



Time use in travel surveys and time use surveys – Two sides of the same coin?



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ABSTRACT

An in-depth understanding of travel behaviour determinants, including the relationship to non-travel activities, is the foundation for modelling and policy making. National Travel Surveys (NTS) and time use surveys (TUS) are two major data sources for travel behaviour and activity participation. The aim of this paper is to systematically compare both survey types regarding travel activities and non-travel activities. The analyses are based on the German National Travel Survey and the German National Time Use Survey from 2002.

The number of trips and daily travel time for mobile respondents were computed as the main travel estimates. The number of trips per person is higher in the German TUS when changes in location without a trip are included. Location changes without a trip are consecutive non-trip activities with different locations but without a trip in-between. The daily travel time is consistently higher in the German TUS. The main reason for this difference is the 10-min interval used. Differences in travel estimates between the German TUS and NTS result from several interaction effects. Activity time in NTS is comparable with TUS for subsistence activities.

Our analyses confirm that both survey types have advantages and disadvantages. TUS provide reliable travel estimates. The number of trips even seems preferable to NTS if missed trips are properly identified and considered. Daily travel times are somewhat exaggerated due to the 10-min interval. The fixed time interval is the most important limitation of TUS data. The result is that trip times in TUS do not represent actual trip times very well and should be treated with caution.

We can use NTS activity data for subsistence activities between the first trip and the last trip. This can potentially benefit activity-based approaches since most activities before the first trip and after the last trip are typical home-based activities which are rarely substituted by out-of-home activities.

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1. Introduction

Activity-based approaches are considered by most researchers as state-of-the-art in transport modelling and travel behaviour analysis. They are regarded superior over trip-based approaches because they conceptualise travel as an activity within

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an individual's daily activity schedule which creates the demand for that travel. Several research topics have evolved from that. These enhance our understanding of the complexity of travel behaviour determinants in the context of daily activity patterns, for example, in-home/out-of-home activity substitution (Aguilera et al., 2012), household interactions (Ettema and van der Lippe, 2009), joint activity participation (Kang and Scott, 2010), activity types (Kemperman et al., 2006; Akar et al., 2011) or on parallel activities (Jain and Lyons, 2008).

Activity based approaches require information on trips and activities at all locations carried out by individuals over the course of a day (Bhat and Koppelman, 2003; Kemperman et al., 2006). National Travel Surveys (NTS) and National Time Use Surveys (TUS) are two major data sources for research on time use and activities in transport (Zumkeller et al., 2008). Travel surveys provide detailed information about trips but only limited knowledge about activities. We can only infer from the trip purpose what the subsequent activity type is. We do not know the activities before the first and after the last trip and we have no information about the activities of a person who does not make a trip on the diary day. Advantages of NTS are their clear focus on the movement of travellers and related information including trip stages and their respective modes; trip distances; the spatial context; the weather on the diary day; and the availability of mobility tools both in general and on the diary day itself.

Time use surveys, on the other hand, provide detailed information about the type and location of any activity throughout the entire day. Typical categories for locations are “home”, “work place”, “school”, “other person's home”, “restaurant”, “hotel”, and “holiday home”. These are typically recorded without geocoding. The 10-min interval commonly used provides only a rough grid for analysing short trips, but gives a comprehensive picture of trips and activities (Gerike et al., 2013; Hubert et al., 2008). Time use surveys should provide a more comprehensive assessment of travel as there is no reason to underreport travel by claiming not to have left home or by omitting individual trips or tours (Gerike et al., 2013; Hubert et al., 2008; van Wee et al., 2006).

Detailed knowledge about the advantages and disadvantages of both survey methods makes it easier to assess their suitability for different types of analyses. It is also needed in order to properly pool NTS and TUS data (e.g. Nakamya et al., 2008; Ironmonger and Norman, 2006) or to develop adapted travel time use diaries (e.g. Gehlert et al., 2012). Previous research concludes that time use data generate more travel particularly with regards to travel time (e.g. Stopher, 1992; Harvey, 2003; Hubert et al., 2008). Other studies have found similar aggregate travel estimates for TUS and NTS (e.g. Bose and Sharp, 2005; Richardson, 2007; Yennamani and Srinivasan, 2008), but differences in disaggregate mobility indicators, for example, number of trips per trip purpose (Ironmonger and Norman, 2006), per travel mode (Bose and Sharp, 2005) or per socio-demographic segments (Yennamani and Srinivasan, 2008).

This paper compares TUS and NTS using a systematic descriptive and model-based approach which includes both trips and non-trip activities (called activities in this paper). Three research questions guided our analyses:

1. Are there differences in travel estimates between TUS and NTS?

Travel estimates, except distance, can be computed for TUS and NTS. Therefore, we compared TUS and NTS in terms of the number of trips, daily travel time and their determinants.

2. What can we learn from NTS about activities?

Activities for respondents with at least two trips were computed for NTS and compared with activities in TUS between the first and the last trip.

3. What is missing in NTS?

NTS neither record activities before the first trip or after the last trip for respondents with at least two trips nor activities for respondents with one or zero trips. We analysed activities in TUS to answer this research question.

Our analyses are based on the German national time-use survey and the German national transport survey ‘Mobility in Germany’ (MiD), both from 2002. Thus, our comparison was not affected by a time gap between TUS and NTS. In order to compare activity patterns in the two surveys we converted the NTS into a time-use format and developed a common coding scheme for the activity types. As a result, both surveys are available in NTS and TUS format.

In the next section, we conduct a review of the literature which compares TUS and NTS. Following this, in Section Three, we describe the two surveys used in this paper, the data processing and sample formation. The results are presented along the three research questions above. Research question one is addressed in Section Four with separate subsections analysing travel estimates and location changes without a trip. Section Five presents the analyses for research questions two and three. Section Six provides a conclusion and a discussion on the limitations of our work with suggestions for further research.

2. Literature review

Previous comparisons of NTS and TUS have focused on travel estimates such as immobility, travel time and number of trips. They have focused on the question of how well time use surveys represent travel. The underlying hypothesis is that activity-based diaries are more intuitive as they put travel in the context of the daily schedule. As a result, respondents should be better able to recall trips and be less susceptible to soft refusal. This should result in a higher level of travel estimates in TUS compared to NTS (Pendyala, 2003). In the following, we review the literature on TUS/NTS comparisons regarding travel time and number of trips. For comparisons regarding immobility see Madre et al. (2007), Hubert et al. (2008) or Gerike et al. (2013).

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