An examination of household travel behaviour survey methods that incorporate stated choice experiments

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Abstract
Using surveys for primary data collection on travel behaviour can provide valuable in-depth information, often lacking in secondary aggregate data sets. Stated preference experiments within such surveys provide an opportunity to explore user priorities when choosing between travel options. In the discrete choice modelling process, the experiment data can be segmented through individual socio-demographic and preference data, including revealed choices and attitudes.

This paper considers three methods used in a series of travel behaviour surveys: 'call and post' (survey staff called on a household with a questionnaire, asking them to complete the questionnaire, and post it back at their own convenience using an enclosed pre-paid return envelope), postal (also with prepaid return envelope) and internet surveys. It examines the methods from four United Kingdom and one United States household travel behaviour surveys; all incorporate stated choice experiments and have sufficient data to segment response. They represent a natural progression of travel behaviour surveys over time, undertaken by the same research team. The five survey data sets can be summarised as:

1. 'Call and collect' non-motorised mode travel behaviour household survey in West Edinburgh: 997 respondents, Summer 2003. It included two stated choice experiments, on the propensity to walk (for a short trip) and the propensity to cycle (for the journey to work).
3. Postal air travel household survey across five East Midlands local authorities: 603 respondents, Autumn 2007 / Spring 2008. It included two stated choice experiments, on flight choice and airport choice.
4. Internet air travel household survey across the East Midlands: 508 respondents, Spring 2008. It included a stated choice experiment on flight choice.
5. Internet air travel household survey across the 'East Coast' United States: 504 respondents, Summer 2008. It included a stated choice experiment on airport choice.

Understanding the ability of each method to achieve representativeness of the intended survey population is crucial to the validity of subsequent analysis and modelling.

As a data collection technique, self-completion postal questionnaire surveys do not involve high personnel travel costs, but can prove difficult to attain a representative sample, due to low response rates (typically 10% - 20% from the surveys in this review). The first travel behaviour survey, examining propensity to walk and cycle in West Edinburgh, achieved a reasonable response rate (33% of those delivered or posted through letter-boxes) by calling on households. Response rates from this survey were lower in high-density housing sub-areas, characterised by multiple flats accessed via a single main entrance (due to difficulties in accessing the stair entrance, and that residents in flats are more likely to be out at the time of call) and those with higher levels of deprivation. Lower response rates from sample sub-areas in the two East Midlands postal surveys can also linked to high levels of deprivation. The problem with low response rates is not the proportion of non-respondents, rather the resultant bias. To reduce bias, the resultant sample can be statistically weighted and/or the survey can be boosted (all or
selected sub-areas). Both of these techniques have been used across the three surveys using either the 'call and post' or the postal methods.

The 'call and post' and postal surveys used a combination of random and clustered sampling techniques. To determine sub-areas to sample for the three surveys, one household was randomly selected from the Electoral Register; the sample was generated by sampling residents in close proximity to the selected household.

Internet surveys are an effective way to get responses from a geographically diverse population, and were used in the two most recent surveys of the five reviewed. In both cases, respondents from an online panel accepted an invitation to complete the air travel behaviour surveys. Therefore, response is less likely to be restricted to individuals with a predetermined interest in the topic. Response rates were higher in internet-based surveys than postal methods, and quotas were incorporated to ensure that response is broadly representative of the region. For instance, in the East Midlands internet air travel behaviour survey the following quotas were set: gender, age, socio-economic group and sub-area. A disadvantage with internet surveys is that they are restricted by internet access and willingness to join an on-line panel; one concern is that respondents tend to be 'professional survey fillers'. A higher proportion of internet respondents tend to be female and younger, as shown with the East Midlands internet survey.

Despite the different travel behaviour applications, the survey questionnaires contained similar variables. Such variables concern socio-economic data (e.g. age, gender, children present in household), background transport and travel data (e.g. car availability), travel behaviour data specific to the transport mode in question (e.g. number of cycling journeys the previous week, return flights made the previous year), and attitudinal statements. Stated preference techniques were incorporated in all surveys to determine travel behaviour trade-offs for the transport mode in question were also included in the questionnaire. The merits of using internet surveys for stated preference experiments is discussed from experience across the five surveys; on-line experiments offer more opportunities, particularly in terms of being able to adapt the experiment to the respondent.

The types of individuals that respond and the quality of their responses across all five data sets are reviewed; the data is also compared with available aggregate secondary data (e.g. Scottish Household Survey, United Kingdom 2001 Census). The issues of respondent burden and resources available are also considered.

The implications for the collection of future travel behaviour information using disaggregate household surveys are discussed. This includes methods such as telephone surveys and hall tests (interviewers on-street recruit individuals into a hall to complete the survey), and the latest technologies, such as the incorporation of personal digital assistants (PDA) to travel behaviour surveys.