

# **T**he Effects of Survey Methodology Changes in the NPTS



Office of Highway Policy Information  
Federal Highway Administration  
400 7<sup>th</sup> Street, SW  
Washington, D.C. 20590

Author: Susan Liss  
[Susan.Liss@fhwa.dot.gov](mailto:Susan.Liss@fhwa.dot.gov)

## THE EFFECTS OF CHANGED SURVEY METHODS ON THE NPTS

Three topics are addressed in this paper:

- # an update on the 1995 NPTS (Nationwide Personal Travel Survey)
- # the changes in survey methodology between 1990 and 1995, which serve as the framework for the discussion of the conflict between improving the travel survey and comparing the data over time
- # what we learned from the NPTS experience and our advice to others.

There were several other presentations in this session of the conference, from Sydney and Melbourne, Australia, Switzerland and Austria, as well as significant comments from the United Kingdom. There were striking similarities in the types of issues we face in conducting national household travel surveys and the considerations we brought to bear in resolving them.

### 1995 NPTS Update

The survey for the 1995 dataset was conducted from May 1995 to July 1996 and the public use dataset will be available in the fall of 1997. The dataset consists of 42,000 households, of which approximately half are in the "national sample". That means that a group of 21,000 households represent travel throughout the U.S.

The four "add-on" areas account for the other 21,000 households. As a part of the NPTS, States and metropolitan planning organizations (MPOs) could purchase additional samples to create a household travel survey for their area. The four add-on areas and the samples they purchased are:

State of New York.....	9,500
Commonwealth of Massachusetts.....	7,500
Oklahoma City, Oklahoma .....	3,000
Tulsa, Oklahoma.....	1,000.

The benefits of the add-on program to the state or MPO (Metropolitan Planning Organization) are that:

- # the US DOT has already paid for designing, developing and pretesting the survey instrument and procedures
- # there is an assurance of a standard of quality in sample selection, interviewing,

editing the data, weighting the data, and a host of other survey elements

- # the add-on area gets a larger sample than they are paying for because the national sample is already doing some interviews for that area and the add-ons get those records.

The benefits to the US Department of Transportation are that we receive an enriched sample from all areas that conduct add-ons. In fact, at the Transportation Research Board conference on Data Needs for the 21st Century, held at Irvine this past March, one of the recommendations was to increase the add-on program in the future.

The NPTS Fact Sheet, Attachment 1, contains a more complete description of the survey.

### **Changes in Survey Content**

In addition to the larger add-on program in the 1995 NPTS, we made a number of other changes. These include:

**Odometer readings** - Two odometer readings and the associated date of the readings, which were approximately 2 months apart, were to be collected on each household vehicle. Oak Ridge National Lab has developed a model to convert these two readings to annual estimates. We believe that the odometer readings will produce an more accurate estimate of vehicle miles than the owner's annual estimate or the summation of travel day trips made in that vehicle.

**Address of residence and workplace** - The first three NPTS surveys, conducted in 1969, 1977 and 1983, used an address sample from the Census Bureau. However, because the Census Bureau had conducted the survey, there were stricter confidentiality requirements and the neither the address nor the Census tract could be provided to us. In the 1990 NPTS we did not need to collect the address, since the survey was conducted totally by phone, with no diary mailings. The purpose of collecting the addresses in 1995 was to append the file with a series of characteristics of the residence and workplace (see Attachment 2 - 1995 NPTS Geographic Descriptors ). Addition of these characteristics to the travel data will allow us to conduct analyses of the land use-transportation connection, and may also allow us to create synthetic travel surveys for states or metropolitan areas.

**Customer service questions** - For the first time in our NPTS series, the 1995 survey addressed questions of the public's opinion of transportation services and systems. Not only was the feedback from the public positive, but we also can now look at these attitudes in the context of how much travel the respondent does, which modes he uses, vehicle ownership and income at the household level and a host

of other characteristics. We anticipate that customer satisfaction questions will continue to be incorporated in future NPTS work.

**Updated trip purposes** - In an effort to better understand travel, we dropped some trip purposes that had poor response in the past and added some we sought to know more about. For example, serve passenger trips were previously reported under the more general category of “other family and personal business.” For 1995 we created two purposes, “drop off someone” and “pick up someone”.

**Seat belt use** - We added questions on how often people use seat belts, and for those that use them some or most of the time, their reasons for not using them all of the time. This is a great benefit to any safety analysis done with the data, and it also resulted in perhaps the best catalog in existence of reasons people use seat belts occasionally.

We believe that all of these elements will make our 1995 NPTS more comprehensive and accurate than its predecessors. For more general information about the NPTS refer to:

- Attachment 1 - 1995 NPTS Fact Sheet
- Attachment 2 - 1995 NPTS Geographic Descriptors
- Attachment 3 - NPTS Over Time

### **Survey Method Changes**

It is particularly timely to address the conflict between improving the survey and maintaining comparability over time. Once we received the NPTS pretest data and our preliminary full survey data, we had reason to contact some of the larger U.S. metropolitan areas to compare their data to ours. We found we were not alone in having made a number of changes that were important improvements, but resulted in problems in looking at our data over time. With the cost of conducting household travel surveys and changes in travel behavior occurring at a rapid pace, we are all under pressure to make changes in our survey methods, procedures and instruments. But what is the cost of these changes in trend analysis and what can be done to address that concern?

Note that the comparisons made in this section are based on the pretest for the 1995 NPTS, because, as of this writing, the full 1995 dataset is not available. The pretest consisted of:

- 2,360 households
- 4,938 persons
- 20,769 travel day person trips.

We conducted a large pretest to determine the best methods for the full survey and to provide a measure of change from the recall method used in 1990, if that method was not

going to be repeated in 1995.

The changes in survey methods for 1995, which are listed in Table 1, resulted in our collecting a seemingly large increase in trips and travel. Basically, Table 1 demonstrates that there was much more that could have been measured than we did. We were naive. We were very much aware of the elements that remained constant between the 1990 and the 1995 surveys. These included:

- same survey contractor, Research Triangle Institute
- same sampling approach
- same trip definition
- same approach to expanding the sample.

We thought that the real increases in tripmaking would show up in the comparison of the recall (or retrospective) approach with the diary. Now that we have some preliminary results, we realize that many of the other survey elements had impact. These impacts are covered in Table 2.

**TABLE 1**

**CHANGES BETWEEN THE 1990 AND 1995 NPTS THAT IMPACTED TRIPS AND TRAVEL**

<b>TOPIC</b>	<b>FROM 1990</b>	<b>TO 1995</b>	<b>Could Measure</b>	<b>Did Measure</b>	<b>Measure after the fact</b>	<b>Estimate after the fact</b>
Respondent Contact	No advance letter	Advance letter (2/3 of sample)	XXXX	XXXX		
	No incentive	Incentive (\$2/person)	XXXX			XXXX
Trip Reporting	Recall	Travel Diary	XXXX	XXXX		XXXX
	All individual interviews	Household rostering of trips	XXXX			XXXX
	Not confirm zero trips	Confirm zero trips	XXXX			XXXX
	Proxy from memory	Proxy from diary	XXXX		XXXX	
	Trip definition	Clearer trip definition				
	On-line edits	More on-line edits				
Overall survey	Completed household-1+ adults	Completed household-50%+ adults	XXXX		XXXX	

**TABLE 2**

**PROBABLE IMPACTS OF NPTS SURVEY CHANGES**

<b>TOPIC</b>	<b>FROM</b>	<b>TO</b>	<b>PROBABLE IMPACTS</b>
Respondent Contact	No advance letter	Advance letter	More trips More male respondents
	No incentive	Incentive (\$2/person)	Obtain respondents that may not have participated other wise
Trip reporting	Recall	Travel Diary	More trips reported More shorter, incidental trips More trips for family & personal business and social & recreational purposes
	All individual interviews	Household rostering of trips	Include forgotten trips Lower respondent burden More coherent picture of household tripmaking
	Not confirm zero trips	Confirm zero trips	Reduce zero trip persons from 25% in 1990 to 6% in the 1995 pretest
	Proxy from memory	Proxy from diary	More trips reported Better reporting of trip characteristics
	Trip definition	Clearer trip definition	Easier for respondent to report trips Interviewers more attuned to pick up incidental trips
	On-line edits	More on-line edits	More coherent trip reporting Increase interviewer awareness
Overall survey	Completed household = 1+ adults	Completed household = 50%+ adults	Works with household rostering to Increase trip reporting

The method changes and their probable impacts are:

Respondent contact:

**Advance letter** - Advance letters were sent to all households with listed phone numbers, i.e., the number is published in the phone book or available from "information." Approximately two-thirds of the households in the U.S. have listed numbers. About 10% of the letters were returned, so we probably reached 60% of the households with the letter. The primary purpose of the letter was to inform the prospective respondents that this was a legitimate survey, not a marketing or fundraising call. It is difficult to determine the impact of the advance letter between the 1990 and the 1995 data because response rates dropped in that time period. The number of times a household received a call from someone they did not know increased, and the level of suspicion about these calls increased. Although these factors make it difficult to measure the impact of the advance letter, we believe it may have resulted in more participation by male respondents, because they were assured it was a legitimate survey effort.

**Incentives** - The pretest data provides some insight into the use of incentives, because the pretest was split into three subsamples: retrospective or pure recall, travel diary and memory jogger. The diary and jogger cases got the incentive, while the retrospective cases did not, and the results are:

	<b>Retro</b>	<b>Diary</b>	<b>Jogger</b>	<b>Total</b>
<b>Overall household response rate</b>	57.4%	47.6%	49.0%	52.6%
<b>Person interview rate</b>	79.2%	88.2%	88.5%	84.9%
<b>Overall response rate</b>	45.4%	42.0%	43.3%	44.7%

The incentive appears to have made a significant difference in the crucial person interview rate. Not only are the person interview completion rates considerably higher than the retro method, but both the diary and jogger rates are higher than the comparable rate from the 1990 NPTS, which was 86.4%

**Trip reporting:**

**Travel diary** - Trip reporting changed considerably from the 1990 survey, and the most apparent change was the use of the travel diary. Not only were more trips collected, but they the types of trips that would be most likely to be overlooked unless a diary was used. As expected, the additional trips were concentrated in the areas of family and personal business and social and recreational activities. Use



of the diary increases the number of shorter, incidental trips reported.

**Household Rostering** - The next change, “household rostering” of trips captured some trips that may well have been overlooked. In “household rostering” the interviewer has the benefit of trip data from all household members he/she has already interviewed. If person #1 took a trip and reported persons #2 and #3 were with him, when persons #2 and #3 are interviewed, they can simply confirm they were on the trip with #1. If person #2 or #3 said they were not on the trip with #1, then that was considered as the last word. This system resulted in a number of benefits for us, including making the tedious travel day reporting easier and, of course, in aiding the memory of the respondent.

**Confirm zero trips** - When the respondent reports not going anywhere on travel day, the is often the ultimate “soft refusal”. He/she doesn’t want to report their trips, but they also don’t want to appear totally uncooperative. In previous NPTS surveys, we were very hesitant to question this, but changed our minds after the 1990 NPTS showed 25% of respondents not taking a travel day trip. We still do not go as far as many of the US urban travel surveys in questioning this, but in 1995 we added the questions “does that mean you did not go anywhere on that day?” For the 1995 pretest, our rate of zero trip persons dropped to 6%. This should not be solely attributed to the inclusion of this one question. We have no way of knowing how much the use of the pre-interview letter, the travel diary and the incentives influenced this result.

**Proxy from Diary** - Use of the travel diary affects proxy as well as self interviews. The comparison of the proxy versus self reporting for the 1990 recall survey and the 1995 diary and jogger portions of the pretest is:

	Daily Person Trips per Person		
	Self	Proxy	Proxy as % of self
<b>1990 NPTS - recall</b>	3.22	2.17	.62
<b>1995 NPTS pretest</b>			
Diary	4.80	3.51	.73
Jogger	4.56	3.5	.77

So the net result in 1995 was that we had fewer proxies and the proxies we had reported more trips.

**Clearer trip definition** - An outsider to this field would have trouble understanding why the definition of a “trip” is so difficult. But anyone who has conducted a household travel survey recognizes the numerous issues involved..... when is something a trip and when isn't it, when is a new trip started, how do you handle a change of mode or vehicle without any other changes, do you collect linked trips or unlinked or some combination of them. For the 1995 NPTS we used the same definition of “trip” that we had used in 1990, but greater care was taken to clarify what a trip was and when each new trip began. While the impact of this cannot be measured, it is important to recognize that it most likely had a impact on the increase of trips collected.

**More on-line edits** - Like a clearer trip definition, the inclusion of more on-line edits most probably had an impact in favor of collecting more trips. For example, 2 people are going to a movie and it is an auto trip of 2 miles that takes 30 minutes in non rush hour traffic. The CATI (computer-assisted telephone interviewing) system produces a message to the interviewer to verify the time. In this example, it turns out they stopped at a friends house and the friend also went to the movie. What was originally reported as one trip has become two. More on-line editing of trips has the effect of increasing the interviewers awareness of typical problems, and all of this probably works in favor of collecting more trips. It is not possible to measure the impact, but it should be noted by the data users.

## **Overall survey:**

**Completed household definition** - The definition of a completed household changed from 1990, which was one or more household adults interviewed, to 1995, which required that 50% or more of the household adults must be interviewed. This resulted in changes in who was in sample and the impact of the person weights in adjusting for missing persons within the household. The pretest was conducted using the one or more adults definition so analysis of the impacts of this change must await the full survey data.

## **Normalizing the Results and Recommendations**

### **Urban Trip Rate Comparison Project**

Now that we have reached this point, we obviously need to determine how much of the increase in trips and travel in the preliminary 1995 data is due to improved survey methods and how much of the increase is real travel. First, we are measuring the impact of change in all the elements that can be measured (see Table 1). Second, we are comparing trip rates in a group of U.S. urban travel surveys conducted around 1990 with other surveys conducted around 1995. We are computing the NPTS data from 1990 and

1995 using the parameters normally used in an urban travel survey, i.e., urban area only, weekday trips only, trips of 75 miles or less, all POV and transit trips included, walk and bike trips included only if to work or school, interview must be within 3 days of travel day, households where all adults were interviewed. Then we will compare the urban surveys rates from 1990 with NPTS from 1990 and the urban travel surveys rate from 1995 with the NPTS from 1995. We are seeking to establish an adjusted 1990 NPTS trip rate, so that when it is compared with the 1995 NPTS trip rate, the differences will be the real increase in travel. Although this will not be an exact measure, we believe we must give our data users some guidance on this issue.

## **Recommendations**

For others going through this process, I offer the following recommendations:

1. Define as many elements of change that you can, and
2. Build a bridge between the old and new data . This can be done in one of two ways, either through a large parallel pretest or through a “comparability component” of the full survey. In either case, seek to replicate the previous survey as closely as possible with one group of the pretest or full survey, and use the new survey instrument and procedures on the rest. If you cannot run a parallel test in the pretest, do it as part of the full survey. But don't ignore it.

The NPTS is unique in some respects, however, when we consider the surveys presented in this session from five countries, we certainly have more in common than not. More in common refers to how we design and deliver our transport surveys, what issues and considerations are surfaced and how they are resolved, and how the data are used in planning and policymaking. The last recommendation is that we pool resources to examine some of our current issues in raising the standard of transport surveys.

Attachments:

- 1 - 1995 NPTS Fact Sheet
- 2 - 1995 NPTS Geographic Descriptors
- 3 - NPTS Over Time

## Attachment 1

# 1995 NPTS (Nationwide Personal Transportation Survey) Fact Sheet

- WHAT** The NPTS is a household travel survey that provides data on the amount and nature of personal travel in the U.S. Data are collected from a sample of households and expansion factors are applied to obtain annual, national estimates of trips, miles of travel, household vehicles, etc. The survey collects data on all trips, by all modes, for all purposes.
- WHY** The NPTS data provide the only authoritative source for the characteristics of travel, particularly as linked to the demographics of the traveler, for the nation. These data allow analysis of trends in travel and the relative use of different modes of transportation.
- WHO** Interviews are conducted for all persons age 5 and older in the household. Persons 14 and older are interviewed directly and a household adult is asked to report for children age 5 -13. A list-assisted Random Digit Dialing sample framework is used. The sample is stratified by region of the country, size of metropolitan area and presence or absence of a subway system.
- HOW** The interviews are conducted by telephone using a Computer-Assisted Telephone Interviewing (CATI) system.
- DATA COLLECTED** Examples of the data collected are:
- Household level- household size, number of household vehicles, income, location.
  - Person level - age, sex, education, relationship within household, driver status, annual miles driven if a worker, worker status, if drive as an essential part of work if employed, seat belt use.
  - Customer service questions -rating of issues in traveling, such as mobility, congestion, traffic conditions and pavement conditions
  - Vehicle level - annual miles (based on odometer readings at two-month intervals), make, model, model year.

**Attachment 1 - (continued)**  
**1995 NPTS (Nationwide Personal Transportation Survey) Fact Sheet**

Trip level - trip purpose, mode, length (in miles and minutes), time of day, vehicle characteristics (if a household vehicle was used), number of occupants, driver characteristics (for private vehicle trips only, and only if a household member was driving).

**SPONSORS**           The 1995 NPTS is sponsored by the following U. S. DOT agencies:  
                            Federal Highway Administration  
                            Bureau of Transportation Statistics  
                            Federal Transit Administration  
                            National Highway Traffic Safety Administration

**COVERAGE**        The NPTS is multimodal in coverage of travel, as well as sponsorship. Trips made on any mode are collected.

**CONDUCTED BY**    Research Triangle Institute, Research Triangle Park, North Carolina

**1995 NPTS PRETEST** - Conducted November, 1994 through January, 1995.  
                            2,330 households were in the final data . Emphasis on inclusion of customer service questions.

**1995 NPTS FULL SURVEY** - Conducted May 1995 through July 1996.  
                            Approximately 21,000 households throughout the nation will be in the final dataset.

**NPTS PRODUCTS** - Reports, Public Use Dataset on CD-ROM, Internet Web Site

**CONTACT PEOPLE**

Both people listed below are at the same  
FAX number -       (202) 366-7742, and  
address-            FHWA - HPM 40, Rm. 3306  
                            Washington DC 20590.

Susan Liss, NPTS Project Manager  
voice- (202) 366-5060  
internet email - susan.liss@fhwa.dot.gov

Bryant Gross, Data User Support  
voice - (202) 366-5026  
internet email - bryant.gross@fhwa.dot.gov

**Attachment 2 -1995 NPTS GEOGRAPHIC DESCRIPTORS**  
**RESIDENCE - Population variables** (at Census tract **and** block group level)

Population density - persons per square mile

% below poverty

% over 25 who are high school graduates

% over 25 who are college graduates

% 65 or older

% foreign born

% Hispanic

% White, % African-American, % Asian-American, % other

**RESIDENCE - Households & Housing variables** (at Census tract **and** block group level)

Urban/rural code-- metro urban, metro suburban, second city, small town, rural

Residential density - dwelling units per square mile

Housing - % single family, % multi-household dwellings

Housing - % owner, % renter

Housing - % dwelling units built since 1985

Housing value - median housing value

Income - median household income and % households: below \$15,000, \$15,000-\$40,000, \$40,000- \$60,000, \$60,000 and over

**WORKPLACE - Employment variables** (Census tract)

Employment density - jobs per square mile

Retail employment (as a measure of accessibility to goods and services)

Employment - % by broad SIC categories (e.g., manufacturing, retail)

### Attachment 3 - NPTS OVER TIME

YEAR	SAMPLE SIZE- Households	METHOD	CONDUCTED BY	CONTENT NOTES	SURVEY NOTES
1969	15,000	in-home interview	Bureau of Census	-auto only, not all POV, trips collected	-shortest NPTS questionnaire -problems with weighting -cannot add daily trips and long trips -used retired CPS sample
1977	18,000	in-home interview	Bureau of Census	-much detail on long trips -mapping certain daily trips to determine urban/rural split of travel	-part of sample also interviewed for a separate long trip survey, NTS -cannot add daily trips and long trips -used retired CPS sample
1983	6,500	in-home interview	Bureau of Census		-sample so small that interviewers never got proficient -used retired CPS sample
1990	22,300 18,400-national 3,900-add-ons	telephone-CATI	Research Triangle Institute (RTI)	-collected segmented trips -collected minor accident data	-recall method (no advance warning of travel day) -first add-on component -list-assisted, stratified RDD (random digit dialing) sample
1995	42,000 21,000-national 21,000-add-ons	travel diary with telephone retrieval	Research Triangle Institute	-odometer readings on household vehicles -address of residence and workplace - information on incidence of telecommuting and transit use	-large add-on component -first use of incentives -first use of travel diary -household rostering of trips -list-assisted, stratified RDD sample