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Continuous Improvement in Regional Household Travel Surveys
The NYMTC Experience

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2 **ABSTRACT**

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4   A reality in travel surveys is the funding constraints that limit the capability of local and state agencies to
5   fund quality data collection efforts. At the same time, public agencies that oversee transportation
6   programs are required to support planning and policy-making with empirical data. As a result,
7   transportation data users and suppliers are consistently pressed to collect necessary data "better, faster,
8   and cheaper." Because of this, <u>continuous improvement</u> in travel survey data methods, procedures, and
9   tools is an imperative not a luxury. This paper presents the implementation and results of a continuous
10 improvement process directed by the New York Metropolitan Transportation Council (NYMTC)
11 regarding its regional household travel survey. It reports on how lessons learned from its 1997-98
12 household travel survey along with feedback from respondents were used to plan and design the 2010
13 household travel survey. The paper identifies new methods and tools that were implemented in a 2010
14 survey pretest and provides conclusions as to the recommended survey design.

15

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INTRODUCTION

Travel Demand Forecasting Models are used by planning agencies across the United States (U.S.) to model current transportation system usage and future system demand. The model results are used for many purposes, including justification for roadway and/or transit system expansions. Standard data inputs for these models are obtained from household travel surveys that collect three categories of data: information about the household, personal information about household members, and travel activity information for household members for a specific assigned period of days. Dependent variables of great interest in household travel surveys relate to the respondent's reported trip making behavior, including the number of trips made by each respondent and the associated information about each trip.

The biggest problem faced in conducting high-quality travel surveys today is nonparticipation. Although most travel surveys start with a random sample of households or individuals selected for participation, many of the selected individuals simply do not respond. Such nonparticipation negatively affects the quality of data collected. While standardized procedures are used for these surveys to ensure quality and reliability of the surveys and also to improve the comparability between surveys, much research in recent years has focused on enhancing participation in travel surveys through improved methods, procedures, and tools. As stated a decade ago in the TRB millennium paper on travel surveys, "the conflict between the need for increasingly detailed and frequent data on daily travel patterns and the growing difficulty in contacting and interviewing persons about their travel will require continued improvements in travel survey methods." [1]

While agreeing with the aforementioned statement, we feel not only that continued improvements in travel survey methods are needed but also that *continuous improvement in travel survey methods is mandatory*. The concept of Continuous Improvement Process derives from the Deming Theory of Management.[2] Continuous Improvement (CI) is a never ending effort to discover and eliminate the main causes of problems. It accomplishes this by using small-steps improvements, rather than implementing one huge improvement. CI is a management approach by which processes are constantly evaluated and improved in the light of their efficiency, effectiveness and flexibility. These three characteristics are highly relevant to the current environment in which travel survey must be implemented.

The fact that CI can be called a management process does not mean that it needs to be executed by 'management' merely that it makes decisions about the implementation of the process and the design of the process itself. In fact, because travel surveys must be designed and implemented in a partnership between data users (e.g., metropolitan planning organizations or state departments of transportation) and data providers (e.g., consulting survey research and / or modeling firms), the application of continuous improvement principles will be most effectiveness in such a partnership environment. In the case reported upon in this paper, the partnership consisted of the New York Metropolitan Transportation Council (NYMTC), New Jersey Transportation Planning Authority (NJTPA) and its consultants (NuStats and Parsons Brinckerhoff), as well as the members in its Steering Committee and Technical Advisory Committee. These partners worked together on the 2010 regional travel survey and its predecessor the 1997-98 survey.

The Steering Committee is composed of 30 members, including representatives from member agencies of both NYMTC and NJTPA. The five-member Technical Advisory Committee includes one professor (Arnim Meyburg, Cornell University), two MPO survey experts (Guy Rousseau, Atlanta Regional Council and Neil Kilgren, Puget Sound Regional Council), one FHWA survey expert (Elaine Murakami), and one independent consultant specialized on travel behavior analysis (Nancy Mcguckin).

RESEARCH CONTEXT AND OBJECTIVE

This paper presents the methods and results of a continuous improvement (CI) process pilot test for a Regional Household Travel Survey (RHTS) in the greater New York, New Jersey, Connecticut (NY-NJ-CT) metropolitan area. It applies the CI principles of self-reflection, respondent feedback, and evolution to the design and execution of a 2010 Regional Travel Survey, sponsored by NYMTC and the NJTPA. This survey will update the 1997-1998 Regional Transportation Household Interview Survey (RT-HIS),

1   with the same two MPO sponsors. The stated purpose of the 1997-98 data collection effort and its 2010
2   update was to provide primary data for the development of travel forecasting models in the NY-NJ-CT
3   metropolitan area. The 1997-98 RT-HIS used a household travel survey methodology that relied on the
4   willingness of local residents to complete a travel diary over a 24-hour period.
5   When planning for the 2010 update, NYMTC wanted to apply lessons learned from the 1997-98
6   surveying efforts, from best practices of other similar surveys, from qualitative interviews with
7   respondents (i.e., customers), and from a rigorous field test to improve the 2010 surveying strategies.
8   This research identifies the recommended improvements to the traditional household travel survey
9   methods, procedures, and tools and discusses how these "worked" in a large-scale survey pretest. This
10   survey pretest was carried out in the Spring 2010. Based on the results of the pretest, the methods,
11   procedures, and tools were refined for the implementation of the main survey starting in Fall 2010.
12
13   **CI PROCESS: SELF-EVALUATION**
14   The process started when NYMTC's 1997-98 RT-HIS completed in May 1998, which provided a rich
15   experience on how to conduct a large scale household travel survey in a complex region, such as the NY-
16   NJ-CT metropolitan area. A list of issues encountered during in the survey was identified in the survey
17   final reports published in January 2000. Figure 1 shows the timeline of major model and survey activities
18   that NYMTC has conducted after the 1997-98 survey was completed.
19
20   **Figure 1 Timeline of NYMTC's Major Model & Survey Activities**
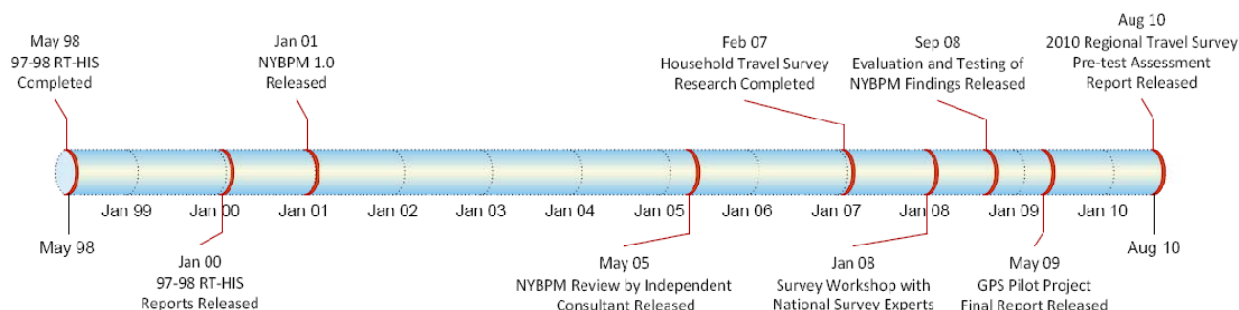
21
22
23   As part of the preparation of the new RHTS, NYMTC contracted with the University of Albany, with
24   Catherine Lawson as principal investigator, to conduct a household travel survey research in 2006.[3] This
25   research was comprised of (1) a review of the various documents produced by the firms involved in the
26   1997-98 surveying effort to identify problems through the surveying process, (2) a summary of key
27   research presented in the 2006 International Transport Survey Research Conference held in Costa Rica
28   and other research that examined or recommended alternative approaches or strategies dealing with
29   identified issues, and (3) a summary of the major findings in the surveying process effort and
30   recommended strategies to address these findings.
31   As a collaborated effort to the survey research project, NYMTC conducted a one day survey
32   workshop with planners in the NY-NJ-CT metropolitan area to discuss the best practices and the needs of
33   travel surveys on January 10, 2008. Working with University Transportation Research Center Region 2
34   (UTRC2), NYMTC invited several national survey experts from MPOs (included Puget Sound Regional
35   Council, Atlanta Regional Commission, Portland Metro, and Metropolitan Washington Council of
36   Governments), FHWA, and universities to participate in the workshop. The major themes that this self-
37   evaluation revealed are discussed below.

38   **Need for Custody/Control Management System**
39   A common problem evidenced in the 1997-98 documentation was the high turnover of personnel both
40   inside NYMTC and with the various consulting firms. Staff changes are to be expected in any agency or

1 firm; however, when a long-term project such as the household travel survey and subsequent model
2 building, testing, and implementation is underway, such changes can be challenging. Since no policy or
3 program can guarantee permanency in personnel, a custody/control management system can act as an
4 oversight tool for the length of the data program.
5 　　　Based on this lesson learned, the Request for Proposal (RFP) for the 2010 survey included the
6 requirement for the "maintenance of record of decisions and the archiving of various versions of all
7 technical documents and materials." In actual implementation, the consulting team comprised of NuStats
8 (prime contractor) with subcontractors GeoStats and Parsons Brinckerhoff established a system that relied
9 on the advent of cloud computing. The team (consultants and clients) use an online management and
10 collaboration tool called Basecamp to share documents, discuss issues, track versions, maintain a record
11 of decisions, etc. (See Figure 2)
12
13 **FIGURE 2 Screen Shot of NYMTC Survey Management Site**

14
15
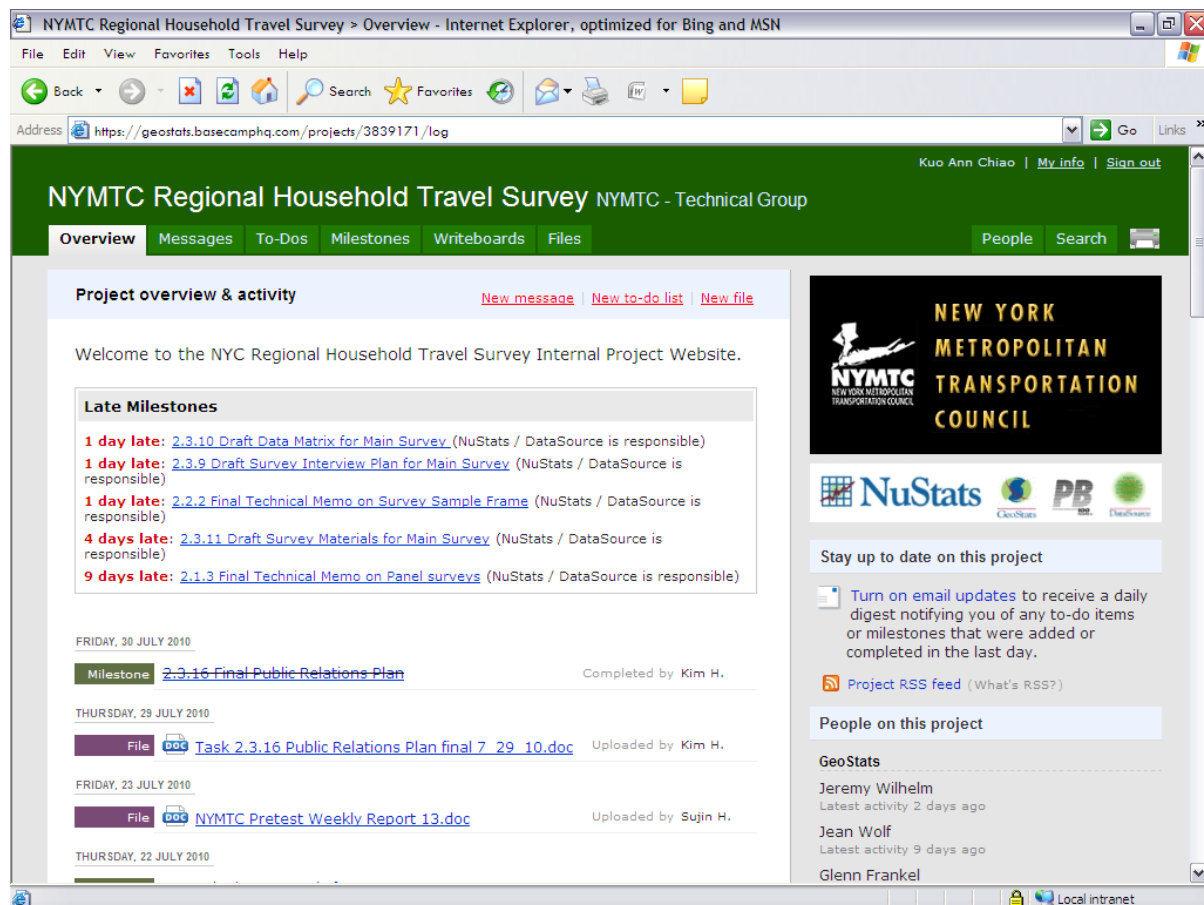
16 **Rethinking the Methodologies for Capturing Travel Data**
17 A review of the documentation from the 1997-98 survey revealed issues with the transit data / mode
18 share. In most American cities; even those with advanced transit systems, transit usage is relatively
19 minimal. However, in the New York region, transit plays a large role in household trip-making activities.
20 According to the recently published *Commuting in America III*, the national mode share for transit to
21 work in the New York metropolitan area has risen over the decade of 1990 to 2000, from 37% to 38%.[5]
22 This level of ridership means travel surveying efforts need to be successful in understanding the
23 transportation services provided by all types of transit in the New York region.

The 1997-98 surveying efforts also revealed quality issues with the sequencing of the transit trips. It was found that the population demographic groups most likely to misreport transit trips had one or more of the following characteristics: being male; being between 36 to 55 years old; having a full-time job; having a driver's license; working in the financial industry; or being Asian. Since there are limited strategies available to more accurately capture transit trips using a traditional household travel survey process, it was recommended that new technologies be considered.

In 2007, NYMTC sponsored a "proof-of-concept" study with UTRC2 to determine whether incorporating Global Positioning System (GPS) technology into the upcoming NYMTC Household Travel Survey would provide an alternate strategy for collecting person-based travel behavior data. There were four objectives for the study: [4]

1. To determine the technical feasibility of using GPS technology to collect "passive" travel behavior data.

2. To determine the feasibility of collecting data for "mixed mode" travel in New York City.

3. To determine the feasibility of collecting data for "misreported" trips from the 1997-98 RT-HIS, particularly those trips that included transit segments.

4. To determine the feasibility of incorporating GPS data in future household travel survey efforts with a sample population based on the ease of use and acceptability of the technology by specific users.

The GPS Pilot Study was able to determine the technical feasibility of using GPS technologies to collect passive data on travel behavior. The GPS unit produced sufficient data for a variety of modes, including walking, transit, rail, and auto; subway use is captured at the entrance and exit of the system. The ability to produce high-quality data could mitigate the issue of misreported transit trips revealed in the 1997-98 RT-HIS efforts.

The GPS Pilot Study demonstrated the feasibility of using GPS in the NYTMC region with relative ease and no extraordinary costs (other than the initial cost of the equipment). The data generated from a GPS deployment provides additional value as it includes more detailed information than with any other methodology. Therefore, GPS could be a complementary data collection method and could eventually be an alternate and substitute method for travel data collection.

Based on its GPS Pilot Study, NYMTC's RFP for the 2010 survey had a requirement for the use of GPS as well as web-based data retrieval technologies for data collection and trip underreporting analyses. The resulting 2010 survey design not only uses GPS equipment as the primary travel data capture mode for 10 percent of sampled households but also uses a new web-and map-based tool (i.e., TripBuilder) to capture travel data from the remaining 90 percent of sampled households.

For the GPS component of the pretest, wearable (on-person) GPS units were used. Sample records were pre-flagged for GPS. These pre-flagged households could opt out of GPS and continue in the survey using traditional diary methods. Advance letters for this sample mentioned the GPS requirement and offered an incentive to participate and return the units. Recruitment methods for these households were the same as for non-GPS flagged sample, namely computer-assisted telephone interview (CATI) and computer-assisted self-interviewing (CASI) via a web interface.

One household member needed to be between the ages of 16 – 75 to qualify for the GPS, and within such households, members younger than 16 and older than 75 were provided diaries to record their travel. After the travel day, data from the units were processed and then displayed in web-and map-based tool (i.e., TripBuilder) in order to conduct a prompted-recall interview with GPS respondents to gather other necessary information about their travel (e.g., purpose, traveling companions, etc.).

The collection of such travel information is a core data requirement in travel surveys and it is also quite burdensome to collect. It involves collecting geographic information to describe the location of the respondent and / or the locations of all trips made by all respondents. As the review of the documentation from the 1997-98 survey indicated the capture of detailed and accurate transit trip data can be even more challenging than trips via other transportation modes.

As illustrated in Figure 3, TripBuilder is an interviewing tool developed by GeoStats for the capture

1   of travel information that can be used in an interviewer-mediated (CATI) or a respondent self-completed
2   (CASI) environment. In TripBuilder the travel data is presented in a place-based fashion, with each place
3   being associated with a trip that leads to it (with the exception of the first place). Places represent all
4   locations a person visited as part of his/her travel date along with the times when these visits took place.
5   This includes places where a change of travel mode happened, like a transit stop or a park'n ride location.
6   The user interface incorporated continuous validation of provided inputs along with help messages
7   to help guide the user in the data collection process. Icons within the places list were used to tell the user
8   if a place passed all validation tests. The application also incorporated support for Undo/Redo, which
9   allowed users to quickly recover from incorrect inputs.
10
11 **FIGURE 3 TripBuilder Travel Reporting Page**

12
13

14 **Coverage of People and Modes**
15 The 1997-98 survey data was used to develop the NYBPM for the greater NY-NJ-CT metropolitan area.
16 Weaknesses in this data infrastructure included an under-representation of certain types of households in
17 the region as well as rare travel markets. The RFP for the 2010 survey contained the requirement for
18 multiple surveying options and targeted sampling strategies to ensure the representative sampling required
19 for the update of the NYBPM. The survey research literature indicates that survey participation rates are
20 increased by enabling respondents to respond in the survey mode of their choice (i.e., telephone, web,
21 mail). At the same time, it should be mentioned that there is more methods research needed on the effects
22 of survey mode on the data provided.
23   The pretest for the 2010 RTHS was truly a mixed mode survey – offering respondents many
24 different survey methods.   Sample records were pre-flagged as using either diary or GPS methods.
25 Recruitment of sample households was via CATI or CASI. Diary households could report their travel

1 (i.e., data retrieval) via mail-back of the completed diary, over the web (CASI), or through CATI. GPS
2 households participated in the prompted-recall interview through CATI or CASI.
3   The 1997-98 survey relied on the standard sampling practice at the time – a random digit dial
4 frame. Because it was known to under-represent specific populations, a concept referred to as Mode
5 Leadership was used to increase the efficiency of the statistical estimation of the choice models by
6 generating sufficient subsamples of important but somewhat rare travel markets and where real (non-
7 dominant) choices exist between travel modes.
8   To implement Mode Leadership, the study area was evaluated in terms of population density,
9 expressed in terms of very high, high, moderate, and low, and mode choice availability, expressed in
10 terms of available modes for each region. While quite detailed because of the limits to the precision of
11 available geodemographic data at the time, nature of the household in-and-out migration and other
12 lifestyle factors, and nonresponse patterns, the Mode Leadership concept did not deliver the robust sample
13 of rare travel markets that was expected.
14   The 2010 sample design, developed by Parsons Brinckerhoff made extensive use of the data
15 collected in the 1997-98 survey and lessons learned from the use of those survey data for model
16 development. Also the sampling frame was an address-based frame that could exploit the power of
17 geodemographic information. Whether for generating calibration targets derived from survey expansion,
18 or supporting model estimation with the unweighted cases of choices observed in the survey, the accuracy
19 of the data for model development benefits from increasing sample sizes in travel segments that
20 correspond to dimensions of the model.
21   The intentional over-sampling of such behaviors increases the value of the data for modeling,
22 especially when it avoids having a final data set with possibly no (zero) observations for important but
23 infrequent choices. There were two different classifications of sub-areas applied in the NYBPM for the
24 modeling of regional travel that have been used to identify sub-areas for over-sampling.
25   Over-sampling increases the productivity of the expected RHTS sample, by generating larger
26 numbers of observations of the selected travel measures than would result from just the county-level
27 based sampling. These two classification schemes are Area Type and Transit Accessibility Group. By
28 focusing on subareas of the region where they were observed to be the most common in the prior RT-HIS,
29 the RHTS sampling plan aims to over-sample three types of travel behavior:

30   1. Longer distance trips within the region (i.e., Very long - greater than 50 miles, Long - greater
31 than 20 miles),
32   2. Work trips to Manhattan and to counties other than where the worker resides,
33   3. Selected travel modes that are important to model accurately but with relatively small overall
34 shares, including: walk-to-premium bus, drive-to-premium bus, walk-to-ferry, drive-to-ferry, walk-to-
35 LRT, drive-to-LRT, and drive-to-Subway/PATH.

36   In addition to sampling to ensure representation of people and transportation modes, the 2010
37 survey design also accounted for the capture of special populations. The 1997-98 survey data indicated
38 that non-English speakers, particularly Spanish and Chinese speakers were not well represented. Thus,
39 the 2010 pretest design attempted to mitigate this by providing all materials and instruments in the four
40 languages that represented the majority of the study area residents (English, Spanish, Chinese, and
41 Russian).   In addition, simultaneous with the implementation of the pretest, qualitative one-on-one
42 interviews were conducted with these special population groups.

43 **CI PROCESS: RESPONDENT FEEDBACK**
44 The continuous improvement process relies on feedback from respondents – those "customers" of travel
45 survey materials and instruments. In the CI process implemented by NYMTC, this feedback was gathered
46 from two sources: (1) from 49 one-on-one interviews with traditionally hard-to-survey persons and (2)
47 from a rigorous field test of the 2010 design.

48

Qualitative Interviews with Hard-to-Survey Groups

These interviews lasted from 1 to 1.5 hours each with young urban adults, African Americans, Spanish, Russian, and Chinese speakers (non-English). The key findings of these interviews related to five key topics: survey participation, survey materials, reactions to the project public website (see Figure 4 for a screen shot from the web site), Tripbuilder usability, and their preferences for diary versus GPS methods are presented below.

Survey Participation

With exception of the U.S. Census very few participants had experience with survey research and none of the participants had ever participated in a diary type of study. A few participants had previously participated in a consumer-oriented Internet survey (e.g., customer service, opinions on product brands, product testing) and about three-fourths had experience with focus group interviews; they were all paid for their time (e.g., money or a product coupon).

The offer of an incentive (e.g., money, transit card) represented the most important factor when considering whether to participate in a survey. However, the topic of transportation was highly salient and deemed as very important and critical to all study participants. Having the opportunity to contribute to transportation improvements in the region, and in particular, public transit, was attractive to participants because it affected them on a daily basis (e.g., congestion, public transportation system, information about accidents or interrupted services, roadway construction). They would need to know how their input would be elicited and be used before making a final decision about whether or not to participate.

Advance notice about the survey through community-based communications (e.g., community groups, newspapers, Internet/survey Website, schools and employers) as well as personalized advance letters was important to increasing awareness about the survey among participants. The advance notice should emphasize the survey will lead to transportation improvements and that input from everyone is critical. Mentioning the types of improvements that could result or the improvements that resulted from the 1997-98 survey would attract attention.

Survey Materials

The purpose of advance letter was understood and the organization and content well-liked. While the letter looked official to participants, Russian and Chinese participants were weary of letters that "look governmental" because of their personal or "hearsay" experience with scams that used a formal-looking governmental letter. To overcome this, the envelope and salutation needed to be personalized; otherwise, Chinese and Russian participants said they would discard the letter.

The first reaction to the diary was that it was intimidating and overwhelming because of the amount of instructions and the number of pages. However, after they completed the first two pages of the diary and understood the flow, with the exception of Chinese and Russian participants, most said it was not as much work as they initially thought.

Russian and Chinese participants found the diary to be an unusual and complicated document. Some of the issues they raised were mostly associated with cultural issues:

▪ Among Russian participants, the start time of 3 a.m. was confusing because none of them started their day at that time and offended women because it "sounded suggestive to them," the translation was not very idiomatic and therefore confusing (the translated word for Place was especially problematic), and some translations caused confusing.

▪ Among Chinese participants, the level of personal information was perceived as excessive and considered taboo by older participants and did not feel comfortable with the translation. Furthermore, the concept of deciding what constituted a "Place" was difficult for some participants as was whether or not they should record how they arrived at or left a "Place."

Nearly all participants did not understand how providing the information in the diary could possibly lead to decisions regarding transportation improvements and some thought they may not

complete the diary for this reason.   Including an open-ended question to write in suggestions or explaining how the data would be used to make transportation improvement decisions would be helpful.

Diary versus GPS Preference
The majority of participants preferred the GPS device to the diary because it would be more convenient, more accurate, and easier to complete their assignment. The offer of an incentive to use the device was essential and a strong factor with their decision to use the device.
        Those that would not use the device, even if an incentive was offered, felt the device was bulky, was intrusive to their privacy (knowing it was not a real-time tracking device relieved some concern), or they would forget to turn it on or bring it with them when they left for the day.

Social Media
All study participants were cell phone users. The younger adults (18-34 years old) used the text function substantially more than the telephone function; older participants were less inclined to text at all. As a result, using text messages to communicate with them during the survey was supported more by younger participants than older ones. However, among young adults, receiving a text message every hour was perceived as excessive. Receiving a text message for recruitment (when combined with an advance letter or phone call) and occasional reminders during data collection (every two to three hours) was acceptable.
        With the exception of older Russian and Chinese participants, nearly all of the interviewees were Facebook users and familiar with other social media sites. They felt social media could play a role in conducting surveys and provided a number of examples such as create an application that could be downloaded to complete a survey; create awareness of and interest in a regional or statewide survey effort through Facebook. Only a few were wary of privacy issues associated with Facebook.

Project Public Website
In general, participants thought the Website was adequate for its purpose and had the look and feel of a government Website (see screen shot in Figure 4). This was perceived as being acceptable and not wasteful of public money with too many "bells and whistles". All participants favorably noted the availability of the Website in different languages but the layout on the Welcome page with the four welcome messages in each language received considerable feedback with many design improvements.
        Videos were included on the home page to provide a personal invite in multiple languages to participate in the survey. The videos were received well by study participants; however, many did not understand why there were two videos in each language with similar messages. Since they were positioned in mid-screen, many persons did not watch them without prompting.

Usability of TripBuilder
TripBuilder usability was tested with the 15 participants who were Internet users. The original plans called for an online tutorial for TripBuilder that would walk study respondents through its use and how it related to the diary. However, schedule challenges with various system components meant that this resource was not available when the pilot began as well as for the participants that participated in the testing described here.
        As instructed, participants completed the diary first then copied their information into TripBuilder. Using TripBuilder to report travel data proved to be challenging, because the user interface of TripBuilder did not match the layout of the diary. Many respondents got frustrated at the onset of their effort while inputting data for Place or Location. Once they entered their home address and completed at least two places, the effort became easier.
        Even though written help materials were available via the user interface, only one out of 15 participants read them. Two others pointed out the instructions (but did not open them); none of the remaining participants noticed the instructions at all. Only two persons were able to complete the TripBuilder test without any problems. One was the person who had read the instructions beforehand.

1   **FIGURE 4 NYMTC Regional Survey Public Web Site (Original Version before Pretest)**

Field Test of 2010 Design

In advance of the main survey scheduled to begin in fall 2010, a pretest for the 2010 RHTS was conducted between April and July of 2010. In the pretest the survey design was tested to check survey methods, materials and procedures under real world conditions. Based on the results of the pretest, changes can be made to the various components of the main survey. The pretest goals were to:

1. Ensure the survey programs were functioning correctly
2. Determine the average interview length and if it contributed to non-response
3. Assess the clarity of question wording and response categories
4. Test the mail/fulfillment process and determine adequate mailing windows
5. Run the appropriate edit/quality checks on the data
6. Evaluate the web-based recruitment survey
7. Evaluate the travel retrieval program (TripBuilder) to ensure we capture the trip detail needed to meet project objectives

The pretest utilized a two-phase (recruitment and retrieval), multi-modal survey design. This consisted of a recruitment interview, assigning a travel day for a household, mailing the diary packets (or GPS devices), and a retrieval interview or online survey. Respondents had the option to participate in both phases (recruitment and retrieval) by mail, phone and web. CASI/web retrieval was available in English and Spanish only during the pretest.

For the pretest, address-based sample was drawn proportionately from each of the 28 counties. Addresses were matched to landline telephone numbers where possible. This preliminary matching process yielded two types of sample: (1) sample that could be matched to a landline telephone number and (2) sample that could not be matched. The latter sample that cannot be matched to a landline telephone number represents non-telephone and cell-only households. Households in the latter condition were offered a monetary incentive of $50 to participate – paid upon verification that data from the household was complete and accurate. GPS households were also be offered a monetary incentive of $25 (payable upon completion verification and return of the GPS equipment) to encourage participation.

The pretest was conducted in English, Spanish, Russian and Chinese. Data collection for the recruitment interviews took place between April 19 and July 8, 2010. Retrieval took place from May 4 to July 22. For matched sample, the mailing contained only the advance letter on project-specific letterhead. Unmatched sample households received the letter and a Return Mail (postage paid) Contact Card encouraging participation by phone, web or mail. Both letters were signed by the Executive Directors of the respective agency sponsors. GPS flagged households also received an advance letter, which was slightly different for matched and unmatched households. One notable difference is unmatched GPS households qualified for $75.

With a CASRO recruit rate of 10%, there were 1,187 households recruited; of which, 173 were flagged as GPS. Recruitment completes were conducted by Computer Assisted Telephone Interviewing (CATI) (92%) and Computer Assisted Self Interviewing (CASI, i.e., web) (8%). A total of 1,389 persons provided trip details. The retrieval rate for the pretest was 62%.

CI PROCESS: EVOLUTION

Retrieval rates for the pretest were lower than expected. To improve retrieval rates it is recommended a wide-scale usage of alternative reminder methods such as email and/or text messaging. Also, it is recommended to alter incentive structure and use reminder postcards to emphasize. Offer incentive for subgroups that are under-represented relative to census parameters. It is also recommended to implement more sample management techniques to continuously "rest and recycle" all soft refusal and noncontact sample.

Long interviews can lead to respondent burden, refusals and partial completes. A review of the data item is underway in order to eliminate unnecessary data items to decrease the survey length especially during recruitment. Reducing the recruitment interview length will more successfully gain and keep respondents' interests in participating in this first stage of the survey. A shorter recruitment

1   interview should simultaneously help to avoid the "burnout" effect that often leads to loss of commitment
2   of households by the retrieval stage (thus leading to poor retrieval or completion rates and/or inflated
3   zero-trip households).
4   There was a low recruitment and retrieval for the Spanish and Chinese speakers. Table 1 shows
5   lower retrieval rates compared to the distribution of these populations in the study area. Additional efforts
6   would have to be performed in the main survey to reach these populations, especial for Spanish and
7   Chinese speakers.
8
9   **Table 1 Language Spoken at Home of GPS versus Diary Retrieved Households (N=714)**

Language Spoken at Home	GPS		Diary		Total		ACS 2006-2008*	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
English	107	93.0%	554	92.5%	661	92.6%	13180604	64.9%
Spanish	1	.9%	17	2.8%	18	2.5%	3580192	17.6%
Chinese	0	.0%	0	.0%	0	.0%	530013	2.6%
Russian	2	1.7%	6	1.0%	8	1.1%	261915	1.3%
Other	5	4.3%	18	3.0%	23	3.2%	2771729	13.6%
Refused	0	.0%	4	.7%	4	.6%	-	-
Total	115	100.0%	599	100.0%	714	100.0%	20324453	100.0%

10   *ACS data for Language spoken at home is only available at Person level (AGE OVER 5).*
11   *** GPS was completed prior to Chinese/Russian sample loaded and dialed for recruit.*
12   *** Russian language data is not available for Hunterdon, Sussex, Putnam, and Warren Counties due to*
13   *small sample size in ACS data.*
14

15   It is recommended to oversample Spanish speakers, conduct targeted public outreach through
16   community leaders and media outlets, simplify the wording in the advance letters and materials, and
17   convey the importance and ability of the respondents to get involved in the survey. Given the large size of
18   the Spanish speaking population additional efforts include special interviewing team for Spanish speakers
19   as well as a targeted Non-Response Follow-Up survey.
20   For the Chinese and Russian speakers additional efforts include advance letter in language based
21   on surname. Reach out to specific communities and local ethnic newspaper media in advance of mailing
22   could address some of the trust issues within special population groups.
23   It was noted that the survey logo does not convey the geographic region of the study. It has been
24   localized to the study area by adding NY/NJ/CT after the pretest. The increase use of the logo creates
25   brand recognition. Use color text on white envelope will make it more attractive to respondents.
26   As expected, the age distribution of the pretest results was skewed to older persons as shown in
27   Table 2. In an effort to control this situation it is recommended to implement an age screener protocol
28   where only every 3rd person over age 65 will be recruited. Also, this age group will be monitored to keep
29   its proportion on the overall population.
30   TripBuilder, the web based retrieval application develop for the survey, has been modified to
31   align better with the diary design to avoid confusing. The map functionality and location are improved to
32   be enticing to users. Roll over instructions will be added where possible to aid users in understanding the
33   different parts of the applications. Error messages will be improved to make clarify the issue(s) in
34   question and how to resolve it/them.
35   For the GPS component, respondents need to be prepared for the prompted recall interview; it
36   was not made apparent to them that they had to remember trip details since they wore the device. It is
37   necessary to improve GPS recruitment and deployment communications to make respondents aware of
38   prompted recall so they will be prepared. Other recommended improvements include: a simple travel log
39   for GPS households to use as memory aid during retrieval would reduce burden on respondents and ease

the retrieval of the information; leverage full use of text, email and phone reminders for web retrieval and make them more personalized.

As a result of these findings, the project team has been working accordingly to improve the survey instruments, websites, and procedures for the main survey which is scheduled to start in fall 2010.

Table 2 Age of Persons of GPS versus Diary Retrieved Households (N=1389)

Age	GPS		Diary		Total		ACS 2006-2008	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Less than 35	112	44.4%	275	24.2%	387	27.9%	9,935,688	45.7%
35-54	70	27.8%	282	24.8%	352	25.3%	6,614,130	30.4%
55-64	44	17.5%	210	18.5%	254	18.3%	2,390,898	11.0%
65 or older	26	10.3%	347	30.5%	373	26.9%	2,805,252	12.9%
Don't Know/Refused	0	.0%	23	2.0%	23	1.7%	-	-
Total	252	100.0%	1137	100.0%	1389	100.0%	21,745,968	100.0%

CONCLUSIONS

Regional household travel surveys provide the essential data for the development of travel forecasting models which are required for the analysis of Regional Transportation Plan, air quality conformity and major investment studies. Such a survey represents a tremendous data collection effort and valuable analytic resource for the transportation planning community in the NY-NJ-CT metropolitan area.

The scope of the survey and complexity of the NY-NJ-CT region requires implementation of groundbreaking new technologies and tools to improve data quality and address various emerging issues derived from changing economics, demographics, and travel behavior. The NYMTC experience demonstrates that the Continuous Improvement Process in travel survey data methods, procedures, and tools is an imperative not a luxury.

Substantial regional cooperation among the involved agencies and the project team members is required during all phases of the project. In addition, the project Steering Committee, which is composed of local planners and modelers, and the Technical Advisory Committee, which is composed of national survey experts, play a critical role of guiding the project direction and issue solving. Careful survey design and execution will yield a rich database of how, when, where, and why area residents travel. The detailed travel information to be collected will be available through NYMTC's web-and GIS-based Transportation Information Gateway and should prove useful to planners, policy-makers, researchers, stakeholders, and, ultimately, the public for years to come.

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