# PILOT-STUDY FOR A NATIONAL TRAVEL SURVEY IN BELGIUM

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## Abstract

This paper describes the development and pilot-testing of different survey methods and the survey material for a nation-wide travel survey in Belgium. Two methods were tested, on a sample of 800 households: a mail survey with telephone support and a telephone survey with mail support. Furthermore, two types of diary for the collection of travel information were tested: a conventional trip-based diary, and an activity-based diary. Face-to-face non-coverage and non-response interviews, and telephonic validation interviews were carried out as well, to allow a better comparison of the different options tested. The different survey protocols and questionnaires are described. The first results showed no major significant differences in response rates for the different survey methods and the different types of diary tested. Further results, among which a detailed analysis of the response rates and of the quality of the data collected with the different survey methods and diaries, will be reported later.

## 1 INTRODUCTION

It is generally recognised today, also in Belgium, that transport policies can no longer be oriented solely towards the provision of more infrastructure. It is becoming more and more important to curb the increasing demand of mobility (Owens, 1995*)*. To be able to do that in an efficient and acceptable way, this demand has to be understood as well as possible. One widely used way to obtain mobility (related) information is via a travel survey. A number of western European countries, as well as the USA, have had nation-wide travel surveys for several years to support the analysis of the evolution of passenger transport in their country. This is not true of Belgium, where crucial and up-to-date information about the mobility of its inhabitants is lacking (Vansevenant, 1996). The only relevant national survey in this domain was a more general 'Energy Survey' held in 1986-1987 (Cornélis and Toint, 1994). More recently (1994-1995) there was a specific travel behaviour survey, but it only covered the Flemish region, the northern part of the country (Hajnal and Miermans, 1996). In recent years this lack of information for Belgium has become even more noticeable as more and more activities are being co-ordinated on a European Union level. Thus, awareness is growing in the country that a consorted national effort is necessary to meet the urgent and growing demand for data from the different organisations, research teams, companies and governmental services involved in transportation and related fields such as urban and land use planning, environmental sciences and road safety.

A national travel survey is a large and costly operation and should be prepared carefully, all the more because there are no standard formulas for such surveys, evidence of which are the European projects (MEST and TEST, 4$^{th}$ Framework, DG VII), international conferences (e.g. Oxford 1996 and Grainau 1997) and various publications (e.g. Richardson *et al*, 1995) entirely dedicated to doing travel surveys. A pilot study was therefore deemed necessary to determine the best survey method, to develop the survey material, and to prepare the methodological and computing framework to support a full-scale nation-wide travel survey. Since there is virtually no experience present in Belgium with surveys of this kind, it was thought advisable to develop and try out such a framework on beforehand, to acquire at least some insight in what the optimal design of that framework might be in this particular context.

It was determined that a Belgian travel survey should not only yield information regarding the mobility of individuals, but also mobility related information on a household level, since, for example, a person's journeys and means of transportation are often dependent on the transportation needs of his/her family members and their place of residence. The travel survey should thus consist of several parts, arranged in two separate questionnaires: the first containing questions about the respondents' mobility in general and their journeys on specific days, and the second containing questions about the respondents' household and the vehicles available to them. To determine the contents of these questionnaires a choice had to be made among a very long list of interesting items, based on the (most urgent) data needs. Next, these question items had to be translated into understandable and answerable questions, a process which required several phases. The details of these activities and the final contents of the survey are described in section 3 of this paper.

The determination of the survey method and protocol to be used in a Belgian travel survey was another important reason for the organisation of this pilot-study. Almost every travel survey has its own 'methodological recipe' (see Axhausen, 1996). What works well in one

country or even region does not necessarily work in another, because of cultural, geographical and other differences. It was thus necessary to test, before launching a full-scale survey, which method would work well in the particular Belgian context. The methodology chosen for the pilot, including the sampling, is explained in section 2 below.

Finally, some results are discussed in section 4. These results are only preliminary, since the fieldwork of the survey was not finished until just before the deadline for this paper.

## 2 SURVEY DESIGN AND METHODOLOGY

### 2.1 The survey sample

The survey objectives outlined in the introduction, i.e. the mobility behaviour of Belgians and their households, determined our target population. Because of these two levels of interest, the individual and the household, the target population consisted of two distinct sets of entities: the whole set of individuals, and the whole set of households resident in Belgium at a given time. This population was narrowed down to all residents/household members over the age of 5. We imposed this age limitation because children younger than that hardly ever make trips on their own.

In the remainder of this section we will briefly describe the sample size, stratification and sampling frame used for the pilot travel survey.

#### 2.1.1 Sample size

Decisions about sample size are always a compromise between the desired level of precision of the results and budget limitations. In the choice of the sample size for our survey, a very important factor was that one of the major objectives of the pilot survey was to test several survey methods (see 2.2 below). We thus had to fix a sample size which allowed a reliable confrontation between the methods selected for testing, taking into account the cost of each of these methods. On the basis of these criteria, a sample size of 800 was fixed, which was the maximum size compatible with the budget.

#### 2.1.2 Stratification

The sampling method that was chosen for the pilot survey was a stratified random sampling based on a geographic criterion, namely province. This criterion was chosen because this project has a federal character, and so the different regions of the country, which are themselves subdivided into provinces, had to be represented fairly. Therefore each province was represented in the sample in proportion to its size, expressed in terms of residential population. We have considered more detailed stratification levels as well, but the sample size was insufficient for such further refinement.

### 2.1.3 Sampling frame

The sampling frame from which the sample was drawn is the National Register, a database with several variables for all individual residents in Belgium. It is managed by the National Institute of Statistics (NIS), but updated directly and regularly by all the municipalities in the country. Several reasons justified the choice of this sampling frame. Firstly, the National Register is more complete than other available frames such as electoral rolls, telephone directories, block lists, etc. Secondly, it is more up-to-date than most of those other frames as well. Thirdly, several variables are available per person, e.g. name, first name, address, sex, date of birth and position within the household (head of household, partner, child,...). The only limitation on the use of the National Register is its restricted access. There is no direct access to this frame, one has to make a request with NIS, and they then draw the sample.

For this pilot survey, first 800 individuals were selected (henceforth referred to as 'the persons selected for the sample'). Then, all the other members of their household older than 5 were retrieved from the National Register and incorporated in the sample. This procedure yielded both a sample of households (n=800) and of individuals (n=2278).

## 2.2 Survey method: rationale

A very important aim of the pilot study was the determination of the best survey method. Should one interview the respondents face-to-face, over the telephone, through self-completion, mail-back questionnaires, or via some combination of these methods? The traditional, 'unimodal' survey methods were all rejected. A pure mail survey was rejected because of its generally low response rates for surveys targeted at the general population (Dillman, 1977), although some of the typical questions in a travel survey (see section 3 below) are perhaps best asked in a self-completion questionnaire, because their answer might need some reflection or consultation. Of course, self-completion questionnaires could be dropped off and picked up at the respondent's home by an interviewer, which would greatly enhance response rates, but such a procedure, or any other one requiring sending out interviewers to respondents' homes would simply be too expensive for the full-scale, nation-wide survey, and so this method was rejected as well. A pure telephone survey, which usually results in good response rates at an affordable price (Ettema *et al*, 1996), was nevertheless dismissed too, out of concern for the quality of certain data: part of a travel survey is a detailed description (travel times, distances, purpose, ...) of all one's trips on a given day (the 'diary day'), and we believed this could not be done accurately and within acceptable time limits over the telephone alone. It has been done in Denmark (Danish ministry of transport, 1994) and Switzerland (Office fédéral de la statistique, 1996) but in both cases the approach was retrospective: the diary day was not announced on beforehand to the respondents, who were phoned the day after and had to provide all their trip details about the previous day unprepared. Instead a prospective approach was favoured, in which the respondents do know on beforehand their diary day and the kind of details that will be asked, and can thus pay extra attention to these details during the diary day, which should result in more accurate data (Ettema *et al*, 1996).

All in all, a combination of mail and telephone seemed the best solution. There are several combinations possible and actually used in travel surveys abroad (Kurth, 1986; Vansevenant, 1996), and we decided to test two that did produce good results in other countries before. The first method selected for testing was inspired by the so-called 'new Kontiv design' (Brög, 1996), which has already proved its value in Germany and Austria (Brög 1996; Spiegel, 1997). Furthermore, the Dutch Central Bureau of Statistics is considering to replace its own travel survey method, which it has used continuously since 1986, with this new Kontiv design as well (Moritz, 1997). So also for the sake of comparability of results, a real concern at the EU level, such a method seemed well worth testing. According to this method, all questions are asked in self-completion, mail-back questionnaires, but the respondents are also contacted by telephone right before the diary day to motivate them to participate, and again after the diary day to remind them to send back the questionnaires (more details about the actual survey protocols will be provided in section 2.3). With this method usually not only the person actually drawn for the sample is questioned, but everybody belonging to his/her household (within certain age limits), increasing the pool of individuals and trips, and allowing a study of the interrelationships between household members' travel patterns. As already mentioned in section 2.1, in this survey everybody in the household above the age of 5 (with the help of a parent if necessary) was asked to participate.

While the first method was predominantly mail, the second method tested was predominantly telephonic. All data were collected during a computer assisted telephone interview (CATI), but with the aid of a postal 'memory jogger', i.e. a diary sent to the respondents shortly before their diary day, in which they were asked to note the details of the trips of that day, in order not to forget them and to make the actual telephone interview afterwards much easier. In that interview general mobility questions were asked too (see section 3 for the contents of the interview). With this method only the person selected for the sample and the head of the household were interviewed - about his/her mobility behaviour and household characteristics respectively - since it was not thought feasible to question all household members over the telephone one by one. If the respondent was younger than 15, the head of the household was asked to respond for the child. This method was selected for testing because of the already mentioned positive results in Denmark (Danish ministry of transport, 1994) and Switzerland (Office fédéral de statistique, 1996) with the pure CATI method and in smaller surveys in the USA with the CATI + memory jogger (e.g. Anderson *et al*, 1986). An additional reason was to assess the potential advantages of a computer assisted method over paper-and-pencil methods, i.e. immediate data coding, more possibilities for control (consistency and range checks, etc.) and the possibility of randomisation (Ettema *et al*, 1996).

Besides the actual contact and interviewing method, there are also debates in the travel survey research world about the travel diary itself (Ettema *et al*, 1996). Most travel surveys use a trip diary, in which a number of details are asked about all the trips made on a given day. Some surveys, however, use an activity-based diary, which asks not about trips but about the out-of-home activities done that day, including details of how, when, etc. one travelled to the place where the activity was carried out. Essentially the same information is gathered with the two kinds of diaries, but they have a different focus. Some of the studies in which an activity-based diary was used report better results, i.e. a higher number of trips reported per day, than with the traditional, trip-based diaries (Stopher, 1992), presumably because the activity-based diary's way of probing for travel information corresponds better

with the way information is stored in memory and the planning of activities (Clarke *et al*, 1981). It was therefore decided to also compare these two kinds of diaries in this pilot study.

Combining the two survey methods selected to be tested with the two kinds of diaries, results in the methodological design depicted in figure 1 (n= size of household subsample for each combination).

*Figure 1: Methodological design of the pilot travel survey.*

| survey method / type of diary | TELEPHONE INTERVIEW + mail memory jogger (trip information of 1 person in the household) | MAIL QUESTIONNAIRE + telephone support (trip information of all persons in the household) |
|---|---|---|
| TRIP-BASED | n = 200 | n = 200 |
| ACTIVITY-BASED | n = 200 | n = 200 |

However, both of the survey methods to be tested rely on the use of the telephone. This means one cannot reach the people in the sample who do not have a telephone connection, or who have a private number (i.e. not available from the telephone information services through which we were to get the phone numbers of the respondents). But these people cannot simply be disregarded, at least not before it has been shown that their mobility behaviour does not significantly differ from that of people with an accessible phone number. If it does differ and a survey method relying on the telephone is used, the information thus gathered has to be weighed for the 'no-telephone' people in order to be representative for the whole population. Therefore, the people in the sample for whom no telephone number was found, were personally contacted at home by an interviewer, who left behind a self-completion individual questionnaire for the person selected for the sample and a household questionnaire for the head of his/her household. A second visit was made a few days later to collect the questionnaires. Only the trip diary version of the individual questionnaire was used, since these interviews were only intended to provide a base for the comparison with the rest of the sample.

The representativeness issue just mentioned also applies to the people who were contacted for the survey but refused to take part, who never sent their mail questionnaires back or who never answered the phone. To find out who they are and how their mobility compares to that of the people who did participate, face-to-face interviews with all the non-respondents of the main survey were set up. Besides general mobility questions, the non-respondents were also asked why they had refused to participate in the survey. This information should help maximise the response rate in the future, to the extent, of course, that the reasons for refusal are controllable by the survey designers.

Finally, also validation interviews were held with a random subsample of people who did respond to our survey. Again the purpose was double. The first purpose was an evaluation of the survey by the respondents, i.e. its strong and weak points, their appreciation of the survey method they were allocated, and their reasons for participation. This information could be very useful to improve the survey methods used and therefore also the response rate and the quality of the data obtained with these methods. The second purpose was a validation of the respondents' answers to the diary questions, more particularly to see whether they had not forgotten to report any trips/activities. This information is important when comparing the different methods and diaries tested. These validation interviews were done by telephone because it was the fastest way to contact the respondents. They had to be contacted as soon as possible after the diary day since they were asked to recall their diary day during the validation interview. In order to limit respondent burden - at the moment of these interviews we had already demanded quite a lot from the respondents - only one person per household was interviewed (see 2.3 for more details).

### 2.3 Survey method: the protocols

In this section we will first discuss the protocols for the 'main survey', i.e. the actual pilot travel survey. After that the protocols for the additional face-to-face, non-response and validation interviews will briefly be described.

Before describing the details of the different protocols, some general remarks might be useful:

- Since we were not equipped to do the fieldwork of the survey (managing the selection, training and supervision of interviewers, the CATI system, ...) ourselves, a market research firm, Dimarso-Gallup Belgium, was contracted to carry out the fieldwork.
- Each person selected for the sample was randomly allocated a survey method (CATI or mail), a type of diary (trip or activity-based) and a diary day.
- Belgium is a federal country with two main languages. The official language of the Flemish region is Dutch, that of the Walloon region French. Both languages are spoken in the Brussels capital region. The Flemish respondents received all the documents in Dutch, the Walloon respondents in French and the respondents living in the Brussels region received both the French and the Dutch versions. For the interviews, there were Dutch speaking, French speaking and bilingual interviewers.
- Whenever the respondent needed to be contacted either by phone or in person, several attempts to establish contact were always made. For the phone calls before and after the diary day 6 attempts to reach the respondent were made, spread over 2 consecutive days. If the respondent was not contacted despite these efforts, he/she was kept in the sample and the protocol moved on to the next stage.

  For the face-to-face procedures and the additional validation telephone interview, 3 attempts to establish contact were made.
- At every stage in the procedure it was possible to postpone the assigned diary day, but only in case of emergencies, for example if the respondent had not received all the necessary documents by the time of the diary day, or if he/she was really incapable of retracing his/her trips/activities of the original diary day. Maximum 3 postponements were possible, and the new diary day was always on the same day of the week as the original diary day, in order to keep an even distribution of the diary days over all the days of the week.

The CATI and mail travel survey protocols consisted of the same steps: announcement of the survey, mailing of the material, phone call before the diary day and phone call after the diary day. The contents of the steps, however, differed for the two methods.

### 2.3.1 Official letter of announcement of the survey

As soon as the sample was available from the NIS, the survey was announced in a letter to either the persons selected for the sample themselves, for the CATI subsample, or the head of the household, for the mail subsample. There were actually two announcement letters. The first was from the organisation financing the pilot-survey, the Belgian Federal Office for Scientific, Cultural and Technical Affairs (OSTC), and explained the general context of the survey, the mobility problems in Belgium and the need for data. The second letter, from the co-ordinator of the project, treated the importance of participating in the survey, the selection procedure, the confidentiality of the information given and the availability of a toll-free telephone number for further information.

### 2.3.2 The CATI survey

One week before the diary day a mail package was sent to the person selected for the sample. This package contained:

- an introduction letter, containing a reference to the official announcement letters, an explanation of the different parts of the survey, the date of the diary day, a motivation of the importance of the respondent's participation, the confidentiality of the information gathered and a toll-free phone number for further information;
- a memory jogger, corresponding to the diary part of the individual mail-back questionnaire (see section 3), to note the details of the trips or activities of the diary day.

Two days before the diary day, an interviewer telephoned the person selected for the sample. If the latter was a child under the age of 15, a parent was called instead of the respondent him-/herself, not only because we had to ask the parent's permission for the interview, but also because we believed the questions to be too difficult to be answered by children of this age as well. Therefore we addressed the parent, who was asked to answer for the child. During this phone call, the interviewer first referred to the letters sent to the respondents and verified the receiving of the documents and the respondent's willingness to participate in the survey, trying to motivate and persuade the respondent if necessary. The interviewer explained the further survey procedure, especially the use of the memory jogger on the diary day. An appointment was made to call back the day after the diary day to do the actual interview. Finally, if the head of the household, or his/her partner, was available at this point, he/she was interviewed about the household and vehicle characteristics. If the respondent had not received the documents or wished to receive them in the other language, the new documents were sent as soon as possible and the diary day was postponed for a week.

The day after the diary day, the interviewer called the respondent a second time, to do the actual interview. The first part of the interview was unprepared by the respondent and contained general mobility questions. The second part contained questions about the

respondent's trips/activities on the diary day. For this, the interviewer and the respondent went through the memory jogger together. During this process, the interviewer tried to verify the coherence of the trips or activities reported as much as possible. After the interview with the respondent, the head of the household, or his/her partner, was interviewed on the household and vehicle characteristics, if this had not already been done before.

### 2.3.3 The mail survey

One week before the diary day a mail package was sent to the head of the household. This package contained:

- an introduction letter, similar in content to the one for the telephone survey mentioned above, but with extra attention for the need for participation of all the household members over the age of 5;
- one household questionnaire;
- individual questionnaires (including the diary) for every household member over the age of 5, plus one extra copy in case the household size information from the NIS was not correct;
- a pre-addressed, postage-paid return envelope.

Two days before the diary day, an interviewer telephoned the head of the household, or his/her partner. During this phone call, the interviewer first referred to the letters sent to the respondents and verified the receiving of the documents and the household's willingness to participate in the survey, trying to motivate and persuade the respondent if necessary. The interviewer explained the further survey procedure, especially the need for participation of everybody in the household over the age of 5, if necessary with the help of a parent. Again, if the household had not received the right documents, they were sent as soon as possible and the diary day was postponed for a week.

The day after the diary day, the interviewer phoned a second time, to ask if there were any questions or problems, to verify whether all household members over the age of 5 had completed their questionnaire, and to urge the household to send the completed questionnaires back in the return envelope as soon as possible.

If the completed questionnaires were not received one week after the diary day, the household was phoned a third time to ask whether the questionnaires had already been mailed back. If the respondent said his/her household had not filled in the questionnaires, but were still willing to participate in the survey, they were given a new diary day, exactly 2 weeks after the original diary day.

A summary of the survey protocols for the travel survey is given in figure 2.

### 2.3.4 The face-to-face survey of the respondents who cannot be contacted by phone

The respondents for whom no phone number was available were not assigned an exact date for their diary day (e.g. Monday 20 October), as was the case in the CATI and mail survey

explained above, but only a specific day of the week (e.g. a Monday). This was done to limit travel expenses, for the limited number of respondents of this pilot-survey were randomly spread over the whole country. Giving the interviewers the freedom to choose the week for the interview themselves, allowed a more efficient organisation of their visits to the respondents.

Two days before the diary day the interviewer made a personal visit at the home of the person selected for the sample. The interviewer referred to the announcement letter of the survey, asked, and if necessary tried to persuade, the respondent to participate, explained the survey procedure and gave the exact date of the diary day. He/she left behind a self-completion, household questionnaire for the head of the household and a self-completion, individual questionnaire, including a trip-based diary[1], for the person actually selected for the sample. Finally an appointment was made for a second visit, one or two days after the diary day, to retrieve the completed questionnaires. During this second visit, the interviewer checked the completion of the questionnaires and asked for clarifications or helped the respondents with the completion if necessary.

*Figure 2: Summary of the survey protocols of the telephone and mail survey.*

| TIME | TELEPHONE SURVEY<br>+ mail memory jogger | MAIL SURVEY<br>+ telephone support |
|---|---|---|
| sample available | official announcement of the survey | official announcement of the survey |
| Dday-7* | announcement of diary day<br>+ 1 memory jogger | announcement of diary day<br>+ 1 household questionnaire<br>+ ... individual questionnaires (incl. diary)<br>+ pre-addressed and postage paid |
| Dday-2 or Dday-1 | reminder of diary day<br>(+ household questionnaire) | reminder of diary day |
| Dday | completion of the memory jogger | completion of the diaries** |
| Dday+1 or Dday+2 | individual questionnaire<br>(including diary)<br>(+ household questionnaire) | verification of completion and mail-back of questionnaires |
| Dday+7 | | if questionnaires not received:<br>verification of mail-back of questionnaires |

* Dday = diary day.

** The rest of the individual questionnaire and the household questionnaire could be filled in at any moment.

[1] As already mentioned in section 2.2, only the trip-based diary was used since these interviews were only intended to provide a base for the comparison with the rest of the sample.

### 2.3.5 The telephone validation interviews of the completed mail and CATI questionnaires

The questionnaires that were to be validated were chosen at random.

For the validation of the telephone interviews, an interviewer telephoned the person selected for the sample the day after the CATI interview had taken place, to ask the respondent for an evaluation of the survey (the negative and positive aspects of the survey, the survey method, the reasons for participation and the use of the memory jogger) and to validate the trips or activities which the respondent had reported for the diary day.

For the validation of the self-completed, mail questionnaires, an interviewer telephoned the person who had filled in the household questionnaire, in theory the head of the household, as soon as the questionnaires arrived at the market research firm. The contents of these validation interviews were the same as those mentioned above, plus an additional question about the effect of the motivational phone calls and an additional validation of the composition of the household based on the individual questionnaires received.

### 2.3.6 The face-to-face interviews of the non-respondents

Non-response interviews were set up for all the persons or households who refused to take part in the survey, who were never reached by phone despite the several efforts at the different stages of the protocol, or who never sent their questionnaires back (mail-subsample only). In order to minimise respondent burden - after all some of these people had already refused participation once - we chose to interview only one person in the household and to allow that if this person refused (again) or was unavailable to participate, another household member respond for the target person. The latter was done also because it was very important to obtain at least some information about these non-respondents for an assessment of the quality of the results of the different methods of our pilot-survey.

An interviewer was sent to the home of the non-respondent and asked to speak to the person selected for the sample or the head of the household, depending on whether it was a non-respondent of the CATI or the mail subsample respectively. The interview consisted of two parts. The first part dealt with the non-response itself, i.e. which person(s) actually decided on the refusal to participate, the reasons for refusing, suggestions to incite participation and an appreciation of the survey method. The second part was composed of some of the general mobility questions from the mail and CATI survey (see 3.2 below): the vehicles available to the household, the frequency of use of the different modes of transport, driving licence, physical handicaps and some details about the home-to-work/school trips.

## 3 THE CONTENTS OF THE PILOT TRAVEL SURVEY

This section examines in more detail the survey material developed for the actual travel survey part of this project. It describes the different kinds of questionnaires and their contents, the layout and the pre-testing of these documents.

### 3.1 The different kinds of questionnaires

Different targets having been identified, on household and individual level, different methodologies having been selected to be evaluated, and different languages being spoken in Belgium, the pilot survey had to be conducted with various questionnaires.

As already mentioned in the introduction, the objectives of a national travel survey are very broad, hence such a survey consists of several parts: household characteristics, vehicle characteristics and use, personal characteristics and travel information. Information about the former three can be collected well with a regular questionnaire (Ettema *et al*, 1996). For the purposes of this project, two main questionnaires were developed:

- a household questionnaire, containing the household and vehicle characteristics, and to be answered by the head of the household;
- an individual questionnaire, containing questions about transport use and personal characteristics, and to be answered by either each member of the household (new Kontiv-based, mail method), or by the person selected for the sample (telephone method).

Travel information, though, is best collected using a diary, rather than a questionnaire (Ettema *et al*, 1996). As already mentioned we developed two versions, a trip-based diary, in which the respondent had to note all the trips made on the diary day, and an activity-based diary, for all out-of-the-home activities on the diary day. For the mail subsample, the diary was part of the individual questionnaire. For the CATI subsample, the diary was separately sent to the respondent in the form of the memory jogger already mentioned.

Of these questionnaires, different versions had to be made for the different methods used in this pilot. These versions were slightly different depending on the particular method, but their contents were similar. Basically, the CATI and face-to-face versions were adaptations of the self-completion, mail-back questionnaires which were developed first. The market research firm transformed the latter into a CATI-questionnaire by changing the wording into more spoken language, adding introductions, ... The self-completion questionnaires for the face-to-face procedure for the respondents who could not be contacted by phone, were the same as the mail-back versions except for any references to the data collection procedure.

Finally, all questionnaires also had to be developed in different languages, i.e. Dutch and French, the two main languages of Belgium. During the whole questionnaire development process, special attention was paid to the similarity of the different language versions.

Figure 3 gives a summary of the different questionnaires and their way of administration.

*Figure 3: Overview of the different questionnaires of the pilot travel survey.*

| | **household questionnaire** | **individual questionnaire** | **trip/activity-based diary** |
|---|---|---|---|
| *MAIL respondents* | paper questionnaire completed by the head of the household | paper questionnaire completed by each member of the household | paper diary completed by each member of the household |
| *CATI respondents under the age of 15* | interview with the head of the household | interview with the head of the household | interview with the head of the household on the basis of the memory jogger |
| *CATI respondents aged 15 or over* | interview with the head of the household | interview with the selected person of the household | interview with the selected person of the household on the basis of the memory jogger |
| *FACE-TO-FACE respondents without a telephone number* | paper questionnaire completed by the head of the household | paper questionnaire completed by the selected person of the household | paper diary completed by the selected person of the household |

### 3.2 The contents of the survey

The exact contents of the questionnaires were determined step by step after examining different transport surveys conducted in Europe and after consultation with several potential users of the data to be collected in the survey, brought together in a 'Users Group' especially established for this purpose. Furthermore, given the fact that the project is financed by the OSTC Programme for Sustainable Development, the survey had to gather information to support policy measures for sustainable mobility.

When determining the contents, it was decided from the beginning to concentrate on revealed preferences (actual behaviour) and not on stated preferences (hypothetical behaviour). In fact stated preferences are very complex and a national survey is too broad and is not the right framework for this technique. Hence the survey contains no questions about road pricing, higher fuel prices and other (dis)incentives for the reduction of solo car use.

Special emphasis was placed on the possibilities to use the travel survey to gather information relevant for the following points:

- Data concerning transport mode choice. The first five questions of the individual questionnaire gather information related to mode choice. Although the Users Group showed interest in the reasons for mode choice for various sorts of trips, questions about this topic were only included for the home to work/school trip. This limitation was imposed because it would have been too much to ask this for different kinds of trips, and because those other categories of trips (recreational, shopping, ...) are rather

heterogeneous. Recreational trips, for example, can range from a walk in the park nearby to a vacation trip, so it is very difficult to treat them in a general manner.

- The assessment of the environmental impact of transport (e.g. vehicle characteristics, rate of use of different transport modes, especially biking, walking and public transport). Data of this kind are necessary to support policy measures for sustainable mobility. For this purpose, environmental policy institutions asked for technical information on motorised vehicles, in order to calculate pollution data.
- The relation between transportation and land use planning (e.g. origin/destination analyses). The urban and land use planners asked for information on the location of residence and work, in order to evaluate the relation between place of residence/work and the transport modes used and to find out more about the directionality of this relation.
- Information on the means of communication of the household, which is important for substitution of trips by tele-activities (tele-working, ...) and to know through which channels to inform and convince people.
- The relation between modal choice and road safety, such as data on physical and material damage and exposure to accident risk, which can be calculated based on the travel information gathered.

An overview with all the question topics is given in annex to this paper.

### 3.3 The layout of the self-completion, mail-back questionnaires

The layout has been done in Word. The questionnaires were A4-sized booklets with the pages printed on both sides. Different colours were selected to identify the various questionnaires.
With reference to the International Conference on Transport Survey Quality and Innovation in May 1997 in Grainau, Germany, and through contacts with transport survey experts, the design of the questionnaire has been reviewed in order to make it easy to complete and very attractive visually to the respondents. In this context, drawings were introduced in the diary/memory jogger to illustrate the explanation of different kinds of trips or activities. For the recording of the details of each trip/activity in the diary and memory jogger, the Kontiv column design was chosen as a reference.

### 3.4 The pre-tests

Before launching the pilot survey, the layout and wording of the questionnaires have been extensively studied, worked on and pre-tested. A first version of the questionnaires was developed and submitted to the Users Group for their comments while also being tested internally at the project partners' organisations. Based on the reactions of the people consulted, a second, improved version was made and tested again in both languages, this time among members of the target audience. As a whole, the pre-tests have been conducted on 82 people belonging to the three regions and of different age categories and professional skills. For some pre-tests the person was asked to complete the questionnaire and their comments about the questionnaire were then collected. Other people were directly observed while completing the questionnaire and/or interviewed on their difficulties with

understanding or answering the questions, following the so-called 'think-aloud-procedure' (Campanelli, 1996).

As a result of these pretests, some questions were simplified, a few deleted. Since it was observed that most of the interviewed people did not, or not fully, read the instructions, all instructions were shortened and gathered at the beginning of the questionnaire as much as possible. Some instructions were omitted, others replaced or enlivened with little drawings. The questionnaire was redesigned at least 4 times before achieving its final version.

## 4 SOME PRELIMINARY RESULTS OF THE PILOT SURVEY

The pilot travel-survey ran from the 15th of October until the 14th of November 1997, so there were 31 diary days. However, since for the mail-back procedure it could take several weeks before the completed questionnaires finally arrived at the market research firm, the fieldwork was not completed until mid-December. The databases were received only shortly before the deadline for this paper, so only very limited results can be reported here. We will only discuss the response rates for the CATI, mail and face-to-face travel survey parts. The final response rates for the other interviews discussed above, i.e. the validation and non-response interviews, were not available yet at the time this article was written. These and other further results, especially regarding the comparison of the two methods and two types of diaries tested, will be presented at the conference itself and reported in future publications.

### 4.1 Response rates

Tables 1-3 below show the response rates for the different methods tested, and also for the face-to-face survey with the people in the sample for whom no telephone number was found. This was the case for 19% of the households in the sample, evenly distributed over the different combinations tested in this pilot. The final subsample sizes for the different methods are also given in the tables. The level of significance for the tests reported below was set at 5%.

*Table 1: Response rates for the different questionnaires of the telephone survey.*

| | Number (rate) of responses | | |
|---|---|---|---|
| | Total | Trip-based diary | Activity-based diary |
| HHs* to be contacted | 323 | 160 | 163 |
| HHs with HH questionnaire | 201 (62%) | 103 (64%) | 98 (60%) |
| HHs with IND* questionnaire | 158 (49%) | 83 (52%) | 75 (46%) |
| HHs with HH *and* IND questionnaire | 153 (47%) | 81 (51%) | 72 (44%) |

* HH = household, IND = individual

*Table 2: Response rates for the different questionnaires of the mail survey.*

| | Number (rate) of responses | | |
|---|---|---|---|
| | Total | Trip-based diary | Activity-based diary |
| HHs* to be contacted | 324 | 162 | 162 |
| *Corresponding n° of HH members* | *944* | *474* | *470* |
| HHs with HH questionnaire | 177 (55%) | 86 (53%) | 91 (56%) |
| HHs with IND* questionnaire(s) | 176 (54%) | 84 (52%) | 92 (57%) |
| *Corresponding n° of IND questionnaires* | *497 (53%)* | *250 (53%)* | *247 (53%)* |
| HHs with HH *and* IND questionnaires | 173 (53%) | 83 (51%) | 90 (56%) |
| *Corresponding n° of IND questionnaires* | *492 (52%)* | *247 (52%)* | *245 (52%)* |

* HH = household, IND = individual

*Table 3: Response rates for the different questionnaires of the face-to-face survey (for households of which no telephone number was found)*

| | Total number (rate) of responses |
|---|---|
| HHs* to be contacted | 153 |
| HHs with HH questionnaire | 76 (50%) |
| HHs with IND* questionnaire | 75 (49%) |
| HHs with HH *and* IND questionnaire | 75 (49%) |

* HH = household, IND = individual

### 4.1.1 Household questionnaires

The response rate for the household questionnaire was 62% for the CATI survey, 55% for the mail survey and 50% for the face-to-face survey. The difference in response rate between the CATI and mail survey is statistically significant. The number of household questionnaires received from respondents who were allocated a trip-based diary did not differ significantly from the number received from the people with an activity-based diary (64% vs. 60% for the CATI and 53% vs. 56% for the mail survey respectively).

### 4.1.2 Individual questionnaires

For the CATI survey, the response rate for the individual questionnaire was 49%. For the mail survey it was 54% and for the face-to-face survey 49%. The difference in response rate between CATI and mail was not statistically significant, nor was that between the trip-based and the activity-based diary approach (52 vs. 46% for the CATI and 52% vs. 57% for the mail survey respectively). For the mail survey, the response from 176 households corresponds to a total number of 497 completed individual questionnaires.

### 4.1.3 Individual and household questionnaires

Looking at the households for which we have both the household questionnaire and at least one individual questionnaire, the response rates are the following: 47% for the CATI survey, 53% for the mail survey and 49% for the face-to-face survey. Again, none of the differences in response rate between the different methods and diary approaches tested were significant. For the mail survey, the response from 173 households corresponds to 492 individuals who completed an individual questionnaire. A comparison, per household, of the number of individual questionnaires completed, with the size of the household according to the data received from the NIS, shows that 84% of the participating households have completed a number of individual questionnaires that is equal to (or higher than) their household size according to the NIS. This means that for all these households we most likely (remains to be verified by checking the household size reported by the respondents themselves) have a complete set of questionnaires.

## 4.2 Discussion of the results

The response rates for the CATI survey are lower than expected on the basis of results generally reported in the literature for telephone surveys. One possible reason for this is the fact that the respondents had to be contacted twice, once before and once after the diary day, which gave them two occasions to refuse participation, compared to only one in 'regular' CATI surveys. In fact, according to intermediary reports from the market research firm, the number of refusals was higher for the second phone call than for the first. Another reason for the low response rate might be that the survey protocol for the CATI survey did not foresee enough attempts to contact the respondents after the diary day. There were 3 attempts 1 day after the diary day and another 3 attempts the next day, but if no contact was made then, the procedure was terminated. We might have lost a number of willing respondents this way. A detailed analysis of the outcome of the different contacts for every household will be carried out to verify this hypothesis.

The response rates for the mail survey are better, given that response rates for mail surveys are usually lower than for telephone surveys, and considering that of a large majority of the households who responded, all the members over the age of 5 participated, as intended. A comparison with the results of other travel surveys based on the new Kontiv design will be made in the near future.

The response rates did not differ significantly for the different diary approaches tested, but this was not really expected. The differences between trip and activity-based diaries reported in the literature (e.g. Stopher, 1992) pertain to the quality of the data, not response rates.

The response rates for the face-to-face survey might seem low, but these figures do not take into account the number of people whom we were unable to contact at all, because of a wrong address for example. For these people evidently no phone number was found, and so they all accumulated in the sample for the face-to-face survey. The exact number of respondents in this case remains to be checked, but it will put the results in the right perspective. Furthermore, one has to consider too that the people whom we were potentially able to contact, were either people who do not have a telephone connection, or

who have a private number. Both of these groups are probably less likely than the rest of the population to participate in a travel survey. The former, usually mostly lower class people with a low educated level, generally do not participate in surveys much, especially not if they include self-completion questionnaires, as was the case for this survey. The people with a private number, on the other hand, are usually busy, very mobile people whom it is difficult to contact at home in the first place, and for whom participation in a travel survey in particular is more demanding than for most people, both exactly because of their high mobility. In addition, the fact that they have a private phone number indicates that they consider their privacy very important, which might be another reason why such people would be less likely to participate in a survey.

## 5 CONCLUSION

In this paper we have outlined the design and fieldwork of the pilot phase of a Belgian travel survey project. In particular, the sampling technique, survey method choice and interview protocols were reviewed, as well as the questionnaire contents and design. Finally, the first results (response rates) were briefly discussed.

Despite their interest in the current report on survey design, the authors are well aware that much further analysis of the data is required in order to draw conclusions on finer aspects of the survey methods. This is the object of ongoing work.


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## REFERENCES


Anderson, J.F., Niebuhr, M.A., Braden, A. and Alderson, S.R. (1986) Telephone interviews: cost-effective method for accurate travel surveys. **Transportation Research Record 1097: Innovations in Travel Survey Methods.** TRB, National Research Council, Washington D.C., pp.4-6.

Axhausen, K. (1996). Travel diaries: an annotated catalogue. **Proceedings of the 4th International Conference on Survey Methods in Transport, 9-11 September 1996.**

Brög, W. (1996) **Das Neue Kontiv-Design.** Unpublished manuscript. Socialdata, München.

Campanelli, P. (1996) Cognitive aspects of survey methodology (CASM): an overview. **Survey Methods Centre Newsletter**, Vol. 16(2), pp. 5-8.

Clarke, M., Dix, M. and Jones, P. (1981) Error and uncertainty in travel surveys. **Transportation**, Vol. 10, pp. 105-126.

Cornélis, E. and Toint, Ph.L. (1994) **Behavioural Aspects of Transportation Mode Choice in the "Énergie" S.P.P.S. Survey.** Report 93/05 of the Transportation Research Group, Department of Mathematics, Facultés Universitaires ND de la Paix, Namur.

Danish Ministry of Transport (1994) **Survey of Danish Transport and Travel Habits.** Unpublished report.

Dillman, D.A. (1977) **Mail and Telephone Survey: The Total Design Method.** Wiley, New York.

Ettema, D., Timmermans, H. and Van Veghel, L. (1996) **Effects of Data Collection Methods in Travel and Activity Research.** European Institute of Retailing and Services Studies, Eindhoven.

Hajnal, I. and Miermans, W. (1996) **Onderzoek Verplaatsingsgedrag Vlaanderen - Analyse Opdracht: Eindverslag.** Provinciale Hogeschool Limburg, Departement Architectuur, Hogeschool voor Verkeerskunde, Diepenbeek.

Kurth, D.L. (1986). A small sample mail-out/telephone collection travel survey. **Transportation Research Record 1097: Innovations in Travel Survey Methods.** TRB, National Research Council, Washington D.C., pp.7-12.

Moritz, G. (1997) **Response Problems in the Dutch National Travel Survey.** Paper presented at the Séminaire GRT n° 51, Transportation Research Group, Department of Mathematics, Facultés Universitaires ND de la Paix, Namur.

Office fédéral de la statistique, Centre de coordination et de planification (1996) **Enquête sur le Comportement Suisse en Matière de Transports en 1994: Plan d'Echantillonage et Estimateurs.** Office fédéral de la statistique, Berne.

Owens, S. (1995) Predict and provide or predict and prevent?: pricing and planning in transport policy. **Transport Policy**, Vol. 2(1), pp. 43-49.

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

Spiegel, Th. (1997) **The Austrian Mobility Survey 1995: Background, Methods and First Evaluation of Methods.** Paper presented at 'Transport Surveys: Raising the Standard', an International Conference on Transport Survey Quality and Innovation, 24-30 May 1997, Grainau.

Stopher, P.R. (1992) Use of an activity-based diary to collect household travel data. **Transportation**, Vol. 19, pp. 159-176.

Vansevenant, P. (1996) **Nieuwe Vervoersenquêtes - Eindrapport.** Report for the Impulse Programme 'Transport and Mobility' 1991-1995 of the Prime Minister's Services - Science Policy Department, Langzaam Verkeer, Leuven.

## ANNEX: THE QUESTION TOPICS OF THE SURVEY

### Household questionnaire

- for each member of the household:
  - first name
  - date of birth
  - sex
  - nationality
  - family link to the head of the household
  - highest diploma
  - professional status
- vehicles present in the household: number of each type (bicycle, motorcycle, car, etc.)
- characteristics of motorised vehicles:
  - type of vehicle
  - make
  - model
  - capacity
  - year of first use
  - year of purchase
  - mileage in last 12 months
  - total mileage
  - type of fuel
  - fuel consumption
  - equipment
  - company car
  - main user
- type and date of residence, reasons for living in this place of residence, ownership of residence
- presence of means of information and communication: radio, newspapers, magazines, television, internet, telephone

### Individual questionnaire

- frequency of usage of different modes of transport
- public transport reductions
- public transport season tickets: company, type, duration
- driving licence
- physical handicaps related to vehicle use
- accident data: physical and material damage, vehicle used
- long trips: number in last 4 weeks,
  for last trip: origin, destination, mode of transport, duration, purpose
- home-work trips:
  - place of work
  - distance from home to work
  - number of days at the workplace
  - main mode of transport used and reasons why
  - occasional alternative main modes of transport used and reasons why
  - other main modes of transport envisaged or tried in the past and reasons for not retaining them
  - professional status
  - full time/part time job
- general opinions or suggestions regarding transport issues

**Trip/activity-based diary**

- any trips/activities done on diary day?
- trips made for work: mode of transport, total distance, total number of trips, type of job
- point of departure of first trip/activity
- time of departure for first activity
- for each trip:
  - time of departure
  - destination
  - purpose
  - modes of transport used + distance and duration for each
  - if car: driver or passenger
  - time of arrival

  for each activity:
  - type of activity
  - starting time of activity
  - place
  - modes of transport used + distance and duration for each
  - if car: driver or passenger
  - ending time of activity