Long distance travel demand measurement methods

Austrian pilot study (A3H/F)

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Final report

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List of Abbreviations

ATS	Austrian Schilling
BMWVK	Austrian Federal Ministry for Science, Transport and the Arts
CEC	Commission of the European Communities
DG	Directorate General
df	Degrees of freedom
EUROSTAT	European Statistical Office
F	Value of F-statistic
$\mathfrak{L}(0)$	Initial Log-likelihood
(ß)	Log-likelihood with all parameters fitted
ÖSTAT	Austrian Staticial Office
R^2	Regression goodness-of-fit measure
ρ^2	Maximum-likelihood estimation goodness-of-fit measure
*	Significant at $\alpha = 0.05$
+	Significant at $\alpha = 0.10$
()	Less then 3 cases

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Final report

LONG DISTANCE TRAVEL DEMAND MEASUREMENT METHODS (AUSTRIAN PILOT STUDY) (A3H/F)

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ABSTRACT

The purpose of this study is to develop a self-completion survey instrument implementing the recommendations of the EUROSTAT working party on long-distance travel and to test how response and data yield change as a function of a number of relevant dimensions of the survey design and protocol.

In the absence of current experiences with stage-based long-distance travel surveys this study had to develop a new instrument from scratch. The instrument, which resulted from a number of informal pretests and from a formal pretest, is not yet optimal, but performed well within the range of expectation for such a complex instrument.

The main study was based on a full factorial of three dimensions of the design and protocol:

temporal orientation: prospective and retrospective
duration of survey period: four or eight weeks
level of complexity of movement description: low and high

The resulting experimental design of eight different surveys was sent to 1080 households in Innsbruck. The sample was constructed to test the instrument intensely, i.e. the sample focused on persons, which could be expected to be difficult to recruit by nature of their high mobility or complex journeys; especially as the survey period in the spring of 1996 covered Easter and all the other public holiday up to and including Pentecost.

The average numbers of journeys (person journeys) reported by the sample are reasonable in comparison with existing numbers, but due to the absence of proper external data for weighting they should be treated with care. Later work will have to integrate this sample into the national long-distance databases.

The methodological results of the study reveal a number of difficult trade-offs for the survey designer. A retrospective survey increases the response rate substantially, but by the same token reduces the data yield throughout, even where the modelling controls for the socio-demographics of the households and persons.

The duration of the survey period has different impacts depending on context. An increase helps to increase participation by assuring that more household have something to report overcoming the traditional problem of the unwillingness of survey respondents to return "Null"-reports. The set of analyses reported here does not allow to draw conclusions about fatigue and therefore the impact on

the number of reported journeys, but the descriptive analysis seems to indicate no impact. The duration has also no impact on the number of stages reported per journey.

The complexity of the description of the stages has a positive impact on written survey participation, probably by indicating the seriousness of the instrument, but reduces the number of stages reported per journey. A fatigue analysis of this aspect should be subject to future work.

The experiences of this study have clearly shown that it is necessary to combine both written and oral (telephonic) elements in the survey protocol. Both response mechanisms are necessary to capture different subsets of the respondents. The analysis has provided insight into the socio-demographics of this subsets, but more work is required.

The results of study, which have clearly identified the response/yield trade-off faces by the survey designers, will significantly contribute to the further development of a benchmark long-distance survey methodology, which is currently under way in the different EUROSTAT pilots studies and the 4th Framework project 'Methods for European Surveys of Travel Behaviour".

KEYWORDS

Austria; Long-distance travel; survey; methods; test and development; EUROSTAT pilot

Endbericht

METHODEN ZUR MESSUNG DES FERNVERKEHRS (ÖSTERREICHISCHE PILOTSTUDIE) (A3H/F)

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KURZFASSUNG

Der Zweck dieser Studie ist es, einen schriftlichen Fragebogen zu entwicklen, der die Empfehlungen der EUROSTAT-Arbeitsgruppe zum Fernverkehr umsetzt, und mit diesem Fragebogen zu testen, wie Antwortwahrscheinlichkeit und Datenertrag (Anzahl Reisen und Etappen) von Fragebogendesign und Befragungsprotokoll abhängen.

Es musste ein neuer Fragebogen entwickelt werden, da es momentan keine Erfahrungen mit etappenorientierten Fragebögen zum Fernverkehr gibt. Der Fragebogen, der nach einer Reihe informeller und formeller Vortests entstand, ist noch nicht optimal, erfüllt aber die an ihn gestellten Anforderungen gut.

Die Hauptbefragung basierte auf einem *full factorial* der folgenden drei Dimensionen des Fragebogendesigns und Befragungsablaufs:

Zeitliche Orientierung: prospektiv und retrospektiv
Befragungsdauer: vier und acht Wochen
Komplexität der Etappenbeschreibung: niedrig und hoch

Die acht Befragungstypen wurden an 1080 Haushalte in Innsbruck verteilt. Die Stichprobe war so gezogen worden, daß niedrige Rücklaufquoten zu erwarten waren, um den Fragebogen so intensiv zu testen. Dazu trug auch die Befragungszeit im Frühjahr 1996 zwischen Ostern und Pfingsten bei.

Die hier ermittelten mittleren Mobilitäten liegen im Erwartungsbereich, der aus anderen Studien bekannt ist. Sie sollten aber vorsichtig verwendet werden, da die Stichprobe bisher nicht gewichtet werden konnte, da die notwendigen offiziellen Statistiken nicht verfügbar waren. Diese Stichprobe muß in Zukunft in die vorhandenen nationalen Stichproben einbezogen werden.

Die methodischen Resulte der Studie zeigen, daß es für den Entwerfer solcher Befragungen eine Reihe schwieriger Abwägungen gibt. Eine retrospektive Befragung erhöht die Antwortwahrscheinlichkeit erheblich, senkt aber gleichzeitig den Datenertrag, selbst wenn für die sozio-demographischen Eigenschaften der betroffenen Personen und Haushalte kontrolliert wird.

Die Wirkung der Befragungsdauer hängt vom Kontext ab. Eine Verlängerung erhöht die Antwortwahrscheinlichkeit, da weniger Haushalte ihre Zurückhaltung überwinden müssen, eine Leermeldung zu machen. Der Einfluß auf die Anzahl der berichteten Reisen konnte noch nicht formal ermittelt werden, aber die ersten beschreibenden Ergebnisse deuten an, daß es keine Wirkung gibt. Das gilt auch für die Anzahl der Etappen pro Reise.

Eine höhere Komplexität der Etappenbeschreibung erhöht die Beteiligung an der Befragung, wahrscheinlich weil sie die Wichtigkeit der Befragung unterstreicht, reduziert damit aber die Anzahl der berichteten Etappen. Eine Analyse des zeitlichen Verlaufs der Berichtshäufigkeit der Etappen sollte in einer zukünftigen Studie unternommen werden.

Diese Studie hat klar gezeigt, daß es notwendig ist schriftliche und mündliche Befragungselemente zu kombinieren. Beide Mechanismen sind notwendig, um verschiedene Teile der Stichprobe zu erreichen. Die sozio-demographischen Eigenschaften dieser Teilstichproben erfordern noch mehr Arbeit, aber erste Ergebnisse werden hier vorgelegt.

Diese Studie, die den Zwiespalt/Widerspruch zwischen Antwortwahrscheinlichkeit und Datenertrag klar aufgezeigt hat, trägt damit wichtige Ergebnisse zu der weiteren Entwicklung einer "Standard"-Befragungsmethode im Fernverkehr bei, die im Moment mit den anderen EUROSTAT-Pilotstudien und dem EU-Projekt *Methods for European Surveys of Travel Behaviour* vorangetrieben wird.

SCHLAGWORTE

Österreich; Fernverkehr; Befragung; Methoden; Test und Entwicklung; EUROSTAT Pilotstudien

1 TASK AND APPROACH

Following the project COST 305 *European passenger travel demand today and tomorrow* a working party coordinated by EUROSTAT (1995a) has developed a minimum set of requirements for a comparable European survey of long distance travel behaviour. A number of the member states of the EU are undertaking pilot studies to test this set of requirements, some of which are cofunded by CEC DG VII. Austria is among these countries (See Table 2).

The approach of this study is to take the question set defined by the EUROSTAT working party as the starting point for a more complex set of experiments aiming to determine the influence of a number of factors on response rate and data quality for self-completion instruments:

Orientation of the survey: prospective and retrospective

Duration of the survey period: four or eight weeks

Detail of the household questionnaire: EUROSTAT set or an expanded set

Detail of the vehicle questionnaire: EUROSTAT set or an expanded set

Detail of the travel questionnaire: EUROSTAT set or an expanded set

The objective of these experiments is to understand the trade-offs between these variables and to provide guidance about future more comprehensive surveys than those implied by the EUROSTAT set.

The purpose of this report is to present the findings of these experiments in both a substantial, as well as a methodological sense. The next two sections briefly discuss the general background to the study with regards to current long-distance survey practice and the current state-of-the-art of travel diary work and the object of the survey. A sequence of four sections then describes the Austrian experiments: development of the survey form, survey administration, survey results and methodological results. Conclusions about future directions and future work conclude the report.

2 BACKGROUND

In the course of the preparation of the Austrian *Bundesverkehrswegeplan* (Kovacic, 1996) two long-distance surveys were undertaken. The first survey was integrated into a large-scale national survey of daily mobility (GfK/IFES study), while the second was part of a control study, which started somewhat later (Sammer/Herry study). The field work experiences of the GfK/IFES study indicated that the long-distance instrument used and the protocol with which it was administered was not optimal, while the field work experiences of the Sammer/Herry study were satisfactory. This pilot study was therefore a good opportunity to explore the possibilities of a newly designed long-distance instrument in comparison with the existing state-of-the-practise.

A recent survey of long-distance travel surveys in Europe (Youssefzadeh and Axhausen, 1996) showed the wide variety of current practice (See Table 1). Striking is both the lack of coordination between the surveys and the wide range of methods. As none of the surveys implements a stage-based design, as stipulated by the EUROSTAT requirements, current practice cannot provide guidelines for the study undertaken here, other than general recommendations and practices.

The series of pilots currently being carried out or planned under EUROSTAT guidance and partially supported by Directorate-General (DG) VII (Transport) of the Commission of the European Communities (CEC) is addressing this gap. Table 2 gives an overview over these studies. While all studies will implement the EUROSTAT requirements, they will do so in ways reflecting the national preoccupations. It is hoped that the variability between the studies will allow firm conclusions to be drawn about the best way forward in this difficult field of survey research.

While surveys of urban and regional mobility are much better established and more frequently undertaken (Axhausen, 1995), a recent study has shown (Ettema, Timmermans and Veghel, 1996) that no detailed consensus exists about all aspects of the performance or design of such surveys.

This study had therefore to be based on the general understanding of the field and its best practices and had to adapt them to the particular survey object at the focus of its concerns: long-distance travel broken down into stages.

Table 1 Recent long-distance travel surveys in Europe

Name	Country	Object	Minimum	Unit	Administration
Verkehrsbefragung BVWP	Austria	All trips	>50 km	Household	Self-completion
Enquête Transports et Communication	France	All trips	>100 km	Household	Self-completion /Personal interview
Mobility	Germany	All trips	>100 km	Household	Personal/ Phone interview
National Travel Survey (1992)	Norway	All trips	>100 km	Household	Phone interview
Riks-RVU	Sweden	All trips	>100 km	Household	Phone interview
National Travel Survey	UK	All trips	>50 miles	Household	Personal interview
Long Distance Travel Survey	UK	All trips	>25 miles	n. k.	n. k.
European Travel Monitor	EU/EEA	Tourism	Abroad	Household	Phone interview
Suivi de la Demande Touristique	France	All trips	>1 night	Household	Self-completion
Inqérito sobre as ferias	Portugal	Holidays	>4 nights	Household	Personal interview
United Kingdom Tourism Survey	UK	Holidays	>1 night	Household	Personal interview
British National Travel Survey	UK	Holidays	Holidays	Household	Personal interview
Business Traveller Panel	UK	Business trips	Trips to mainland	Person	Self-completion
Enquete aux Frontières	France	All trips	Border	Driver	Personal interview
Inquérito ao movimento nas fronteiras	Portugal	All trips	Border	Driver	Personal interview
Inquérito ao movimento nas fronteiras	Spain	All trips	Border	Driver	Personal interview
international Passenger Survey	UK	All trips	Border	Driver	Personal interview

Source: adapted from Youssefzadeh and Axhausen (1996), Table 2

Table 2 On-going pilots coordinated by EUROSTAT

Country	Status	Method	Perspective	Comment
Austria	Completed	Selfcompletion	Prospective/ Retrospective	Stage based, various levels of workload, 4-8 weeks
France	Planned	CATI/ Selfcompletion	Retrospective	Stage-based
Germany	Completed	Selfcompletion	Retrospective	Stage based
	Completed	CATI	Retrospective	Stage based
Italy	Planned	CAPI	Prospective	Stage-based
Portugal	In-field	CAPI	Retrospective	Stage based
Spain	Planned	Interview	Retrospective	Stage-based
Sweden	Planned	CATI	Retrospective	Expanding existing trip-based to stage-based

Source: Axhausen (1996), Table 1

3 SURVEY OBJECT

Each survey designer and by implication policy maker has to specify the exact object of his/her inquiry to provide a base for the development of the instrument and for the choice of the administration method. The dimensions of this description are:

- **Overall approach:** Stage-, trip- , journey- or activity-based.
- **Minimum distance** is the threshold for recording the journey. It can be defined as crow-flight distance, road or track distance.
- **Minimum duration** is the threshold for recording journeys independent of distance, e.g. journeys involving overnight stays.
- **Geographic range of exclusion** is that area, within which the respondent does not need to record any details of a the journey.
- **Temporal range of exclusion** is that time period during which the respondent does not need to record any details of the journey.
- **Other exclusions** could concern regular journeys, frequent travellers etc.
- **Treatment of regular travellers**
- **Treatment of regular journeys**
- **Spatial definition of destination**
- **Reference location** is the location from which journeys can begin.

The EUROSTAT definition (EUROSTAT, 1995a) addresses some of these, but not all of them:

"1.1. Trip - Voyage - Reise

> A trip is a movement to one or more destinations, and covers the whole period that a person is away from the place of residence. For the long-distance mobility survey, at least one point of destination has to be situated at more than 100 km from the point of origin. The return is included in the same trip. A trip can have just a single journey.
>
> The place of work or study can also be the origin of a trip. In special circumstances, when people live during the survey period in another place than their usual (first residence, this place should be taken as origin).
>
> In cases such as that of a commercial traveller, the most remote destination and the main mode of transport used are to be described.
>
> To improve the quality of the understanding of the threshold, maps (from the place of residence) might be used to show the limits of the area not covered by the survey.

1.2. Journey - Deplacement - Fahrt

> A journey is an activity based movement from a specified point of origin to a specified point of destination. A new journey is to be described each time an important activity will take place or if there is at least one overnight stay. A journey can have just a single stage.

1.3. Stage - Trajet - Etappe

> A stage (segment) is a part of a journey defined by one single mode or mean of transport. Another stage must be taken into account if a change of mode or means of transport during a journey takes place. The locality of change or means of transport are to be described.
>
> In each mode of transport, several means of transport can be used. For example, in the road transport mode you can travel by private car or by bus, even by bicycle which are means of transport. In the railway transport mode, you can travel by high speed train or normal train.
>
> Stages going to/from terminals (places of changing modes or means) are to be described, only if the distance of such a stage is at least 100 km. It is due to subsidiarity of the states to use a narrower threshold." (Eurostat, 1995a)[1].

The following of the above dimensions are therefore specified:

- **Overall approach:** Stage/journey-based.
- **Minimum distance**: 100 km
- **Minimum duration**: None
- **Geographic range of exclusion:** Undefined
- **Temporal range of exclusion:** Undefined
- **Other exclusions**: None
- **Treatment of regular travellers**: Not addressed
- **Treatment of regular journeys**: Not addressed
- **Spatial definition of destination**: Undefined
- **Reference location**: Not precisely defined

The EUROSTAT definition assumes the existence of a main haul in the long-distance trip with trips to and from the terminal of that main haul. While many, maybe most long-distance trips will have such a structure, e.g. taxi to the airport, flight, taxi to the hotel, not all of them will do and it is additionally not clear that the implementation of such a two tier, stage/journey, survey structure will make it easier for the respondents.

For the purpose of this study the following further choice were made:

- **Overall approach:** pure stage-based; to simplify the survey structure
- **Minimum distance**: 75km; to increase the number of journeys reported
- **Minimum duration**: None
- **Geographic range of exclusion:** all trips at the destination
- **Temporal range of exclusion:** None
- **Other exclusions**: None
- **Treatment of regular travellers**: Not specifically addressed

[1] The use of the terms 'trips' and 'journey' by the EUROSTAT working group is non-standard in comparison with the travel behaviour literature, where their usage is reversed. EUROSTAT is consistent with usages of tourism statistics, but the following will be employed here: a trip is a sequence of stages between activities and journeys are sequences of trips starting and ending at a reference location.

- **Treatment of regular journeys**: Not specifically addressed
- **Spatial definition of destination**: by implication the municipality/urban area visited
- **Reference location**: any destination where the respondents stays two consecutive nights

Normal, urban practice requires the respondents to report all trips outside a building (compound, such as a factory or campus, by implication). The choice of excluding all trips at the destination translates this idea to long-distance context. The potential spatial errors deriving from this exclusion, e.g. the missing information about the exact gate used to leave a factory or shopping mall, are usually small in an urban context. In the long-distance context, these errors could be substantial. Consider, for example, the lack of information about the correct motorway used to leave a city such as Berlin or Vienna. Still, the increase in reporting burden was judged to be too high to justify a more detailed reporting within the destination area.

Normal, urban practice excludes movements undertaken as work, i.e. working time is excluded for workers, for which driving is their task, e.g. taxi drivers, garbage truck drivers, bus conductors etc. In the long-distance context these travellers are the most interesting ones and cannot be excluded.

Especially frequent business travellers have a substantial work load in a survey of long-distance travel. Clearly, it would have been desirable to accommodate them by special forms or items. Unfortunately, this is impossible in the self-completion context, to which this study was committed. This is also the reason that frequent travellers and frequent journeys were not given special consideration in the definitions or the design.

4 SURVEY DEVELOPMENT AND EXPERIMENTAL DESIGN

4.1 Survey design

4.1.1 Design considerations and pilot design

One of the main challenges of survey design is how to communicate the object of survey to the respondent, so that the respondent's natural categories can be employed by him in answering the questions. Clearly, in a self-completion context the need for this match implies a very strong constraint. Here, the object might have to be adjusted to the natural categories used, which require no further explanation[2]. Unfortunately, there are no obvious natural categories in the case of long-distance travel. German distinguishes, for example, among others between *Reise, Ausflug, Dienstreise, Geschäftsreise, Urlaub*. More important still none of these terms clearly conveys to the respondent the need to record not only the main destination, but also minor destinations during the journey. The other two recent Austrian long-distance surveys implement such a 'naive' approach (See Figure 1 and Figure 2), which focuses the attention of the respondent on the furthest destination reached. In most, but not all cases, this destination will also be the main destination and the activity there will be the main purpose of the journey. This approach relies therefore on additional interviews to clarify this position and to collect information about stages and other destinations during the journey.

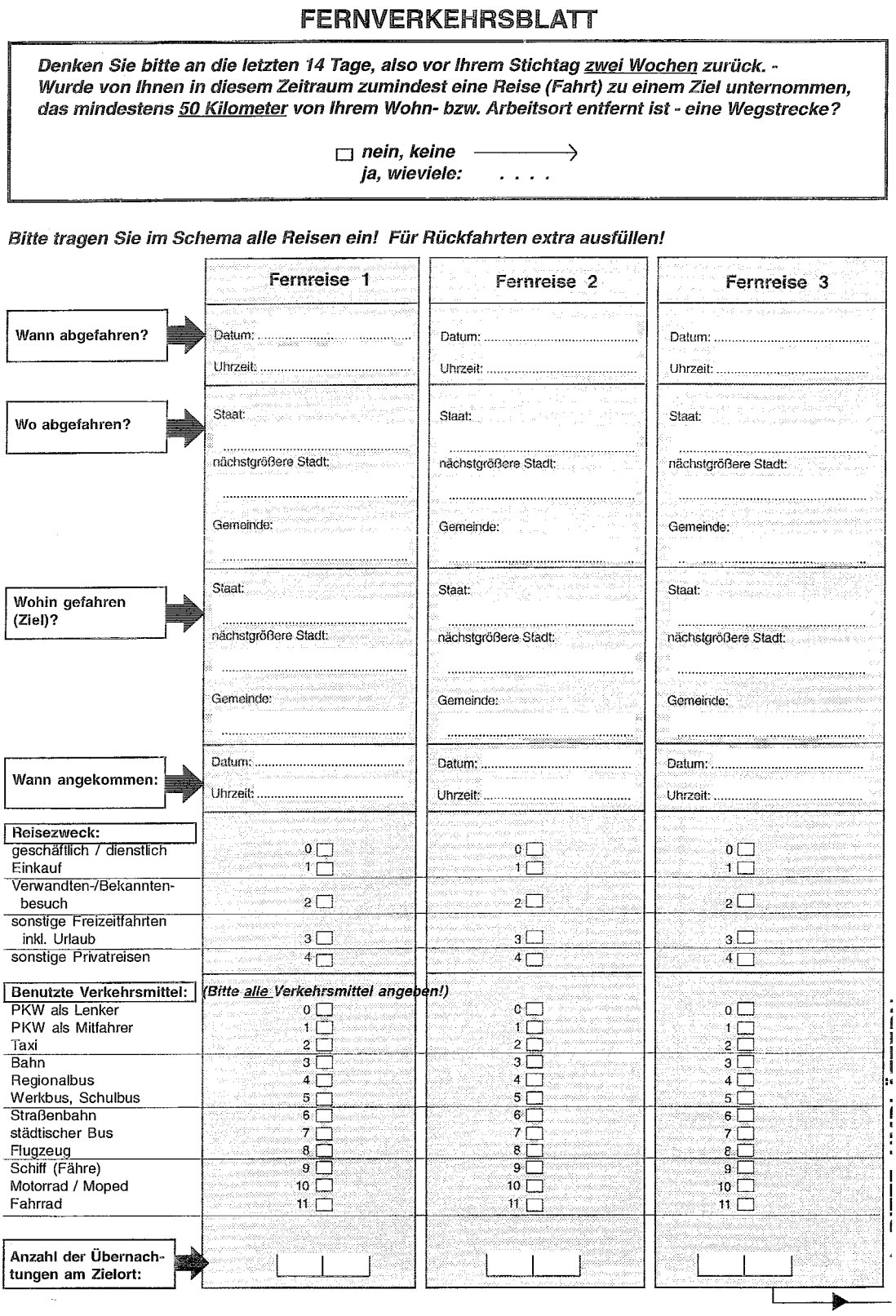
In the context of a stage-based survey without the possibility of additional interviews for the purpose of movement related data collection, this survey had to implement a complex instrument. In particular the need to collect information both at the stage level and the journey level creates problems for such a self-completion instrument. At the journey level the respondent should be able to indicate the main purpose and the associated main destination. This is information, which cannot easily be established from the information collected at the stage level, which gives each stage and associated activities equal rank.

Travel diaries collect information about the household and its vehicles, the household members and their movements. The allocation of the respective items to a form is a design decision. Following common European practice, the household, person and vehicle information were grouped into one form, while the movement items were allocated a separate form.

Household/Person/Vehicle form

hone retrieval at a later point in time (private communication). The cost/quality trade-off implied in this strategy is not obvious and requires further work.

Figure 1 Long-distance survey form - Bundesverkehrswegeplan



FERNVERKEHRSBLATT

Denken Sie bitte an die letzten 14 Tage, also vor Ihrem Stichtag zwei Wochen zurück. - Wurde von Ihnen in diesem Zeitraum zumindest eine Reise (Fahrt) zu einem Ziel unternommen, das mindestens 50 Kilometer von Ihrem Wohn- bzw. Arbeitsort entfernt ist - eine Wegstrecke?

☐ ***nein, keine*** ⟶
ja, wieviele: . . . .

Bitte tragen Sie im Schema alle Reisen ein! Für Rückfahrten extra ausfüllen!

	Fernreise 1	Fernreise 2	Fernreise 3
Wann abgefahren?	Datum: ..... Uhrzeit:	Datum: ..... Uhrzeit:	Datum: ..... Uhrzeit: .....
Wo abgefahren?	Staat: ..... nächstgrößere Stadt: ..... Gemeinde:	Staat: ..... nächstgrößere Stadt: ..... Gemeinde:	Staat: ..... nächstgrößere Stadt: ..... Gemeinde: .....
Wohin gefahren (Ziel)?	Staat: ..... nächstgrößere Stadt: ..... Gemeinde:	Staat: ..... nächstgrößere Stadt: ..... Gemeinde:	Staat: ..... nächstgrößere Stadt: ..... Gemeinde: .....
Wann angekommen:	Datum: ..... Uhrzeit:	Datum: ..... Uhrzeit:	Datum: ..... Uhrzeit: .....
Reisezweck:			
geschäftlich / dienstlich	0 ☐	0 ☐	0 ☐
Einkauf	1 ☐	1 ☐	1 ☐
Verwandten-/Bekannten-besuch	2 ☐	2 ☐	2 ☐
sonstige Freizeitfahrten inkl. Urlaub	3 ☐	3 ☐	3 ☐
sonstige Privatreisen	4 ☐	4 ☐	4 ☐
Benutzte Verkehrsmittel:	*(Bitte alle Verkehrsmittel angeben!)*		
PKW als Lenker	0 ☐	0 ☐	0 ☐
PKW als Mitfahrer	1 ☐	1 ☐	1 ☐
Taxi	2 ☐	2 ☐	2 ☐
Bahn	3 ☐	3 ☐	3 ☐
Regionalbus	4 ☐	4 ☐	4 ☐
Werkbus, Schulbus	5 ☐	5 ☐	5 ☐
Straßenbahn	6 ☐	6 ☐	6 ☐
städtischer Bus	7 ☐	7 ☐	7 ☐
Flugzeug	8 ☐	8 ☐	8 ☐
Schiff (Fähre)	9 ☐	9 ☐	9 ☐
Motorrad / Moped	10 ☐	10 ☐	10 ☐
Fahrrad	11 ☐	11 ☐	11 ☐
Anzahl der Übernachtungen am Zielort:	☐☐	☐☐	☐☐

The household form follows in its design current practice, i.e. using an A3 portrait format folded to A4 to present the items. The experimental design (see below) required two alternative forms covering different numbers of items coded at different levels of detail (a short form and a long form). It was possible to fit the content of the short form (see Appendix A.1) on one sheet A3 folded to A4 (cover page with brief instructions, items on the inside, blank back page), while the long form required two sheets of A3 (cover page with brief instructions, household/person items, vehicle items, two empty pages, blank back page) (See Appendix A.2 and Figure 3).

The household and person questions for the short form implemented the questions required by the EUROSTAT Working Group, while the set for the long form included additional items relating to long-distance travel, such as the ownership of airline frequent flyer cards (See Table 3). The coding for the short form implemented the EUROSTAT Working Group requirements, while the long form expanded it. The main difference to current urban practice in the large set was the absence of a specific item about working status (employed, retired, housewife etc.). This item was covered by a series of more detailed ones.

Many items allowed the respondent only to indicate presence of, for example, a driving licence, but not the absence. While attractive graphically, it is not a recommended practise due to the impossibility of distinguishing absence and item non-response.

The EUROSTAT working group had made no recommendation with regards to the desired information about the household vehicles. Two question sets were constructed in analogy to the household/person sets (Table 4).

Movement form and explanatory booklet

The movement form is the central element of a survey of travel behaviour. As explained above, the demand for simplicity is in conflict with the complexity of the survey object and the chosen form of survey administration. After a number of drafts and informal pretests with about 20 persons the final design was based on the following key points (See Figure 4):

- separate journey and stage level items
- distribution of the explanatory information across the movement form and an explanatory booklet
- a column format for the stages

Table 3 Items: household and person

Item	Small set	Large set
Location of main residence	open	open
Name	open	open
Age	year of birth	year of birth
Sex	m, f	m, f
Profession	of highest earner	open
Marital status		single, married, widowed, divorced
Nationality		Austrian, other
Highest educational qualification		compulsory schooling (with/without degree), apprenticeship, technician, baccalaureate, university
Selfemployed		y
Current paid working hours		open
Work schedule		fixed, flexible, shift
Car licence		y
Rail discount cards		Family card, 50% discount pass, prepaid mileage pass, regional six month season ticket, regional yearly season
Frequent flyer cards		Swissair/AUA Qualiflyer, Lufthansa Miles & more, other
Membership of car sharing clubs		y

Table 4 Items: vehicles

Items	Small set	Large set
Kind	car, motorcycle, truck	car, motorcycle, truck
Make	-	open
Motor size	-	cc
Age	-	year of manufacture
Fuel	-	gasoline, diesel
Catalytic converter	-	y, n
Mileage in the last 12 month	-	open
Odometer reading	-	open
Main user	-	name of household member
Registration	name of household member, employer, other family member, other	name of household member, employer, other family member, other
Leasing	-	y, n

The form establishes at the journey level (see Figure 4): departure time and place (home, elsewhere), the main purpose without which the journey would not have taken place, the main destination, if there was one, the names of all accompanying household members and the number of others travelling with the reporting household member. The inclusion of the size of party information at the journey level is a simplification, as this number could change by stage, but it was felt, that this simplification was required to reduce the complexity of the stage level. Main purpose and destination were asked for explicitly, as the information cannot be extracted from the stage level without undue simplification in the analysis.

The small item set for the short movement form is based on the EUROSTAT requirements. The large one covers the same items in more detail and adds items about the cost of travel and the form of accommodation (See Table 5 and Table 6) (See also Axhausen, 1996).

The purpose coding includes the unusual items "break/eating en route" and "being at home", where the German term *Wohnen* is not specific with regards to being at one's main residence. The first item was introduced to stress the stage nature of the survey and to encourage the reporting of breaks in longer car journeys. The second item was introduced to reduce the confusion at the end of the journey, where initial versions without this item created problems in the informal pretests. A fair number of respondents felt at a loss at their last stage and forgot some further items.

The complexity of the survey object requires substantial explanation to minimize the work load of the respondents. Still, a complicated looking set of explanations will not be read and might frighten the potential respondents off. In addition, it is known that some respondents will start filling any survey irrespective of the information provided, while others tend to use the information (Jenkins, 1996).

The relevant information was therefore divided into three parts:

- basic instructions on the front page of the movement form (4 lines including reporting period)
- more detailed definitions on the front page of the explanatory booklet (about 15 lines of text) plus a calender covering the reporting period indicating the weekends and the legal holidays.
- a set of three annotated example journeys of increasing complexity forming the body of the explanatory booklet (see Figure 5). The example journeys start and end in Innsbruck.

Table 5 Items: Movement form - journey level

Item	Small set	Large set
Departure location	home/other location	home/other location
Departure time	day, hour	day, hour
Main purpose	work, eduction, business, shopping visiting, leisure, other (open)	work, eduction, business, shopping visiting, leisure, other (open)
Main destination	n, y (open)	n, y (open)
Names of household members	open	open
Number of others travelling	[]	[]

Table 6 Items: Movement form - stage level

Item	Small set	Large set
Mode	household car (+nr), other private vehicle, rental car, taxi, business vehicle, mc, bicycle, high speed, other train, bus, coach (scheduled, charter), air (scheduled, charter), sea, other	household car (+nr), other private vehicle, rental car, taxi, business vehicle, mc, bicycle, high speed, intercity, other long-distance local train, tram, bus, coach (scheduled, charter), air (scheduled, charter), sea, other
Fare class		train (1/2), air (1, business, economy)
Paid by		self, client, family, host, employer, other
Destination	open	open
Arrival time	day, hour	day, hour
Purpose (tick all, which apply)	change mode, break/eating, overnight stay, work, education, business, shopping, visiting, leisure, other, at home,	change mode, break/eating, overnight stay, work, education, business, private business, shopping, visiting, leisure, pick up/drop off, other, at home
Type of accommodation		hotel, 'club', youth hostel, camp ground, private room, with relatives, own second home, other second home, other
Paid by		self, client, family, host, employer, free
Departure time	day, hour	day, hour

Figure 4 Example: movement form - large set

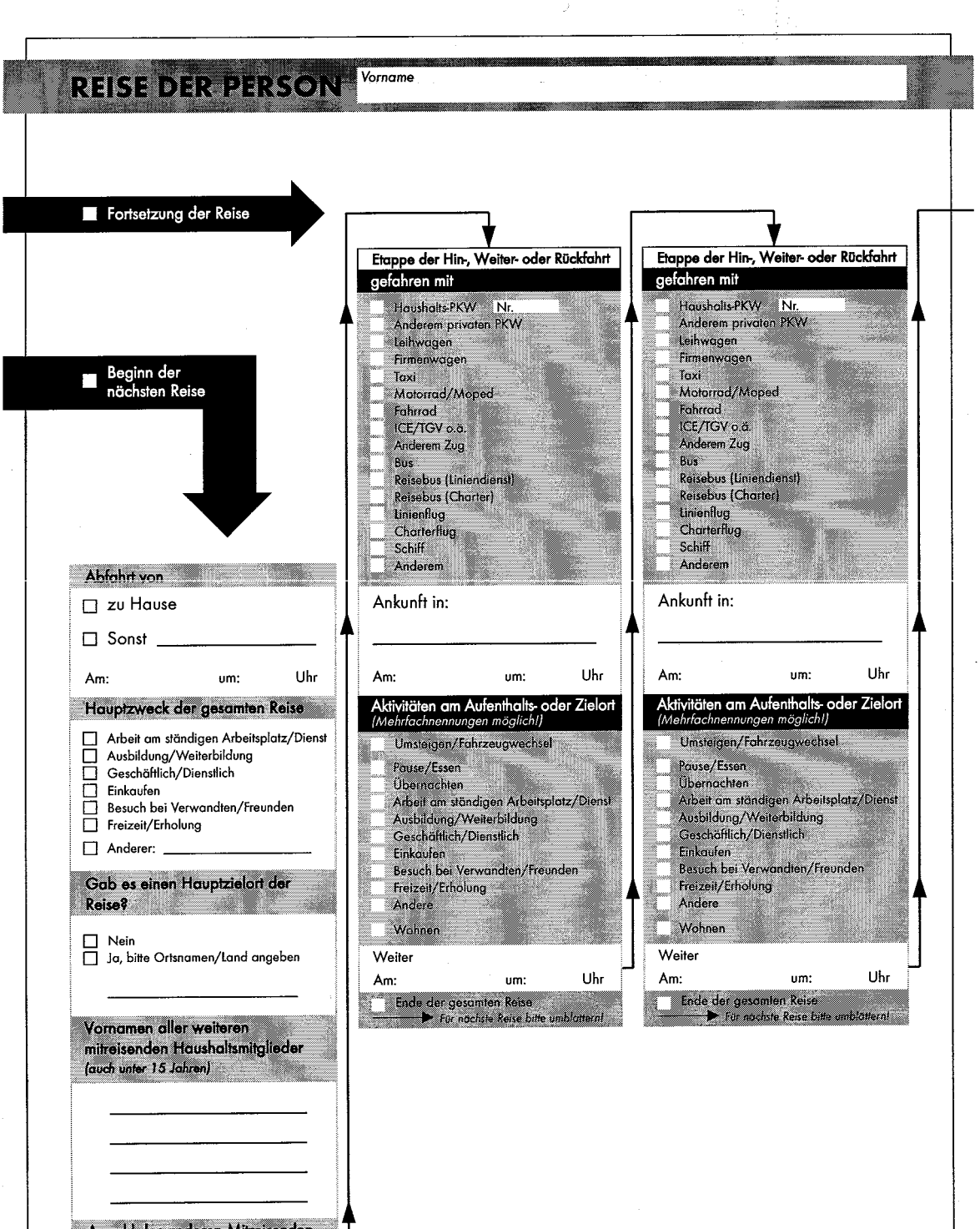
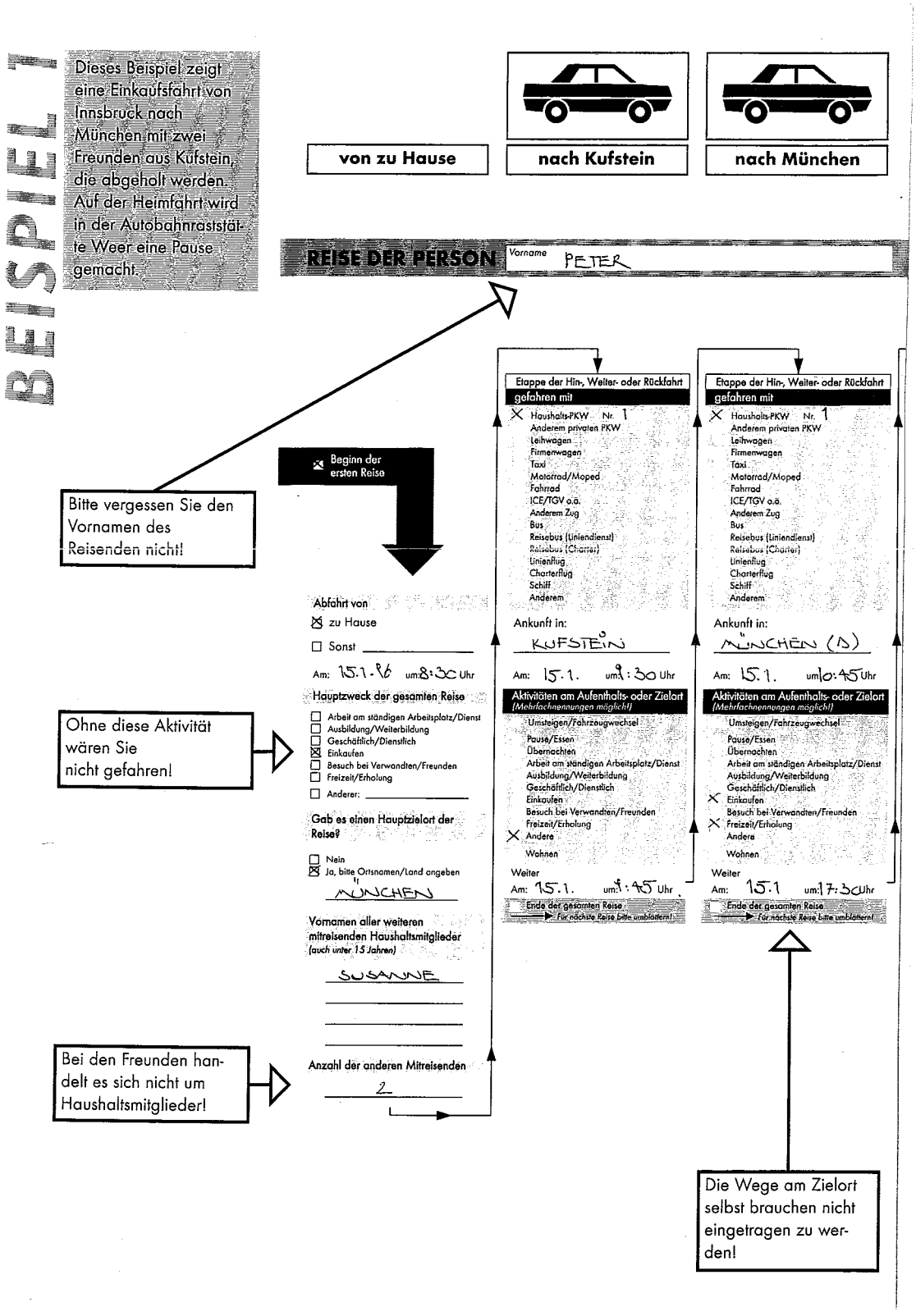


Figure 5 Example page from the Explanatory booklet



This allows the respondents, who wants to start immediately, to do so. He can ignore the extra information. This also allows that respondent, who wants to learn more about the task, to do so at his leisure and to the degree desired. The more detailed definitions are not exhaustive, as that would require substantially more text, but some of these finer points are illustrated by the examples.

The format follows the well known column format, as pioneered by the 1973 KONTIV design. The form offers per double page one column for the journey information and five for the stage information. This is a slightly awkward compromise, as a pure two-trip car journey requires only two columns, whereas a properly reported trip involving public transport requires 6 stages (access - long haul - egress and return). Still, it was judged that the alternative of offering "1+5" + "6" on two double pages was too space wasting. Special care was therefore given to the arrows guiding the respondent to continue on the following page, if he needs to report more stages for this journey.

The movement form has eleven double pages.

On the back side of the form, the respondents were asked to provide the basic items about their last long-distance journey before the survey period and the next one planned after the survey period (dates, destination and names of accompanying household members).

4.2 Response- and Non-Response-Interviews

The methodological objective of this study made it necessary to obtain feed-back from both respondents and non-respondents about the study. Obviously, it is good practice in any case to contact the households to check for errors or to obtain information from initial non-responders.

The response-interviews (R-interviews) covered three parts:

- corrections to survey form returned
- assessment of the difficulties with the form and possible improvements
- household income

No explicit attempt was undertaken to enquire about missing journeys, but they were recorded, if offered by the respondents.

The non-response interviews had a larger coverage:

- reasons for non-response

- recording of the basic items of the journeys undertaken in the survey period (dates, destination, accompanying household members)
- household income

The journey information will be used later for models of non-response.

4.3 Survey protocol

The survey protocols adopted are a variant on current good practice combining various reminders and survey pack redistribution (Richardson, Ampt and Meyburg, 1995).

The protocol for the prospective surveys was:

- Announcement letter (about 2-3 days in advance of the survey)
- Survey distribution
- First encouragement letter (about 1/3 through the survey period)
- Second encouragement letter (about 4/5 through the survey period)
- Reminder (one week after the end of the survey period)
- Redistribution of the survey (two weeks after the end of the survey period; survey period moved by two weeks to be filled as a retrospective survey)

The contact attempts for the response-interviews commenced immediately after coding. The household was classified as unreachable, if not reached within 5 attempts spread over a number of days.

The contact attempts for the non-response-interviews commenced two weeks after the redistribution of the survey materials. The household was classified as unreachable, if not reached within 5 attempts spread over a number of days.

The protocol for the retrospective surveys was:

- Announcement letter (about 2-3 days in advance of the survey)
- Survey distribution
- Reminder (one week after the end of the survey period)
- Redistribution of the survey (two weeks after the end of the survey period; survey period moved by two weeks)

The contact attempts for the response-interviews commenced immediately after coding. The household was classified as unreachable, if not reached within 5 attempts spread over a number of days.

The contact attempts for the non-response-interviews commenced two weeks after the redistribution of the survey materials. The household was classified as unreachable, if not reached within 5 attempts spread over a number of days.

4.4 Experimental design, pretest and final design

The original brief of the study had envisaged testing five factors for their effects on response rates and data quality: temporal orientation, duration of the survey period, level of detail of the household/person, vehicle and movement form. This would have implied 16 different surveys in a fractional factorial design out of 32 combinations possible in total. But before the design was finalized, the study team decided to conduct a pretest of the newly developed instrument.

4.4.1 Pretest

The pretest was undertaken with the two extreme cases of the survey design:

- retrospective, 8 weeks, small set for household, vehicles and travel
- retrospective, 8 weeks, large set for household, vehicles and travel

Given the time frame it was impossible to include a prospective instrument in the pretest. The surveys were conducted between February 14th (Announcement letter) and March 8th (Second reminder). The last return to be included was received March 21st. A detailed breakdown of the response to the mail-back- and telephone follow-up surveys is given in Table 7.

The response rate to the mail-back survey is 44.0% correcting for a small sample loss of 3.5% of the original sample of 200 households. The vast majority of those responding could also be reached for the follow-up-telephone interview (77.6%); all of which were willing to participate in this interview.

The non-response interview work yielded 27.8% successful interviews (of the 66% of the sample who were eligible for this interview) or 15% of the total sample. No information was obtained from 72.2% of those eligible (39% of the total sample); the bulk (50% or 28% respectively) being active refusers.

These results showed that the design and survey protocol was usable for the intended purposes. They also indicated that the small household, person and vehicle set had only a small positive impact on response rates. It was therefore decided to drop these from the experimental design. The telephone interviews showed that the household were unhappy with receiving a separate movement form for each

Table 7 Response to mail-back and telephone follow-up survey (pretest)

Mail-back return	Telephone interview	Information (Mail back)	Information (Telephone)	N	Comments
Yes	Yes	Partial	Full	4	
Yes	Yes	Full	Full	62	
Yes	No	Partial	None	1	Not reached by telephone
Yes	No	Full	None	18	Not reached by telephone
No	No	None	None	7	Respondent moved
No	Yes	None	None	24	No contact possible
No	Yes	None	None	10	Returned survey and refused interview
No	Yes	None	None	44	Refused interview
No	Yes	None	Partial	4	
No	Yes	None	Full	24	

member of the household and the need to record the same journey repeatedly. To accommodate this criticism the final design employed a joint movement form for all members of the household.

4.4.2 Experimental design

After dropping the factors "Details of the household" and "Details of the vehicles" it was possible to test all combinations of the remaining three factors:

- *temporal orientation*: prospective and retrospective
- *duration of the survey period*: four and eight weeks
- *details of the movement*: small and large question set

The following eight combinations resulted:

- Prospective, four weeks, small set
- Prospective, four weeks, large set
- Prospective, eight weeks, small set
- Prospective, eight weeks, large set
- Retrospective, four weeks, small set
- Retrospective, four weeks, large set
- Retrospective, eight weeks, small set
- Retrospective, eight weeks, large set

Each household was offered a small incentive (ATS 20) in the form of a donation to a charity of their choice from a list of six. The charities included in the list address local and international concerns, as well as social and environmental issues.

5 SURVEY ADMINISTRATION

5.1 Sample

Due to data protection legislation no sample could be obtained from official sources, such as the registry, electoral rolls or similar. The sample had therefore to be acquired from an address dealer. The sample was specified as males between 25-45 living in Innsbruck. This group was chosen as potentially difficult, i.e. low-response group of respondents. They can be expected to be difficult, as they might be travelling more then average due their professional commitments, have complex travel pattern due to their families and relative little time for extra activities, such as answering surveys.

The 1500 addresses acquired were checked against the most up-to-date CD-ROM telephone book of the Austrian PTT for the presence of a telephone and for the correctness of the address. Due to the lack of a telephone 120 addresses had to be removed. Nine persons with mobile phones were deleted as well. In 74 cases the address provided was not the same as the one in the phone book. These addresses were also removed, as we could not ascertain, whether they were identical. The pretest used 200 addresses leaving 1097 for the main study. A sample of 135 addresses was used for each of the eight experiments.

5.2 Survey administration

The survey was administered from the offices of the Ingenieurbüro Köll, which offered a service phone, which was manned weekdays throughout the survey period from 9:00 to 18:00.

The announcement letter and the return envelope was franked with stamps to highlight their importance. All other postings were machine franked to reduce costs.

The survey period for the four-week-surveys was March 23rd to April 21st (April 6th to May 5th), while to eight-week-surveys ended May 19th (June 2nd).

The telephone interviews were also conducted from the offices of the Ingenieurbüro Köll. Due to space limitations only two interviewers could work at any one time. These were specially trained and were also employed for other tasks surrounding the survey and its administration.

5.3 Response rates

The details of the response behaviour are shown in Table 8, which is summarized as response rates in Table 9. Sample loss is the number of survey packs returned by the post or new tenants as "Addressee unknown" or "Wrong address". The response rate is the share of those returning usable forms after accounting for the sample loss. The rate of unreachables is the share of households which we tried to reach by phone for either type of telephone interview and which could not be reached within five attempts. The rate of non-response (NR) interviews is the share of households eligible for a NR-interview, which did participate (i.e. excluding households which we could not finally reach). The rate of response-interviews is defined analogously (Table 9). The response rate on average across the experiments of 33.2% is in the range expected, but the total response (return of the form or a full NR-interview covering journeys made) is 52.7% of all respondents (minus sample loss).

Table 8 Response behaviour

Return	Telephone contact	Prospective				Retrospective			
		4 weeks		8 weeks		4 weeks		8 weeks	
		Small	Large	Small	Large	Small	Large	Small	Large
Sample loss		18	15	15	8	12	14	7	6
No	Not reached	16	21	18	31	17	13	24	15
No	Yes	29	23	21	18	20	30	13	21
No	Refused	36	25	33	35	32	29	33	37
Empty	Not reached	0	0	1	0	2	0	2	2
Empty	Yes	4	2	7	1	1	2	1	2
Empty	Refused	2	9	8	7	3	2	6	3
Yes	Not reached	8	11	8	6	12	7	5	7
Yes	Yes	22	28	24	29	33	37	43	42
Yes	Refused	0	1	0	0	3	1	1	0

Table 9 Response rates

Experiment Orientation	Survey period	Movement form	Response rate [%]	Un-reachable [%]	Share of NR-Inter-views [%]	Share of R-inter-views [%]	Sample loss [of 135]
Prospective	4 weeks	Small	25.6	20.5	46.5	100.00	18
Prospective	4 weeks	Large	33.3	26.7	42.4	96.6	15
Prospective	8 weeks	Small	26.7	22.5	40.6	100.00	15
Prospective	8 weeks	Large	27.6	29.1	31.2	100.00	8
Retrospective	4 weeks	Small	39.0	25.2	37.5	91.7	12
Retrospective	4 weeks	Large	37.2	16.5	50.8	97.4	14
Retrospective	8 weeks	Small	38.3	24.2	26.4	97.8	7
Retrospective	8 weeks	Large	38.0	18.6	36.5	100.0	6
All			33.2	22.9	39.4	97.7	8.8

The share of the households unreachable by telephone is independent of the characteristics of the experiment (grand mean of 22.9).

The share of the non-response interviews varies between 31.2% and 50.8%. There is a drop depending on the duration of the survey period (See below for a more detailed analysis).

The respondents, who had returned the form, were nearly all willing to participate in the short follow-up interview we conducted (grand mean of 97.7%).

The response was relatively slow. Those returning needed on average 13.75 days, two weeks after the distribution of the form or the redistribution. Figure 6 shows an example of this process: the cumulative return over time for the retrospective surveys.

It took an average of 3.74 days after the first attempt or 1.20 calls, if the first attempt was not successful to reach the respondents by phone. It was not possible to implement a one call a day routine due to staff limitations. The distribution of calls required is shown in Table 10. It shows a clear exponential pattern. It is interesting to note, that the Swedish Statistical Office is able to reach 95.2% of those finally reached for its CATI-based travel survey within five calls. Adding further calls in our study would therefore not have been likely to raise response significantly.

Table 10 Calls required to reach a household for a successful interview

Number of attempts	Percent	Cum. Percent
1	40.2	40.2
2	24.9	65.1
3	18.2	83.3
4	9.2	92.5
5	7.6	100.1

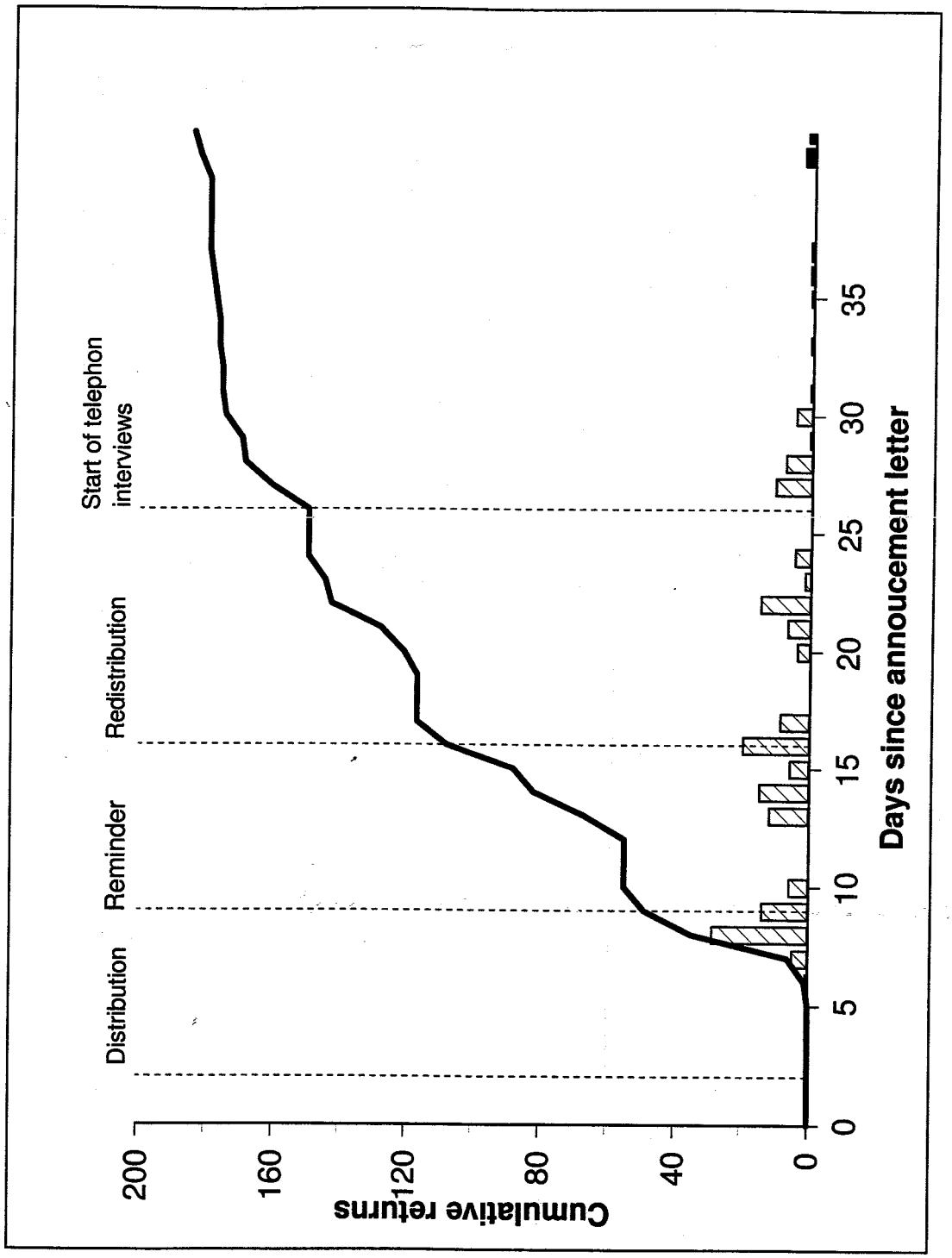
5.4 Charities chosen

Table 11 shows the preferences of the respondents with regards to the charities offered.

Table 11 Charities chosen

Name	Share pretest [%]	Share main study [%]	Type
Caritas	7.4	6.0	Catholic, local recipients
Licht ins Dunkel	22.2	15.8	Austrian charity for handicapped
Nachbar in Not	7.4	16.4	Support for Jugoslavian refugees
SOS-Kinderdorf	48.1	34.9	Tirol-based, but international children's charity
UNICEF	1.9	6.2	UN children charity
WWF	13.0	20.6	Environmental charity
Sum	100.0	99.9	
Preference indicated	64.3	44.5	
No preference indicated	35.7	55.5	

Figure 6 Response speed: retrospective surveys



6 SURVEY RESULTS

6.1 Socio-demographics

6.1.1 Household characteristics

The 523 households, for which the survey produced results, are divided between 328, which returned survey forms, and 195, which were reached only by phone. The distribution of incomes is shown in Table 12, while crosstabulations of household size and number of licence holders against the size of the household vehicle fleet are shown in Table 13 and Table 14. The crosstabulation of household type and household vehicle fleet is shown in Table 15.

Table 12 Distribution of household income [ATS/month]

Income class [%]	Households responding	Households interviewed only
Known	63.7	80.0
20000 and below	34.0	28.9
20000 to 40000	56.9	59.0
40000 and above	9.1	12.1
Unknown/refused	36.3	20.0
N	328	195

The income pattern for the two household type are comparable. The pattern for household size, fleet size and licence ownership are expected. The median household is the four person, one car, one licence household.

The car ownership patterns are as expected, i.e. show an increasing number of vehicles for larger households and households with more licence owners or adults.

Table 13 Household size against vehicle fleet size (Responding households only)

Household size [%]	Number of vehicles Zero	One	Two	Three	Four +	*Share of households*
One	39.1	52.2	8.7	-	-	*14.1*
Two	14.0	54.4	24.6	5.3	1.8	*17.5*
Three	11.4	71.4	12.9	4.3	-	*21.5*
Four	4.4	67.0	23.5	4.4	0.9	*35.3*
Five	0.9	70.6	17.7	2.9	-	*10.4*
Six	(25.0)	(75.0)	-	-	-	*1.2*
All	13.8	64.1	18.4	3.7	0.0	*100.0*

Table 14 Number of licence holders in the household against vehicle fleet size (Responding households only)

Licence holders [%]	Number of vehicles Zero	One	Two	Three	Four +	*Share of households*
Zero	85.7	14.3	-	-	-	*4.0*
One	22.1	72.1	5.8	-	-	*26.5*
Two	5.5	65.0	24.4	4.6	0.5	*66.8*
Three	-	(71.4)	-	(14.3)	(14.3)	*2.1*
Four +	-	-	(50.0)	(50.0)	-	*0.6*
All	13.8	64.1	18.4	3.7	0.0	*100.0*

Table 15 Household type against number of household vehicles (Responding households only)

Household type	Number of vehicles			Share of households
[%]	Zero	One	Two plus	
Single adult	39.1	52.2	8.7	*14.1*
Single adult/1 child	-	-	-	-
Single adult/2+ children	-	(100.0)	-	*0.9*
2+ adults	16.9	53.9	29.2	*19.9*
2+ adults/1 child	9.2	65.8	25.0	*23.3*
2+ adults/2 children	3.8	70.5	27.7	*32.2*
2+ adults/3+ children	9.7	74.2	16.1	*9.5*
All	13.7	64.1	22.1	

6.1.2 Person characteristics

Both the household form and the non-response interview yielded information about the members of the household. In the table below, only the results from those households replying will be presented, which concern 1025 out of the 1632 persons identified.

Table 16 gives the distribution across the most important socio-demographic characteristics. The patterns match the expectations about a sample, as the one used here. Table 17 provides a cross tabulation of age and sex.

Table 16 Persons: socio-demographic characteristics (Responding households only) (Base: persons)

Characteristic	Share [%]
Sex	
Male	54.7
Female	45.3
Age	
0-5 years	10.6
6-14 years	22.0
15-18 years	5.0
19-24 years	2.2
25-44 years	51.2
45-64 years	5.1
65+ years	0.9
Missing	3.1
Nationality	
Austrian	98.0
Other	2.0
Marital status	
Married	54.7
Single, Divorced, Widowed	45.3
Highest qualification	
Not completed yet	27.6
Compulsory schooling	11.0
Apprenticeship	18.3
Baccalaureate	13.5
Technical college	13.9
University	15.7
Driving licence (of adults)	90.4
ÖBB Half-Price pass	14.1
ÖBB Family pass	6.2
ÖBB *Kilometerbank* (discount prepurchased mileage)	1.5
Regional six monthly season	3.2
Regional annual season	4.1
Member in the AUA frequent flyer programme	0.7
Member in other frequent flyer programmes	0.9
Membership in car sharing programme	0.4

Table 16 Persons: socio-demographic characteristics (Responding households only) Continued

Characteristic	Share [%]
Working status	
Not working	11.0
In education	35.3
Working	53.7
Working hours	
Part time	22.7
Full time	77.3
Working pattern	
Fixed	61.4
Flexible	30.9
Shift	7.7
Selfemployed	8.0
Profession	
Missing	0.7
Professional	1.5
Technician	9.2
Clerk	16.8
Sales person	1.3
Craftsmen	4.8
Industrial worker	2.3
Other working	3.4
Working: classification unknown	2.7
Pupil or student	40.4
Other non-working	14.0

Obvious is, for example, the slightly higher share of singles among the males. The age distribution matches the request to the provider of the sample addresses pretty well, only a small share of the adult males are outside the specified age range of 25 to 45. Here, the Tyrolian habit of naming the son for the father could have led to a number of cases, where the senior member of the family replied for the adult junior member.

Licence holding is very high, but in the expected range. Higher than expected is the rate of ownership of the ÖBB half-price ticket with 14.1% of all persons in this subsample, whereas the membership in frequent flyer programs is very low.

Due to the lack of official statistics or other representative statistics it is impossible to judge at this stage, how closely this sample matches the population.

Table 17 Age versus sex (Responding households only) (Base: persons)

Age [%]	Sex Missing	Male	Female	All
Missing	6.3	50.0	43.7	*3.1*
0-5 years	-	47.7	52.3	*10.6*
6-14 years	-	49.3	50.7	*22.0*
15-18 years	-	62.8	37.2	*5.0*
19-24 years	-	31.8	68.2	*2.2*
25-44 years	-	53.7	46.3	*51.2*
45-64 years	-	61.5	28.5	*5.1*
65+ years	-	55.6	44.4	*0.9*
All	0.2	52.2	47.6	

6.1.3 Vehicle characteristics

The vehicle form gave a substantial amount of information about the vehicles of the household. A total of 374 vehicles was recorded by the respondents. The main characteristics are given in Table 18. The median vehicle is 4 years old and was driven for about 12000 km during the last twelve months. It has a catalytic converter and is mainly used by the person, who owns it.

Interesting to note are the more complex ownership and use patterns. For example, 19% of the vehicles are registered for someone other than the main user, but outside ownership is rare in the sample (5% business cars and 3% other outsiders).

6.1.4 Summary

The sample characteristics match expectations in general, but due to the current absence of a matching representative sample this cannot be verified. The size of the households responding is smaller than those households responding in the non-response interviews. This is a clear indication, that the information derived from the non-response interviews is necessary to provide a balanced view of the travel behaviour of the population (See also Section 7.1)

Table 18 Vehicle characteristics (Responding households only) (Base: vehicles)

Characteristic	Share [%]
Type	
Car	88.5
Motorcycle	10.4
Truck	1.1
Fuel	
Gasoline	72.7
Diesel	27.3
Catalytic converter	56.8
Year of manufacture	
1989 and older	39.0
1990	7.8
1991	7.2
1992	10.2
1993	10.2
1994	8.6
1995	10.4
1996	4.3
Mileage in the last twelve months	
4999 km or less	14.2
5000 - 9999 km	21.7
10000 - 14999 km	29.4
15000 - 19999 km	13.9
20000 km or more	14.4
Registered for	
Employer	4.8
Main household user	72.7
Other household member	19.0
Other family member	0.5
Other	2.9
Main user	
Owner	72.7
Other household member	24.0
All licence holders equally	3.2
Leased vehicle	7.4

6.2 Travel behaviour: journeys

The survey design and protocol recorded four different types of journeys, which need to be kept separate:

- Journeys during the survey period recorded in the survey form (full details)
- Journeys outside the survey period recorded on the survey form (basic details)
- Journeys during the survey period recorded during the non-response interview (basic details)
- Journeys outside the survey period recorded during the non-response interview (basic details)

In the following discussions, in general, the first and the third type will be considered. In addition, it is necessary to distinguish household journeys and person journeys. A household journey is a journey undertaken by one or more household members. A person journey is a journey undertaken by a household member. For example, a joint journey by two household members would count as one household journey, but as two person journeys. A total of 1332 household journeys was recorded (858 on the forms, 474 by interview) generating a total of 1632 person journeys.

6.2.1 Journey characteristics

The key descriptive characteristics of the journeys are presented in Table 19. The dominant mode is the private car (74%) followed by long-distance rail (17%) and air (7%). All other modes have negligible shares. The main destination is Austria (66%) followed by the near-abroad in Germany and Italy. Again, other destinations are negligible. Three purpose dominate: business, leisure and visiting.

The patterns of departure and return show the expected peaks on Friday and Sunday respectively, while the remainder of the week is roughly constant (See also Figure 11 ff. for a graph depicting the journey patterns over the survey period).

The durations of stay, duration of the stages and the size and composition of the travelling parties show the expected patterns of variation. The distributions of duration of stay and sum of stage durations also show the expected exponential patterns.

Table 19 Characteristics of the journeys (Survey period only) (Base: household journeys)

Characteristic	Share [%]
Destination	
Austria	66.0
Germany	12.9
Italy	16.5
Other	4.6
Departure day	
Monday	15.2
Tuesday	12.6
Wednesday	12.6
Thursday	12.9
Friday	20.0
Saturday	17.3
Sunday	9.5
Return day	
Monday	14.2
Tuesday	12.6
Wednesday	11.4
Thursday	13.0
Friday	12.9
Saturday	10.8
Sunday	24.9
Main purpose	
Business	35.5
Education	6.5
Escorting	1.3
Leisure	21.4
Private business	1.2
Private service	0.8
Shopping	2.9
Visiting	24.7
Work	4.0
Other	1.8
Main modes	
Air	6.6
Regional public transport	0.3
Cars etc.	73.6
Long distance bus	1.6
Long distance train	17.1
Non-motorized modes	0.2
Sea	0.7
Mean duration of stay	3.6 days
Mean stage durations	9.64 hours
Mean size of party	2.63 persons
Mean number of household members	1.66 persons
Mean number of non-household members	0.98 persons

Table 20 Travel participation by household characteristics (Survey period only)

Characteristic	Journeys/week and household		Person journeys/ person and week
	Household journeys	Person journeys	
All	0.24	0.39	0.14
Monthly household income (ATS)			
20000 and below	0.14	0.23	0.10
20000 to 40000	0.23	0.40	0.16
40000 and more	0.41	0.60	0.21
Missing	0.30	0.43	0.17
Household size			
1	0.19	0.18	0.17
2	0.37	0.48	0.22
3	0.25	0.43	0.18
4+	0.22	0.41	0.12
Number of vehicles			
0	0.20	0.25	0.10
1	0.26	0.44	0.14
2	0.41	0.63	0.16
3	0.32	0.62	0.18
Number of licences			
0	0.18	0.27	0.06
1	0.19	0.31	0.15
2	0.32	0.52	0.15
3	0.36	0.50	0.12

The patterns of long-distance travel participation by household and person characteristics are shown in Table 20 and Table 21. The raw, unweighted average number of journeys is reasonable (0.24 household journeys and 0.39 person journey/week and household and 0.13 journeys/person and week), but substantially higher than the estimate of the Austrian Central Bureau of Statistics (ÖSTAT, 1995) for non-business travel alone (See Section 7 for a better estimate). This survey implies, using the raw data, 6.9 long-distance journeys per year, while ÖSTAT reports only roughly 1.12 journeys (including all journeys with at least one overnight stay and no business travel). Accounting for the fact, that journeys of less than one day make up about 45% of all journeys recorded here and that, 36% are business journeys, reduces the difference to about 2.5 journeys, which is reasonable given the composition of this sample in comparison to the national representative sample of ÖSTAT.

Table 21 Travel participation by person characteristics (Survey period only) (Base: persons)

Characteristic	Person journeys/ week and person
All	0.14
Age	
17 and under	0.08
18 to 30	0.20
31 to 40	0.19
41 and over	0.21
Sex	
Male	0.18
Female	0.11
Working status	
Not working	0.09
In education	0.07
Working	0.20
Car licence	
Yes	0.20
No	0.09
Highest educational qualification	
None	0.09
Compulsory schooling only	0.10
Apprenticeship	0.14
Baccalaureate	0.24
Technical college	0.16
University	0.28

The distribution of the number of person journeys and of household journeys are shown in Figure 7 and Figure 8. Number of journeys, durations of stay, size of party and number of trips/journey broken down by age, sex, profession and household type are the subject of Table 22 to Table 33.

Figure 7 Distribution of person journeys by sex (Survey period only)

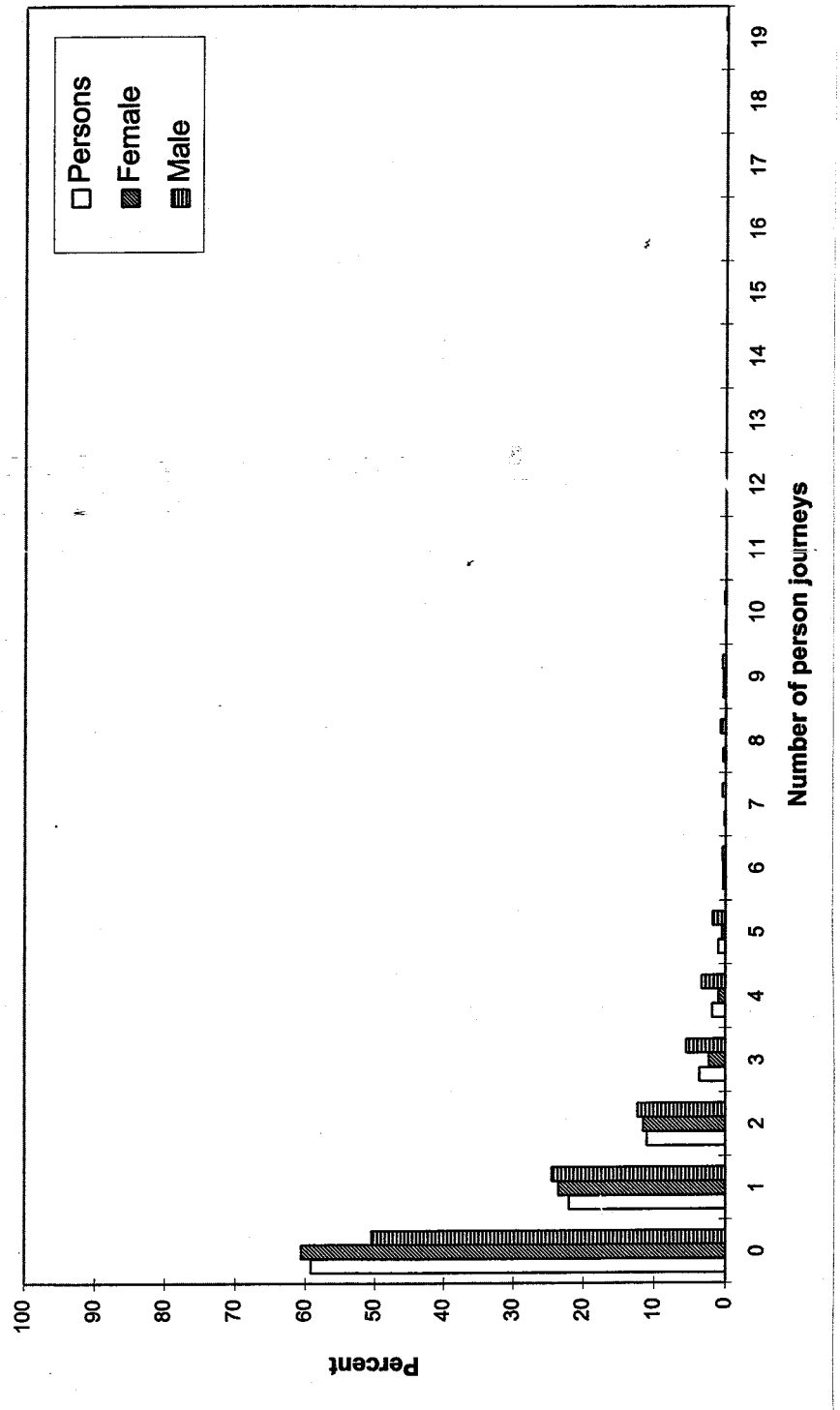


Figure 8 Distribution of household journeys (Survey period only)

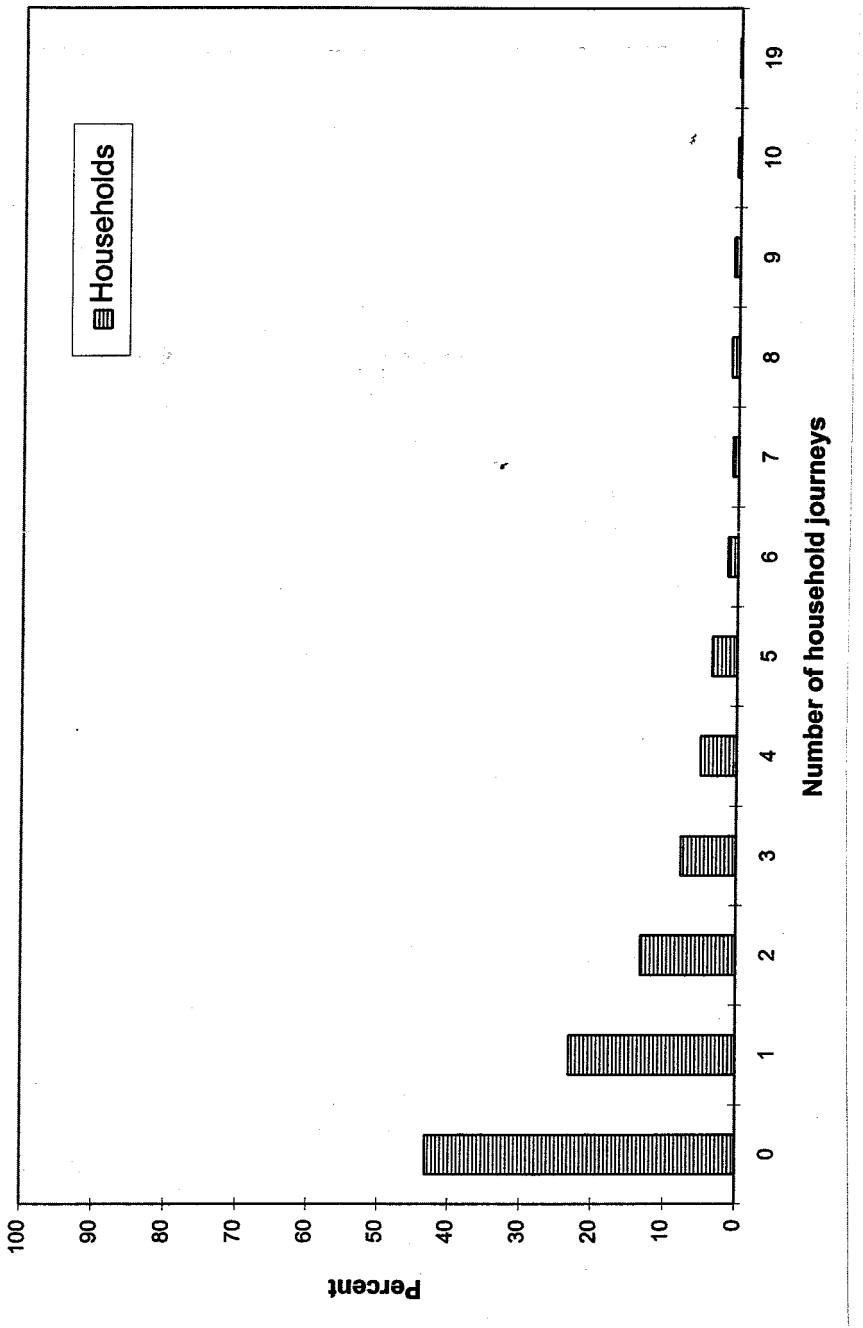


Table 22 Average number of person journeys/person and week by age and sex (Survey period only) (Base: persons)

[]	Sex Female	Male	Missing	All
Telephone interviews only	*0.07*	*0.15*	*0.04*	*0.09*
Households responding				
Missing	0.04	0.17	0.12	*0.10*
0-5 years	0.07	0.07	-	*0.07*
6-14 years	0.09	0.09	-	*0.09*
15-18 years	0.04	0.08	-	*0.07*
19-24 years	0.12	0.05	-	*0.10*
25-44 years	0.15	0.24	-	*0.20*
45-64 years	0.17	0.30	-	*0.25*
65+ years	0.03	0.05	-	*0.04*
All	*0.12*	*0.18*	*0.12*	*0.15*
All sources	*0.11*	*0.18*	*0.04*	*0.13*

Table 23 Average number of person journeys/person and week by profession and sex (Survey period only) (Base: persons)

[]	Sex Female	Male	Missing	All
Telephone interviews only	*0.07*	*0.15*	*0.04*	*0.09*
Households responding				
Missing	0.18	0.31	0.24	0.26
Manager	0.00	0.47	-	0.44
Professional	0.26	0.32	-	0.30
Technician	0.24	0.30	-	0.30
Clerk	0.15	0.23	-	0.20
Sales person	0.09	0.21	-	0.13
Craftsman	0.14	0.13	-	0.13
Industrial worker	0.00	0.16	-	0.14
Other working	0.20	0.16	-	0.18
Other working: Non classified	0.24	0.20	-	0.21
Student	0.08	0.09	0.00	0.09
Other non-working	0.11	0.00	-	0.11
All	*0.12*	*0.18*	*0.12*	*0.15*
All sources	*0.11*	*0.18*	*0.04*	*0.13*

Table 24 Average number of household and person journeys/household and week by household type (Survey period only) (Base: households)

[]	Household journeys/ household and week			Person journeys/ household and week		
	Telephone only	Responding	All	Telephone only	Responding	All
Missing	0.00	0.12	0.04	0.00	-	-
Single adult	0.18	0.19	0.19	0.17	0.18	0.18
Single adult/1 child	-	-	-	-	-	-
Single adult/2+ children	0.00	0.28	0.17	0.00	0.44	0.27
2+ adults	0.25	0.43	0.36	0.36	0.57	0.49
2+ adults/1 child	0.11	0.29	0.24	0.22	0.49	0.41
2+ adults/2 children	0.14	0.24	0.21	0.26	0.48	0.39
2+ adults/3+ children	0.21	0.25	0.23	0.36	0.51	0.44
All	*0.17*	*0.28*	*0.24*	*0.27*	*0.46*	*0.39*

Table 25 Average duration of stay by age and sex (Survey period only) (Base: persons)

[days]	Sex			
	Female	Male	Missing	All
Telephone interviews only	*4.93*	*3.54*	*4.82*	*4.13*
Households responding				
Missing	7.00	6.15	5.89	*6.22*
0-5 years	7.51	7.27	-	*7.38*
6-14 years	8.07	7.15	-	*7.63*
15-18 years	14.35	8.05	-	*10.28*
19-24 years	23.89	16.20	-	*22.73*
25-44 years	6.31	5.65	-	*5.91*
45-64 years	7.39	1.27	-	*2.82*
65+ years	9.67	11.80	-	*11.00*
All	*7.59*	*5.68*	*5.89*	*6.46*
All sources	*7.37*	*5.38*	*4.93*	*6.12*

Table 26 Average duration of stay by profession and sex (Survey period only) (Base: persons)

[days]	Sex Female	Male	Missing	All
Telephone interviews only	*4.93*	*3.54*	*4.82*	*4.13*
Households responding				
Missing	17.40	4.00	5.89	0.26
Manager	-	3.77	-	0.44
Professional	4.82	3.47	-	0.30
Technician	6.83	5.76	-	0.30
Clerk	6.29	5.32	-	0.20
Sales person	11.29	4.38	-	0.13
Craftsman	6.16	8.44	-	0.13
Industrial worker	11.50	8.28	-	0.14
Other working	11.45	6.52	-	0.18
Other working: Non classified	2.30	5.34	-	0.21
Student	8.99	7.17	0.00	0.09
Other non-working	6.80	8.29	-	0.11
All	*7.59*	*5.68*	*5.89*	*6.46*
All sources	*7.37*	*5.38*	*4.93*	*6.12*

Table 27 Average duration of stay by household type (Survey period only) (Base: households)

[days]	Telephone only	Responding	All
Missing	-	8.00	8.00
Single adult	5.84	7.11	6.86
Single adult/1 child	-	-	-
Single adult/2+ children	-	3.22	3.22
2+ adults	5.51	7.24	6.92
2+ adults/1 child	5.35	3.62	3.73
2+ adults/2 children	2.46	5.46	4.96
2+ adults/3+ children	1.69	5.50	4.58
All	*4.00*	*5.65*	*5.39*

Table 28 Average size of party by age and sex (Survey period only) (Base: persons)

[]	Sex Female	Male	Missing	All
Telephone interviews only	*2.81*	*2.10*	*3.77*	*2.63*
Households responding				
Missing	2.57	1.90	4.20	*2.50*
0-5 years	3.98	3.99	-	*3.98*
6-14 years	4.20	4.22	-	*4.21*
15-18 years	4.87	4.78	-	*4.81*
19-24 years	4.07	3.00	-	*3.91*
25-44 years	2.96	2.67	-	*2.78*
45-64 years	2.89	2.59	-	*2.66*
65+ years	2.00	3.00	-	*2.63*
All	*3.33*	*2.97*	*4.20*	*3.12*
All sources	*3.29*	*2.85*	*3.82*	*3.05*

Table 29 Average size of party by profession and sex (Survey period only) (Base: persons)

[]	Sex Female	Male	Missing	All
Telephone interviews only	*2.81*	*2.10*	*3.77*	*2.63*
Households responding				
Missing	2.40	2.33	4.20	3.04
Manager	-	2.40	-	2.40
Professional	2.42	2.49	-	2.47
Technician	2.33	2.28	-	2.28
Clerk	3.47	2.96	-	3.09
Sales person	2.78	1.75	-	2.46
Craftsman	2.58	2.61	-	2.61
Industrial worker	2.00	2.77	-	2.74
Other working	2.98	2.73	-	2.91
Other working: Non classified	2.20	2.57	-	2.50
Student	4.06	4.08	0.00	4.07
Other non-working	3.13	1.86	-	3.10
All	*3.33*	*2.97*	*4.20*	*3.12*
All sources	*3.29*	*2.85*	*3.82*	*3.05*

Table 30 Average size of party by household type (Survey period only) (Base: households)

[]	Household journeys/household and week		
	Telephone only	Responding	All
Missing	-	14.50	14.50
Single adult	1.08	1.45	1.38
Single adult/1 child	-	-	-
Single adult/2+ children	-	2.00	2.00
2+ adults	2.19	2.18	2.19
2+ adults/1 child	2.22	2.81	2.77
2+ adults/2 children	2.42	2.94	2.86
2+ adults/3+ children	1.69	3.25	2.88
All	*2.05*	*2.60*	*2.51*

Table 31 Average number of trips/journey by age and sex (Survey period only) (Base: persons)

[]	Sex			
	Female	Male	Missing	All
Telephone interviews only	-	-	-	-
Households responding				
Missing	2.75	2.47	2.67	*2.56*
0-5 years	1.96	1.96	-	*1.96*
6-14 years	2.15	2.03	-	*2.09*
15-18 years	2.67	2.24	-	*2.30*
19-24 years	4.20	2.00	-	*3.83*
25-44 years	2.10	2.45	-	*2.33*
45-64 years	2.56	2.61	-	*2.60*
65+ years	2.00	2.00	-	*2.00*
All	*2.20*	*2.39*	*2.67*	*2.32*
All sources	*2.20*	*2.39*	*2.67*	*2.32*

Table 32 Average number of trips/journey by profession and sex (Survey period only) (Base: persons)

[]	Sex			
	Female	Male	Missing	All
Telephone interviews only	-	-	-	-
Households responding				
Missing	2.00	2.14	2.67	2.31
Manager	-	2.39	-	2.39
Professional	2.36	2.68	-	2.60
Technician	2.33	2.50	-	2.49
Clerk	2.16	2.44	-	2.38
Sales person	2.00	2.00	-	2.00
Craftsman	4.60	2.67	-	2.97
Industrial worker	-	2.15	-	2.15
Other working	2.25	2.40	-	2.29
Other working: Non classified	1.86	1.91	-	1.90
Student	2.16	2.05	-	2.10
Other non-working	2.07	-	-	2.07
All	*2.20*	*2.39*	*2.67*	*2.32*
All sources	*2.20*	*2.39*	*2.67*	*2.32*

Table 33 Average number of trips/journey by household type (Survey period only) (Base: households)

[]	Household journeys/household and week		
	Telephone only	Responding	All
Missing	-	2.00	2.00
Single adult	-	2.75	2.75
Single adult/1 child	-	-	-
Single adult/2+ children	-	2.00	2.00
2+ adults	-	2.65	2.65
2+ adults/1 child	-	2.24	2.24
2+ adults/2 children	-	2.34	2.34
2+ adults/3+ children	-	2.14	2.14
All	-	*2.43*	*2.43*

Also, the expected patterns are shown by the breakdown of these variables by purpose and mode (Table 34 and Table 35).

Table 34 Average duration of stay, size of party and sum of stage durations by person journey purpose (Survey period only) (Base: journeys)

	Duration of stay [d]	Size of party []	Sum of stage durations [h]
Missing	4.23	2.38	7.45
Commuting	4.52	2.23	9.47
Business	2.13	1.60	8.61
Shopping	1.00	2.80	3.98
Visit	3.33	3.39	8.42
Leisure	5.02	4.44	12.45
All	*3.64*	*3.19*	*9.62*

Table 35 Average duration of stay, size of party and sum of stage durations by main mode (Survey period only) (Base: journeys)

	Duration of stay [d]	Size of party []	Sum of stage durations [h]
Missing	4.52	2.77	3.00
Scheduled air	6.85	2.51	17.63
Non-scheduled air	11.86	4.86	23.38
Scheduled bus	6.50	17.25	15.13
Non-scheduled bus	3.71	19.79	17.43
Car	2.69	3.07	8.01
High-speed-train	3.00	2.00	24.79
Other train	3.43	2.75	10.08
Ship	5.14	3.86	43.49
Motorcycle	2.67	4.00	6.33
Others	6.00	4.00	29.00
All	*3.64*	*3.19*	*9.62*

Further, more detailed breakdowns of the various variables can be found in Table 36 to Table 43.

Table 36 Distribution of size of party by main purpose (Survey period only) (Base: journeys)

[%]	Size of party [persons] 1	2	3+	Share [%]
Telephone only	31.3	23.1	45.6	
Responding households				
Missing	31.3	50.0	18.7	*1.7*
Commuting	62.3	19.4	18.1	*7.6*
Business	60.1	25.5	13.5	*20.2*
Shopping	6.7	23.3	70.0	*3.2*
Visit	8.4	16.5	75.1	*36.3*
Leisure	5.1	18.6	76.3	*31.1*
All	22.4	20.0	57.6	
All	24.7	20.8	54.6	

Table 37 Distribution of size of party by main mode (Survey period only) (Base: journeys)

[%]	Size of party [persons] 1	2	3+	Share [%]
Telephone only	31.3	23.1	45.6	
Responding households				
Missing	30.2	30.2	39.6	*5.6*
Other	-	-	100.0	*0.5*
Car	17.6	20.2	62.2	*67.7*
Bus	11.1	33.3	55.6	*1.9*
Train	36.6	15.9	47.6	*17.3*
Ship	-	57.1	42.9	*0.7*
Flight	36.7	13.3	50.0	*6.3*
All	22.4	20.0	57.6	
All	*24.7*	*20.8*	*54.6*	

Table 38 Main journey purpose by occupation (Survey period only) (Base: person journeys)

[%]	Main journey purpose					
	Miss-ing	Commu-ting	Busi-ness	Shop-ping	Visit	Leisure
Telephone only Responding households	15.0	0.6	27.5	4.4	18.8	33.8
Missing	5.5	-	11.1	5.5	44.4	33.3
Manager	-	-	62.9	-	22.9	14.3
Professional	4.1	16.4	25.7	1.2	27.5	25.2
Technician	-	7.4	46.3	5.6	22.2	18.5
Clerk	0.5	4.6	28.2	3.2	29.2	34.3
Sales person	-	-	11.1	-	66.6	22.2
Craftsman	8.6	31.4	20.0	-	17.1	22.9
Industrial worker	-	-	19.1	4.8	42.9	33.3
Other working	-	7.1	16.7	9.5	28.6	38.1
Other: non classified	3.1	9.4	40.6	-	15.6	31.3
Student	0.4	4.1	-	3.2	58.2	34.1
Other non-working	2.1	4.1	6.2	5.2	42.3	40.2
All	1.7	7.6	20.2	3.2	36.3	31.1
All	*5.0*	*5.8*	*22.1*	*3.5*	*31.9*	*31.7*

Table 39 Main journey mode by occupation (Survey period only) (Base: person journeys)

[%]	Main journey mode						
	Miss-ing	Other	Car	Bus	Train	Ship	Air
Telephone only Responding households	-	-	-	-	-	-	-
Missing	11.1	-	66.7	-	16.7	-	5.6
Manager	5.7	-	82.9	-	8.6	-	2.9
Professional	7.0	0.6	55.6	2.3	20.5	2.9	11.1
Technician	5.6	1.9	50.0	-	33.3	-	9.3
Clerk	3.2	0.5	76.9	3.7	8.8	-	6.5
Sales person	11.1	-	66.7	-	11.1	-	11.1
Craftsman	8.6	-	71.4	-	14.3	-	5.7
Industrial worker	4.8	-	71.4	-	19.1	-	4.8
Other working	2.4	2.4	69.1	-	19.1	-	7.1
Other: non classified	12.5	-	50.0	-	31.3	6.3	-
Student	5.5	-	69.1	0.9	20.0	-	4.6
Other non-working	5.2	-	73.2	4.1	14.4	-	3.1
All	5.6	0.5	67.7	1.9	17.3	0.7	6.3

Table 40 Main journey mode by main journey purpose (Survey period only) (Base: person journeys)

[%]	Main journey mode						
	Miss-ing	Other	Car	Bus	Train	Ship	Air
Telephone only	-	-	-	-	-	-	-
Responding households							
Missing	68.8	-	25.0	-	6.3	-	-
Commuting	12.5	-	33.3	2.8	34.7	-	16.7
Business	3.1	-	67.2	-	20.3	1.0	8.3
Shopping	-	-	83.3	-	16.6	-	-
Visit	3.8	-	79.4	-	16.8	-	-
Leisure	4.8	1.7	63.4	5.4	12.2	1.7	10.1
All	5.6	0.5	67.7	1.9	17.3	0.7	6.3

Table 41 Average duration of stay by main journey mode and main journey purpose (Survey period only) (Base: person journeys)

[d]	Main journey mode						
	Miss-ing	Other	Car	Bus	Train	Ship	Air
Telephone only	-	-	-	-	-	-	-
Responding households							
Missing	12.0	-	2.50	-	1.00	-	-
Commuting	4.13	-	3.25	5.50	4.32	-	7.92
Business	5.33	-	1.64	-	2.10	2.00	5.50
Shopping	-	-	1.00	-	1.00	-	-
Visit	7.85	-	2.90	-	4.41	-	-
Leisure	6.31	4.00	3.26	4.19	3.06	6.40	10.41
All	7.60	4.00	2.69	4.33	3.43	5.14	8.60

Table 42 Average size of party by main journey mode and main journey purpose (Survey period only) (Base: person journeys)

[d]	Main journey mode						
	Miss-ing	Other	Car	Bus	Train	Ship	Air
Telephone only	-	-	-	-	-	-	-
Responding households							
Missing	1.73	-	3.00	-	1.00	-	-
Commuting	4.56	-	1.92	1.00	2.32	-	-
Business	1.00	-	1.63	-	1.54	2.00	2.31
Shopping	-	-	2.64	-	3.40	-	-
Visit	4.69	-	3.37	-	3.29	-	-
Leisure	5.43	4.00	3.83	21.50	3.39	4.60	4.59
All	3.83	4.00	3.07	19.22	2.74	3.86	3.33

Table 43 Average duration of stages by main journey mode and main journey purpose (Survey period only) (Base: person journeys)

[h]	Main journey mode						
	Miss-ing	Other	Car	Bus	Train	Ship	Air
Telephone only	-	-	-	-	-	-	-
Responding households							
Missing	-	-	6.88	-	9.75	-	-
Commuting	-	-	7.07	36.08	9.34	-	10.19
Business	3.00	-	5.72	-	14.55	37.25	14.92
Shopping	-	-	4.22	-	8.33	-	-
Visit	-	-	8.44	-	8.33	-	-
Leisure	-	15.40	9.60	14.54	10.62	46.60	25.57
All							

Figure 2 Long-distance survey form - Bundesverkehrswegeplan Zusatzbefragung

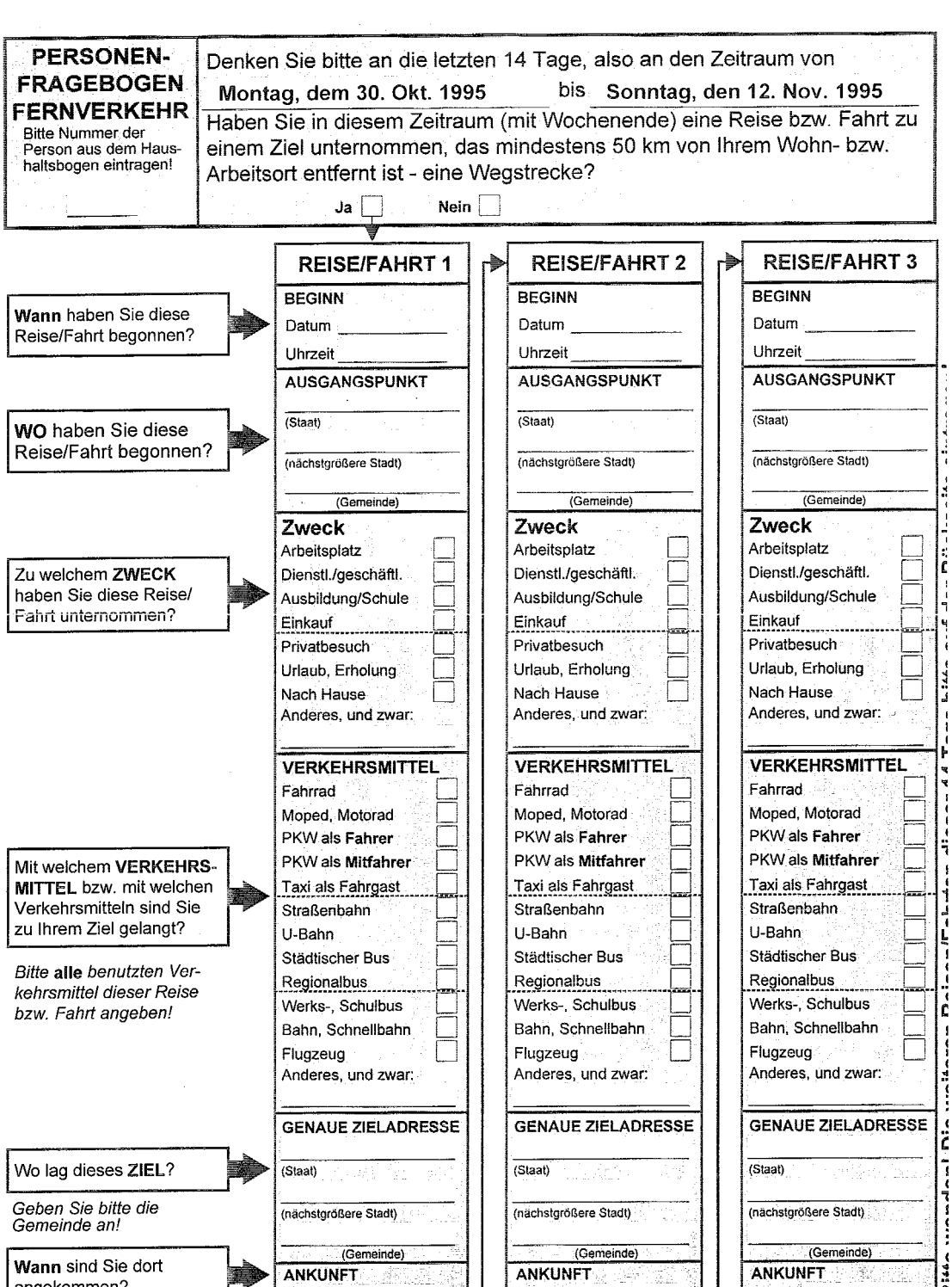
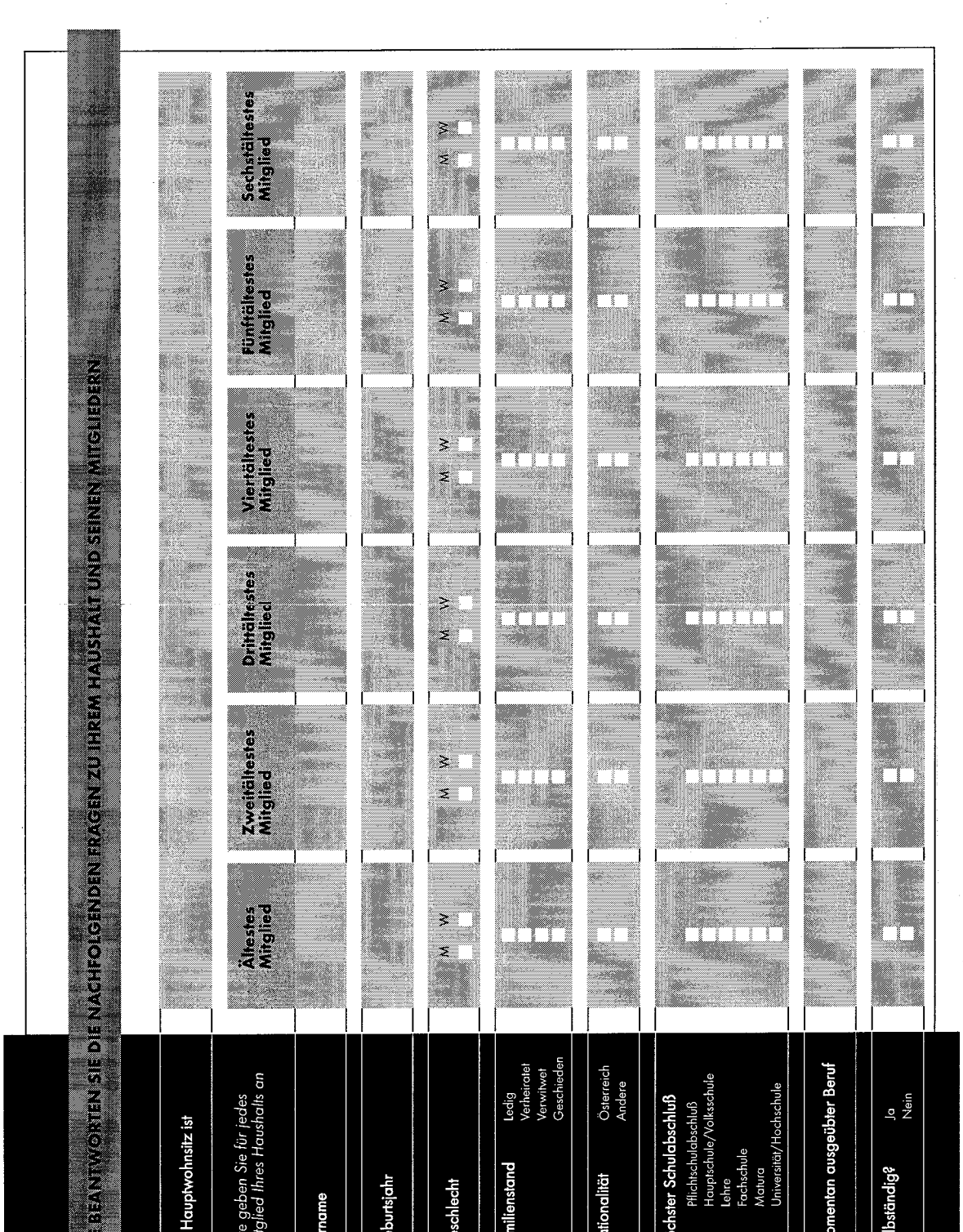


Figure 3 Example: Long household/vehicle form - household/person items



6.3 Travel behaviour: trips

Trips were not a separate level of the survey process. They were identified from the recorded stages. A new trip was assumed, when the person reported an activity other than a transfer or a break of less than thirty minutes duration. The distribution of trips per journey is shown in Figure 9 and the main characteristics in Table 44, while the origin-destination patterns are shown in Table 45 and Table 46.

Table 44 Characteristics of the trips (Survey period only; responding households only) (Base: person trips)

Characteristic	Share [%]
Mode	
Air	6.9
Scheduled	4.9
Non-scheduled	2.0
Long distance bus	3.1
Scheduled	0.7
Non-scheduled	2.4
Car	70.3
Long distance train	17.8
High-speed-train	0.7
Other train	17.1
Ship	1.1
Motorcycle	0.2
Others	0.9
Main trip purpose	
Break	-
Business	18.7
Change mode	-
Education	5.2
Escorting	1.8
Overnight stay	18.7
Private	12.1
Return home	40.9
Work	2.6

Figure 9 Distribution of trips/journey by purposes business/work and other (survey period and responding households only)

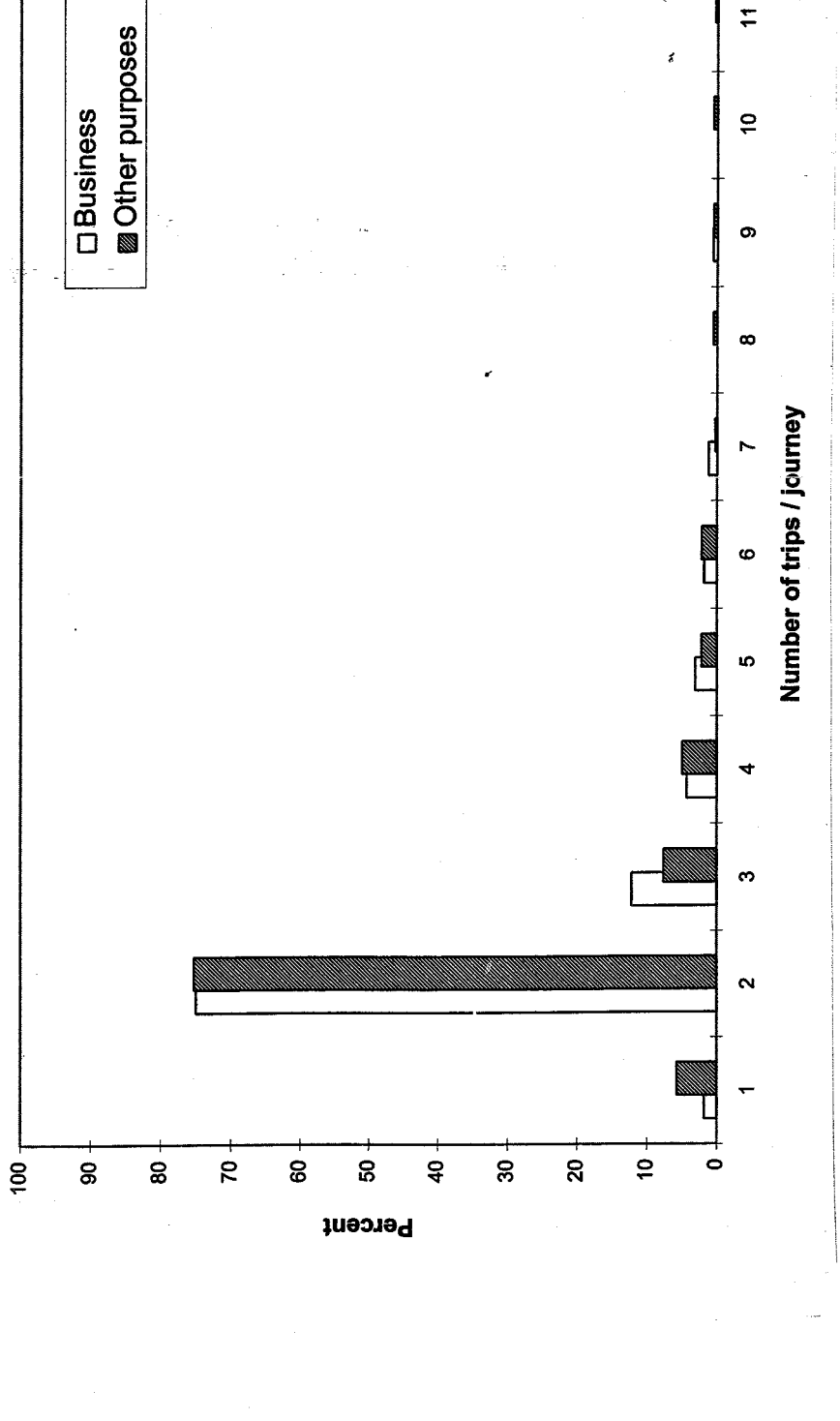


Table 45 Trip origin-destination matrix (Person trips; survey period only; responding households)

Origin	Destination																
	Miss.	AT1	AT2	AT3	Benelux	DE Rest	DE2	FR Rest	FR8	GR	IT Rest	IT2	IT3	UK	ALL
Missing	22	8	.	52	.	.	.	.	2	.	.	.	1	.	85
AT1	3	10	2	71	1	.	.	.	.	.	.	.	.	.	87
AT2	1	.	4	21	.	.	.	.	.	.	.	.	.	.	26
AT3	53	68	20	619	.	15	36	10	1	3	15	5	52	6	903
Benelux	.	1	.	.	2	.	.	.	.	.	.	.	.	.	3
DE Rest	.	.	.	17	.	1	.	.	.	.	.	.	.	.	18
DE2	.	.	.	33	.	2	1	.	.	.	.	.	1	.	37
FR Rest	.	2	.	7	.	.	.	2	1	.	.	.	.	1	13
FR8	2	.	.	2	.	.	.	.	11	.	.	.	.	.	15
GR	.	.	.	3	.	.	.	.	.	.	.	.	.	.	3
IT Rest	.	.	.	15	.	.	.	.	.	.	3	2	.	.	20
IT2	.	.	.	6	.	.	.	.	.	.	1	8	1	.	16
IT3	1	.	.	50	.	.	.	.	.	.	2	1	6	.	60
UK	.	.	.	3	.	.	.	1	.	.	.	.	.	4	8
ALL	82	89	26	899	3	18	37	13	15	3	21	16	61	11	1294

Table 46 Regional trip origin-destination matrix (person trips; survey period only; responding households) (NUTS2)

	Destination							
	AT31	AT32	AT33	AT34	DE21	DE27	IT31	ALL
	N	N	N	N	N	N	N	N
Origin								
AT31	8	2	28	.	.	.	.	38
AT32	.	9	50	.	.	.	.	59
AT33	30	48	347	44	29	3	33	534
AT34	.	.	41	12	.	.	.	53
DE21	.	.	27	.	.	1	1	29
DE27	.	.	2	.	.	.	.	2
IT31	.	.	35	.	.	.	2	37
ALL	38	59	530	56	29	4	36	752

6.4 Travel behaviour: stages

The characteristics of the 1912 recorded stages are shown in Table 47. These are in line with the characteristics of the journeys reported above. Nearly all stages were single purpose.

Table 47 Characteristics of the stages (Survey period only; responding households only)

Characteristic	Share [%]
Mode	
Air	6.1
Scheduled	4.7
Non-scheduled	1.4
Long distance bus	6.3
Scheduled	3.2
Non-scheduled	3.1
Car	68.6
Business vehicle	9.2
Household vehicle	43.5
Other private vehicle	10.2
Other	5.7
Long distance train	15.2
High-speed-train	0.3
Other train	14.9
Ship	0.8
Motorcycle	0.2
Others	2.6
Travel paid by	
Missing	61.0
Employer	8.8
Self	24.4
Main stage purpose	
Break	9.8
Business	12.7
Change mode	21.4
Education	3.6
Escorting	1.8
Overnight stay	12.7
Private	8.3
Return home	27.9
Work	1.8

6.5 Reasons for non-response

The non-response interviews enquired about the reasons, why the households did not participate in the surveys. It offered a range of reasons and the respondents were allowed to name more than one. The results are shown in Table 48. The reasons can be grouped into three sets: non-response due to no long-distance travel, non-response because of the time involved, non-response due to lack of motivation.

Table 48 Reasons for non-response (multiple answers possible)

Reason	Mean	Survey type					
		Pro-spective	Retro-spective	Four weeks	Eight weeks	Small set	Large set
No long-distance travel	35%	37%	31%	39%	29%	34%	35%
No time	35%	34%	36%	37%	32%	25%	45%
Too time consuming	15%	17%	12%	15%	14%	9%	22%
Too much long-distance travel	8%	7%	9%	7%	9%	3%	14%
Don't want to	6%	9%	1%	7%	4%	4%	8%
No motivation	5%	7%	3%	6%	4%	3%	8%
Don't answer surveys	5%	7%	1%	2%	7%	1%	8%
Too difficult	2%	3%	0%	0%	4%	1%	3%
Too personal	1%	2%	0%	1%	1%	0%	3%
Didn't open the letter	1%	2%	0%	1%	1%	1%	1%

N = 153 out of 193 eligible to answer

From the pattern of the replies it seems, as if the reason "No long-distance travel" is only affected by the duration of the survey period. It is clear that for too short a survey period this reason becomes very prominent. It is therefore important to find ways of encouraging the respondents to return "null-returns" without encouraging too many others to use this as a short cut.

The lack-of-time justification becomes more prominent, when the expected work load increases, i.e. for the more detailed stage reporting. It will be necessary to reduce the first impression of this workload.

The group of unwilling respondents is unaffected by the survey format. This group will need special motivation attempts, e.g. by phone or other personalized approaches. The cost effectiveness of such special efforts needs to be established in future work.

6.6 Experiences with the survey from the response interviews

Part of the response-interviews were questions about the survey and how the respondents filled it in, e.g. how much time they required. This section discusses the results obtained.

The first questions established the amount of time needed to fill in the survey and asked an overall assessment of the survey using the school grading system (1 to 5; good to fail). Clearly, one has to keep in mind, that the respondents answering are self-selected (See Table 49).

Table 49 Time required for and grading of the surveys

Experiment			Mean time required		Grade	
Orientation	Survey period	Movement form	Household form [min]	Movement form [min]	Household form []	Movement form []
Prospective	4 weeks	Small	7.78	20.75	1.27	1.70
Prospective	4 weeks	Large	8.63	15.32	1.12	1.61
Prospective	8 weeks	Small	9.86	19.55	1.54	2.04
Prospective	8 weeks	Large	9.41	23.17	1.20	1.73
Retrospective	4 weeks	Small	8.25	16.56	1.35	2.13
Retrospective	4 weeks	Large	7.24	20.77	1.06	1.63
Retrospective	8 weeks	Small	6.35	13.09	1.55	2.38
Retrospective	8 weeks	Large	6.76	25.24	1.02	1.43
Grand mean			7.84	19.37	1.26	1.85
Std of grand mean			5.48	15.93	0.54	1.01

The time spent on the household form - on average just under eight minutes - is independent of the survey form, as expected. The time spent on the movement form increases with its complexity from 17 to 22 minutes. What is surprising that the doubling of the survey period does not have a stronger impact on the time required (18.5 to 20.0 min), indicating quite strong learning effects.

The grading is very positive, but as said above the sample answering is self-selected. This self-selection becomes obvious in the grading of the movement form, which is slightly worse overall than the grading of the household form. Here, those using the more complex form, give on average a better grade. It seems that those committed to the task, will express and justify their commitment by good grading.

A second set of questions were directed at the difficulties encountered and the sources used for help (see Table 50). There was also a question after suggestions for improvement, but only one person answered.

Table 50 Difficulties encountered and help used

Item	Share [%]
Difficulties (35 answering of 258 eligible)	
To remember the journeys	16
To remember the details	66
To understand the stage concept	34
To understand the activity concept	0
Confused by (15 answering of 258 eligible)	
Examples	7
Explanations	7
Layout	93
Helped by (138 answering of 258 eligible)	
Examples	66
Explanations	39
Layout	59
Family, friends	2
Calender	12

Only 14% of those interviewed reported problems. These were concentrated on the layout (about 9% of all interviewed). Equally small is the share (6% of all interviewed) of those confused by the layout. For a new and complex form, this is a good result, even considering the self-selection problems. See for example, that only two percent of the non-respondents found the survey "too difficult".

In line with expectations, there is a substantial group of respondents, which made use of the examples and explanations, with a clear trend towards the use of the examples (35% versus 21% of all interviewed). It shows, that the investment is worthwhile, as these support materials help a substantial group of respondents. Still, one would have to investigate, how the response behaviour would change in the absence of the support materials. It could be that they frighten potential respondents by their shear bulk and seeming complexity.

7 METHODOLOGICAL RESULTS

The methodological focus of this project was the effect of the experimental variables - temporal orientation, duration of survey period and level of stage detail - on response behaviour and data yield, expressed in journeys and stages reported.

The first subsection will look at the response behaviour, while the second will look at the data yield. The overall modelling strategy is shown in Figure 10. The conclusions will be drawn in the final section.

7.1 Response behaviour and the experimental variables

The first set of analyses looks at the aggregate response behaviour, i.e. how all sampled persons exposed to a particular survey reacted. For the question of response behaviour this aggregate analysis will be complemented by a disaggregate, household based analysis.

Three aspects of the response behaviour will be analyzed here: response rate, rate of unreachable households and rate of participation in the non-response interviews. Table 9 presented those results for the eight different experimental conditions. The issue is, whether the experimental variables did influence these behaviours. A first aggregate analysis relates the rates to the variables by linear regression (See Table 51, Table 52 and Table 53).

The aggregate results for the response rates show a significant impact of the temporal orientation on the response rates. The prospective orientation reduces the response by 9.8%. The other experimental variables have no significant effects. The regression equation as a whole is significant.

The regression for the rate of unreachables is not significant as a whole, nor is any of the experimental variables significant. This is the expected result.

The regression for the participation in the non-response interviews is not significant as a whole, nor is any of the experimental variables at the usual significance level ($\alpha = 0.05$). The increase in duration has a marginally significant parameter ($\alpha = 0.093$) indicating that the original request for a 8 week survey period will reduce the willingness to participate in the non-response interviews by about 11% in comparison with a four week survey period.

Figure 10 Modelling strategies

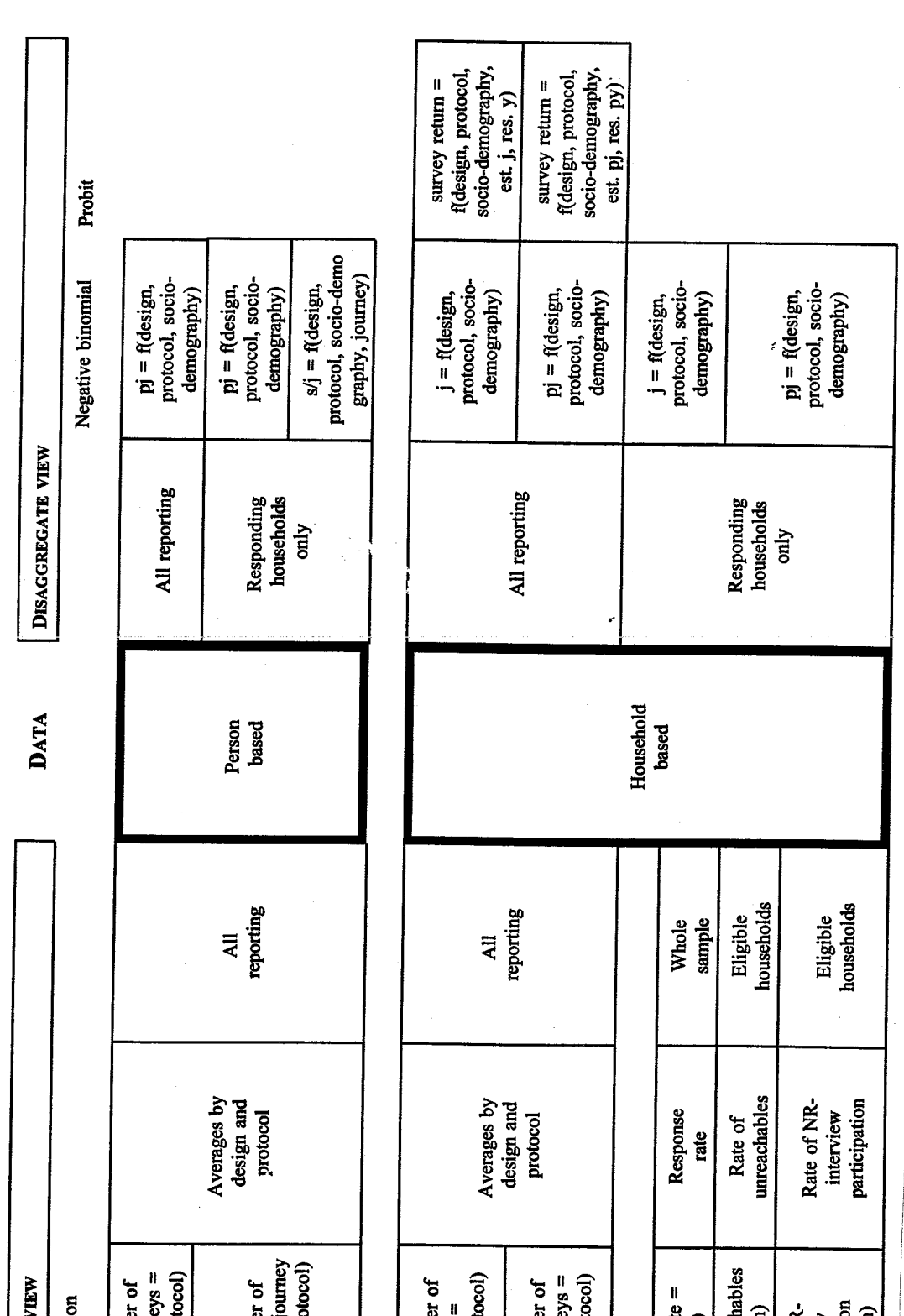


Table 51 Response rates: aggregate analysis (Base: whole sample)

Linear regression	Parameter	t-statistic	
Constant	29.18	8.81	*
Retrospective	9.83	5.143	*
Duration of survey period	-0.28	-0.59	
Large set of movement items	1.63	0.85	
Adjusted R^2		0.78	
F		9.17	*
df		7	

Table 52 Rate of unreachable households: aggregate analysis (Base: sample reduced by sample loss)

Linear regression	Parameter	t-statistic	
Constant	22.83	3.81	*
Retrospective	-3.58	-1.03	
Duration of survey period	0.34	0.40	
Large set of movement items	-0.38	-0.11	
Adjusted R^2		-0.34	
F		0.41	
df		7	

Table 53 Rate of participation in the non-response interviews: aggregate analysis (Base: whole sample reduced by sample loss and unreachable households)

Linear regression	Parameter	t-statistic	
Constant	54.88	6.53	*
Retrospective	-2.38	-0.49	
Duration of survey period	-2.66	-2.19	+
Large set of movement items	2.48	0.51	
Adjusted R^2		0.25	
F		1.76	
df		7	

The availability of the data from the non-response interviews allows a more detailed, disaggregate analysis of the non-response behaviour, as we know through these interviews some of the relevant information, which might have predisposed the sample to non-response. In particular, we know about the long-distance travel behaviour of the initial non-respondents and it is reasonable to assume that persons with many long-distance journeys will not participate. The analysis performed here follows Polak and Ampt (1996), which adapted an idea from Kitamura and Bovy (1987) for this context. The central idea of this analysis is to test for the impact of the amount of long-distance travel on response in conjunction with the other socio-demographic variables available. Two steps are involved: the first step reported below (see Section 7.2) relates the socio-demographics to the reported number of journeys, while the second step reported here relates the socio-demographics, the predicted number of journeys and the observed residual to the willingness to return the survey form.

The probability, that a household will return the form, is estimated as a probit model (See Table 54) using once the number of household journeys and in the other case the number of person journeys as the indicator variable for the travel behaviour of the household (See Appendix D.1). The model using the person journeys is to be preferred on the ground of better statistical fit of the equation predicting the number of journeys, but the conclusions are nearly the same in any case.

The parameter value of the temporal orientation confirms that the recipients of retrospective are more likely to reply in writing, as, surprisingly, are those receiving a longer and more complex questionnaire. Those receiving a second set of forms are less likely to be converted into written responses, other things being equal.

Due to the rather restricted set questions used for the non-response interviews, the socio-demographic description of the households is poor. Household size, measured as number of adults in the household, has a clear, but not significant, positive impact on written participation, while the negative impact of increasing income is not significant. Again, surprisingly, a larger number of journeys increases the written participation probability, but not significantly. The observed residual has no impact. The results indicate, that active households often appreciate the opportunity to participate in such written surveys and that a complex form indicates to them the seriousness of the study and of the analysis.

Table 54 Response probability: disaggregate analysis (All reporting households)

Variable	Household journeys			Person journeys		
Probit (1 = Written response)	Parameter	t-statistic		Parameter	t-statistic	
Retrospective	0.487	2.21	*	0.516	1.96	*
Weeks of survey period	0.104	1.97	*	0.105	1.49	
Large set of movement items	0.368	2.38	*	0.349	2.29	*
Redistribution required	-1.517	-4.69	*	-1.563	-4.21	*
Income (in classes)	-0.349	-1.77	+	-0.306	-1.65	+
2 adult household	0.226	1.02		0.148	0.49	
3 adult household	0.576	1.42		0.488	1.23	
4 adult household	0.764	0.95		0.630	0.67	
Estimated number of journeys	0.195	0.71		0.111	0.45	
Observed residual	0.055	1.18		0.042	1.60	
N		357			357	
ρ^2		0.17			0.32	
(0)		-242.8			-242.8	
(ß)		-182.8			-182.4	
Correct predictions [%]		76.2			74.8	

7.2 Data yield and the experimental variables

Equally important in comparison with the response behaviour is the yield of the survey in terms of journeys and stages reported. A survey with a 100% response rate with substantial underreporting would be quite useless, for example. The analysis reported here is both aggregate and disaggregate and looks at the data yield in terms of journeys reported and stages/journey reported (See also Table 55 to Table 60).

The results of the aggregate analysis are reported in Table 61. They are based on all households responding. At this level of analysis none of the experimental variables have a fully significant influence on the yield reported, but temporal orientation for person journeys. Duration is also marginally significant. All three variables at their more complex level have a negative impact on yield. Late conversions report fewer trips, while those reporting in writing report more. This indicates again the importance of commitment to the survey task.

Table 55 Average number of journeys / household and week by design and response mode (All reporting households)

Design			Journeys/household and week			
		Stage	Telephone	Survey form		All
Orientation	Duration	Complexity		Without Redis-tribution	With Redis-tribution	
Prospective	4 weeks	Small	0.197	0.379	0.215	0.261
		Large	0.106	0.332	0.332	0.245
	8 weeks	Small	0.237	0.425	0.123	0.297
		Large	0.155	0.302	0.123	0.214
Retro-spective	4 weeks	Small	0.207	0.256	0.322	0.255
		Large	0.181	0.284	0.263	0.238
	8 weeks	Small	0.184	0.309	0.157	0.238
		Large	0.075	0.279	0.192	0.194
All			0.170	0.314	0.214	0.242

Table 56 Average number of person journeys / household and week by design and response mode (All reporting households)

Design			Person journeys/household and week			
		Stage	Telephone	Survey form		All
Orientation	Duration	Complexity		Without Redis-tribution	With Redis-tribution	
Prospective	4 weeks	Small	0.219	0.621	0.295	0.364
		Large	0.212	0.543	0.543	0.416
	8 weeks	Small	0.390	0.619	0.246	0.463
		Large	0.304	0.558	0.268	0.409
Retro-spective	4 weeks	Small	0.287	0.380	0.434	0.364
		Large	0.302	0.454	0.439	0.389
	8 weeks	Small	0.351	0.463	0.273	0.384
		Large	0.107	0.461	0.353	0.324
All			0.268	0.501	0.352	0.387

Table 57 Average number of trips / household and week by design and response mode (Responding households only)

Design			Trips/household and week			
		Stage	Telephone	Survey form		All
Orientation	Duration	Complexity		Without Redis-tribution	With Redis-tribution	
Prospective	4 weeks	Small	-	0.920	0.375	0.756
		Large	-	0.883	0.573	0.821
	8 weeks	Small	-	1.274	0.246	1.017
		Large	-	0.655	0.246	0.526
Retro-spective	4 weeks	Small	-	0.519	0.772	0.598
		Large	-	0.490	0.483	0.488
	8 weeks	Small	-	0.673	0.368	0.561
		Large	-	0.592	0.430	0.539
All			-	0.724	0.448	0.644

Table 58 Average number of person trips / household and week by design and response mode (Responding households only)

Design			Person trips / household and week			
		Stage	Telephone	Survey form		All
Orientation	Duration	Complexity		Without Redis-tribution	With Redis-tribution	
Prospective	4 weeks	Small	-	1.575	0.644	1.295
		Large	-	1.418	0.966	1.328
	8 weeks	Small	-	1.847	0.522	1.516
		Large	-	1.162	0.536	0.965
Retro-spective	4 weeks	Small	-	0.761	0.998	0.835
		Large	-	0.845	0.790	0.831
	8 weeks	Small	-	1.042	0.600	0.880
		Large	-	0.990	0.752	0.912
All			-	1.161	0.730	1.035

Table 59 Average number of person journeys / person and week by design and response mode (All reporting households)

Design			Person journeys / person and week			
		Stage	Telephone	Survey form		All
Orientation	Duration	Complexity		Without Redis-tribution	With Redis-tribution	
Prospective	4 weeks	Small	0.070	0.192	0.139	0.121
		Large	0.058	0.193	0.218	0.141
	8 weeks	Small	0.120	0.207	0.107	0.153
		Large	0.103	0.172	0.065	0.123
Retro-spective	4 weeks	Small	0.096	0.127	0.175	0.127
		Large	0.107	0.153	0.127	0.131
	8 weeks	Small	0.096	0.138	0.089	0.115
		Large	0.043	0.159	0.113	0.112
All			0.087	0.165	0.120	0.128

Table 60 Average number of person trips / person and week by design and response mode (Responding households only)

Design			Person trips / person and week			
		Stage	Telephone	Survey form		All
Orientation	Duration	Complexity		Without Redis-tribution	With Redis-tribution	
Prospective	4 weeks	Small	-	0.486	0.223	0.413
		Large	-	0.478	0.368	0.458
	8 weeks	Small	-	0.583	0.182	0.490
		Large	-	0.357	0.131	0.275
Retro-spective	4 weeks	Small	-	0.249	0.374	0.284
		Large	-	0.268	0.235	0.260
	8 weeks	Small	-	0.301	0.186	0.259
		Large	-	0.330	0.241	0.300
All			-	0.369	0.234	0.329

Table 61 Household: aggregate analysis of travel behaviour (All households reporting)

Variable	Number of journeys / week and household					
	Household journeys			Person journeys		
Linear regression	Parameter	t-statistic		Parameter	t-statistic	
Constant	0.392	7.00	*	0.544	6.46	*
Retrospective	-0.078	-1.88	+	-0.146	-2.34	*
Weeks of survey period	-0.011	-1.79	+	-0.007	-0.78	
Large set of movement items	-0.032	-1.35		0.003	-0.08	
Redistribution required	-0.066	-1.85	+	-0.08	-1.54	
Form returned	0.048	1.65		0.08	1.93	+
df		23			23	
R^2		0.58			0.58	
F		7.45			7.39	

The results of the matching disaggregate analyses are shown in Table 62 to Table 64 reflecting different sets of variables available. The disaggregate analysis models the number of journeys reported in the survey period as count data using the negative binomial model (Greene, 1995) (See Appendix D.2 for details).

The Table 62 reports the models for all reporting households using only those variables which are available for all households. The number of weeks of the survey period is significant, as expected. The model of the number of the person journeys is substantially better in statistical terms, although few of the relevant variables are significant. The significant overdispersion parameter indicates that the negative binomial model is to be preferred to a simple Poisson model. The retrospective surveys reduce the number of reported journeys, but the parameters are not significant. The complexity of the stage description has no impact on the number of reported journeys in this model.

Table 63 reports models using a large set of household descriptors available only for those households returning the forms. These models are only marginally better than those reported in the next table, which use a much smaller set of variables and should therefore be preferred.

Table 62 Household: disaggregate analysis of travel behaviour (All households reporting)

Variable	Number of journeys in the survey period					
	Household journeys			Person journeys		
Negative binomial model	Parameter	t-statistic		Parameter	t-statistic	
Retrospective	-0.221	-1.15		-0.254	-0.90	
Weeks of survey period	0.072	2.25	*	0.092	2.31	*
Large set of movement items	-0.145	-0.97		0.008	0.04	
Redistribution required	-0.77	-4.31	*	-0.627	-2.83	*
Income (in classes)	0.303	3.19	*	0.187	1.49	
2 adult household	-0.216	-0.97		0.381	1.23	
3 adult household	-0.449	-1.06		0.146	0.29	
4 adult household	-0.221	-0.37		0.625	0.59	
Overdispersion parameter α	0.746	4.83	*	1.589	7.60	*
N		357			357	
ρ^2		0.17			0.32	
(0)		-643.4			-989.1	
(ß - Poisson)		-574.4			-871.9	
(ß - binomial)		-521.9			-673.7	

The parsimonious models of Table 64 show that retrospective surveys reduce the number of reported trips ceteris paribus. The complexity of the stage form has no significant impact on the number of trips reported. Even the impact of the redistributed is muted, when controlling for the socio-demographics.

The income parameters are both positive, indicating an increasing number of journeys for richer households, but they are not even significant at $\alpha = 0.10$. The highest education achieved by a household member, used here as a dummy for socio-economic status, shows a U-shaped influence, with the middle levels of achievement reporting significantly fewer trips.

The significant overdispersion parameter again indicates the appropriateness of the negative binomial model.

Table 63 Household: disaggregate analysis of travel behaviour (Responding households only) (large set of variables)

Variable	Number of journeys in the survey period					
	Household journeys			Person journeys		
Negative binomial model	Parameter	t-statistic		Parameter	t-statistic	
Retrospective	-0.449	-1.86	+	-0.437	-1.41	
Weeks of survey period	0.074	1.35		0.085	1.27	
Large set of movement items	-0.137	-0.60		0.036	0.11	
Redistribution required	-0.151	-0.52		0.066	0.20	
Income (in classes)	0.243	1.08		0.179	0.72	
2 adult household	0.385	0.93		1.139	1.98	+
3 adult household	0.357	0.57		0.997	1.33	
4 adult household	-0.755	-0.62		0.396	0.36	
Highest education: 8 years	0.106	0.18		0.641	0.91	
Highest education: Baccalaureate	-0.559	-1.93	+	-0.667	-1.63	+
Highest education: technician	-0.814	-2.69	*	-0.632	-1.70	+
Number of licences	-0.245	-1.11		-0.338	-1.33	
Number of vehicles	0.149	0.93		0.021	0.09	
Highest age: 20-29	-0.930	-0.48		-1.738	-0.80	
Highest age: 30-39	-11.342	0.00		-11.511	0.00	
Highest age: 40-49	0.551	0.16		0.381	0.19	
Highest age: 50-59	0.117	0.51		0.207	0.71	
Highest age: 70+	0.032	0.03		0.172	0.10	
Overdispersion parameter α	0.340	1.94	+	0.971	4.28	+
N		144			144	
ρ^2		0.17			0.29	
(0)		251.0			384.5	
(ß - Poisson)		212.9			321.7	
(ß - binomial)		208.0			272.9	

An alternative way at looking at this data is to plot the share of household departing, absent or returning over the survey period. Here the difference between the prospective and retrospective surveys becomes obvious. It is tied in particular to the reporting of the long-distance journeys at and just before Easter. (Figure 11, Figure 12 and Figure 13).

Table 64 Household: disaggregate analysis of travel behaviour (Responding households only) (small set of variables)

Variable	Number of journeys in the survey period					
	Household journeys			Person journeys		
Negative binomial model	Parameter	t-statistic		Parameter	t-statistic	
Retrospective	-0.409	-1.83	+	-0.342	-1.11	
Weeks of survey period	0.091	1.99	*	0.143	2.70	+
Large set of movement items	-0.131	-0.66		0.087	0.33	
Redistribution required	-1.999	-0.75		0.015	0.05	
Income (in classes)	0.249	1.26		0.327	1.34	
Highest education: 8 years	-0.499	1.50		-0.667	-1.68	+
Highest education: Baccalaureate	-0.814	1.96	*	-0.689	-1.68	+
Highest education: technician	0.023	-0.06		-0.274	-0.55	
Overdispersion parameter α	0.444	2.26	*	1.189	4.43	*
N		144			144	
ρ^2		0.15			0.27	
(0)		-251.0			-384.5	
(ß - Poisson)		-222.7			-344.3	
(ß - binomial)		-213.3			-281.0	

The survey protocol allows further interesting comparisons. A particular concern is the effect of fatigue over the survey period. Figure 14 compares the share of persons away from surveys lasting four and eight weeks. No fatigue effects are obvious, but further more detailed testing is required.

A further instructive comparison is possible, because of the redistribution of the survey forms as retrospective surveys to those originally 'prospective' households, which did not reply within a fortnight of the end of the survey period. Three combined response modes result: retrospective/retrospective; prospective/prospective and prospective/retrospective. The comparison in Figure 16 shows the clearly lower journey rates of those prospective/retrospective households, while the comparison of the other two highlights the obvious omission of journeys at the beginning of the survey period by those reporting retrospective/retrospective (Figure 15).

Figure 11 Share of households departing (All reporting households)

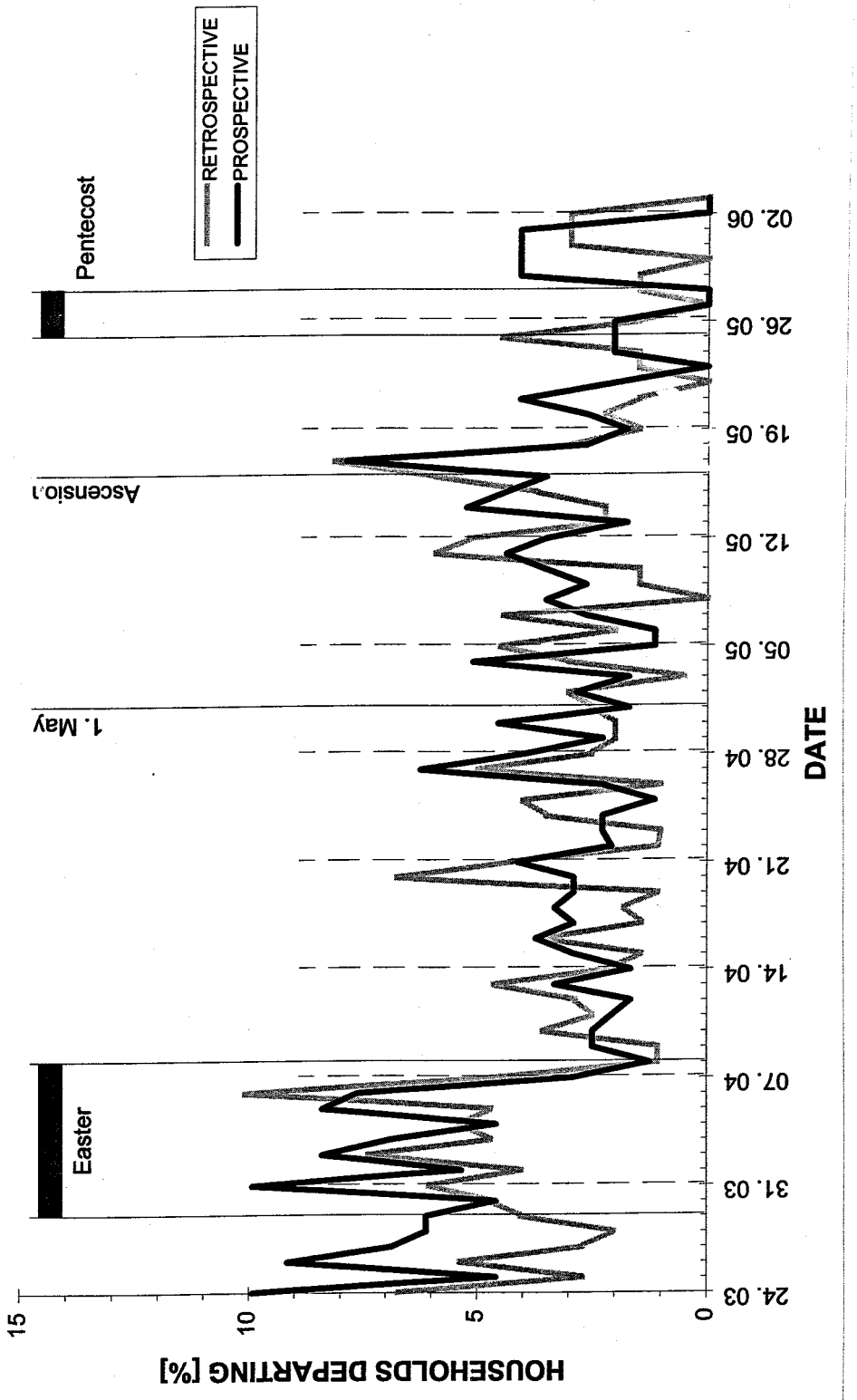


Figure 12 Share of households returning (All reporting households)

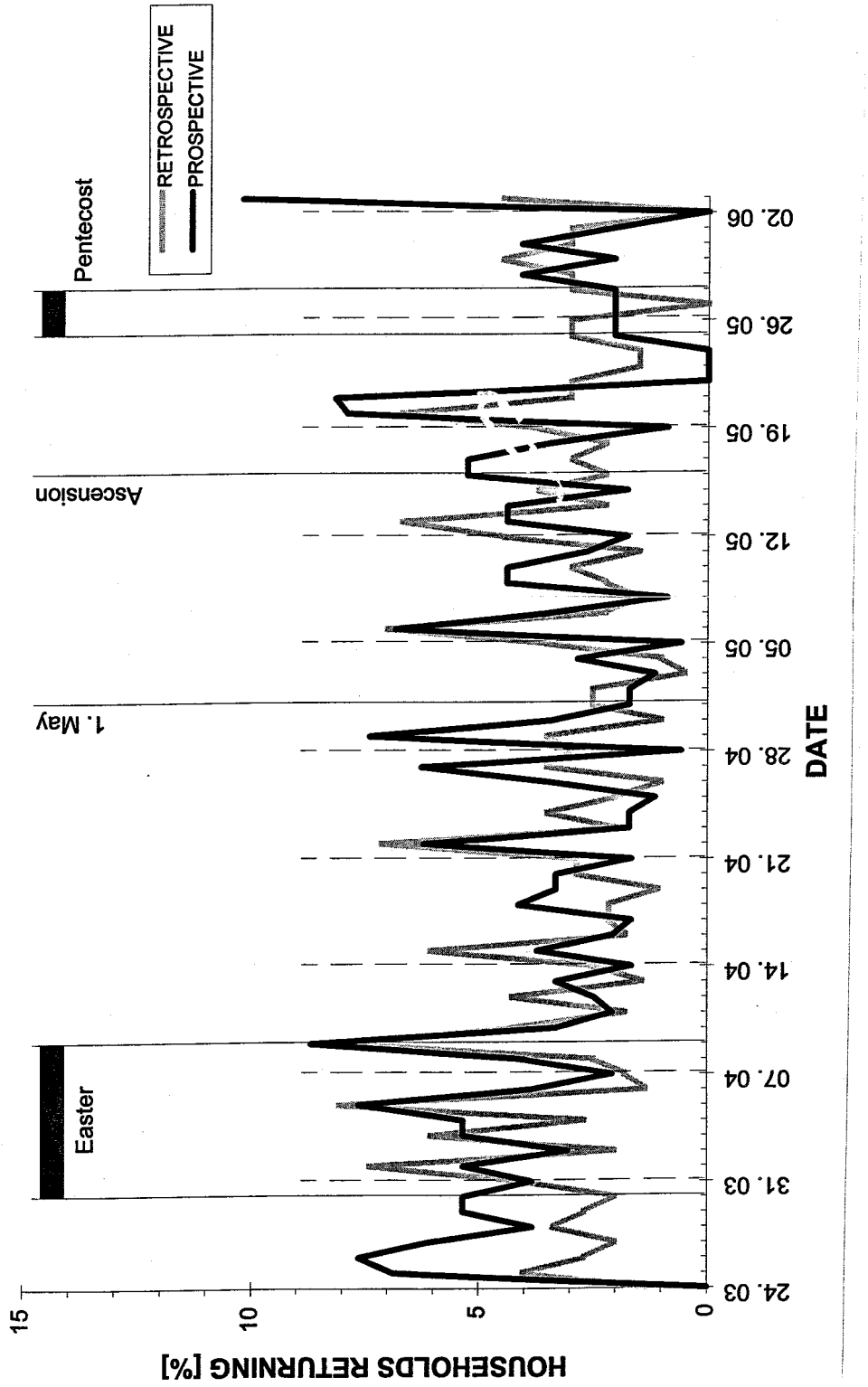


Figure 13 Share of households away (All reporting households)

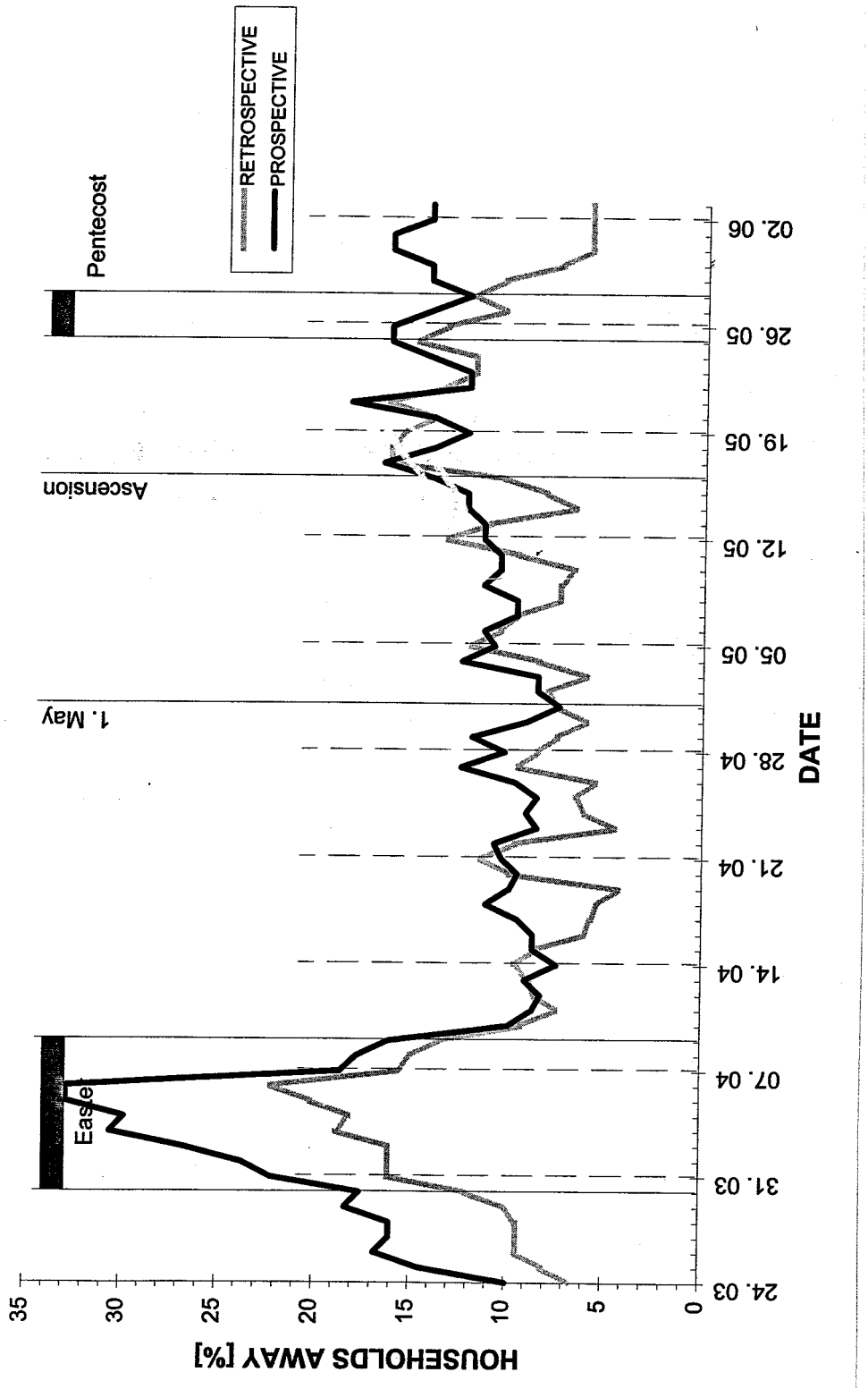


Figure 14 Share of persons away by duration of survey period (Responding households only)

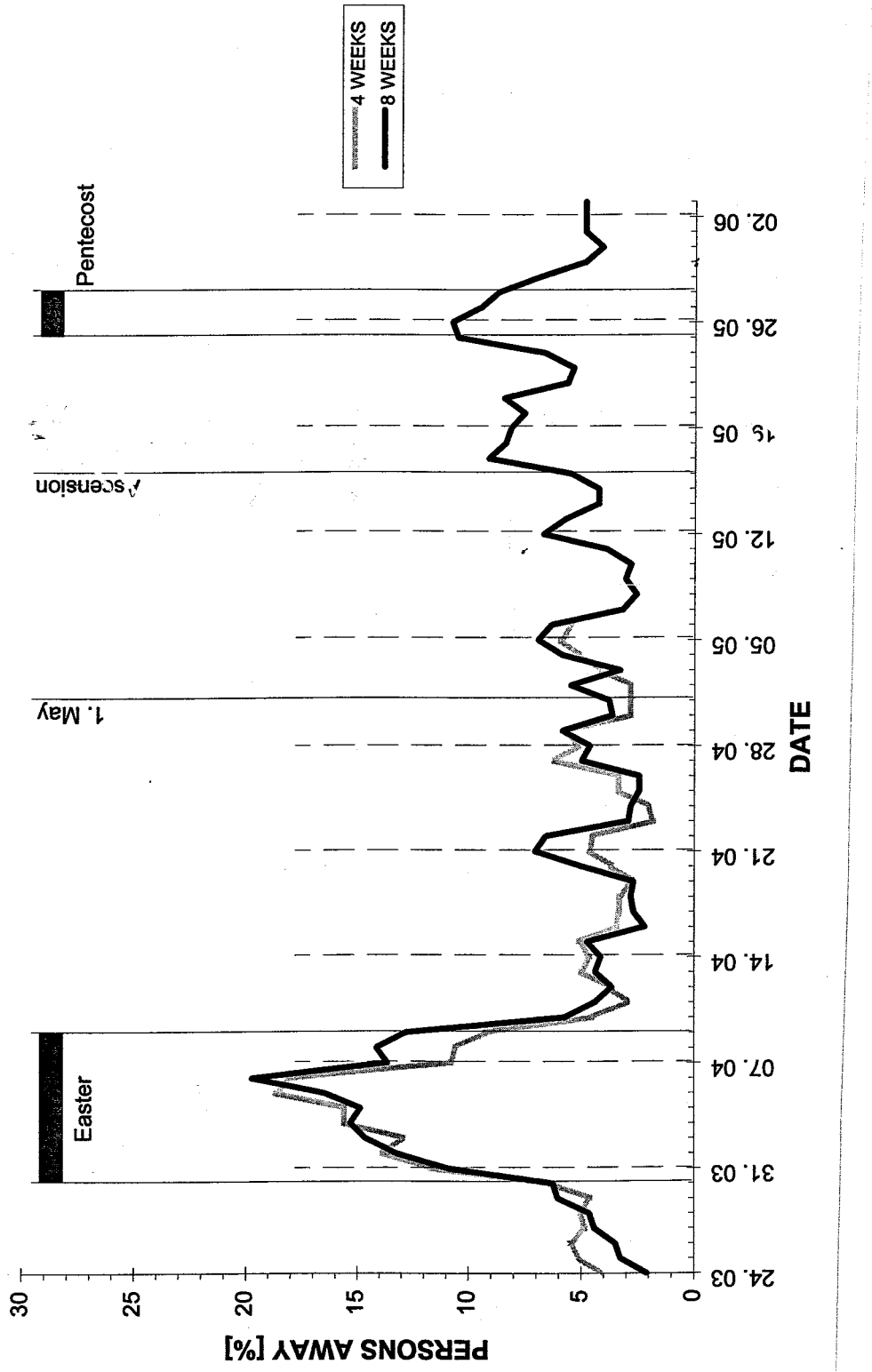


Figure 15 Share of persons departing by response mode (retrospective/retrospective vs prospective/prospective) (Responding households only)

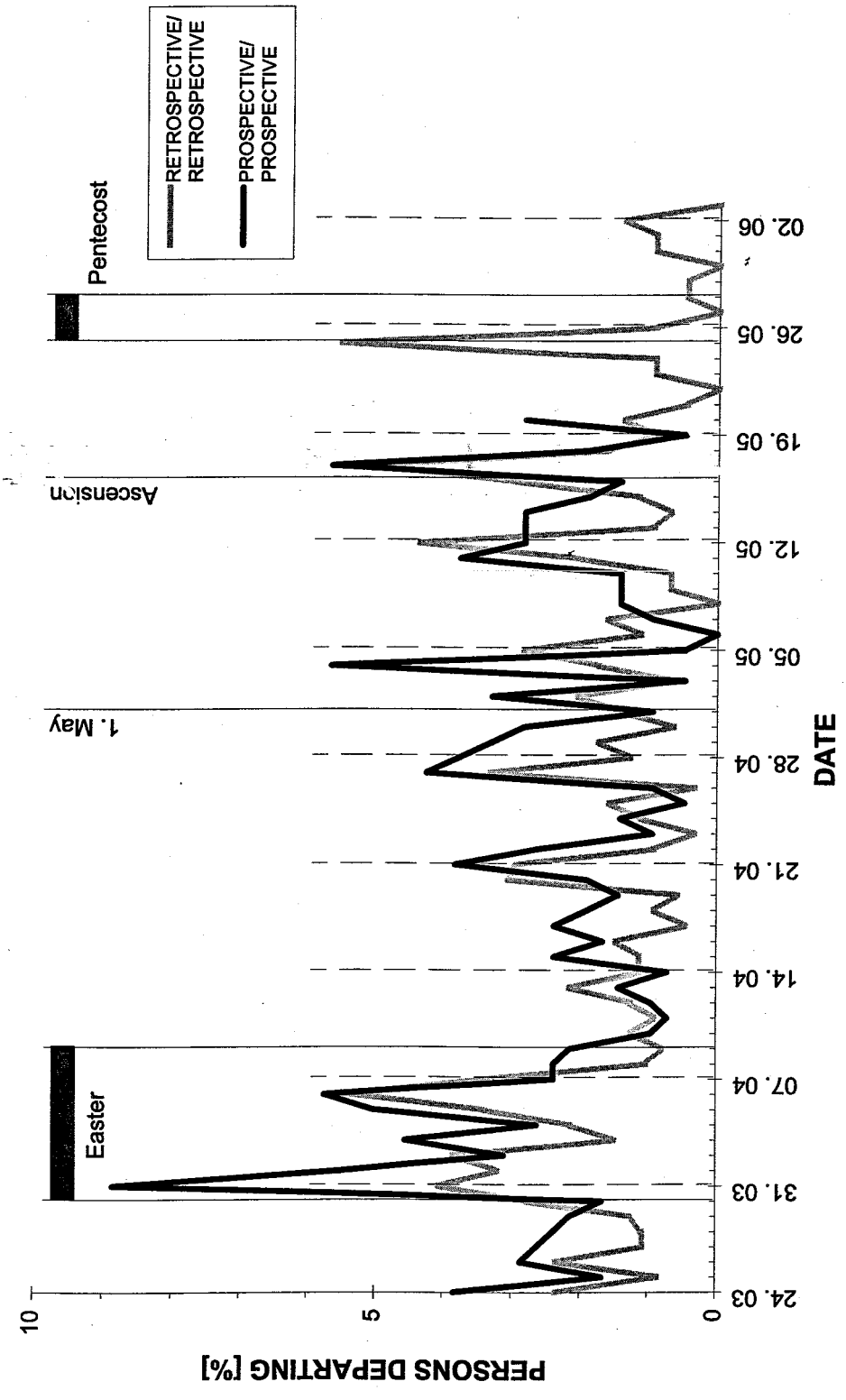
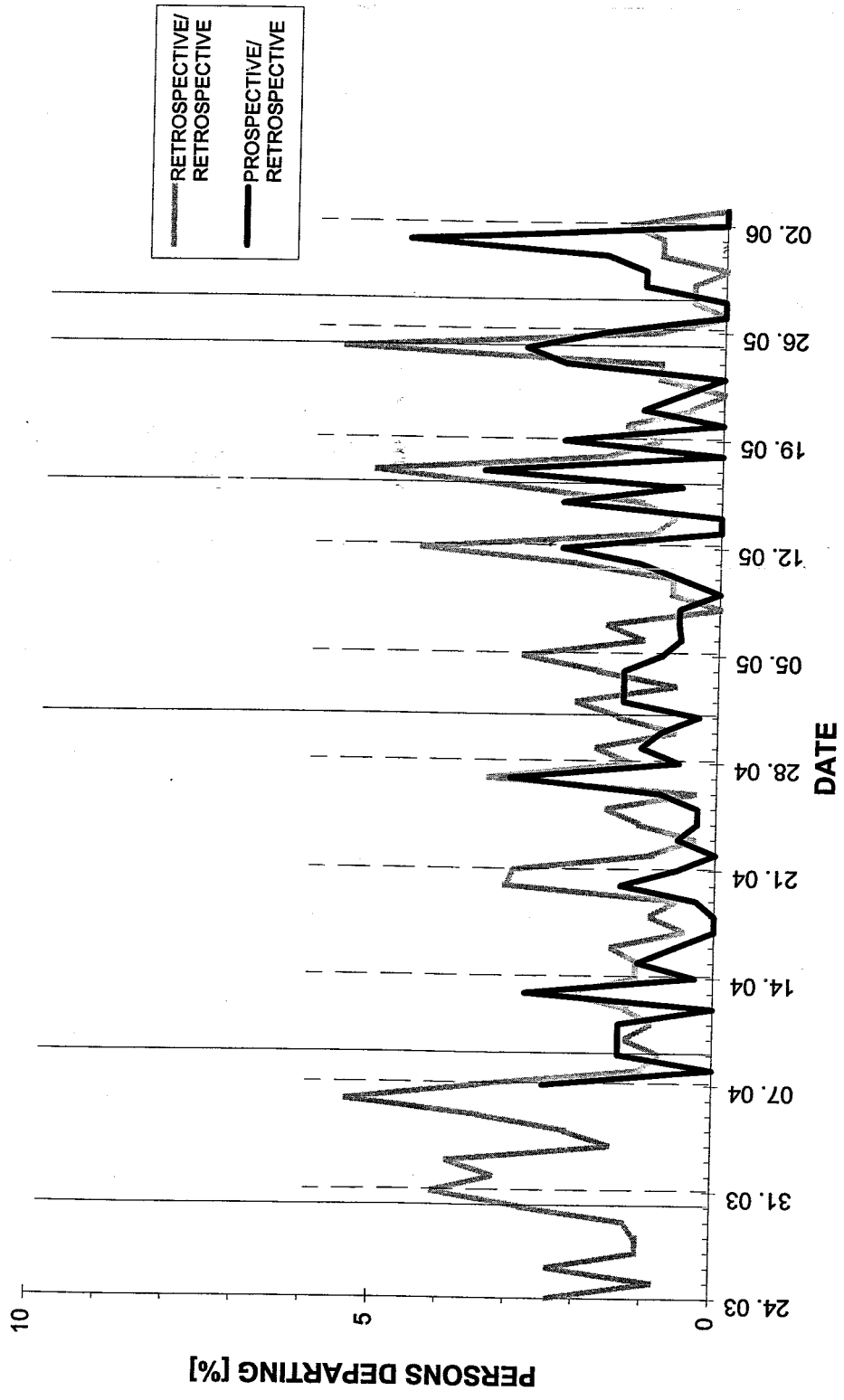


Figure 16 Share of persons departing by response mode (retrospective/retrospective vs prospective/retrospective) (Responding households only)



A comparable analysis can be conducted at the person level, instead of a the household level. The aggregate analysis across all persons is significant, but only a retrospective survey has a significant negative impact on the number of person journeys. The analysis of the adult males is significant overall and indicates that a retrospective survey reduces the number of journeys reported per week marginally (See Table 65).

The matching disaggregate analysis is performed first for all persons and second for those reported in returned forms. The first analysis (Table 66) confirms again the negative impact of the retrospective survey format. The complexity of the question set has no significant impacts. Males make significant more journeys, while being in education and working has a significant negative impact of the amount of travel. The analysis for the males only replicates the results, with the exception of showing no significant reduction of travel for the working males.

The second analysis can use a more detailed description of the persons. The addition of these variables does not substantially increase the explanatory power of the models estimated (Table 67). The ownership of various discount instruments or of a driving licence increases the amount of travel, but the parameters are not significant. The only new significant variable is the ownership of a university education, which increases the amount of travel. It acts as a dummy for job position and income. The analysis for the males only replicates the results.

The final element of the yield is the number of stages reported per journey. The aggregate results indicate, that a retrospective survey leads to a loss of detail, as does a more complex survey (although not statistically significant) (See Table 69). The duration of the survey period has no impact at this level, as neither does a late reply. The reporting tends to omit journeys, not stages.

The matching disaggregate analysis (See Table 70) confirms the negative impact of retrospective surveys on data yield. The duration of survey has again no impact, but the complexity of the stage description shows up with a negative impact in this analysis. At the level of the number of stages adding detail discourages the respondents from entering all of them. The delay has no impact ceteris paribus.

The disaggregate analysis corrects for the characteristics of the journey. Only those modes/purposes were retained, which had a significant impact in comparison of the other modes/purposes. The socio-demographic variables, but for work status show no significant effect, but this partly the result of mixing persons and purposes.

Table 65 Person: aggregate analysis of travel behaviour (All households reporting)

Variable	Number of person journeys / week and person					
	All persons			Adult males		
Linear regression	Parameter	t-statistic		Parameter	t-statistic	
Constant	0.181	5.63	*	0.278	6.01	*
Retrospective	-0.048	-1.97	+	-0.057	-1.67	
Weeks of survey period	-0.005	-1.48		-0.004	-0.82	
Large set of movement items	-0.004	-0.27		0.027	-1.36	
Redistribution required	-0.015	-0.74		-0.030	-1.01	
Written reply	0.043	2.53	*	-0.007	-0.31	
df		24			24	
R^2		0.52			0.24	
F		5.90	*		2.44	+

Table 66 Person: disaggregate analysis of travel behaviour (All households reporting)

Variable	Number of person journeys in the survey period					
	All persons			Male adults		
Negative binomial model	Parameter	t-statistic		Parameter	t-statistic	
Retrospective	-0.237	-2.27	*	-0.276	-2.11	*
Weeks of survey period	0.147	7.20	*	0.138	5.38	*
Large set of movement items	0.018	0.21		-0.071	-0.64	
Redistribution required	-0.645	-6.38	*	-0.763	-5.88	*
Males	0.293	3.12	*	-	-	
In education	-1.476	-8.42	*	-1.022	-4.42	*
Working	-0.596	-3.46	*	-0.132	-0.71	
Overdispersion parameter α	0.721	8.35	*	0.719	7.12	*
N		1251			669	
ρ^2		0.19			0.18	
(0)		-1799.7			-1115.9	
(ß - Poisson)		-1551.2			-985.4	
(ß - binomial)		-1458.0			-912.5	

Table 67 Person: disaggregate analysis of travel behaviour (Responding households only)

Variable	Number of person journeys in the survey period					
	All persons			Male adults		
Negative binomial model	Parameter	t-statistic		Parameter	t-statistic	
Retrospective	-0.242	-2.44	*	-0.237	-1.99	*
Weeks of survey period	0.130	5.74	*	0.143	5.24	*
Large set of movement items	0.005	0.06		-0.041	-0.37	
Redistribution required	-0.256	-2.20	*	-0.327	-2.30	*
Males	0.252	2.65	*	-	-	
Frequent flyer card	0.498	0.85		0.571	0.78	
Rail discount or season ticket	0.131	1.19		0.157	1.21	
Driving licence	0.222	1.26		0.147	0.70	
Single	-0.114	-0.92		-0.102	-0.74	
In education	-1.253	-5.26	*	-1.095	-3.80	*
Working	-0.946	-3.77	*	-0.721	-2.39	*
Compulsory schooling only	-0.039	-0.22		-0.071	-0.29	
University education	0.421	3.94	*	0.526	4.11	*
Overdispersion parameter α	0.365	4.64	*	0.344	3.86	*
N		768			476	
ρ^2		0.14			0.15	
(0)		-1151.6			-773.3	
(ß - Poisson)		-1020.2			-675.6	
(ß - binomial)		-996.1			-659.0	

8 CONCLUSIONS

The purpose of this study was to develop a self-completion survey instrument implementing the recommendations of the EUROSTAT working party on long-distance travel and to test how response and data yield change as a function of a number of relevant dimensions of the survey design and protocol.

In the absence of current experiences with stage-based long-distance travel surveys this study had to develop a new instrument from scratch. The instrument, which resulted from a number of informal pretests and from a formal pretest, is not yet optimal, but performed well within the range of expectation for such a complex instrument.

Table 68 Average number of stages / person journey (person based) by design and response mode (Responding households only)

Design			Stages/ person journey (person based)			
		Stage	Telephone	Survey form		All
Orientation	Duration	Complexity		Without Redis-tribution	With Redis-tribution	
Prospective	4 weeks	Small	-	5.848	2.867	5.322
		Large	-	3.283	2.250	3.118
	8 weeks	Small	-	4.712	3.333	4.367
		Large	-	3.524	2.750	3.345
Retro-spective	4 weeks	Small	-	2.834	3.135	2.935
		Large	-	2.605	2.810	2.653
	8 weeks	Small	-	3.424	3.975	3.581
		Large	-	2.797	2.765	2.786
All			-	3.499	3.062	3.386

Table 69 Stages: aggregate analysis of travel behaviour (Responding households only)

Variable	Number of stages/journeys All journeys		
Linear regression	Parameter	t-statistic	
Constant	3.988	9.43	*
Retrospective	-1.328	-4.15	*
Weeks of survey period	0.087	1.54	
Large set of movement items	-0.721	-3.19	*
Redistribution required	-0.019	-0.07	
df		16	
R^2		0.70	
F		9.74	*

Table 70 Stages: disaggregate analysis of travel behaviour (Responding households only)

Variable	Number of stages reported by journey					
	All persons			Involving adult males		
Negative binomial model	Parameter	t-statistic		Parameter	t-statistic	
Retrospective	-0.331	-5.10	*	-0.325	-4.54	*
Weeks of survey period	-0.003	-0.24		0.009	-0.63	
Large set of movement items	-0.118	-2.36	*	-0.125	-2.23	*
Redistribution required	0.086	1.10		0.066	0.73	
Males	-0.023	-0.46		-	-	
Single	0.093	1.63		0.125	2.06	*
Compulsory schooling only	-0.017	0.17		-0.130	-0.67	
University education	-0.064	-1.26		-0.146	-2.43	*
In education	1.151	8.64	*	0.987	6.16	*
Working	1.260	11.15	*	1.214	9.70	*
Journey abroad	0.166	2.98	*	0.156	2.48	*
By bus	0.616	5.00	*	0.591	4.59	*
By long-distance train	0.274	4.19	*	0.265	3.47	*
By sea	1.061	9.50	*	1.226	10.12	*
By air	0.932	14.85	*	0.919	13.02	*
For education	0.187	1.81	+	0.282	2.45	*
For private business	0.577	5.24	*	0.311	2.33	*
Overdispersion parameter α	0.038	2.49	*	0.032	1.92	+
N		746			539	
ρ^2		0.14			0.15	
(0)		-1670.2			-1215.6	
(ß - Poisson)		-1440.4			-1035.8	
(ß - binomial)		-1433.5			-1032.1	

The main study was based on a full factorial of three dimensions of the design and protocol:

- temporal orientation: prospective and retrospective
- duration of survey period: four or eight weeks
- level of complexity of movement description: low and high

The resulting experimental design of eight different surveys was sent to 1080 households in Innsbruck. The sample was constructed to test the instrument intensely, i.e. the sample focused on persons, which could be expected to be difficult to recruit by nature of their high mobility or complex journeys; especially as the survey period in the spring of 1996 covered Easter and all the other public holiday up to and including Pentecost.

The average numbers of journeys (person journeys) reported by the sample are reasonable in comparison with existing numbers, but due to the absence of proper external data for weighting they should be treated with care. Later work will have to integrate this sample into the national long-distance databases.

The methodological results of the study reveal a number of difficult trade-offs for the survey designer (see Table 71). A retrospective survey increases the response rate substantially, but by the same token reduces the data yield throughout, even where the modelling controls for the socio-demographics of the households and persons.

The duration of the survey period has different impacts depending on context. An increase helps to increase participation by assuring that more household have something to report overcoming the traditional problem of the unwillingness of survey respondents to return "Null"-reports. The set of analyses reported here does not allow to draw conclusions about fatigue and therefore the impact on the number of reported journeys, but the descriptive analysis seems to indicate no impact. The duration has also no impact on the number of stages reported per journey.

The complexity of the description of the stages has a positive impact on written survey participation, probably by indicating the seriousness of the instrument, but reduces the number of stages reported per journey. A fatigue analysis of this aspect should be subject to future work.

The experiences of this study have clearly shown that it is necessary to combine both written and oral (telephonic) elements in the survey protocol. Both response mechanisms are necessary to capture different subsets of the respondents. The analysis has provided insight into the socio-demographics of this subsets, but more work is required.

The results of study, which have clearly identified the response/yield trade-off faces by the survey designers, will significantly contribute to the further development of a benchmark long-distance survey methodology, which is currently under way in the different EUROSTAT pilots studies and the 4th Framework project 'Methods for European Surveys of Travel Behaviour".

Table 71 Overview of the methodological results

Subject	Variable Retro-spective survey	Weeks of survey period	Large movement question set	Redis-tribution required	Written response
HOUSEHOLD-BASED STATISTICS					
AGGREGATE RESULTS					
Whole sample/subsets					
Response rate	+ (*)	. (.)	. (.)	. (.)	. (.)
Rate of unreachables	. (.)	. (.)	. (.)	. (.)	. (.)
Rate of NR-interviews	. (.)	- (+)	. (.)	. (.)	. (.)
All reporting households					
Mean number of journeys	- (+)	- (+)	. (.)	- (+)	. (.)
Mean number of person journeys	- (*)	. (.)	. (.)	. (.)	+ (+)
DISAGGREGATE RESULTS					
All reporting households					
Participation	+ (*)	[+ (+)]	+ (*)	- (*)	. (.)
Number of journeys	. (.)	+ (*)	. (.)	- (*)	. (.)
Number of person journeys	. (.)	+ (*)	. (.)	- (*)	. (.)
Responding households only					
Number of journeys	- (+)	+ (*)	. (.)	. (.)	
Number of person journeys	. (.)	+ (*)	. (.)	. (.)	
PERSON-BASED STATISTICS					
AGGREGATE RESULTS					
All reporting households					
Mean number of person journeys	- (*)	. (.)	. (.)	. (.)	+ (*)
Responding households only					
Mean number of stages/person journey	- (*)	. (.)	- (*)	. (.)	
DISAGGREGATE RESULTS					
All reporting households					
Number of person journeys	- (*)	+ (*)	. (.)	- (*)	. (.)
Responding households only					
Number of person journeys	- (*)	+ (*)	. (.)	- (*)	
Number of stages/journey	- (*)	. (.)	- (*)	. (.)	

Direction of influence (significance level: * = 0.05; + = 0.10; . > 0.10)

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