I. METHODS

A. Is a pilot survey worth the cost? What is the risk of not conducting a pilot? How much time should be allocated between the end of the pilot and the beginning of the full study to ensure the pilot effort is maximized?

According to the following articles, pilot surveys are beneficial for survey design and implementation.

1. *Continuous Survey for Modeling in Oregon* (Zmud, Wolf et al. October 2005) - The report documents the design, implementation, and results of a pilot test conducted as part of the Continuous Survey for Household and Travel Decisions in Oregon (COSMO). The primary objective of the pilot study was to test specific survey methods and data collection approaches in order to identify the best design for the statewide COSMO. The report presents the background, design, and findings from the pilot test effort.

2. *Will it Work? Pilot Results from First Large-Scale Global Positioning System–Based Household Travel Survey in the United States* (Giaimo, Anderson et al. 2010) - The Greater Cincinnati Household Travel Survey (HTS) is a proof-of-concept study for replacing travel diaries with a large-scale multiday Global Positioning System (GPS) survey. The objectives are to collect multiple-day data from more than 3,000
households with portable GPS devices and improve existing processing software to provide data that support modeling approaches in Ohio. A subsample of follow-up prompted recall surveys allow respondents to review GPS interpreted travel information for verification. This paper describes the survey process developed for this HTS.

B. What are the benefits/drawbacks of continuous/panel survey efforts?

1. *Setting up a Continuous Panel for Collecting Travelling Information: Discussion on Methodological Issues* (Moons and Wets)- It has been established that calendar events (holidays, long weekends, etc.) have a serious impact on travel demand. However, the effect of these regular events has never been combined with different household characteristics; only the impact on traffic intensities has been assessed. This can perfectly be encompassed by a longitudinal survey. Therefore, the idea was suggested of setting up a continuous panel and to ask the respondents to report their travel behavior (in relation to the other household members). The aim of this paper is to discuss some of these methodological issues that will arise if one transfers from a multiple cross-sectional method to a more continuous approach of collecting data. Some of the issues that will be addressed are the survey method, the sample rotation and the handling of nonresponse.

2. *Improving Continuous Surveys: Analysis of Attrition and Reported Immobility in the Madrid-Barcelona Corridor Panel Survey* (Pearson, Hard et al. 2010) - Participation is an issue in all travel surveys, but response rates in each survey wave of a panel is critical because it may cause biased data if the remaining participants do not represent the population of study. If the period of time for which number and characteristics of trips are requested is fixed, the probability of obtaining a non-trip response is inversely proportional to the trip frequency. The result is that an important percentage of panelists they did not make any trips within the period investigated. Additionally, other factors related to memory effects and soft refusals may be involved in obtaining non-trip data.

3. *Continuous Mobility Surveys: The State of Practice* (Ortuzar, Armoogum et al. 2010) - this paper challenges the prevailing practice of conducting one-off cross-sectional mobility surveys, making a case for change on the basis of usefulness and cost-effectiveness. Authors establish that urban areas over one million inhabitants should collect mobility data on a continuous basis as part of their efforts to guarantee sustainable development. This would allow them to gain a proper understanding of the pressing environmental and transport-related issues of today’s world, as well as of the effects of economic growth and price (especially for fuel) volatility.

4. *Integrative Software for Dataflows in Continuous Travel Surveys* (Richardson, Richardson et al. 2011) - One of the challenges in the conduct of continuous travel surveys over an extended survey period is maintaining control over dataflows associated with various aspects of the survey process. This paper will describe a number of these processes and programs within the context of the Victorian
Integrated Survey of Travel & Activity (VISTA), a self-completion diary survey, with survey material personally delivered and collected from households.

C. For how many days should data be collected? What are the cost implications of multiple day collection? What kind of decline in response rates should be expected? How often should surveys be conducted?

These articles provide overview of the travel survey process, in a step-by-step approach.

1. *On Large Scale On-Going Mobility Surveys: The State of the Art* (Ampt, Ortuzar et al. 2008) – Describes main features and overview of an “ongoing survey” methodology; addresses sample selection, data coding, etc.

2. *The Travel Survey Toolkit: Where To From Here?* (Stopher 2008) – This keynote paper focuses on travel surveys of human populations and the main focus within travel surveys of human populations is on the household travel survey. However, some mention is made in passing of other travel survey needs, especially in relation to on-board transit surveys and roadside or intercept surveys.

3. *Capturing Activity-Travel Sequences for Infrequent Events: A Sampling and Data Collection Approach* (Arentze, Borgers et al. 2008)- when collecting such data, the key questions are: (1) what are the relevant infrequent, perhaps unplanned and exceptional events we want to collect data on? (2) How do we collect information about activity-travel sequences that are associated with such events, both before and after? (3) How should we sample respondents and how often should we prompt them for information, considering the trade-off between respondent burden and memory recall bias?

D. Use of Incentives and Advance Letters

What is the proper balance of advance notification and incentives?

Advance letters do increase response rates as do pre-paid vs. promised incentives, as discussed in the articles below.

1. *Experiments with Incentives in Telephone Surveys* (Singer, Van Hoewyk et al. 2000) - This article reports on a series of experiments carried out over a period of about 2 years with a monthly telephone survey, the Survey of Consumer Attitudes, in an effort to increase response rates or reduce interviewer effort. Report on experiments with prepaid versus promised incentives; advance letters; and advance letters with prepaid incentives; and we also report on the effects of incentives on response quality, sample composition, response bias, interviewer and respondent expectations, and costs.

2. *The Cost-Effectiveness of Alternative Advance Mailings in a Telephone Survey* (Hembroff, Rusz et al. 2005)- Advance letters are being used increasingly to combat the decline in response rates, but their effectiveness depends partly on their being read. In terms of response rates, the results clearly indicate that sending advance letters is more effective than sending postcards, which, in turn, is more effective than sending nothing.
3. *The Influence of Advance Letters on Response in Telephone Surveys* (De Leeuw, Callegaro et al. 2007) - This study reviews the evidence for this advice and presents a quantitative summary of empirical studies on the effectiveness of advance letters in raising the response rate for telephone surveys. The major conclusion is that advance letters are also an effective tool in telephone surveys, with an average increase in response rate (RRI) from 58 percent (no letter) to 66 percent (advance letter), and an average increase in cooperation rate (COOPI) from 64 percent (no letter) to 75 percent (advance letter).

4. *The Effect of Advance Letters on Cooperation in a List Sample Telephone Survey* (Goldstein and Jennings 2002) - The results of the field experiment reported here show that, although notification letters do not solve the problem of sample nonresponse in political telephone surveys, they can significantly increase response rates.

5. *Advance Letters as a Means of Improving Respondent Cooperation in Random Digit Dial Studies* (Link and Mokad 2005) - The data reported here corroborate previous findings, in terms of the positive impact that advance letters can have on overall response rates (approximately a 6-percentage-point gain). Moreover, the advance letters were cost-efficient in that the cost of obtaining a fixed number of completed surveys using advance letters was lower than the cost without letters.

6. *Recruiting Probability Samples for a Multi-Modal Research Panel with Internet and Mail Components* (Rao, Kaminska et al. 2010) - Survey response rates have been declining over the past several decades, particularly for random-digit-dialing (RDD) telephone surveys (see de Leeuw and de Heer 2002; Steeh 1981). This trend affects research panels such as the Gallup Panel, which uses RDD methodology to recruit its members. This paper presents the findings of a mail and telephone mode experiment conducted by the Gallup Panel to analyze the individual and combined effects of incentives, advance letters, and follow-up telephone calls on the panel recruitment response rate. Study results also suggest that the advance letter, incentive, and telephone follow-up conditions all have independent, positive influences on the response rate; and that the groups that receive an advance letter, that receive incentives, and that receive a follow-up telephone call have higher panel recruitment response rates than the control group.

7. *Early Reports on Incentive Effectiveness on Household Cooperation in GPS Validation Study* (Minser, Michalowski et al. 2012) - This paper provides early findings on the effectiveness of incentives in securing cooperation with households using personal GPS devices to measure travel behavior for household members over 12 years old in a large metropolitan area. The authors draw on survey research and social science literature to better understand the effects of offering incentives to survey participants, to explore how offering incentives influences study compliance—including providing all data necessary in a timely fashion—how data quality is affected, and some of the underpinnings of what actually gets a household to participate. The initial findings suggest incentives may not always be necessary depending on the study population, offering larger incentives are not always the best option, and data quality may or may not be impacted by the type of incentive a
household receives. The authors offer a pragmatic approach to using incentives, provide recommendations for other practitioners, and suggest future research opportunities.

What are the effects of incentives on response rates?

1. *The Effects of Incentives, Interview Length, and Interviewer Characteristics on Response Rates in a CATI Study* - (De Leeuw, Callegaro et al. 2007) Research shows that advance letters and postcards improve response rates significantly and cost-effectively. It also indicates that advance letters improve response rates by 5.8 percentage points and postcards by 2.8 percentage points in a telephone survey. In addition, incentives also show a positive effect on response rates. Pre-paid incentives are more effective than promised incentives.

What are alternatives to cash incentives if a DOT/MPO is prohibited from offering cash incentives?

1. *Survey Responses: Mail Versus Email Solicitations* (Holland, Smith et al. 2010) - Surveys, particularly electronic surveys, are becoming popular methods of eliciting consumer responses. For example, many businesses now have survey sites printed on the bottom of receipts with some future discount as an enticement to participate. Clearly, the intent of such incentives is to stimulate participation. Surveys have also become popular in academia, but rarely are incentives offered. Clearly, those in academia also prefer a high participation rate, but without financial incentives what can be done to encourage participation? This research attempts to address that question.

E. Use of Internet and Social Media

1. *Online Travel Surveys and Response Patterns* (Pan 2010) - This article reviews the benefits and issues with online surveys as it relates to response rates, speed of response, representativeness of the samples, and the differences in results due to different survey media. The study suggests that surveying a pilot sample and analyzing their responses can allow a researcher to estimate the parameters of the response model for a large-scale survey and thus conduct a study in a more effective way.

2. *Internet users’ perceptions of ‘privacy concerns’ and ‘privacy actions’* (Paine, Reips et al. 2006) - A consistent finding reported in online privacy research is that an overwhelming majority of people are ‘concerned’ about their privacy when they use the Internet. It is important to understand the discourse of Internet users’ privacy concerns, and any actions they take to guard against these concerns. A Dynamic Interviewing Programme (DIP) was employed in order to survey users of an instant messaging ICQ (‘I seek you’) client using both closed and open question formats. Results indicate that Internet users are concerned about a wider range of privacy issues than surveys have typically covered. The results do not provide final
definitions for the areas of online privacy, but provide information that is useful to gain a better understanding of privacy concerns and actions.

3. **Toward an Open-Source Methodology: What We Can Learn from the Blogosphere** (Blumenthal 2005) - This article provides some examples of "blog" commentary on automated and Internet polls and then explores the lessons to be learned from the spirit of innovation and openness of the Internet in evaluating new survey methods such as automated polls and those conducted over the Internet.

F. **Involving/Regarding the Respondent**

1. **You're the boss! Time to place the respondent at the forefront of our survey design** (Johnson, Mills et al. 2008)- The need to balance falling response rates is expressed, noting that research was performed to determine whether survey design can improve participation rates. Three variables were tested in the research, including the visual appearance of the survey, the inclusion of instant feedback on other participants' responses, and the use of fun questions. The results of the research are reported, noting that participants in enhanced and well-designed surveys are more likely to participate in future surveys.

2. **Effects of survey techniques on on-board survey performance** (Memarian, Jeong et al. 2012)- On-board survey is one of the most common survey methods utilized on transit units like buses to obtain vital information regarding customer trip characteristics, travel behavior, demographic characteristics, and customers’ attitude toward services. The tests were conducted on selected routes of the Tulsa Transit System. The test results indicate that different combinations of techniques will result in different response rates and unit costs. Thus, good planning and piloting tests for the different on-board survey techniques, and appropriate interpretations of the pilot test results, are crucial to acquiring the expected performance of the main survey while staying within the budget.

3. **Qualitative Methods in Travel Behavior Research** (Clifton and Handy 2001)- Methods such as focus groups, interviews, and participant-observer techniques can be used in conjunction with quantitative approaches or on their own to fill the gaps left by quantitative techniques. Some of the most interesting research in travel behavior in recent years has made use of qualitative methods of one sort or another.

**Social networks, mobility biographies, and travel: survey challenges** (Axhausen 2008)- Social network membership and biography shape a person's mental map and social network geography, and thus should influence his or her travel behavior. This paper discusses what content needs to be added to the current set of questions asked in travel behavior surveys if we want to capture those concepts.

G. **Variability in Travel Behavior**

1. **The Distributions of day to day variability in travel times on urban roads – some empirical evidence** (Susilawati, Taylor et al. 2010) Study of travel time variability on commuter routes. What they did: studied 5 routes, day by day observations by a given traveler, using GPS, and journeys starting same time each day. Findings:
Longitudinal data, fitting specific distributions to travel time variability; Explicit definitions of reliability metrics; Need to determine ranges of values for the Burr parameters c, k and links—observed bimodalityon some (short) links.

2. The Significance and Measurement of Variability in Travel Behavior - (Jones and Clarke 1988) Drawing on recent studies in the UK and Australia, in conjunction with a review of the literature, the paper first examines the policy and analytical rationale for using multi-day data, then illustrates different ways of measuring variability, and finally discusses issues relating to the collection of suitable data for such analyses. Three measures of variability are presented: a graphical form showing daily differences in behaviour at the individual level; an aggregate, similarity index; and a hybrid graphical/numerical measure, which provides new insights into variability in daily patterns of behaviour. The paper raises a number of issues for debate, probably the most crucial of which is: variability in what? The way in which behaviour is measured can crucially affect conception of stability and variability.

3. Measurement Issues in Identifying Variability in Travel Behavior - (Schlich 2001) This paper addresses the question how the similarity and variability of travel behavior can be measured adequately, methods to calculate similarity and their advantages/disadvantages; and how the measured variability changes with different length of the reporting periods.

4. Systematic Variability in Repetitious Travel - (Hanson and Huff 1988) The focus of this paper is the degree to which day-to-day variability in the individual's travel pattern has a systematic, or nonrandom, component. The authors reviewed the different sources of variability in travel, emphasizing the difference between-individual and within-individual variation and the implications of this difference for travel analysis. The analysis focuses on two questions: - How well does observation over one week capture longer-term (five-week) travel behavior; in other words, is behavior highly repetitive from week to week? - How systematic is within-individual variability; in other words, are certain stops distributed over the five-week record in a nonrandom, that is either regular or clustered, fashion? The results suggest that behavior does not follow a weekly cycle closely enough for a one-week travel record to measure the longer-term frequency with which the individual makes certain stops or to assess the level of day-to-day variation present in the individual's record.

5. Measuring Day-to-Day Variability in Travel Behavior Using GPS Data - (Pendyala 1999) The specific objectives of the research project were to: explore day-to-day variability in travel behavior with respect to selected variables such as trip chaining, departure time, trip frequency, and path selection; Compare day-to-day variability found in the GPS-based data set against that reported in the literature to assess the potential benefits and pitfalls associated with using a GPS-based data collection methodology.
Endnotes


Kruger National Park, South Africa.


Moons, E. and G. Wets "Setting up a Continuous Panel for Collecting Travelling Information: Discussion on Methodological Issues." Transportation Research Institute.


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