Survey issues in long-distance travel

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Abstract

Travel behaviour surveys have to win and then maintain the cooperation of respondents from the first to the last contact with them. While not excessively demanding, they do require respondents to engage in a task with a highly variable response burden. This is due to the varying number of journeys undertaken during the reporting period. For long distance travel this can range from zero to dozens of journeys in a typical eight week reporting period. The details about each journey are also substantial (duration, timing, mode, costs, (route) of each stage, i.e. vehicle used), so that respondents have to be conscientious. The specific challenge of long-distance travel surveys is therefore to find a balance between the need to capture the correct number of all such journeys, while obtaining detailed information for at least some of them.

In the Framework of the KITE Project (A Knowledge Base for Intermodal Passenger Travel in Europe) a new survey methodology based on the MEST (Methods for European Surveys of Travel Behaviour) and INVERMO (Intermodale Vernetzung) approaches has been developed which contains a journey roster with basic descriptions of long distance journeys and a stage form for the detailed information about the last previous three long distance journeys.

The paper will discuss the problems of long-distance travel surveys in general, with examples from recent studies, and show a possible solution to overcome these problems.

Keywords

Travel behaviour survey – long-distance travel

1. Introduction

This paper describes the problems of long-distance surveys in general and a methodological approach to overcome these problems.

First, available sources of long-distance travel data are presented. In a following step general survey problems and their implications on long-distance travel surveys are discussed. Different examples from previous studies are presented to point at the issues. Based on the experiences of earlier surveys a methodology is drawn which tries to overcome these problems by mixing different elements which are needed to measure and understand long-distance travel behaviour in a balanced way.

1.1 Long-Distance Travel Data

This section gives a brief overview of the different long-distance travel surveys and data available. Further it describes the different problems in producing comparable statistics with long-distance travel surveys for different needs e.g. transportation planning or tourism. In case of transport policies this would be imperative cost considerations in the process of coordination of the existing transport facilities and the planning of new ones, thus information about travel costs, prices of competitive modes and reasons for mode choice are absolutely required. In the context of transport planning, information about trip costs are more useful if they provide insight into the costs' structure, such as vehicle operating costs, user charges, taxes and tolls. But long distance travel data is also especially needed for tourism policies, energy policies or environmental policies.

Data sources of long-distance travel can be divided into three groups:

- Surveys of daily mobility,
- surveys of daily mobility with elements dedicated to long distance mobility
- and surveys exclusively dedicated to long distance travel.

Long-distance travel is only in rare cases a part of daily mobility (e.g. salesmen, ambassadors or bagmen). Therefore, the movements reported in surveys of daily mobility are rare events (in the case of the 1995 *American Travel Survey* 4.0 journeys/year over 100 miles, about one percent of

all journeys[1] fall into this category. (BTS, 1997)). However national travel surveys (NTS) dedicated to daily mobility are the only way of measuring long-distance travel in many European countries (e.g. in Denmark, Greece or Netherlands). The problem in these surveys is the difficulty of obtaining representative statistics of long distance travel even with a relatively big sample. Therefore in most national travel surveys today elements are dedicated to long distance travel with the exceptions mentioned above. The most common format in these surveys is that respondents are asked to report their long-distance journeys in addition to their mobility on a given day with the reporting period for long-distance travel being longer (e.g. Great Britain NTS (2002-2004), French NTS (1993-1994), Swiss Microcensus on Travel Behavior (2005), and Swedish RES (2005/2006)). A further but less frequent source of data for long distance travel are surveys exclusively dedicated to long-distance travel. A small number of such surveys exists and are chronically listed in Table 1.

Table 1 Surveys exclusively dedicated to long distance travel

Survey	Year/ Date	Focus	Background
MEST/TEST	1996-1997	Transportation planning	Generation of harmonised data on the European level for transportation planning decisions
INVERMO	1999-2002	Transportation planning	Generation of harmonised data on the German national level for transportation planning decisions
DATELINE	2001-2002	Transportation planning	Generation of harmonised data on the European level for transportation planning decisions
European Tourism Demand Statistic	Continuously ongoing	Tourism	Generation of harmonised data on the European level for monitoring tourism as an instrument of development and socioeconomic integration
European / World Travel monitor	Continuously ongoing	Tourism	Generation of harmonised data on the world wide level as a basic tool for commercial marketing decisions in tourism

[1] Stage: a continuous movement with one mode/means of transport; trip: a sequence of stages between two activities; tour: a sequence of trips starting and ending at the same location; journey: a tour starting and ending at the current base (e.g. home)

Whereas the first three surveys in Table 1 are focusing on long distance travel, the other surveys are dedicated to tourism. These two different fields have many data needs in common, such as destination choices or trip frequencies, but also differences like method of booking for tourism or route choice for transportation planning. These different needs lead to different definitions, survey items and survey designs. But also within the same focus the collected and obtained data in these surveys differs highly. The reason for these differentiations is discussed in the following sections.

2. General Problems in Long-Distance Travel Surveys

The core of the design problems for long-distance travel surveys is their very limitation to journeys with a minimum distance or duration. The movements to be reported are rare events requiring long reporting periods to increase the chance that the respondent can report at least one journey and that the contact is not wasted in terms of capturing information about travel. Counterbalancing this is the problem of recalling events, which might have happened weeks ago, in some detail, which limits the reporting period to a range of four to eight (twelve) weeks, given the relatively low salience of routine long-distance travel for many above average frequency travellers (Armoogum and Madre, 1997).

To point out the effects of different limitations of journeys captured in a survey and the counterbalancing of recalling for the respondents and level of details requested, a short comparison between different data sources for long-distance travel is made. This consists of data from a NTS with elements dedicated to long-distance travel: the Swiss MC, Dateline dataset which is a household-level survey of 86'000 residents of EU 15 and Switzerland about their long-distance travel, the INVERMO survey in Germany focusing on long distance travel carried out on the national level independent from a regular national travel survey as a panel survey, and the German MiD (Mobilität in Deutschland). Table 2 presents the basic figures of theses four different data sources.

The long-distance data in the Swiss Microcensus (Swiss MC) are only published by its definitions in the questionnaire which are either journeys with overnight stays or excursions of three hours or more. In both cases the numbers are higher than in Dateline, but only the number of journeys with overnight stays can be compared. The data from Dateline and the German Surveys MiD and INVERMO are better comparable and here it shows quite clearly, that Dateline produces much less number of journeys than the MiD or INVERMO. The MiD and INVERMO are otherwise much more equal if we consider, that a journey consist at least of one outward and return trip, which would mean that the MiD data consist of >6 journeys with more than 100 km reported distance per person and year compared to 8 journeys in INVERMO and 3 with more than 100 km crow-fly distance in Dateline. According the resulting modal split of the different surveys Dateline produces similar figures compared to Swiss MC. In comparison with the Dateline German MiD and INVERMO show again differing figures in the share of car travel (-16% and -9%), air travel (+14% and +7%), while differences between MiD and INVERMO are much lower.

Table 2 Comparison of long distance journeys per person and year and modal split

	INVERMO	German MiD	Dateline		Swiss MC	
Definition of long-distance travel			GER	CH	Excursions	Overnight journeys
Journeys > 100 km reported distance per person and year (without commuting)	8					
Trips > 100 km reported distance per person and year (without commuting)		14				
Journeys > 100 km "crow-fly" distance per person and year (without commuting)			3	2		
Journeys with overnight stays				2		3
Excursions of three hours or more (including time spent at destination) per person and year					10	
Modal Split [%]						
on Foot, Bicycle	-	-	-	0	5	-
Car	74	81	65	54	68	55
Bus	5	4	6	5	-	3
Train	11	11	12	21	-	20
Air	8	1	15	20	-	18
Ship	0	1	0	0	-	-
Public Transport Total	24	17	33	46	24	41
Other	2	3	2	0	3	4

The large differences in the number of long-distance journeys and the modal split have different reasons. The major reasons leading to theses different figures have their origin in the survey design which will be discussed in a more detailed way in the following sections. These reasons (e.g. differences in coverage, sampling, recruitment or contents) are subdivided in three main

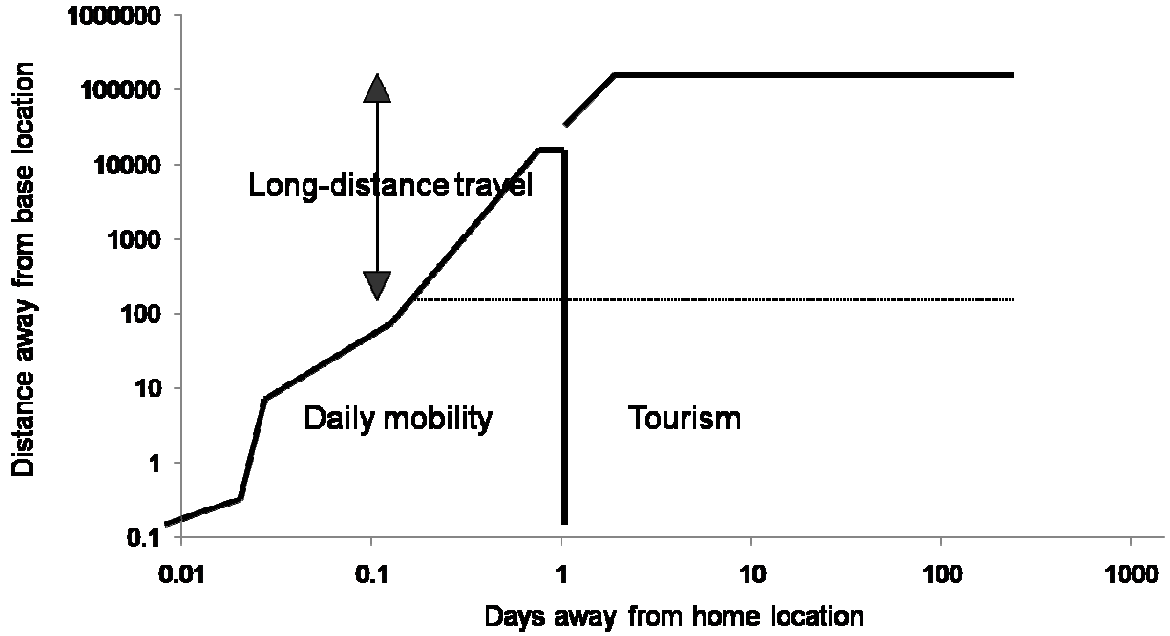
types of problems which occur especially in surveys about long-distance travel. These three main issues are: Definitions, recall problems and fatigue effects.

2.1 Long-Distance Travel Definitions

In surveys of daily mobility certain questions do not need to be asked (Richardson, Ampt and Meyburg, 1995) as they are either self-evident or widely agreed. In particular the study objective is clear: the capture of all movements of the respondents for a day, excluding only movements within large facilities, such as shopping precincts or factories. Even this basic question is open to discussions in the case of long-distance travel. Because of the division between movements relevant to long-distance travel and the related decision making and the irrelevant local movements needs to be defined, as it is impossible to ask the respondents to report all movements undertaken during a multi-day long-distance trip (See Axhausen, 1996 for a more thorough discussion).

The difficulty in designing is to avoid complex definitions and to find a natural description, which invites the respondents to report all relevant movements, by minimising the difference between the reported movements and those which should have been reported. As mentioned in section 1.1 there are mainly two different focuses in long distance travel surveys which leads to two different perceptions on a long-distance travel definition. Figure 1 shows these two possible perception views on long-distance travel as a schematic overview. On one hand it is possible to differentiate long-distance travel from daily mobility by the duration of being away from home; on the other hand it is possible to define it by a minimal distance travelled from a certain base location. Whereas the duration of a stay is mainly in focus when looking at tourism where the data need is needed for supply and marketing decisions, the duration of stay is not crucial for transport planning, where the data need is more focused on route/mode choices which are determined by distance.

Figure 1 Long-distance travel definition



Source: Adapted from Axhausen, 1996

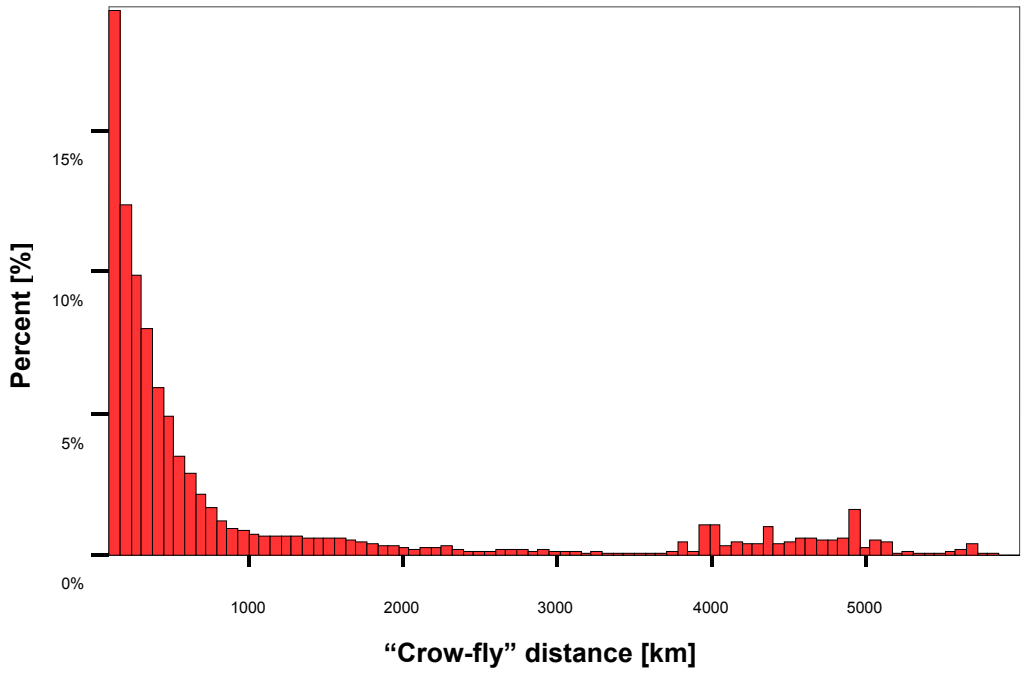
While the decision of using distance as a borderline from daily mobility is widely accepted in transport planning long-distance surveys, the exact dimension and type (crow-fly or network distance) of distance were never harmonized and vary from country to country.

Table 3 Definitions in different long-distance travel surveys

Definition	Survey
Excursions of three hours or more (including time spent at destination) per person and year	Microcensus Switzerland
Trips > 20 km	Italy NTS
Trips > 50 miles	UK NTS; US NTS
Trips > 80 km crow-fly distance	France NTS 1993/1994
Journeys > 100 km crow-fly distance to the destination	Dateline
Journeys with at least one overnight stay	European Tourism Demand Statistic MiD (Germany); Microcensus Switzerland

Whereas the definitions for long-distance travel differs, also the distance used itself is not defined in some cases. Table 3 shows, that in Italy, UK and US NTS reported distance over a certain level is used to define long-distance travel. Reported distances have been analyzed in Chalasani et al. (2004) where it has stated, that reported distance differs by the used mode of transport but is rather used as network distance than as crow-fly distance. The proportion of network distance and crow-fly distance again depends strongly on the topography etc. of the studied country or region. If we consider the strongly exponential distribution of long-distance journeys (see Figure 2) it is clear that small changes of the limitation of long-distance travel have big effects on the basic figures of long-distance travel.

Figure 2 Distance distribution of journeys in Dateline



A further problem in defining long-distance travel is the lack of defining journeys. For example, in the Dateline survey a journey is a roundtrip which starts and ends only at home location. If a journey starts and ends at home, but during this journey from a fixed base location a second journey is made, this second journey is not accounted for in the Dateline data. This would also be the case if we ask respondents about their entire trips as opposed to reporting each destination (maybe this is what you mean?).

All these different definitions of long distance travel in surveys lead to less comparable data and to incomparable numbers of reported long-distance journeys/trips. Beside other problems this is a source for biases. Therefore the difficulty for the design is to avoid complex discussions of definitions and to find a neutral description, which invites the respondent to report the relevant movements, while minimising the differences between those reported and those which should have been reported.

2.2 Recall problems

As in chapter 2.1 the problem of definitions in long-distance surveys was discussed a further implication of this discussion occurs: Recall problems. As long-distance travel are rare events it is indispensable to have a relatively long duration of reporting period.

The duration of the reporting period interacts as a design variable with the basic unit of the reporting chosen (i.e. stage, trips or journey) and therefore the level of detail which implies a certain recall burden for the respondent. The wish of the analyst for detail has to be traded off against the response burden and recall difficulty of stages or even trips undertaken some time ago. A four week reporting period might be compatible with stages while a twelve week reporting period only with journeys.

In postal questionnaires this issue is compounded by the issue of the "standard" trip or journey to provide for: a simple out-and-return journey or a complex trip involving multiple stages. A paper form cannot accommodate certain levels of complexity in a self-completion context, which limits the possibility to choose a base unit and to define it. Related to this is the question of how frequent travellers or repeated trips can be supported. In the first case, one would like to reduce the response burden by either simplifying the task or by reducing the reporting period.

Long reporting periods occurs usually in surveys of long-distance travel, and one way to avoid the recall problems is to make the survey prospective, i.e. to inform the respondent before the reporting period starts that he or she will be asked to participate in a survey of that period. In surveys of daily mobility, it is typical to send the survey form the day before and ask the respondents to fill out the form the following day. This has been shown to substantially increase the number of movements reported and the related detail in comparison with retrospective surveys, where the respondent is approached "cold" and asked to recall the last day or a period ending with the day of contact. This method was used in INVERMO and worked quite well based on our comparison.

In long-distance surveys the long reporting period reduces the advantage by asking the respondent to commit an unknown amount of time to the survey task, as the respondent cannot

know exactly how much he/she will travel in advance. This uncertainty in comparison with a retrospective survey, for which the respondent can assess the workload, seems to reduce the response rate (Axhausen, Köll, Bader and Herry, 1997). Still, those who do respond provide more and better quality data. A further problem with prospective surveys is that they need huge support expenses as Axhausen and Youssefzadeh (2003) has shown. The respondents will not fill in a questionnaire over a longer period autonomous without fatigue. Therefore a lot of remainders and motivation calls are needed. Otherwise the respondents may just fill in the questionnaire at the end of the period if they haven't lost it.

A too long reporting period in long-distance surveys leads to a lack of details and information. In the case of Dateline which exhibits much lower journey rates (journeys/person/year) than national long-distance travel surveys have shown (Table 2), individuals reported travel of over 100 km crow-fly distance for the purposes of "holiday" in the previous 12 months, as well as "other private" and "business" in the previous 3 months, and "commuting" for the previous 4 weeks. These reporting periods seems to be too long if we compare them to other retrospective surveys with a reporting period of 8 weeks like the German MiD which produces similar figures compared with INVERMO.

2.3 Fatigue effects

A relatively long reporting period for surveying a rare event creates a further problem of fatigue effects. For example, Last, Manz, Zumkeller (2003) found that half of the population in their sample produced over 90% of the long-distance journeys. But the most mobile one percent of the population made long-distance journeys ten times more frequently than the national average. This causes highly skewed distributions of travel frequency. The response burden distribution in long-distance travel surveys is therefore also highly skewed in contrast to daily mobility surveys. To avoid the tedium of repeating the description of very similar movements for frequent travelers one could offer shortcuts. Since both things can be achieved in CATI/CAPI contexts, they are not as easily employed on paper forms without inviting other respondents to use these short-cuts. In addition, one is interested in the details of those journeys by frequent travellers, if one has doubts about the identity of those repeated journeys.

The same questions reoccur when looking at the design of the question sets for each reporting unit: number of items, complexity of the items, complexity of the available precoded answers. The designer has to trade-off desired detail against respondent boredom and response burden. This issue interacts with the design of the questions on the page, where multiple units on each page save postage and reduce the footprint of the forms, while equally generating the impression of complexity through the busyness of the page.

This brief discussion has highlighted the special difficulties inherent in conducting surveys of long-distance travel, where the complexity of the subject, the resulting response burdens and the data needs have to be balanced, so that valid and useful data at a reasonable cost are obtained.

2.4 A short note on the survey protocol

In a European survey the survey protocol has to allow for very different attitudes and experiences with surveys across Europe, as well as for the different legal requirement and limitations. It is clear from the experiences that a protocol based on a single method of approach and retrieval, such as postal, telephone or personal, will not work. The protocol will have to mix these methods to combine their strengths in reaching and motivating different groups of potential respondents. Telephone can be used to motivate respondents, as well as to retrieve information from persons unable/unwilling to read and write or which have language difficulties. Written forms allow the respondents to work at their leisure and to reach persons, who do not answer the phone or are seldom at home. Personal interviews can be used for those requiring or preferring the personal presence of an interviewer to support the respondents.

The disadvantage of a mixed mode survey is that it is unclear, whether the data can be combined without special treatment, as it is currently done. The experiences with combining *stated preference* and *revealed preference* data in the modelling of choices has shown (Hensher and Bradley, 1993) that at least the different variance structures have to be incorporated into the model formulation. Equivalent models have not yet been developed for travel data resulting from travel diary surveys.

3. Survey Methodology in KITE

Considering the results of previous survey work, especially the INVERMO project, the MEST project and the project DATELINE, a survey methodology has been developed to overcome the problems in long-distance surveys described in chapter 2.

3.1 Project Overview and Contribution

The survey methodology here presented was developed within the work package 3 of the KITE project "A Knowledge base for Intermodal passenger Travel in Europe". It aims to develop a suitable survey methodology that intends to close remaining informational gaps about intermodal and long distance travel behaviour. This work is funded by the European Union 7th Framework programme.

The development of the methodology includes pilot surveys that will be carried out in Switzerland, the Czech Republic and Portugal.

3.2 Definitions used in the KITE Survey

One of the major problems in analysing the data of previous long-distance travel surveys were the dimensions and definitions used which are not comparable or do lack in accuracy. The dimensions of the survey methodology effect data quality and the different response behaviours. As learned from earlier work done, they have been fixed as follows. A short explanation and summary of the findings in chapter 2 is given to every dimension and definition.

Survey object All stages of journeys, involving at least one destination further than 75 km from the current base of the respondent.

A stage is a continuous movement with one mode or vehicle, including any incidental waiting periods.

One of the major problems in having different surveys all over Europe is that different definitions of long-distance travel are used. The relative low cut at 75 km and leaving it open if this is network or crow-fly distance, allows us the possibility to fix the cut-off points afterwards by adding the geocodes and calculating the distances afterwards, instead of letting the respondents decide what kind of distance they use or defining it in a different way than

their "mental map" (Chalasani et al., 2004).

Reporting period 8 weeks

MEST specifically tested different reporting periods. They found that 8 weeks is an appropriate duration to obtain enough long distance journeys as well as a timeframe that is remembered well enough by people to give accurate information. A similar result can be optained in the German MiD.

Approach stage-based (i.e. movements with one mode); with some journey level questions (i.e. regarding the whole movement from home back home)

The survey object is set on stage level. This is very detailed, but affordable because of the project goal which is to get information about intermodal passenger travel. Therfore there is a need to have detailed information about every mode used. As a stage is defined as a movement with one mode this level of detail is used.

Temporal direction retrospective

As it has been observed in earlier travel diaries (Axhausen and Youssefzadeh, 2004), that respondents tend not to fill in the diaries during the reporting period without expensive and costly support, but will do it at its end, i.e. in retrospective way.

Destination area municipality or urban area

The destinations will be coded at this relatively low level. No precise street addresses will be collected, because the respondents typically have a low geographical knowledge about their destinations in long-distance travel, e.g. zip code.

Reference location any destination, where the respondent stays for longer than one consecutive night

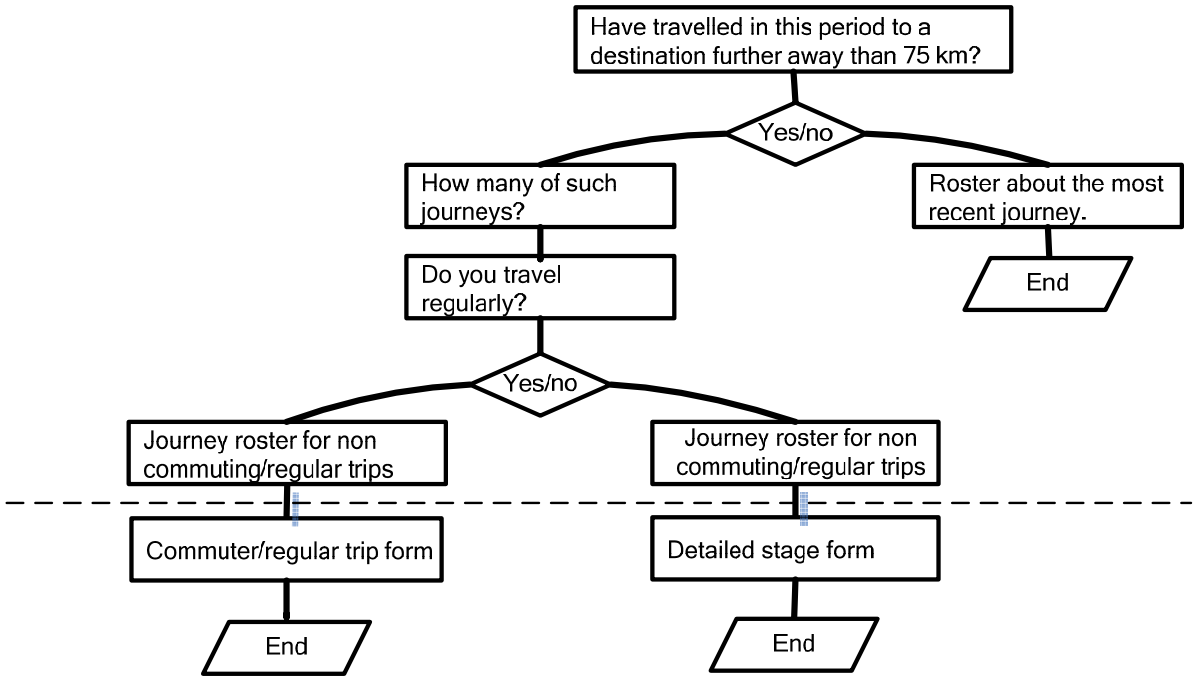
To include not only journeys from home to home, in many previous questionnaires different definitions were used for the reference location. This rather complicated definition will be needed only in rare cases, but can avoid biases caused, for example, by journeys starting and ending at a second home location etc.

3.3 Survey protocol

In addition to the normal household data, person data and travel diary in the survey, a protocol of three parts is used.

From the conclusion in chapter 2 and the given definitions in chapter 3.2 there is a conflict in balancing the analysts' wish for high level detail data and the response and recall burden. The chosen relatively long reporting period disagrees with the need of capturing stages and the low cut of 75 km as a definition of long-distance travel, because of fatigue effects. To avoid this imbalance, two arrangements from the MEST and the INVERMO survey are implemented into the survey protocol. First screening by CATI is implemented to screen the relevant respondents and filter frequent long-distance travellers to help the respondent to abbreviate the description of repeated journeys. Second a journey roster is applied which obtains the basics of the undertaken journeys during the reporting period, such as started/ended, date of departure/return, destination, main mode, main purpose and size of party. The detailed stage description then follows for the most recent maximum three journeys. In addition to avoid repeated questions for frequent long-distance travellers to lower their response burden a special commuter/regular trip questionnaire asks only for one of these repetitive journeys. This gives the advantage to reduce the jump off rate of this very important segment of travellers in the survey. The logic of the protocol is graphically presented in Figure 3.

Figure 3 Logic of the protocol



4. Conclusion and Future Work

The comparison of different long-distance travel surveys has shown the need for a careful definition of the scope of a long-distance travel survey and its design. Different definitions and survey concepts were discussed and these could be put together in different variations. The final choice of mixing the different possibilities depends on the aim of the survey. But in the end it is always important that the chosen concept is consistent and allows the researcher to reconstruct the relevant movements.

The presented survey design has its specifications as a survey to conduct intermodal information. Therefore the level of detail for the capturing of movements is already given as stages. To bring the level of detail in balance with acceptable response burden and boredom and a sufficient reporting period, the concept uses a journey roster and a screening methodology.

The results from the pilot survey will demonstrate whether the presented concept succeeds. The field work started at the beginning of October and will end at the beginning of January. The survey is being conducted in the Czech Republic, Portugal and Switzerland with an equal sized sample of 1255 respondents. It has to be noted, that long-distance travel has also strong seasonal influences and should therefore be collected during a whole year for the main study. After the field work the collected data will be enriched with a route and mode choice set.

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