

**Commute Atlanta Value Pricing Program:  
Recruitment Methods and Travel Diary Response Rates**

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**Abstract**

The Commute Atlanta program is an instrumented vehicle research program funded by the Federal Highway Administration (FHWA) Value Pricing Program and the Georgia Department of Transportation. One major objective of the multi-year program is to assess the effects of converting fixed automotive costs, such as vehicle registration and insurance fees, into variable operating costs. The main research hypothesis is that given a per-mile pricing system, participants will modify their driving patterns in an effort to reduce their total insurance and other payments, pocketing the savings. The Commute Atlanta project includes the parallel collection of instrumented vehicle data, household socio-demographic surveys, two-day travel diaries, and employer commute options surveys. The research team will monitor the changes in driving patterns and will use statistical analyses of household characteristics, vehicle travel, and relevant employer survey data to examine the relationships between the incentives offered and subsequent travel behavior changes.

This paper focuses on the recruitment methods and travel diary response rates for the two-day diary surveys conducted in February/March 2004. As in other instrumented vehicle studies, researchers collected data that allow the comparison of reported diary travel with monitored vehicle travel. However, this paper focuses on a new type of comparison. Because the households had been recruited into the study 8-months prior to the diary study and their vehicles were transmitting activity data during the travel diary period, the research team had their first opportunity to examine whether there were differences in household vehicle activity across those 77% of households that completed the diary data collection and the 23% of those that did not. The differences were significant at both the high and low ends of the travel-reporting spectrum and may have some major implications for evolving household travel survey methods.

**Key words**

Travel Diary, Survey, Response Rate, Sampling, Respondent Burden

## 1. BACKGROUND

The Commute Atlanta program is an instrumented vehicle research program funded by the Federal Highway Administration (FHWA) Value Pricing Program and the Georgia Department of Transportation. One major objective of the multi-year program is to assess the effects of converting fixed automotive operating costs into variable mileage-based costs. The main research hypothesis is that given a per-mile pricing system, participants will modify their driving patterns in an effort to reduce their total payments, pocketing the savings. To establish baseline travel patterns, the research team is currently monitoring vehicle trip making undertaken by the Commute Atlanta pool of household participants for one year with no pricing treatments. The research team installed 487 GT Trip Data Collectors in the vehicles of 268 participating households to collect second-by-second vehicle activity data (vehicle speed, acceleration, position, and engine operating parameters). The Commute Atlanta project includes the parallel collection of instrumented vehicle data, household socio-demographic surveys, two-day travel diaries, and employer commute options surveys. Assessment of pricing response requires that the researchers collect information about the socioeconomic factors that may affect consumer choice. In the second year of the study, pricing for the 268 household study participants will be implemented on a per-mile basis. Participants that reduce their household miles of travel will receive rebates in accordance with their mileage-based rate schedule. Participants that continue their pre-existing driving patterns or increase travel in the pricing year will not be penalized. The research team will monitor the changes in driving patterns and assess the statistical relationships between household characteristics, vehicle travel, and relevant employer survey data, incentives offered, and subsequent travel behavior change.

Data from travel diaries provides the foundation for travel model development in the United States, and is a critical component of the Commute Atlanta research program. The issue of non-response is fundamental to survey bias and accuracy of any models derived from survey data. Non-response is particularly troublesome if the participation refusal rates are different across groups that exhibit different travel behavior (see Richardson, et al., 1996). Even with random stratified sampling, non-response rates are a concern within socio-demographic groupings if the travel behavior differs across these households. Richardson, et al. (1996) similarly found in an Australian study that the travel activity (number of stops/person/day) for households reporting after multiple reminder letters and calls, data which would usually be lost in a typical study that only employs one or two reminders, were significantly lower than the travel activity reported by households during the first wave of reporting. Korimilli, et al. (1998) reported widely varied response rates to CATI surveys, ranging from 46% to 90%, with the highest response rates associated with one-day travel surveys with relatively short questionnaires. Activity diary studies conducted in Washington, D.C. and Portland Oregon tended to have much lower response rates, with "...a little over one-half of those recruited or about one-quarter of those contacted responding to the survey (Korimilli, et al., 1998).

Several studies (Zmud and Wolf, 2003; Wolf, Oliviera, and Thompson, 2003; Wolf, Loechl, Thompson, and Arce, 2003) were recently conducted in an effort to better understand the nature of misreported (mostly unreported) trips. These studies all supplemented standard computer aided telephone interview (CATI) retrieval with GPS technologies. In addition to completing a standard diary or memory jogger, the survey participant also received a GPS device that conveniently plugs into a vehicle power outlet (cigarette lighter). The device continuously

collects data over the one-day to multi-day diary period, until the respondent unplugs the device. While this device is able to discern many missed trips, a large number of trips are still missed prior to and at the end of the report period due to late equipment installation and premature removal. Nonetheless, these units have provided significant data on issues of underreporting. Wolf et al (2003b) analyzed CATI versus GPS data from the 2000-2001 California Travel Survey (specifically in San Diego, Sacramento, and Alameda counties). The results showed 20-34% underreporting of trips across the three counties – meaning that the survey participants reported only 66-80% of their actual trips.

This paper focuses on the recruitment methods and travel diary response rates for the two-day diary surveys conducted in Atlanta, Georgia during February/March 2004. As in other instrumented vehicle studies, researchers collected data that allow the comparison of reported diary travel with monitored vehicle travel. However, this paper focuses on a new type of comparison. Because the households had been recruited into the study eight months earlier, received permanent in-vehicle instrumentation, and were continuously transmitting vehicle activity data, the research team had their first opportunity to examine whether there were differences in household vehicle activity across those 77% of households that completed the diary data collection and the 23% of those that did not. Although the 23% did not supply diary data, researchers still received data from their instrumented vehicles for the previously assigned travel days. The travel behavior of these households was significantly different than those households that did respond to the survey and the findings may have some major implications for evolving household travel survey methods. As expected, households that made large numbers of trips during the diary period were less likely to participate in travel diary efforts due to the intense respondent burden. However, the researchers also noted that households that made few trips during the diary period were also less likely to participate, possibly because they did not feel that their lack of travel was important.

## 2. RESEARCH DESIGN

The Commute Atlanta research program spans three years and includes multiple data collection efforts. Year 1 is the baseline year and includes no treatments. Due to seasonal variations in travel, researchers determined that a one-year baseline was necessary to develop appropriate relationships between pricing treatments and changes in travel behavior in future years. The implementation of pricing programs will begin in year two (starting January 2005) and will continue into year three. This paper focuses only on the year one baseline data collection period. At the time of this report, households recruited into the project in the earliest phase have completed the one-year baseline data collection. The research program recruited and installed data collection equipment in participating households over a 6-month period; therefore, baseline data collection will continue for some households through January 2005.

There are six main components involved in the data collection effort:

- Recruitment – Recruitment includes the sample selection, advance mailings, the actual recruitment call, and explanation of the research program to potential participants.
- Household socio-demographic survey – Collection of standard household, person, and vehicle socio-demographic information via computer-assisted telephone interview (household address, household income, number of people in household, employment

status, education level, number of vehicles, and vehicle characteristics such as vehicle year, make, model, and type of vehicle.).

- Consent and installation – According to the protocols established for receipt of the study's Certificate of Confidentiality (from the National Institutes of Health), each household member of driving age signs consent to participate in the study prior to installation. Certified and insured installers travel to the participants home or work location and install the in-vehicle trip data collection equipment.
- In-vehicle data collection – After installation, automated collection of second-by-second trip information (e.g., date, time, location, speed, heading) commences and data are downloaded weekly via cellular connection within the in-vehicle equipment package.
- Annual two-day travel diary surveys – Each household member over the age of 5 is asked to maintain a standard two-day diary of their travel, recording the times and places visited and the activities undertaken. Travel diary data are retrieved through a computer-assisted telephone interview (CATI).
- Annual employer surveys – Researchers survey employers of the participants to assess the commute incentives offered by the employer (i.e. transit passes, carpooling, telecommuting, and parking). The household surveys include parallel questions for the participants. This research component is necessary to ensure that noted changes in travel behavior result from the incentives implemented and not because an employer unexpectedly begins charging for parking or providing subsidized transit passes.

## 2.1 Recruitment

Originally, the research plan called for two recruitment and installation phases – the pilot phase, and general recruitment. However, the general recruitment did not result in complete recruitment of households in several recruitment strata (primarily in low-income ranges), so the research team added a subsequent recruitment phase (Phase II). Figure 1 shows the timeline for all three phases, along with the timing of the individual research components. The pilot phase consisted of testing recruitment scripts and key study concepts on a small sample of participants. This same group also served as the pilot group for testing equipment installation and final field-testing of equipment. The pilot phase sought to determine: 1) participants understanding of the study based on the recruitment script; 2) factors that attract them to the study; 3) factors that positively and negatively affect their active participation; 4) willingness to have vehicles instrumented; and 5) logistics for setting installation appointments and completing installations. The pilot phase resulted in the addition of information regarding the project description; the transfer of responsibility for initial appointment scheduling to recruitment firm; and additional completion checks for household information, especially alternative telephone contact information. Researchers completed the pilot phase in June 2003. Phase I recruitment began in July 2003, and Phase II began in November 2003.

## 2.2 Sample Selection

The research team developed the sampling framework (household and vehicle recruitment) to specifically accommodate hypothesis testing within the pricing-based research goals described above. Prior to sample selection, the research team established income, household size, and

vehicle ownership groupings that reflect the major distribution of households in the Atlanta region.

As a starting point, researchers examined the cross-classification matrices from the previous 8,000-household study conducted in 2001, known as the Strategies for Metropolitan Atlanta Transportation and Air Quality (SMARTRAQ) study. The SMARTRAQ matrix will ultimately be used in comparative analyses, to examine the potential impacts of pricing implementation across the region. Income bins were established in 10k increments (\$0-\$100+), household size bins from 1-7+ persons/household, and auto ownership bins from 0-4+ vehicles/household. Researchers immediately eliminated zero-vehicle households, and high-income single-vehicle households, given that the study goals were to examine the effects of pricing on travel modification. Zero vehicle households did not provide opportunities for pricing, and high-income single vehicle households would likely require pricing above what would be acceptable before modification would take place. The matrix proved useful in developing sample subsets. Researchers established expected values for vehicles in each final stratum and estimated the recruitment call burden to complete some combined strata that represent a smaller percentage of total households.

For the purposes of this study, researchers wanted to account for auto availability in the household to monitor changes in commute patterns as well as the overall changes. Shared cars leave fewer transportation options and are important in the sample. However, cars in excess of the number of drivers were not likely to be important, since shifts across vehicles were not expected. Income is also a significant potential factor in travel change. Given the limited budget, aggregation was required in the higher income groups.

Numerous sampling strata were examined, iterating between developing a selection criteria and evaluating the number of households and vehicles (based upon vehicle/household data) that would end up being included in the study (plus a check to make sure recruitment call burdens would not be too great). Researchers finally settled upon the recruitment characteristics shown in Table 1.

### **2.3 Survey Methodology**

The recruitment firm used a standard phone list for the Atlanta region, randomly selected households to receive advance letters, and then subsequently called households to recruit participants. During each call, the recruitment firm first determined into which sampling strata the household fell. For this study, researchers targeted a minimum of 35-40 households per recruitment strata. In most cases, surveyors obtained household socio-demographic information during the recruitment call. This call also served to set the schedule for installation of the in-vehicle equipment. During Phase I, households were also scheduled for the 2003 Summer Travel Diary Survey that immediately followed recruitment. Phase II households were recruited and installed up to five months in advance of the 2004 Spring Travel Diary Survey. All Phase I

households were re-recruited for the 2004 Spring Travel Diary Survey. As shown in Figure 1, the length of time between recruitment and installation can span up to four months.<sup>1</sup>

Figure 2 shows the flow of the recruitment through all stages including installation. The following sections describe the major steps associated with the recruitment effort.

### *2.3.1 Verification Call*

Because of the large time gap between the recruitment interview and conduct of the travel diary phase of the study, the recruitment firm recommended that a verification call to each participating household be completed prior to the start of Phase II. This verification call served four key purposes. First, it increased the probability that respondents will follow all the instructions and complete the survey materials in a timely manner. Second, it provided an opportunity to further reinforce legitimacy and to answer any questions participants may have. Third, the verification call allowed for a data item completion or correction process. For example, changes in households status like income, household size, and household location may be verified and adjusted. Fourth, a measure of nonparticipating households was obtained. Studies which have a significant time delay built into the design frequently experience sample attrition. Surveyors assigned travel day pairs during the verification call.

### *2.3.2 Mailing of Survey Packet*

The diary pack that is sent to recruited households plays a critical role in the overall success (response rates) and quality of the survey. The recruitment firm uses this diary mailing to both encourage participation and improve the quality of the information reported. As a result, the diary mailing includes a variety of tools and resources that make the task of participation in the study clear and simple. Within one day of the verification call, a survey packet is mailed to each recruited household. For Phase I, which was followed by an immediate travel diary survey, packages included all materials. For Phase II, participants were recruited up to four months prior to the administration of the diary. Phase II participants received two separate packages – one at initial recruitment with the cover letter, brochure, and FAQ; and the second prior to the 2004 Spring Travel Diary immediately following the verification call. Phase I participants were also asked to complete a second survey along with the Phase II participants, and therefore they received two diary packages in total. All participants ultimately received:

- A cover letter, with a custom-worded “thank-you” to the respondent household,
- A tri-fold brochure (shown in Figures 3 and 4), providing information about the steps involved in the program and benefits of participation, and more information about the survey, including a toll-free “800” number,
- A FAQ (frequently asked questions) handout containing answers to respondents’ most frequently asked questions,

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<sup>1</sup> The authors are currently undertaking the statistical analyses necessary to develop project-related choice models, designed to assess the impact of participant burden and spacing between vehicle instrumentation and diary activities on participation and response rates.

- A consent form describing the program in detail and any risks associated with participation (required by Georgia Tech Institutional Review Board for all projects using human subjects),
- A sheet that reminds households of the assigned travel days AND the callback appointment time for diary collection,
- A sample “completed” diary excerpt that also provides tips on how to complete diaries most efficiently, and
- A paper travel diary for each member of the household.

One diary is completed for each household member. To personalize the diaries, the recruitment firm labeled each diary separate with the name of each household member. The labels on the diary also contain serialized codes that allow the diary to be linked to a participating household within the recruitment system.

### *2.3.3 Reminder Call*

The recruitment firm placed a reminder call to each household up to two days before the household’s assigned travel days. Reminder calls were made as close to the assigned travel day as possible. If the reminder call is made too far in advance of the travel day, the effect of the call is significantly reduced.

### *2.3.4 Retrieval of Travel Data*

The recruitment firm scheduled retrieval appointment calls for the day following the travel day pair to retrieve the diary information. During this call, surveyors collected trip information from each household member. Multiple call-backs were made to attempt to collect diary information from each household member directly. Travel diary information from one household member could be provided by another, then coded as “proxy” in the data set. A household was considered “completed” when demographic, travel, and activity data had been collected from all adult household members eligible to participate in the survey.

## **2.4 Vehicle Instrumentation**

The onboard vehicle instrumentation package was designed to Georgia Tech specifications and provides a robust data collection platform. The Linux-based 386 computer operates on 12V vehicle power (with an extremely low power draw when the vehicle is not in operation). The entire system is packaged in an aluminum extrusion case, approximately 8” by 6” by 2”. The device is installed under the vehicle seat or on the floorboard and connected to constant power, switched power, and ground.

The onboard GPS equipment monitors engine start date and time, second-by-second vehicle position (latitude and longitude), heading, and speed. More than 95% of position data fall within 3 meters of actual location, allowing accurate route matching to the Atlanta roadway network. A speed wire connection is also included to provide a more accurate data stream for speed and acceleration than is provided by the GPS system. The number of satellites and GPS signal quality indicators are also collected and used in route matching routines. For post-1996 model year vehicles, the equipment also provides up to ten engine and emissions-related parameters



from the onboard diagnostics system via a direct connection to the onboard diagnostics engine computer (OBD-II) port.

Trip data are currently transmitted during the off peak period, once or twice weekly, via a cellular connection. Each vehicle reports when polled via SMS (e-mail) messaging. Hence, the units can report at any desired frequency (limited only by e-mail message delay via the Internet). A tracking command also allows the researchers to trigger the box to report its location in real time, for use in tracking a stolen vehicle or to examine the congestion conditions on a specific roadway at a given time. All systems are remotely configurable via SMS, allowing the researchers to select alternative data streams for monitoring or change data capture frequency. The onboard software can also be upgraded remotely by transmitting new software to the device via the cellular connection.

Data are stored in a flat file structure for each vehicle trip to facilitate data analysis. Each trip is post-processed to calculate basic trip-level summary statistics. Longitudinal studies have the advantage of being able to link trip origin and destination position to trip purpose for more than half of the trips, using basic latitude and longitude coordinates and information collected during the standard two-day household diary study. Trips per day, trip length, trip distance, and engine soak time duration is readily determined by examining trip summary data. Trip length can be ascertained by integrating the vehicle speed trace. The basic data stream can also be used to examine vehicle speed and acceleration for any portion of a vehicle trip.

### **3. SURVEY DATA**

#### **3.1 Recruitment and Installation Rates**

After the initial round of sampling, researchers found the sample skewed to higher income households. Recruitment and retention in higher income households was much more successful than is normally the case in standard travel diary studies. This occurrence was thought to be related to the theft tracking capabilities of the device, as well as the general technology and congestion focus of the program objectives. Surveyors targeted the final round of recruitment toward obtaining additional lower income households with the final recruitment sample as shown in Table 1 (Pilot Phase households are included with Phase I). Unfortunately, the recruitment occurred in small bursts, and installations occurred over a much longer time-period. This lag made it difficult to determine the actual response rate by sample cell. Although households agreed to participate and provided household socio-demographic information, this did not guarantee their participation in the required instrumentation component. Table 2 gives the rates for recruited/opted out and recruited/installed/retrieved for both recruitment phases. Regardless of meeting the minimum recruitment criteria, low-income households did not participate at the same rate in the instrumentation component as higher income households. Low-income households had the highest opt-out rate at 63%. The time between contact and installation may have negatively affected the installation rates. Additionally, 10% of the household income levels were unknown until after the 2004 Spring Travel Diary Survey collection. At this point, the research team had completed equipment installations and it was too late to recruit households into the low response cells. The overall recruitment completion rate was 54.3%.

The level of low-income households that were fully installed, and for which diary data was obtained was lower than expected in Phase I of the study. This is due to a combination of the incidence of low-income households with one or more vehicles, lower completion rates during the vehicle installation phase, and lower completion rates among installed households during the trip retrieval stage. The sample design for Phase I of the Value Pricing Study required the recruitment of low income households in sufficient numbers to support a minimum of 30 fully installed low income households as part of the overall sample design and analysis requirements. Surveyors successfully recruited 55 low-income households into the study; however, only 20 of completed the installation component.

Identification of low-income households is challenging in any telephone-based survey because even with the latest Census information, household income levels are at aggregate geography levels. As part of the overall sample strategy, low-income Census tracts were over-sampled to increase the available pool of low-income households for participation in the study. However, this group historically has the lowest participation rates in even the most basic research programs. The level of participation effort required in this study and the absence of incentives made the full recruitment of low-income households challenging.

The incidence rate of this target demographic for the Atlanta region is 21.0 percent. This does not take into account the level of zero household vehicles within this group, which hovers around 8.0 percent. Overall then, the percentage of available households meeting the low income criteria is approximately 13 percent. The proportion (7.5%) of low-income households completing the study is low in comparison, even with extensive over-sampling and multiple (12 or more) contact attempts.

Both retrieval rates and installation rates are lower for the low-income household group. Going into the study, the recruitment firm knew that over-sampling and over recruitment would be necessary to achieve the required number of fully participating low-income households. However, the participant requirements in this pioneering study are unique and the full impact of the study design on participation rates for different demographic groups was relatively unknown at the onset.

Researchers are currently working on an in-depth analysis of the response and non-response rates for this instrumented vehicle project. This data set provides a unique opportunity to analyze the discrete choice of the household to participate in the instrumentation component. Overall, 494 households were recruited into the study with complete household socio-demographic data. Ultimately, only 268 households completed the instrumentation component. The forthcoming analyses will cover the following issues:

- Number of initial contacts vs. recruitment,
- Point of exit during initial contact (i.e., before or after project description or income question),
- Socio-demographics of households opting out of installation,
- Non-response as a function of burden, and
- Non-response as a function of time from recruitment to installation, and from installation to travel diary days.

### 3.2 Travel Diary Response Rates

The recruitment and completion figures for the 2004 Spring Travel Diary Survey are shown in Tables 3 and 4. Table 3 provides the overall recruitment and retrieval rates. There is a column entitled 'Not Recruited' showing 27 households as not recruited for the spring diary survey. Unfortunately, the recruitment firm did not include the original Pilot Phase participants in the sample. Therefore, only seven households were officially not recruited into the study. The reasons for this are unknown, but are most likely attributable to difficulties in contacting households – either because the household is screening calls or was out of town at the time of contact.

Table 4 shows the recruitment and retrieval rates by recruitment Phase. Some of the non-response is attributable to the added burden for households who had previously completed the summer travel diary, as shown in the differences between Phase I 65.7% and Phase II 80.3% completion rates.

### 3.3 Differences in Respondent vs. Non-respondent Travel Behavior

The recruitment firm assigned travel days for diary completion to all households recruited to participate in the 2004 Spring Travel Diary Survey. As described previously, 23% of the households recruited for the survey did not complete it. While preparing trip data from in-vehicle instrumentation and the diary survey for a comparison of reported versus actual trip making, researchers noticed patterns in household trip making for non-response households. Trips recorded by the in-vehicle instrumentation showed that many of these households had substantially higher numbers of daily trips as well as zero trips.

Researchers hypothesized that households that make a large number of trips will not complete the diary due to increased levels of burden. However, another hypothesis is that households that do not make trips (or make few trips) do not believe that it is important to report that they made no trips. To test these hypotheses, researchers pulled information on instrument-recorded and household-reported trips for responding households and instrument-recorded trips for non-responding households. To be included in the analysis, only trips reported by the responding households as having been made by one of the household members in one of the instrumented vehicles were selected from the diary data. The analysis included all trips recorded by the in-vehicle instrumentation for both responding and non-responding households on the assigned diary days. Figures 5-8 contain the distribution of trips per day for reporting and non-reporting households for both diary days. The bars represent the percentage of total trips per household per day. Visual inspection of these charts indicates trends of higher numbers of zero trips and higher numbers of large trips in the non-responding households.

Researchers performed Chi-square tests to examine whether the differences between the distributions were statistically significant. Aggregation of the trips per household per day created five groups for analysis: 0 trips/hh/day, 1-5 trips/hh/day, 6-10 trips/hh/day, 11-15 trips/hh/day, and 16+ trips/hh/day. For both day one and day two, the non-response distributions were tested against the reporting distributions. Table 5 shows the results of the analysis. The residuals show that the non-responding households made no trips 3.0% and 3.9% more often than responding households on days one and two, respectively. Similarly, non-responding

households had a greater incidence of trip reporting at the 11-15 trips/hh/day and 16+ trips/hh/day levels. The 16+ trips/hh/day level was the greatest difference between the groups at 7.2% for both days. The increased incidence of higher daily trips in the non-responding group more than compensates the increases in zero trips for these households, leading to a higher average household daily instrumented vehicle trip rate of 9+ trips/hh/day, compared to the 6+ instrumented vehicle trips/hh/day in the responding group.

#### 4. CONCLUSIONS

Travel behavior analysis and travel demand modeling depend upon the collection and analysis of representative household travel diary data. Demand modelers understand that nonresponse bias can significantly affect modeling results. Previous research reported in the literature has identified and quantified the potential effects associated with low participation rates of low-income households in travel diary studies. To help counter these effects, random stratified sampling techniques are employed. The researchers noted that low-income household participation was significantly lower for low-income households when travel diary studies are combined with vehicle instrumentation components. Households with incomes greater than \$100,000 also participated at much higher levels than all other income categories.

Previous research efforts have focused on differences noted between reported travel diary data and data collected in parallel from instrumented vehicles. Under reporting of trips is significant. However, this study determined that significant differences exist between trip making patterns of non-responding households and responding households, revealed through analysis of instrumented vehicle data. Non-responding households have higher incidences of zero-trip days and 16+ trip days. Overall, non-responding households make a higher average number of trips per day per household.

These findings are useful from the perspective of planning research. First and foremost, transportation planners need to recognize that non-response bias is present and significant in the household recruitment process. To the extent that interventions and incentives can be implemented to encourage reporting (either through reduction in diary burden or through economic incentives), the study results are likely to be more accurate. Secondly, it may make sense to prepare educational materials for participating households to clarify that even when no trips are made, such information is important from a planning perspective (to try to encourage such reporting). Given that under-reporting is likely to occur in diary studies, the use of instrumented vehicle data for collection of household travel diary data offers a significant advantage in that actual trips can be used in trip generation modeling, especially when initial instrumentation recruitment interviews can establish detail associated with routine trip destinations. The research team is currently assessing the under-reporting across the recruitment strata and by various demographic and socio-economic variables in an effort to identify additional interventions that might be implemented in the next wave of sample recruitment and the next annual diary data collection effort.

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TABLE 1: Sampling Plan and Recruitment Totals

Sampling Group	Annual Income	HH Size	# Vehicles	Population %	Target	Recruited Phase I	Recruited Phase II	Total Recruited
0	Any	Any	0	7.4	0	0	0	0
1	<30k	Any	1+	18.4	40	15	5	20
2	30-75k	1	1+	11.3	40	21	13	34
3	30-75k	2+	1	6.8	40	9	9	18
4	30-75k	2	2+	10.6	40	23	15	38
5	30-75k	3+	2+	13.9	40	19	15	34
6	75+	1	1+	2.8	0	5	0	5
7	75-100k	2+	1+	12.1	40	39	2	41
8	>100k	2+	1+	16.8	40	73	0	73
99	Uknown	Any	Any	n/a	0	3	2	5
				100	280	207	61	268

## Table 1 Notes:

- Annual income is the reported combined gross household income
- # Vehicles indicates the number of vehicles owned by members of the household, including leased and business-owned vehicles
- Population percent reflects the percentage of Metropolitan Atlanta households that fall into each strata
- Target reflects the targeted number of households to be met by the recruitment subcontractor
- Recruited indicates the actual number of households recruited by the subcontractor

TABLE 2: Overall Opt Out and Installation Rates for all Household Recruits

Sample Group	Total Recruited	Phase I		Phase II		Phase I and II Total	
		Recruited and Opted Out	Recruited and Installed	Recruited and Opted Out	Recruited and Installed	% Recruited and Opted Out	% Recruited and Installed
1	55	22	15	13	5	63.6%	36.4%
2	59	16	21	9	13	42.4%	57.6%
3	46	13	9	15	9	60.9%	39.1%
4	62	18	23	6	15	38.7%	61.3%
5	71	17	19	20	15	52.1%	47.9%
6	12	7	5	0	0	58.3%	41.7%
7	63	22	39	0	2	34.9%	65.1%
8	102	29	73	0	0	28.4%	71.6%
99	24	14	3	5	2	79.2%	20.8%
	494	158	207	68	61	45.7%	54.3%



TABLE 3: Spring 2004 Travel Diary Survey Recruitment and Retrieval Rates

<b>Sample Group</b>	<b>Total Sample</b>	<b>Not Recruited</b>	<b>% Not Recruited</b>	<b>Recruited Retrieved</b>	<b>% Recruited Retrieved</b>	<b>Recruited Not Retrieved</b>	<b>% Recruited Not Retrieved</b>
1	20	5	25.0%	12	60.0%	3	15.0%
2	34	3	8.8%	27	79.4%	4	11.8%
3	18	3	16.7%	14	77.8%	1	5.6%
4	38	1	2.6%	31	81.6%	6	15.8%
5	34	2	5.9%	25	73.5%	7	20.6%
6	5	1	20.0%	2	40.0%	2	40.0%
7	41	2	4.9%	29	70.7%	10	24.4%
8	73	8	11.0%	45	61.6%	20	27.4%
99	5	2	40.0%	0	0.0%	3	60.0%
	268	27	10.1%	185	69.0%	56	20.9%

TABLE 4: Spring 2004 Travel Diary Survey Recruitment and Retrieval Rates  
(Phase I and Phase II Separated)

Phase I							
GTSample	Recruited Phase I	Not Recruited	% Not Recruited	Recruited Retrieved	% Recruited Retrieved	Recruited Not Retrieved	% Recruited Not Retrieved
1	15	4	26.7%	10	66.7%	1	6.7%
2	21	2	9.5%	15	71.4%	4	19.0%
3	9	2	22.2%	6	66.7%	1	11.1%
4	23	1	4.3%	17	73.9%	5	21.7%
5	19	2	10.5%	13	68.4%	4	21.1%
6	5	1	20.0%	2	40.0%	2	40.0%
7	39	2	5.1%	28	71.8%	9	23.1%
8	73	8	11.0%	45	61.6%	20	27.4%
99	3	2	66.7%	0	0.0%	1	33.3%
Total	207	24	11.6%	136	65.7%	47	22.7%
Phase II							
Sample Group	Recruited Phase II	Not Recruited	% Not Recruited	Recruited and Retrieved	% Recruited and Retrieved	Recruited Not Retrieved	% Recruited Not Retrieved
1	5	1	20.0%	2	40.0%	2	40.0%
2	13	1	7.7%	12	92.3%	0	0.0%
3	9	1	11.1%	8	88.9%	0	0.0%
4	15	0	0.0%	14	93.3%	1	6.7%
5	15	0	0.0%	12	80.0%	3	20.0%
6	0	0	0.0%	0	0.0%	0	0.0%
7	2	0	0.0%	1	50.0%	1	50.0%
8	0	0	0.0%	0	0.0%	0	0.0%
99	2	0	0.0%	0	0.0%	2	100.0%
Total	61	3	4.9%	49	80.3%	9	14.8%

TABLE 5: Chi-square Results for Non-responding vs. Responding Trip Distribution

<b>Assigned Travel Diary Day 1</b>			
<b>Trip Rate Group</b>	<b>Observed N</b>	<b>Expected N</b>	<b>Residual</b>
0 trips/hh/day	6	3	3
1-5 trips/hh/day	9	20.3	-11.3
6-10 trips/hh/day	21	23.6	-2.6
11-15 trips/hh/day	11	7.3	3.7
16+ trips/hh/day	9	1.8	7.2
Total	56		
Chi-Square(a)			39.818
df			4
Asymp. Sig.			0.000

<b>Assigned Travel Diary Day 2</b>			
<b>Trip Rate Group</b>	<b>Observed N</b>	<b>Expected N</b>	<b>Residual</b>
0 trips/hh/day	9	2.1	3.9
1-5 trips/hh/day	7	23.6	-16.6
6-10 trips/hh/day	24	21.8	2.2
11-15 trips/hh/day	10	6.7	3.3
16+ trips/hh/day	9	1.8	7.2
Total	56		
Chi-Square(a)			49.108
df			4
Asymp. Sig.			0.000

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FIGURE 1: Phasing and Implementation Schedule

Phase	Component	May-03	Jun-03	Jul-03	Aug-03	Sep-03	Oct-03	Nov-03	Dec-03	Jan-04	Feb-04	Mar-04
Pilot	Recruitment	■										
	Installation	■	■									
	Summer Diary		■									
	Spring Diary											■
Phase I	Recruitment			■								
	Installation			■	■	■	■	■	■			
	Summer Diary				■	■						
	Spring Diary											■
Phase 2	Recruitment							■				
	Installation							■	■	■		
	Spring Diary											■



FIGURE 3: Participant Package Brochure (Page 1)

## ***Why should you participate?***

There are 2 reasons why you should participate in this study:

- Theft Recovery\*:** If your vehicle were to be stolen, the on-board equipment may be able to provide your vehicle's position. This information could help the police in locating your vehicle.
- Help Planners Gain Knowledge:** To provide transportation planners the opportunity to learn about regional travel patterns, congestion levels throughout Atlanta, and driving behavior of Atlanta drivers.

***YOUR PRIVACY...***

The information that we collect will remain confidential. To assist us in protecting your privacy, we have obtained a Certificate of Confidentiality from the National Institutes of Health. This Certificate ensures that researchers cannot disclose information that would identify you.

**COMMUTEAtlanta**



**Saving Lives and Saving Time**

**COMMUTEAtlanta**

Sponsored by:

**Georgia Department of Transportation**



For more information about the COMMUTE Atlanta research program, please call our hotline at:

404-385-2376

*\* Due to the nature of the research program, we cannot guarantee the recovery of a stolen vehicle.*

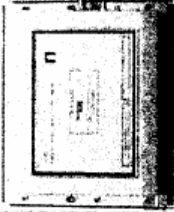


FIGURE 4: Participant Package Tri-fold Brochure (Page 2)

# What does your participation involve?

Your household was recently selected to participate in the **COMMUTE Atlanta** program research program. There are five parts to participation:

- 1 CONSENT**  
Your participation in this study is voluntary. To ensure that you have sufficient information on the details of the project, you will be asked to read and sign a consent form. Minors will be required to sign an assent form and have their parent/guardian sign a parental permission form.
- 2 INSTALLATION**  
We have contracted with professional installers to equip your vehicle with a data collection device. The device will be located under the seat of your vehicle with all cabling hidden from view. Installations can be done at all local Hi-Fi Buys locations or on-site at your home/work.
- 3 DRIVE**  
Once the unit is installed in your vehicle, you will continue to drive as you normally would. The device turns on and off automatically with your vehicle ignition. You will not be required to input anything into the device. The recorded data will be downloaded over a cellular connection every week. Starting your vehicle once a week is recommended to ensure battery charge.
- 4 REPORT**  
If you will be trading, selling, or retiring your car from service please give us a call at the hotline to let us know. We will gladly uninstall the data collection device and reinstall it in your new car. Please also call if you should happen to be the victim of a theft, or involved in a crash.
- 5 FOLLOW-UP**  
We will contact you approximately every six months during the study period. The follow-up survey will be used to find out if there were any major changes in your travel habits and to update you on the status of the project.



## COMMUTE Atlanta: What is it?

Do you recall hearing that 60% of households in the US were tuned into the Super Bowl game this year? Did you ever wonder how they know what you watch on television? The answer – 5,000 households nationwide volunteer to have their television viewing monitored by Nielsen Media Research with a People Meter recording device. The People Meter collects information on what is being watched, for how long, and who is doing the watching. These results are then used to determine nationwide statistics.

While Nielsen collects information on television viewing habits, Georgia Tech, the Georgia Department of Transportation, and the Federal Highway Administration are collecting information on Atlanta's driving habits. In the "COMMUTE Atlanta" research study, Georgia Tech researchers will monitor the travel behavior of 500 Atlanta drivers



with a recording device called the GT Trip Logger. Researchers are interested in where and when travel occurs, and how long it takes. Data collected by COMMUTE Atlanta will help planners and researchers understand vehicle use in the Atlanta region, which is essential to if we are to make our transportation system more efficient.



FIGURE 5: Spring Travel Diary Retrieved Household Reported Trips Day 1

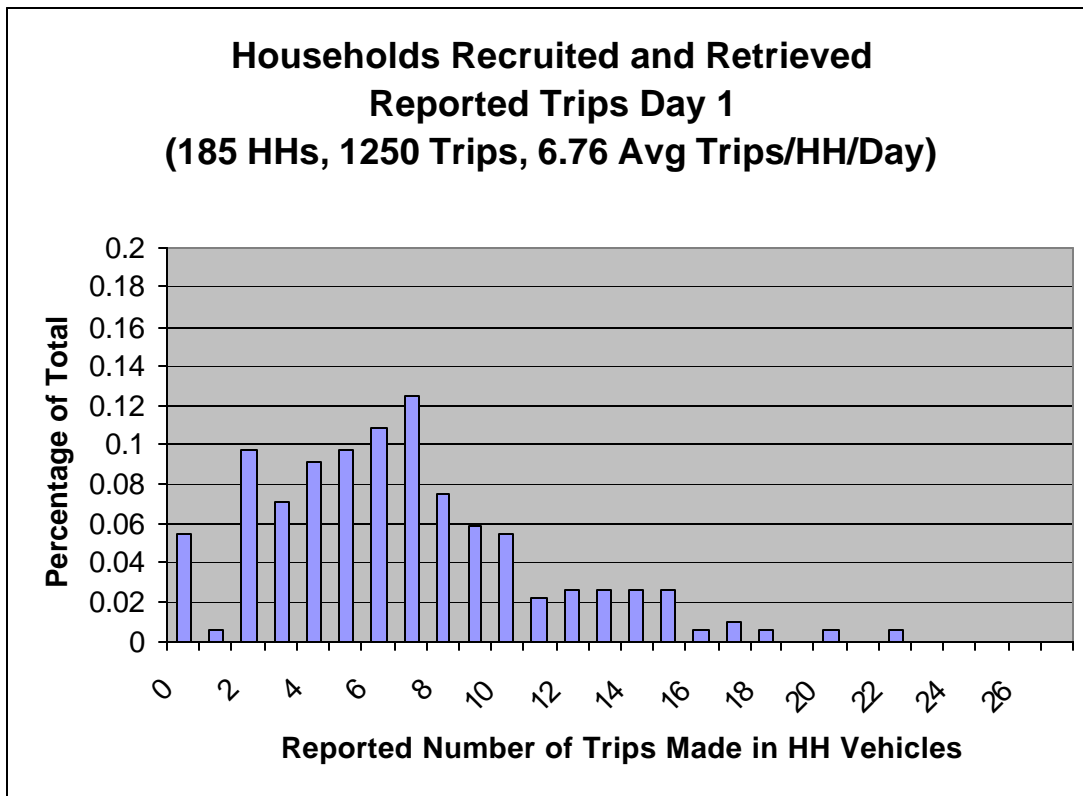


FIGURE 6: Spring Travel Diary Retrieved Household Reported Trips Day 2

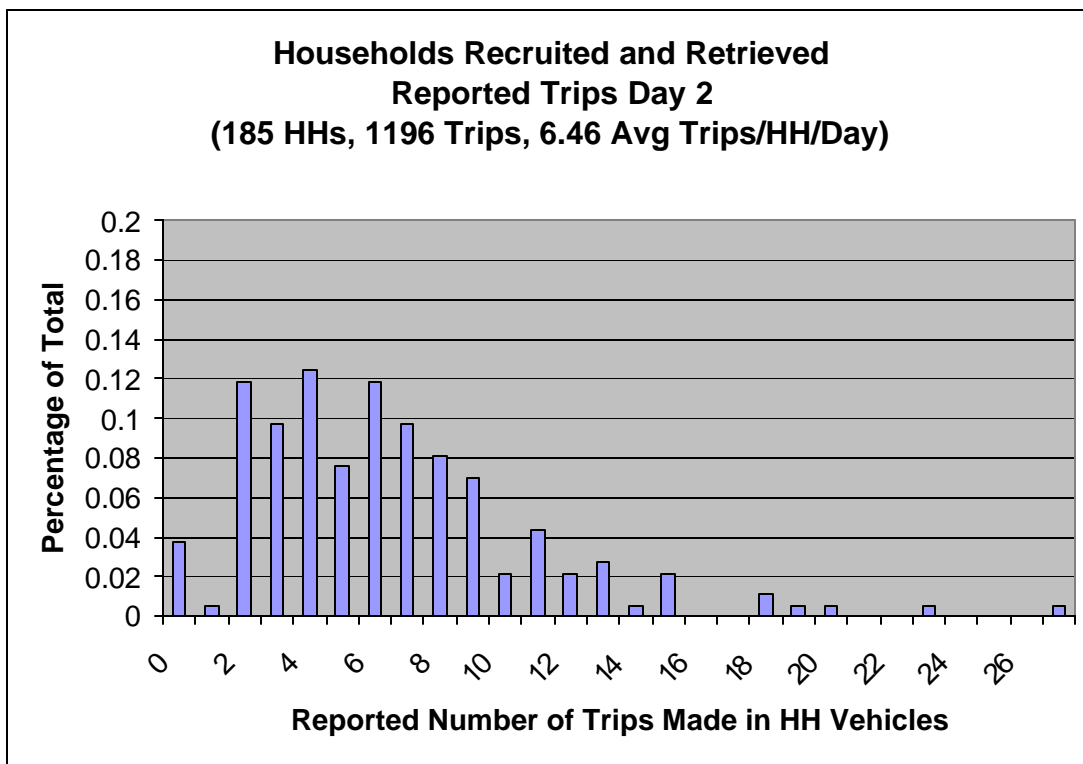


FIGURE 7: Actual Household Vehicle Trips Day 1 for Non-Reporting Households

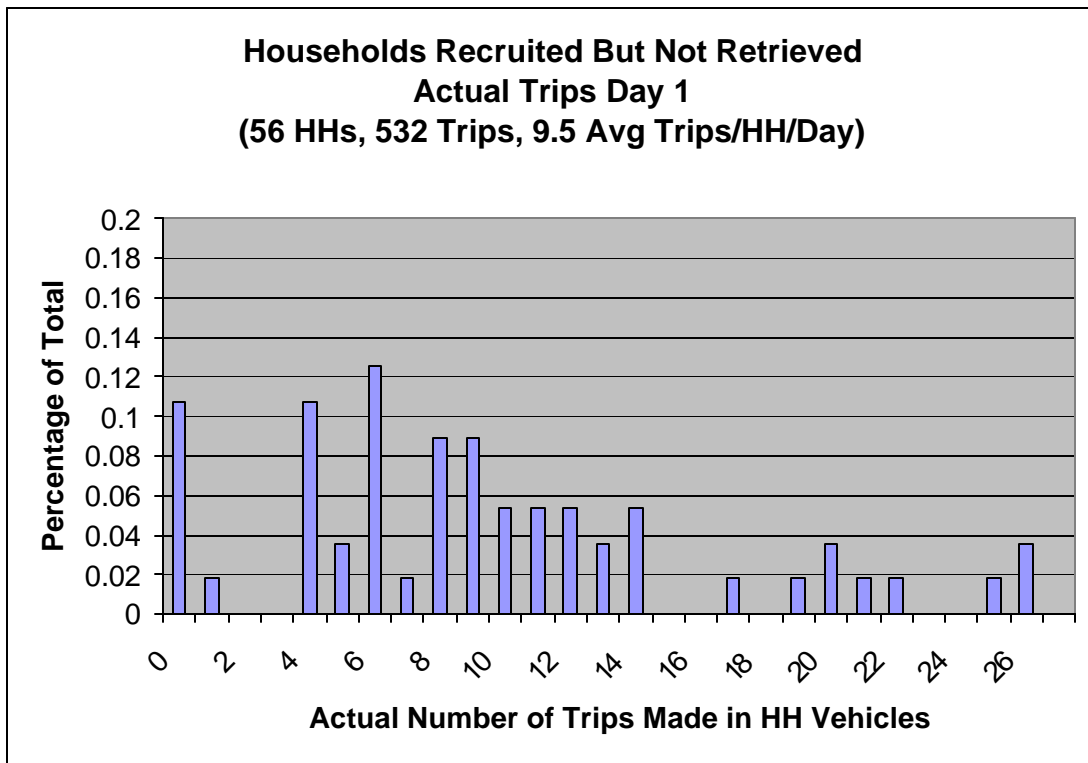


FIGURE 8: Actual Household Vehicle Trips Day 2 for Non-Reporting Households

