81	11.12
\$100,000 – \$149,999	10.62	11.49
\$150,000 or More	10.89	11.82
Don't Know	7.14	7.29
Refused	8.21	8.87

## HEALTH & PHYSICAL ACTIVITY SUBSAMPLE

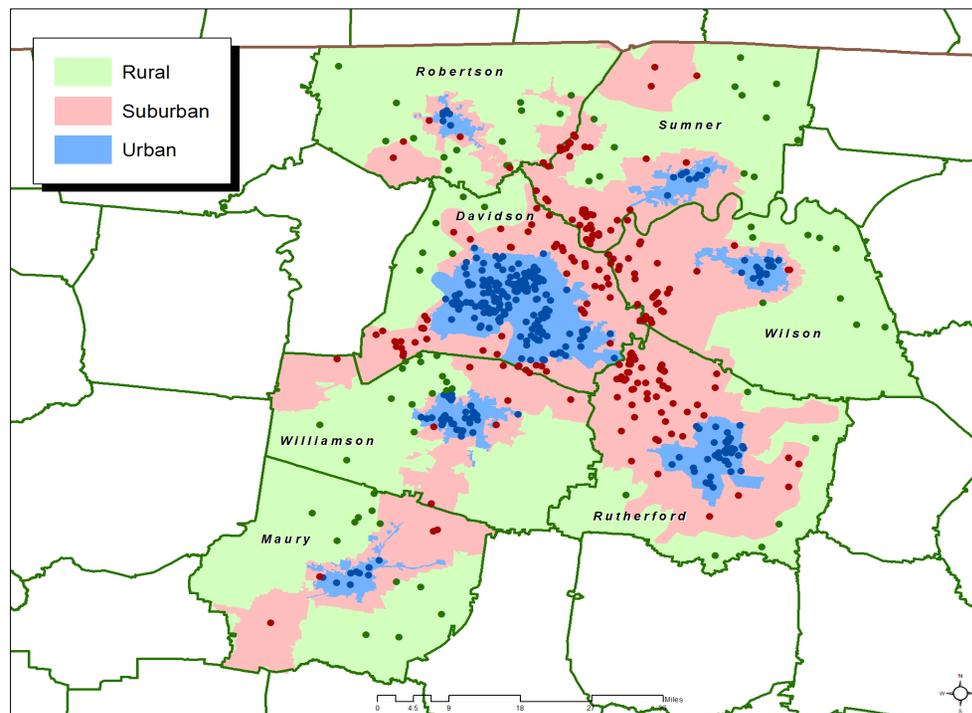
- 10% of all households participate in health study
  - One adult (18-75) to receive a GPS and a physical activity monitor (PAM)
  - All other adults (16-75) receive GPS
  - Wear for 4 days
- Devices shipped with logs and instructions
- First day to coincide with 'assigned' travel date
- 60+ question health survey available once retrieval complete and equipment returned
  - survey based on BRFSS, IPAQ, & SF-12
- Incentive offered for completion of all elements



# HPA DATA COLLECTION SUMMARY

Household Type	Recruited	Deployed	Retrieved	Activity Only Complete	GPS Only Complete	Health Survey (Only)
Rural	166	166	125	111	111	108
Suburban	332	332	242	236	239	218
Urban	510	508	355	319	316	303
<b>Total</b>	<b>1,008</b>	<b>1,006</b>	<b>722</b>	<b>666</b>	<b>666</b>	<b>629</b>

Household Type	Retrieved & Health	Retrieved w/ GPS	Retrieved w/ GPS & Accelerometer	Retrieved w/ GPS & Health	Retrieved w/ GPS, Accelerometer & Health
Rural	107	98	94	96	92
Suburban	216	214	206	204	196
Urban	302	283	270	268	260
<b>Total</b>	<b>625</b>	<b>595</b>	<b>570</b>	<b>568</b>	<b>548</b>



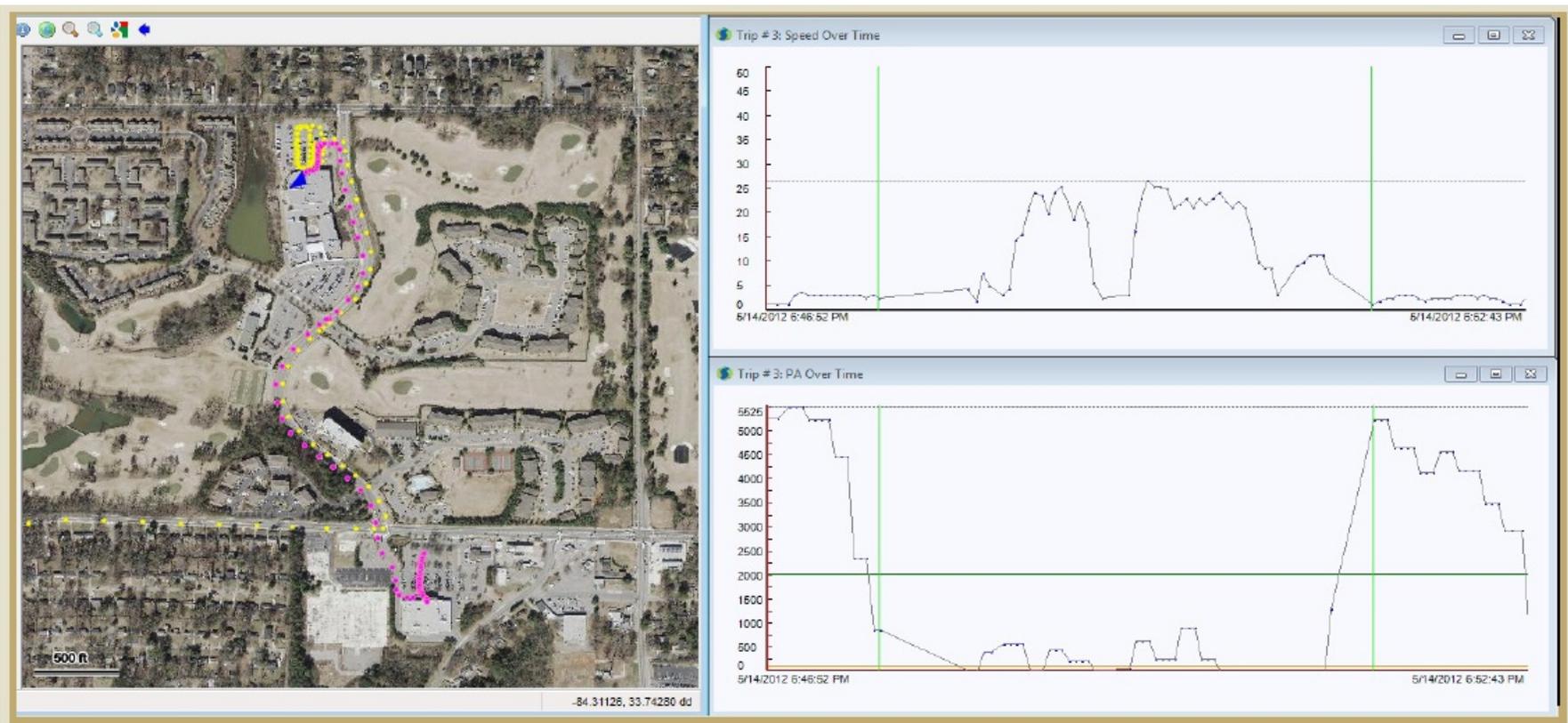
# HPA CHALLENGES

- Complexity of health component created some challenges
  - Additional material preparation, matching devices and surveys to individuals, specifying what to return and what to keep
  - Higher than typical refusal rates



# HPA SUCCESSES AND BENEFITS

- 90% of HPA households that reported travel and returned equipment also completed the health survey
- Robust baseline data collected for GPS, PAM and Surveys
- Data can be used to inform project prioritization
- Identification of active transportation in high obesity areas



# HEALTH RESULT EXAMPLE

Average Sit Hours per Weekday by Age Group – Self Report

Age Group	Unweighted				Weighted			
	Average Hours	Total Hours	Frequency	Percentage	Average Hours	Total Hours	Frequency	Percentage
0-2	3.70	1,118	323	3%	3.02	189,818	62,803	4%
3-5	4.00	1,457	370	3%	4.09	284,010	69,415	5%
6-11	5.60	3,534	678	6%	4.91	635,480	129,461	9%
12-17	6.10	3,640	642	6%	5.59	554,831	99,338	7%
18-24	5.40	2,864	565	5%	4.34	632,029	145,537	10%
25-34	6.30	9,518	1,554	14%	5.76	1,246,153	216,473	15%
35-44	6.00	8,018	1,404	13%	5.33	1,108,959	208,186	14%
45-54	5.80	7,945	1,446	13%	5.26	1,114,814	211,834	15%
55-64	6.00	9,536	1,704	16%	5.42	862,241	159,149	11%
65+	5.70	11,438	2,093	19%	5.51	823,686	149,604	10%
<b>Valid Total</b>	<b>5.46</b>	<b>59,068</b>	<b>10,779</b>	<b>97%</b>	<b>4.92</b>	<b>7,452,021</b>	<b>1,451,799</b>	<b>97%</b>
Don't Know	5.50	104	20	6%	3.51	10,198	2,908	7%
Refused	4.90	1,440	315	94%	3.81	151,058	39,636	93%
<b>Other Total</b>	<b>5.20</b>	<b>1,543</b>	<b>335</b>	<b>3%</b>	<b>3.66</b>	<b>161,255</b>	<b>42,545</b>	<b>3%</b>
<b>Grand Total</b>	<b>5.42</b>	<b>60,611</b>	<b>11,114</b>	<b>100%</b>	<b>4.71</b>	<b>7,613,276</b>	<b>1,494,344</b>	<b>100%</b>

## LESSONS LEARNED / OBSERVATIONS: HPA

- Urban households completed at a lower rate than suburban and rural households
- Households in which the household member who agreed to do the study was the same person randomly assigned as the HPA person completed at a higher rate
- HPA study design was more complicated than anticipated
- The Health Survey proved to be less burdensome than expected

## LESSONS LEARNED / OBSERVATIONS: OVERALL

- Advanced mailings with opportunity to self-recruit via web prior to CATI calling was effective
- Web participation was higher than anticipated
  - Recruitment = 44%
  - Retrieval = 53%
  - Health Survey = 61%
- Address-Based Sampling is effective in reaching targeted populations
- Transportation and Health objectives can be combined effectively
- Offer multiple modes to participate
- Public Outreach cannot be underestimated

**THANK YOU!**

**Questions?**

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Questions about how the research will be incorporated in the Nashville Area MPO policy and planning efforts – Please contact

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