

## IMPUTATION OF PERSONS NOT INTERVIEWED IN HOUSEHOLD TRAVEL SURVEYS

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**Abstract:** Traditional household travel surveys collect detailed travel information for all members of the household. Trip production models are widely used in transportation analyses, and they are generally developed at the household level based on rates of household trips, not person trips. Collecting data from each (adult) household member, however, reduces response rates and increases costs. This talk will explore the advantages and disadvantages of procedures based on collecting data from a subset of household members (possibly just one), randomly selected. Data from the 1995 Nationwide Personal Transportation Survey will be used to evaluate the alternatives.

### 1. Background

*Trip production models*, extensively used by transportation analysts, require household trip rates. Travel surveys have traditionally obtained the household trip rates by interviewing every adult member of the household about their trips. Older children and teenagers may also be interviewed. Data for other children in the household are obtained from an adult household member. Trip data must be obtained on most or all household members for the household to be useable. There are several drawbacks to trying to obtain trip data from each (adult) household member: reduced household response rates, higher costs, and more respondent burden. The goal of this research is to investigate an alternative method for the National Household Travel Survey (NHTS) of the Bureau of Transportation Statistics and the Federal Highway Administration.

Richardson, Ampt, and Meyburg (1995) is a recommended source on survey methods as used for transportation analyses.

### 2. Alternative Method

The 1995-96 Delaware Household Travel Survey collected trip data on only one randomly selected household member (for cost and response burden

reasons). The survey has basic demographic data on all members of the household. The Delaware method was to create "synthesized households." Essentially the trip data were imputed for the adult household members not randomly selected.

Research by G. D. Erhardt (2000) at Cornell University (based on New York City Area data) reported good results for the Delaware procedure for a metropolitan area study. The Delaware method has not previously been tried on a federal survey or a survey at the national level.

### 3. Investigation

The goal is to investigate the Delaware procedure (and variations) on 1995 Nationwide Personal Travel Survey (NPTS) data. The NPTS (along with the American Travel Survey for longer trips) is the survey that has evolved into the NHTS. The NPTS collected trip data on all adult household members, thus facilitating the study. See Research Triangle Institute and Federal Highway Administration (1997) for further information on the 1995 NPTS data.

For this preliminary investigation, we considered only households with three or more persons and two or more workers. Such households are often (but not always) households with two working parents and with children living at home. One household member was randomly selected within each household. The trip data for other members of the household were then "synthesized" by using mean values for the randomly selected persons in the same age category and living in the same sized Metropolitan Statistical Area (MSA). These randomly selected persons are also in the same type of household: three-or-more-person households with two or more workers.

The seven age categories are 15 or less, 16 through 18, 19 through 24, 25 through 34, 35 through 44, 45 through 54, and 55 or over. The six MSA sizes are given in the captions to the tables. No fine-tuning of any of these categories was performed — this will be done in future work.

Table 1 provides a comparison of the "synthesized" estimate of trips per person with the actual value. There is more interest in trips per household than trips per person so the results were extended to cover that estimate (Table 2). In

computing trips per household, an adjustment is made for trips involving more than one household member to account for these trips' increased probability of selection. The results in Tables 1 and 2 are encouraging although further refining will be needed.

#### 4. Concluding Remarks

There are clearly many matters that remain to be explored. The preliminary results presented here need to be expanded and refined. The work of Reuscher, Schmoyer, and Hu (2001) should prove helpful for determining homogeneous classes of households.

It would be interesting to explore selecting *two* adults per household — this would permit analysis of within household correlations.

Does data quality for responding households decline under Delaware-like procedures? When household members are interviewed sequentially, trip data from a previous household respondent can be used to prompt subsequent ones. Because household members often travel together, such prompting should improve data quality. This has to be weighed against the benefits of higher household response rates and lower costs per household.

The use of proxy respondents also needs investigation.

The results of the research have the potential to improve future National Household Travel Surveys and the personal travel surveys of states and metropolitan areas.

#### References

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Research Triangle Institute and Federal Highway Administration (1997), *1995 NPTS User's Guide for the Public Use Data Files*, Federal Highway Administration, Washington, DC.

Timothy R. Reuscher, Richard L. Schmoyer, and Patricia S. Hu (2001), "Transferability of Nationwide Personal Transportation Survey Data to Regional and Local Scales," submitted to Federal Highway Administration, Oak Ridge National Laboratory, Oak Ridge, TN.

A.J. Richardson, E.S. Ampt, and A.H. Meyburg (1995), *Survey Methods for Transport Planning*, Eucalyptus Press, Melbourne.

**Table 1: Two or More Workers, Three or More Person Households (1995 NPTS Data)**

MSA Size	Trips/Person Synthesized	Trips/Person "True"
01	4.78	4.63
02	4.74	4.73
03	4.52	4.59
04	4.53	4.61
05	4.27	4.28
94	4.56	4.64
All U.S.	4.46	4.49

**MSA size:** 01=less than 250,000      02=250,000 – 499,999      03=500,00 – 999,999  
 04=1,000,000 – 2,999,999      05=3,000,000 +      94=not in metro area

**Table 2: Two or More Workers, Three or More Person Households  
(1995 NPTS Data)**

MSA Size	Trips/Household Synthesized	Trips/Household “True”
01	14.2	13.8
02	13.8	14.3
03	13.4	13.8
04	13.3	14.1
05	12.6	13.2
94	12.9	13.8
All U.S.	13.1	13.6

**MSA size:** 01=less than 250,000      02=250,000 – 499,999      03=500,00 – 999,999  
 04=1,000,000 – 2,999,999      05=3,000,000 +      94=not in metro area