



Working Paper

## Fatigue in long-duration travel diary surveys

**Author(s):**

Axhausen, Kay W.; Löchl, Michael; Schlich, Robert; Buhl, T.; Widmer, Paul

**Publication Date:**

2005-04

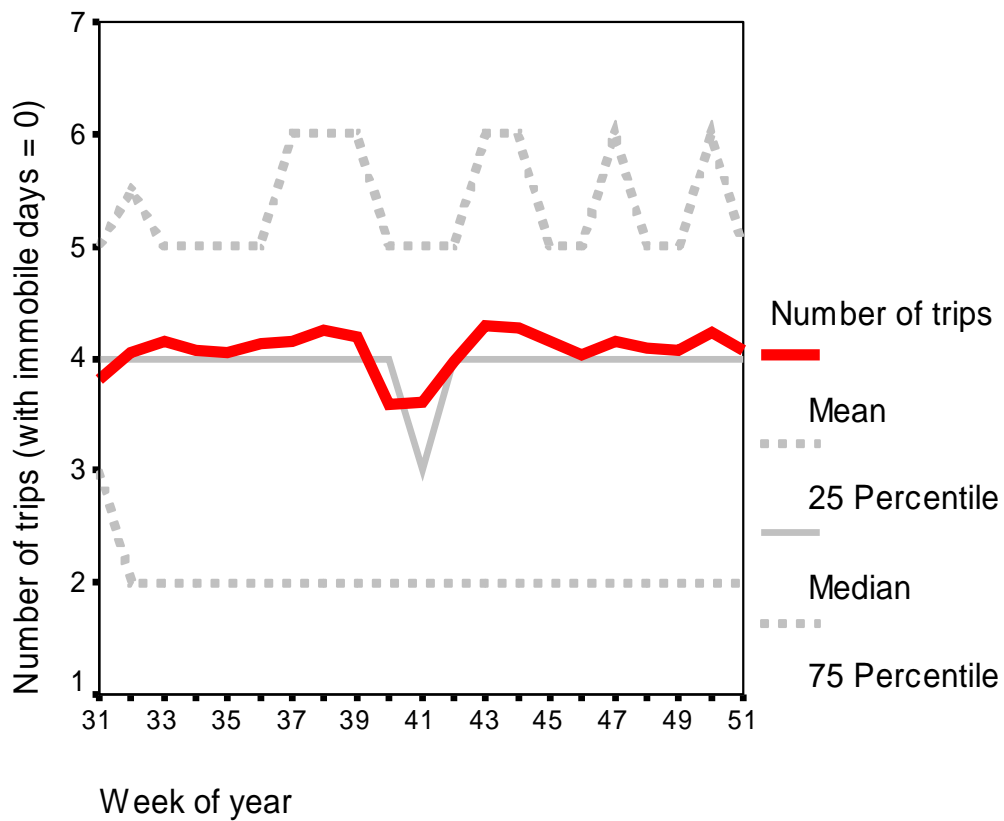
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## Fatigue in long-duration travel diary surveys

**KW Axhausen**

**M Löchl**

**R Schlich**

**T Buhl**

**P Widmer**

Arbeitsbericht Verkehrs- und Raumplanung 286

April 2005

Arbeitsberichte Verkehrs- und Raumplanung

## Ermüdung in langen Verkehrsverhaltenstagebüchern

KW Axhausen  
M Löchl  
IVT  
ETH Zürich  
CH – 8093 Zürich

R Schlich  
SBB  
CH – 3003 Bern

T Buhl  
P Widmer  
Büro Widmer  
Bahnhofplatz 76  
CH – 8500 Frauenfeld

Telephon: +41-1-633 3943  
Telefax: +41-1-633 1057  
[axhausen@ivt.baug.ethz.ch](mailto:axhausen@ivt.baug.ethz.ch)

Telephon: +41-512-203463  
Telefax: +41-512-205382  
[robert.schlich@sbb.ch](mailto:robert.schlich@sbb.ch)

Telephon: +41-52-722 1684  
Telefax: +41-52- 721 8922  
[widmer@buero-widmer.ch](mailto:widmer@buero-widmer.ch)

April 2005

## Kurzfassung

Dieser Aufsatz untersucht die Frage, ob die Teilnehmer an einer 6-wöchigen Tagebuchbefragung bereit und in der Lage sind, kontinuierlich über ihre Wege zu berichten; d.h. ob die Anzahl der berichteten Wege wegen Ermüdung der Befragten zurückgeht.

Im ersten Teil des Aufsatzes wird die Befragung, die 2003 im Thurgau durchgeführt wurde, vorgestellt, wobei insbesondere auch erste Ergebnisse und Erfahrungen mit einer Reihe neuer Fragen vorgestellt werden, die im Wegetagebuch gestellt wurden.

Die Analyse der Antworten zeigt, dass es keine systematische Ermüdung gibt. Der Anteil der Befragten, der Ermüdungserscheinungen zeigt, ist so klein, dass er auch zufällig sein kann.

## Schlagworte

Verkehrsverhalten, Tagebuch, 6 Wochen, Ermüdung, Thurgau, Schweiz, Mobidrive

## Zitierungsvorschlag

K.W. Axhausen, M. Löchl, R. Schlich, T. Buhl und P. Widmer (2004) Fatigue in long-duration travel diaries, *Arbeitsbericht Verkehrs- und Raumplanung*, **262**, IVT, ETH Zürich, Zürich.

Working Paper

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KW Axhausen  
M Löchl  
IVT  
ETH Zürich  
CH – 8093 Zürich

R Schlich  
SBB  
CH – 3003 Bern

T Buhl  
P Widmer  
Büro Widmer  
Bahnhofplatz 76  
CH – 8500 Frauenfeld

Telephone: +41-1-633 3943  
Telefax: +41-1-633 1057  
[axhausen@ivt.baug.ethz.ch](mailto:axhausen@ivt.baug.ethz.ch)

Telephone: +41-512-203463  
Telefax: +41-512-205382  
[robert.schlich@sbb.ch](mailto:robert.schlich@sbb.ch)

Telephone: +41-52-722 1684  
Telefax: +41-52- 721 8922  
[widmer@buero-widmer.ch](mailto:widmer@buero-widmer.ch)

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## Abstract

This paper has introduced a new long-duration travel diary survey, which complements the existing 1999 Mobidrive survey by covering a small town and rural environment. The 2003 Thurgau data followed the protocol of the earlier study, but developed the set of questions further. These new questions concerned both the social context of the respondents, but also trip related items, such as planning horizon of the activity, previous frequency of visit or the groups involved in the trip or activity.

The descriptive and model-based analysis of the data showed that respondent fatigue is not an issue in either survey. Where significant deviations from a steady number of reported trips were found, they were more likely in a positive direction. The learning inherent in the intensive round of contacts between respondent and interviewer does pay off. Papers on travel diaries tend not to report interviewer effects, although their impacts are well known. The analysis shows, that the four interviewers employed in this survey have substantial and significant effects on the number of reported trips.

## Keywords

Travel behaviour, 6 week travel diary, fatigue, Thurgau, Switzerland, Mobidrive

## Preferred citation style

K.W. Axhausen, M. Löchl, R. Schlich, T. Buhl and P. Widmer (2004) Fatigue in long-duration travel diaries, *Arbeitsbericht Verkehrs- und Raumplanung*, **262**, IVT, ETH Zürich, Zürich.

# 1 Introduction: Long-duration surveys and observational studies

Recent years have seen a flurry of long-duration surveys and observational studies. Some were motivated by policy concerns, others by methodological and theoretical issues. Examples for the first groups are GPS-based observational studies of speed choice by drivers whose cars are equipped with speed advisory systems (Vägverket, 2000) or recent GPS-based studies of simulated road pricing schemes in Copenhagen (Nielsen and Jovicic, 2003) or Atlanta (Li, Guensler, Ogle and Wang, in press). Examples for the second group are various GPS-based studies added to traditional one-day diaries to verify the reported levels of trip making, to improve trip length and duration estimates and to add exact route choice information (see for example Wolf, 2000). New theoretical issues, such as the stability of human travel behaviour (Schlich, 2004; Schlich and Axhausen, 2003; Joh, 2004; Joh, Arentze, Hofman and Timmermans, 2002), the rhythms of activity participation (Bhat, Srinivasan and Axhausen, 2003; Bhat, Frusti, Zhao, Schönfelder and Axhausen, 2004; Schönfelder and Axhausen, 2000), the rates of innovation (Schönfelder and Axhausen, 2004) or the size and shape of human activity spaces (Schönfelder and Axhausen, 2003a and b) have motivated a series of travel-diary studies (Axhausen, Zimmermann, Schönfelder, Rindsfuser and Haupt, 2002; Schlich, Simma and Axhausen, 2004 and the surveys introduced below). In each case, the objectives of the study required reporting or observation periods of multiple days (GPS-based supplements to one-day travel diaries), multiple weeks (travel diary studies) or multiple months (GPS-based studies). Next to the recruitment of representative participants the question of reporting (observation) fatigue is the highest ranking concern of the study. While fatigue is usually associated with travel diaries, it can occur in GPS-based studies, when the participant has to install or switch on the device each day or for each trip. Only studies, which permanently install the device can avoid this issue, but this expense is only warranted when a very long observation period is planned.

Fatigue and its extreme form attrition reduces a) the number of reported mobile days and b) the number of trips (tours) reported for each mobile day in a systematic way to be discussed below. The recent availability of a new six-week travel diary (see below) offers the opportunity to revisit the previous result, that fatigue is not an issue in well-conducted long-duration diaries. This conclusion was based on the analysis of the six-week 1999 Mobidrive travel diary (Axhausen et al., 2002) and the twelve-week leisure activity diary (Schlich et al., 2004). If this result holds, then the field could employ such surveys more easily, when there is a requirement for such data.

The rest of the paper is structured as follows: the next section will describe the new 2003 Thurgau survey in detail, including some substantive results derived from a number of new items tested here; the second section presents the models estimated here to test for the presence of fatigue at the level of

the individual respondents from the Mobidrive and the Thurgau survey. The final section offers an outlook and conclusions.

## **2 Thurgau 2003**

### **2.1 Motivation and field work experience**

The success of the German Mobidrive survey encouraged the Swiss Association of Transportation Engineers (SVI) to suggest a similar study for Switzerland. The aims of the brief were the study of the rhythms of daily travel behaviour and of the patterns of space use and innovation on the basis of a long duration survey. The tender was won by the IVT, ETH Zürich in collaboration with the Büro Widmer, Frauenfeld, which was in charge of the fieldwork.

The scope and protocol of the Mobidrive survey was maintained in principle, but adjusted to reflect recent experiences and new interests. The one major change was the choice of a small town and its rural hinterland for the recruitment of the respondents. This provides a contrast to the large towns Karlsruhe and Halle, both over 200'000 inhabitants, which were the locations of the Mobidrive survey.

The protocol involved an announcement letter to randomly chosen persons in Frauenfeld, the capital of the canton Thurgau with about 25'000 residents, and villages on the Seerücken, a rural area north of Frauenfeld, but just south of the Rhine, which delineates the boundary between Germany and Switzerland in this region. Quotas were set for single households, couple households and families (with children over 10 years of age). The aim was to have one third shares for each group. All respondents, including the children, were asked to fill out the questionnaires themselves. The incentives were 80, 120 and 150 sFr (about 65, 95 and 120 US\$) respectively. An effort was made to include commuters, defined as persons not working in their residential municipality, but no explicit quota was set (See Table 1 and Table 2). The quotas were not met exactly, but within an acceptable band. The share of households with commuters is substantially, but not unexpectedly, higher in the rural villages outside Frauenfeld.

Table 1 Number of participating households by type and area

Household type	Area		Total
	Frauenfeld	Seerücken	
Singles	18	15	33
Couples	19	16	35
Families	11	20	31
Total	48	51	99

Table 2 Number of participating households by presence of commuters and area

Household type	Area		Total
	Frauenfeld	Seerücken	
Commuter present	21	39	60
No commuter present	27	12	39
Total	48	51	99

If the respondents agreed during a telephonic recruitment interview, they were visited by a member of fieldwork staff, who conducted a generally one-hour interview covering the socio-demographics of the household and its members, the moving history of the persons and the locations of their friends and relatives. The diary was also explained in detail and the first weekly diary handed over together with the pre-paid return envelope. The respondents received a new diary each week for the next five weeks. They were asked to return the diaries at the end of the week, which allowed the fieldwork staff to check the diary and to clarify any errors, omissions and questions briefly after the event. The respondents received a letter asking them for their account details in week 5, which reminded them of the promised incentive. The field work staff used a large share of the call-backs to obtain detailed address information. The geocoding itself was performed separately after the end of the survey (Machgut, Löchl and Bürgle, 2004; Machgut and Löchl, 2004), as was the addition of information on the non-chosen alternatives.

A share of 16% of those contacted and eligible returned all their weekly forms (Table 3). A small number of households, which had been recruited towards the end of the survey period (August to December 2003), are counted as complete, although they were given the permission to not return the forms covering the Christmas and New Year weeks. This share is comparable to those observed in the Mobidrive and SVI 12-week leisure (Schlich, Simma and

Axhausen, 2004) surveys. The share of respondents refusing after recruitment at either the initial interview or not completing the six weeks is slightly higher than in the earlier surveys, but with 13% still acceptable. There is an obvious trade-off between the time spent explaining the survey during the recruitment interview and the loss of respondents at the later stages. There are no substantial differences between the two areas, but for the slightly higher rate of non-contact in the rural area with the higher share of commuters.

Figure 1 Number of reported days by week of year (survey period) and reporting period (RP)

shows the return of the forms by week of the survey and week of the reporting period. After an initial surge, the fieldwork staff maintained a steady number of participants

Table 3 Response behaviour by area

	Area		Total		
	Frauenfeld	See-rücken	[Number]	Share of letters sent	Share of contacted, eligible households
Announcement letters sent	433	648	1082	100%	
No valid telephone number	5.5%	3.9%	49	4.5%	
No telephone contact made <sup>1</sup>	13.9%	17.3%	172	15.9%	
Did not match quota criteria	5.1%	5.7%	59	5.5%	
No contact attempt <sup>2</sup>	18.9%	19.1	206	19.1%	
Contacted, eligible households	56.6%	54.0%	596	55.1%	
Refused by calling in	7.4%	6.9%	77	7.1%	12.9%
Refused when called	32.1%	31.5%	343	31.7%	57.6%
Quota already exhausted	3.9%	6.8%	61	5.6%	10.2%
Recruited on the phone	13.2%	8.8%	114	10.7%	19.3%
Refused during the initial interview	1.2%	0.6%	9	0.8%	1.5%
Discontinued after starting	0.9%	0.3%	6	0.6%	1.0%
Full participation	11.1%	7.9%	99	9.2%	16.1%

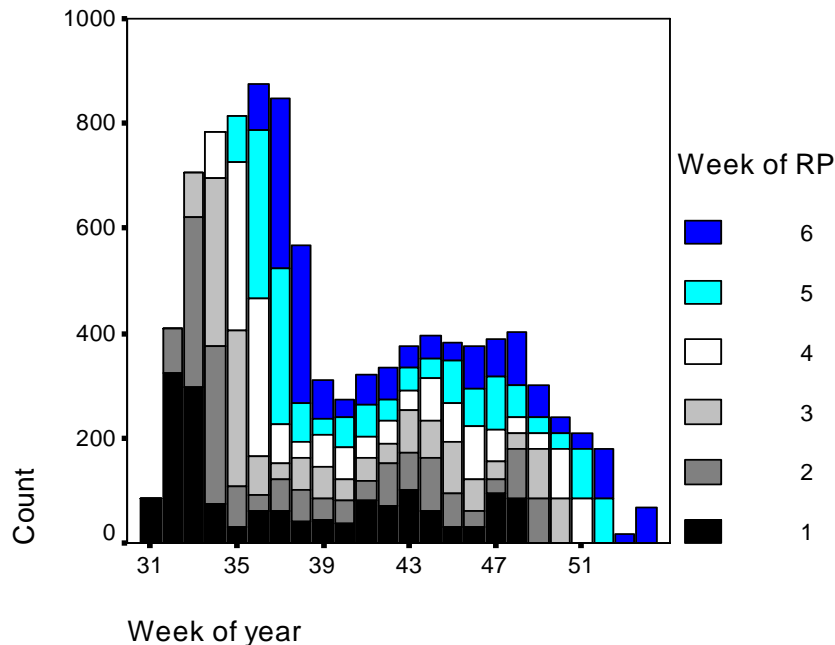
<sup>1</sup> Not reached after five contact attempts spread over the whole day and a number of days

<sup>2</sup> Not contacted, as all quotas had been filled

Using the CASRO standard the response rate (unknowns allocated to eligible and uneligible status) is 13.2% (see <http://home.clara.net/sisa/resprhlp.htm> for the calculations).



Figure 1 Number of reported days by week of year (survey period) and reporting period (RP)



To place the participants into the context of the local population persons, who had refused to participate, were asked to answer a small set of questions about their household. A total of 212 persons did answer these questions for their household, 49 of which answered for households which were in one way or another not eligible for participation in the survey. Therefore information about 262 households can be used for a selectivity analysis. Using the binary logistic procedure of SPSS 12.0 a logit model was estimated using the log-likelihood ratio test forward entry method to identify the relevant variables. The Expectation Maximisation method was used to impute any missing value on that short interview, employing all available variables. The fit of the model is good identifying 84% of the household correctly with a  $\rho^2$  of 0.44 (See **Fehler! Verweisquelle konnte nicht gefunden werden.**)

In contrast to the Mobidrive experience, there is a number of variables, which did influence participation in the 2003 Thurgau survey. Income, number of public transport season tickets and number of employed increased participation significantly, while licence ownership and household size decreased it. Location, household tenure, and the number of children had no significant impact. Similarly to other recent Swiss surveys with substantial response burdens, higher earning, employed public transport users are more likely to participate in such exercises (e.g. Axhausen, König, Abay, Bierlaire and Bates, 2004; König, 2004 or a recent non yet reported SP survey)

Table 4 Results of the selectivity analysis (Base: Households completing the interview against non-participating households; excluding non-eligible households)

Household variable	Parameter	Significance level
Income [k SFr]	0.22	0.00
Number of season tickets	0.82	0.00
Number of driving licence holders	-1.99	0.00
Number of employed	1.20	0.00
Household size	-0.35	0.05
Constant	-1.57	0.00
N	262	
$\rho^2$	0.44	

## 2.2 The new variables

While the study maintained the protocol of the earlier Mobidrive study, it did adapt the contents in various areas. In the person questionnaire two innovative elements were added. The persons were asked to report their home and work locations for each of the last ten April 1st, a very common moving day in Switzerland, jointly with their car and season ticket availability for each of those days. This biographical element which had been tested in an earlier study (Axhausen, Beige and Martinovits, 2004) adds depth to the analysis of the activity spaces (for references see above), as it describes the level of local knowledge. The activity spaces should be influenced by the locations of the most important friends and relatives (Axhausen, 2004 and in press). Using a simple name generator, the respondents reported the names, addresses and frequency of visit of up to four non-resident family members and up to five friends and acquaintances, which they see regularly.

The design of the weekly diary was left unchanged, but the Mobidrive questions about trip and activity expenditures were exchanged and the question about the size of the party modified. The expenditure questions were felt to be sensitive and also less interesting in the Swiss context than the new ones. The new or adapted questions were:

- What is the walking distance from where you left the last vehicle you used to the destination ?
- How often have you visited this location before (Never, one to three times, more often) ?
- When did you plan this activity (One or more days in advance, during the day, spontaneous, routine/returning home) ?

- How many people travelled with you (number of household members, others, dog) ?
- How big was the group with which you performed the activity (number of household members, others, dog) ?

The second question arises from an interest in behavioural innovation (Schönfelder and Axhausen, 2004). In the earlier surveys it had been possible to determine, if a location was new to the observing researcher, but not if it was new to the respondent. This question filled the gap and created no problems for the respondents. The third question was adapted from the work on activity scheduling, as pioneered by Doherty and Miller (2000). Jointly with the second new question, it allows us more insight into the stability of travel behaviour. While many surveys in the past have asked about the travel group size, fewer have divided it by household and non-household members. The importance of the presence of the dog had been established in the Mobidrive and the 12-week leisure activity survey. Time budget diaries tend to query the presence of others only qualitatively. Given the importance of the social element of travel, leisure travel in particular, this double question fills a gap, as it reveals both the group size while travelling and while performing the activity. It reveals the number of the persons met.

As this paper is dedicated to the analysis of the fatigue aspects of the respondents, there will be no in-depth analysis of the new variables. Still, a number of descriptive analyses will be presented below to indicate their possibilities.

The respondents had no difficulty in naming relevant relatives and contacts and the frequency of contact with them (Figure 3). The more detailed relationships were grouped into nine categories, of which two were dropped as their occurrence was too small for further analysis (neighbours and non-residential partners). While the range of the types of family contacts is as expected, the categories of personal contacts are surprising, as acquaintances and „Kollegen“, a term covering in Swiss – German co-workers, class mates, but also a less intensive form of friendship, figure prominently. The mean and median (not shown here) distances between the homes of the respondents and their contacts varies systematically with the frequency of contact.

Equally surprising is the importance of activities planned substantially in advance for never before visited locations (Table 5). The odds are three-times higher than for the other two relevant categories. The share of never-before visited locations is quite substantial with 4%, about one absolutely new location per week. Routine and long-planned activities dominate, while spontaneous activities make up 10% of the total. This figure is difficult to compare as other surveys asking the question chose different categorisations.

Figure 2 Column from the travel diary

Day of week (tick circles for each day)

Departure time (military time)

Purpose

Dropping off or picking up, private business, work related business, school or training, work (at work place), shopping (grocery/daily or longer term goods)

Leisure (please specify)

Other (please specify)

Return home

Mode, indicating the minutes spent travelling with each

Walking, bicycling, motorcycle, car as driver, car as passenger, local public transport, heavy rail, other

Distance walked from the stop or parking space

Exact street address of destination

Frequency of visit

Never before

Once to three times

More often

Number of people travelling with respondents/joining them during the activity

Household members

Other persons

Household dog

Time since the activity was planned

One or more days in advance

During the course of the day

Spontaneous/right now

Routine/return home

Arrival time (military time)

Distance travelled (km and meters)

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Figure 3 Distance between the homes of the respondents and their contacts by type

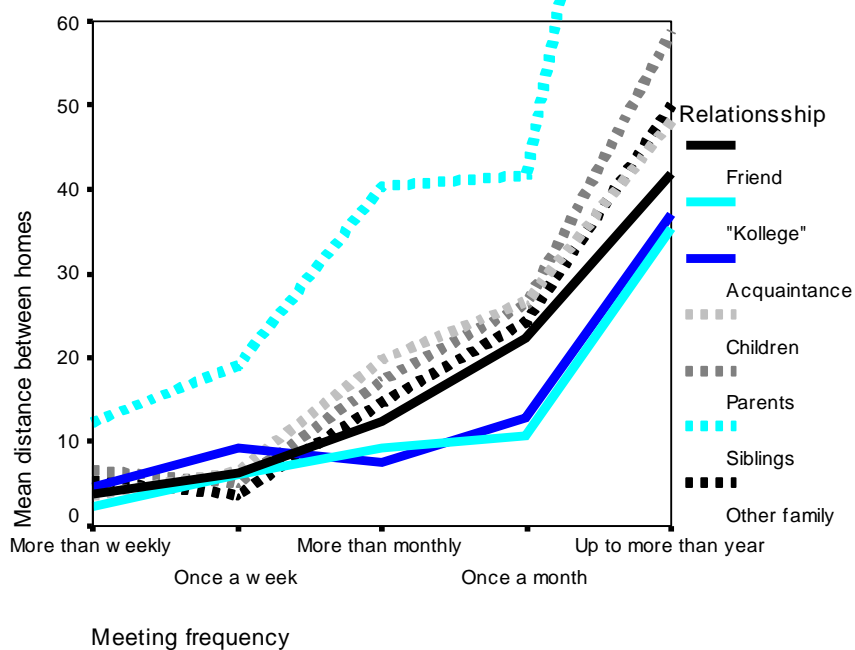


Table 5 Share of trips by timing of the planning and the frequency of previous visits to the visited location (row percentages)

Frequency of visit to this location	When planned				Routine/Return home	Share of trips
	One or more days in advance	During the day	Just now			
Never before	60.8%	16.7%	22.5%	.	4.1%	
1-3 times	53.2%	23.0%	23.8%	.	6.4%	
More often	14.3%	8.6%	9.7%	67.5%	89.5%	
Share of trips	18.7%	9.8%	11.1%	60.4%	100%	

There seems to be pervasive lift giving in this sample of trips, but the bulk is associated with trips returning home, where the group seems to dissolve, largely because the diary does not ask about in-home activities (Table 6). Still, the data highlight the importance of meeting others for an activity, with whom the respondent had not travelled before.

Table 6 Share of trips by number of persons travelling along and participating the ensuing activity (Row percentages)

Persons travelling along	Persons participating in the ensuing activity						Share of trips
	None	One	Two	Three	Four	Five plus	
None	89.8%	4.1%	1.6%	1.5%	.8%	2.2%	61.2%
One	38.6%	52.7%	2.5%	2.2%	1.0%	3.1%	24.5%
Two	40.9%	4.0%	45.9%	2.6%	1.6%	5.0%	6.9%
Three	39.7%	2.1%	1.5%	46.9%	1.4%	8.4%	3.7%
Four	45.4%	1.7%	1.9%	3.8%	38.8%	8.4%	1.4%
Five plus	36.9%	2.7%	.8%	2.8%	2.3%	54.5%	2.3%
Share of trips	70.2%	15.8%	4.9%	3.5%	1.5%	4.1%	100%

The distribution of the final walk stage is left skewed, with the users of private vehicles generally indicating that they found a parking space directly in front of their destination. Still, this item requires further analysis as some of the mean and median distances seem unrealistically low.

### 3 Modelling fatigue effects

The key problem for any survey is to win the commitment of the respondents at the stage of the recruitment and then to maintain it, while the respondents perform the tasks requested by the survey. This arc from the first contact until the respondents return the questionnaire, put down the phone after the last answer, log out from the website or says good-bye to the interviewer requires the full attention of the survey designer. The protocol, tools and forms used can potentially irritate the respondents in many ways endangering their commitment up to the point where they discontinue the interaction. In long duration surveys, boredom with the task can reinforce this process. The survey methods literature (e.g. Groves, 1989; Dillman, 1978 and 2000) highlights such pitfalls, so no review is required at this point. Equally problematic for the survey designer is the partial loss of commitment, which might express itself in item non-response, random answers or episode non-response<sup>1</sup>, in this

<sup>1</sup> The survey methods literature does not offer a good term for the non-response at the level of episodes, such as trips in travel diaries, times of unemployment in life course calendars, hospital stays in health questionnaires

case of the trips, which the respondents are asked to report in daily varying numbers. In many shorter diaries (two to seven days) this loss of commitment expressed itself in a systematic reduction in the number of reported trips as the reporting period went on. The a-priori assumption is that this loss of commitment or fatigue should express itself as a steadily decreasing number of reported trips as a function of the duration of the reporting period. This function might be linear or non-linear. In the protocol described above, two countervailing processes are at work: the respondent learns about his task to a degree, which a respondent in a two, three or seven day survey never does. One would assume that this makes the task easier and less error prone. In addition, his commitment is reinforced by the steady stream of interactions with the fieldwork staff: weekly mailings, regular call-backs to clarify errors and problems, a growing recognition of each others as persons, when on the one hand the fieldwork staff query for trips, which they would have expected given past weeks, and when on the other hand, the importance of the study to the staff becomes obvious to the respondent. One would expect the learning and the maintenance of the commitment level should increase the number of reported trips. As there is a natural maximum, this increase reaches a limit, implying, for example, a logarithmic shape of the function relationship. Any model of fatigue has therefore to test a number of different hypotheses about the impact of the reporting period, which combine these processes, while being aware of the strong correlations between the linear and transformed variables:

Hypothesis	Due to loss of commitment		Due to learning
	Linear	Quadratic	Logarithmic
1	x		x
2		x	x
3	x	x	x

### 3.1 Descriptive results

Next to the impact of the on-going reporting period, one would expect that the season has an impact on the level of trip making, as well as the interaction with the interviewer (see for example Christensen, 2004 for an analysis of the Danish National Travel Survey). A more detailed analysis of the socio-demographic and household factors influencing the level of trip making is not required here and will be reported elsewhere. As Table 5 and Table 6 make clear, there is no prima-facie evidence of fatigue at the aggregate level. A school holiday week has the biggest impact.

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etc. Item non-response is specific to the individual variable describing an episode or unit, while the term unit non-response is reserved for person or household non-response.

Figure 4 Number of reported trips as a function of the reporting period

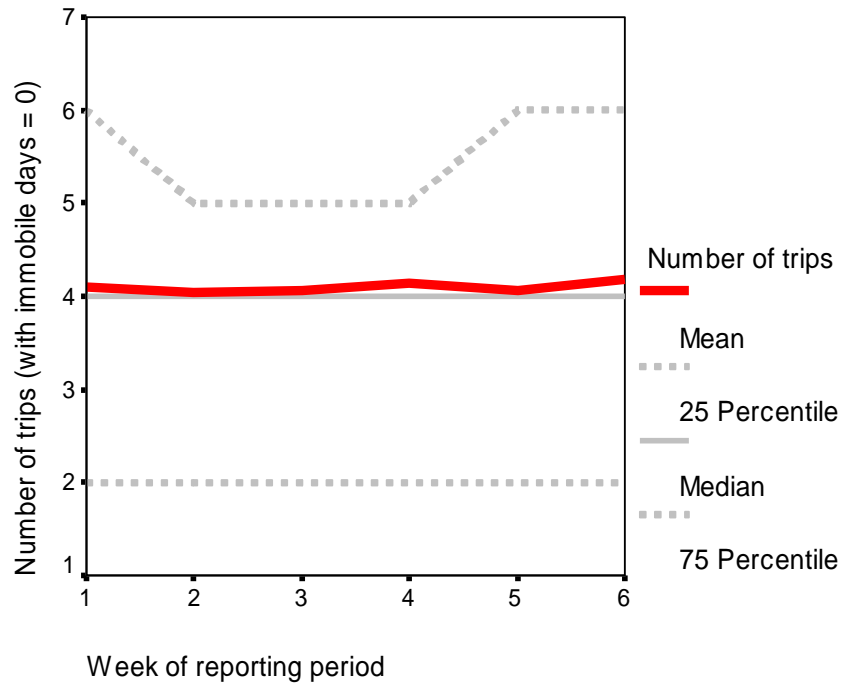
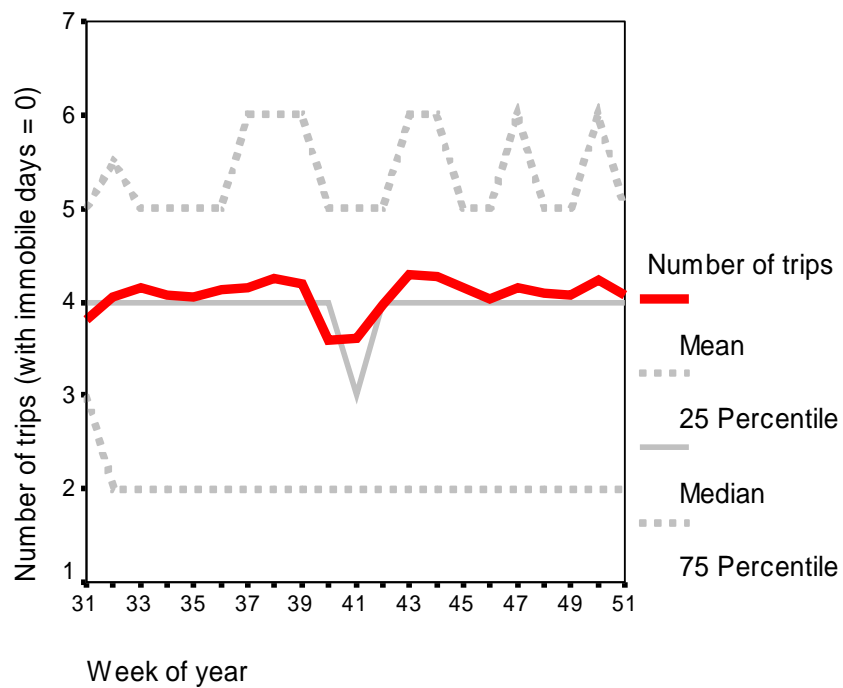


Figure 5 Number of reported trips as a function of the week of year



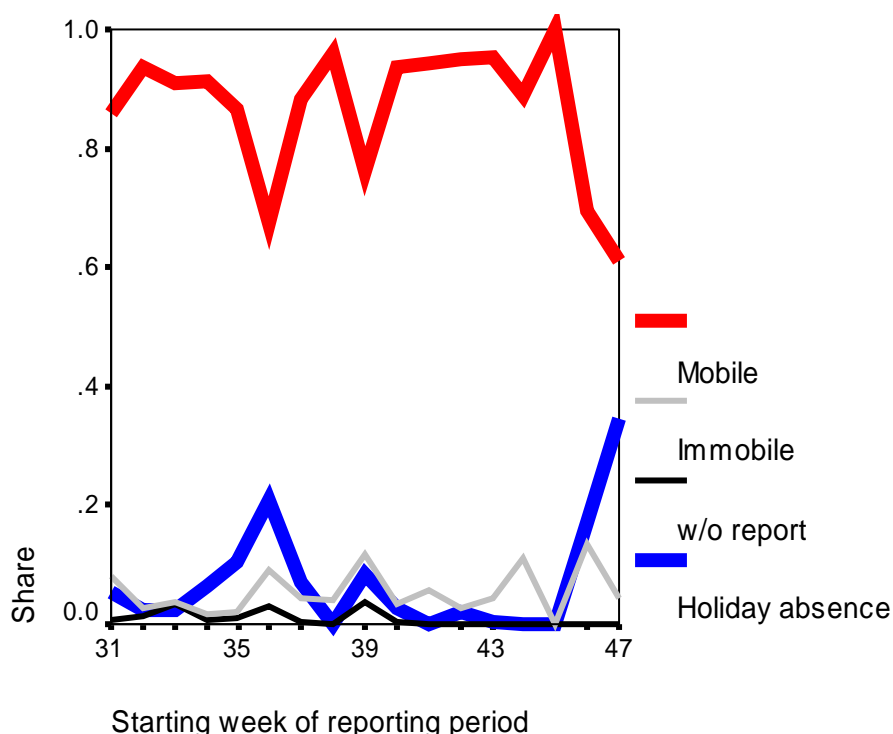


The impact of the school holiday week and of the *reporting holiday* of the households starting in weeks 46 and 47, mentioned above, is visible in Figure 6. Here the shares of the four possible returns for each day are shown by the starting week of the reporting period, i.e. when the respondents began their participation (See also

Figure 1 Number of reported days by week of year (survey period) and reporting period (RP)

). While there is variation, there is no trend, in particular for the shares of immobile days and the days without any report.

Figure 6 Daily shares of reporting status by starting week of reporting period



### 3.2 Interviewer effects

The impacts of interviewers are much more substantial and interesting. The mean impact of interviewer B is clearly visible in Figure 7, but Figure 8 puts this in perspective. It is clear, that interviewer B learned on job, but that interviewer B, as the others, flagged towards the end of their engagement. An univariate analysis of variance of the number of trips revealed a more differentiated picture. Controlling for home location, income, age (in decades), sex, interaction of car and season ticket ownership, the respondents of interviewer B reported sig-

nificantly fewer trips independent of their sex then respondents of interviewer D. In comparison with interviewer D, interviewers A and C received significantly more trips from male respondents.

Figure 7 Mean number of trips by interviewer and week of reporting period

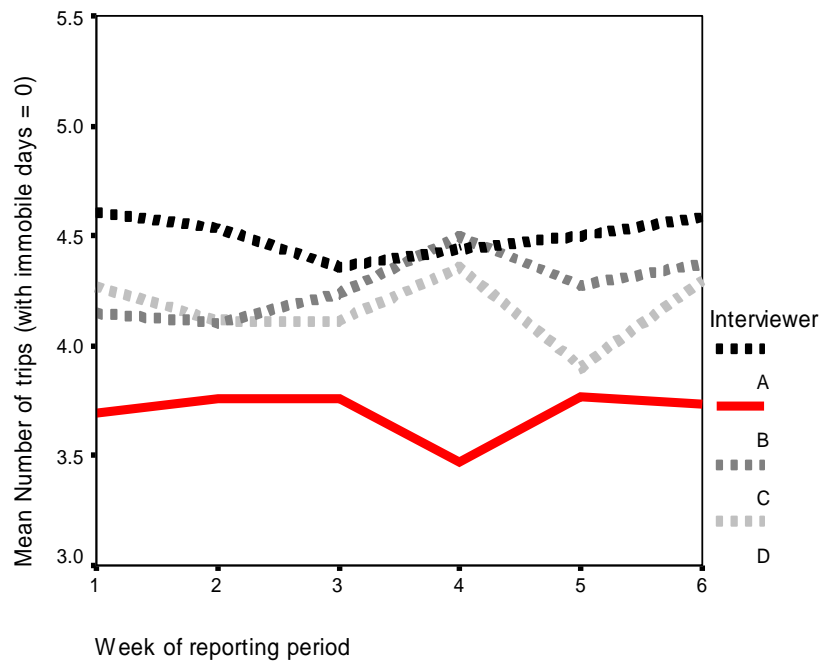
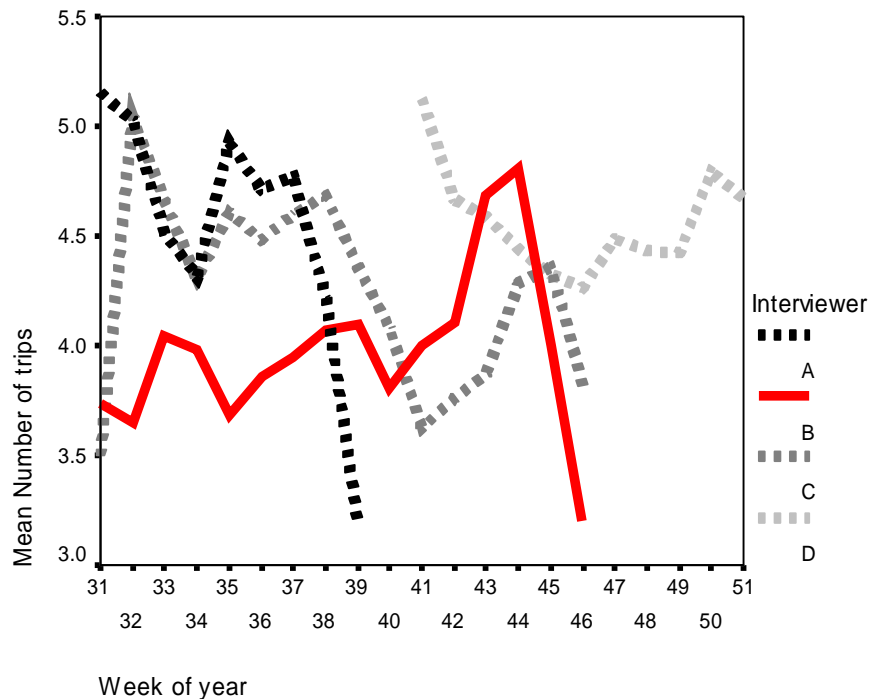


Figure 8 Mean number of trips by interviewer and week of year



The analysis also showed, that the interviewer effects stayed stable over the reporting period. The initial contact experience, maybe sympathy between respondent and interviewer, seems the prime determinant.

### 3.3 Regression results

In the analysis of the fatigue one is not interested in the mean levels, but only if the individual respondents show signs of fatigue. The analysis was therefore performed for each individual separately after standardising the reported numbers of trips to have a mean of zero and standard deviation of one. This also removes the interviewer impacts (but see below). Using the Generalised Linear Model procedure of SPSS 12 and the SAS Proc GENMOD for a Poisson regression the hypotheses outlined above were estimated for each respondent, while controlling for day-of-week effects, which were estimated to be equal across all respondents. To put the 2003 Thurgau data in perspective, the same analysis was performed with the 1999 Mobidrive data. This extends the modelling of fatigue reported for this dataset in Axhausen et al., 2002). For reasons of space only the results for hypotheses 1 and 3 will be presented in the following.

The results in Table 7 to Table 10 confirm the impression of the descriptive analysis. No significant effects can be detected in the vast majority of respondents. In those cases, where significant effects are detectable, they indicate a continuing increase in the reporting of trips (only positive effects) or mixed effects, where the direction of the total effect is determined by the size of the parameter estimates. No case, where both or all three parameters were significant and negative, was found. The Thurgau and the Mobidrive results are similar in this respect, even if the Mobidrive data is less affected by time trends, both in a positive (learning) or negative way (fatigue). As the log and the linear term are strongly correlated, the OLS analysis was repeated with only the linear or the logarithmic term. The number of significant results was even smaller than those reported above.

Linear regression is not ideal for count data, such as the number of trips, considered here. The models were therefore re-estimated using Poisson regression using SAS Proc GENMOD. Again, the regressions were calculated for each person, but the day-of-week effects were estimated here at the person level. As the count data were not standardized for the Poisson regression, the mean trip rate was characterised through a constant.

Table 7 Results for hypothesis 1 (Significance level = 0.05)

<b>Thurgau OLS</b>		Logarithmic term			Total (N = 230)
Linear term	Negative	Not significant	Positive		
Negative		.9%	3.0%		3.9%
Not significant		90.0%			90.0%
Positive	4.3%	1.7%			6.1%
Total	4.3%	92.6%	3.0%		100.0%
<b>Thurgau Poisson</b>		Logarithmic term			Total(N = 230)
Linear term	Negative	Not significant	Positive		
Negative		2.6%	2.6%		5.2%
Not significant	3.4%	81.1%	3.0%		87.6%
Positive	3.0%	3.4%	.9%		7.3%
Total	6.4%	87.1%	6.4%		100.0%
<b>Mobidrive OLS</b>		Logarithmic term			Total (N = 361)
Linear term	Negative	Not significant	Positive		
Negative		.6%	3.3%		3.9%
Not significant		93.6%	.6%		94.2%
Positive	1.1%	.8%			1.9%
Total	1.1%	95.0%	3.9%		100.0%

Table 8 Results for hypothesis 3: Thurgau OLS (Significance level = 0.05)

Linear term	Quadratic term	Logarithmic term			Total (N = 230)
		Negative	Not significant	Positive	
Negative	Negative				
	Not significant				
	Positive		.4%	5.7%	6.1%
Not significant	Negative		.9%		.9%
	Not significant		87.0%	.9%	87.9%
	Positive		.9%		.9%
Positive	Negative	2.6%			2.6%
	Not significant	1.7%			1.7%
	Positive				
Total		4.3%	89.1%	6.5%	100%

Table 9 Results for hypothesis 3: Thurgau Poisson (Significance level = 0.05)

Linear term	Quadratic term	Logarithmic term			Total (N = 230)
		Negative	Not significant	Positive	
Negative	Negative				
	Not significant		.9%		.9%
	Positive		1.3%	5.2%	6.5%
Not significant	Negative		1.3%		1.3%
	Not significant	.9%	79.1%	1.7%	81.7%
	Positive		2.2%		2.2%
Positive	Negative	2.6%	3.5%		6.1%
	Not significant	1.3%			1.3%
	Positive				
Total		4.8%	88.3%	7.0%	100.0%

Table 10 Results for hypothesis 3: Mobidrive OLS (Significance level = 0.05)

Linear term	Quadratic term	Logarithmic term			Total (N = 230)
		Negative	Not significant	Positive	
Negative	Negative				
	Not significant			1.4%	1.4%
	Positive		1.4%	3.9%	5.3%
Not significant	Negative		.3%		.3%
	Not significant		88.1%	1.1%	89.2%
	Positive				
Positive	Negative	2.8%	.8%		3.6%
	Not significant		.3%		.3%
	Positive				
Total		2.8%	90.9%	6.4%	100.0%

## 4 Outlook and conclusions

This paper has introduced a new long-duration travel diary survey, which complements the existing 1999 Mobidrive survey by covering a small town and rural environment. The 2003 Thurgau data followed the protocol of the earlier study, but developed the set of questions further. These new questions concerned both the social context of the respondents, but also trip related items, such as planning horizon of the activity, previous frequency of visit or the number of persons involved in the trip or activity.

The descriptive and model-based analysis of the data show that respondent fatigue is not an issue in either survey. Where significant deviations from a steady number of reported trips were found, they were more likely in a positive direction. The learning inherent in the intensive round of contacts between respondent and interviewer does pay off.

Papers on travel diaries tend not to report interviewer effects, although their potential impacts are well known. The analysis shows, that the four interviewers employed in this survey had substantial and significant effects on the number of reported trips even after correcting for the sociodemographics of the respondents. The size of the effect raises the question, if one should not impute the missing trips

and journeys. The results of numerous comparisons between GPS-based observations and parallel diaries raises the same issue, substantial underreporting of trips and journeys, if arising here from a different source. This challenge will be the subject of later work.

The availability of the fully geocoded Thurgau dataset allows a wide variety of further analyses. Choice models can be estimated to highlight mode and destination choice, both at the level of the trip and of the tour (see Cirillo and Axhausen, 2004 or Cirillo, Koppelman and Axhausen, 2004 for an possible approach). More importantly, the dataset allows to investigate aspects, which are not visible in one or two-day diaries: the rhythms of activity participation by type and location, the interactions between household members of time, the size and structure of activity spaces (For some initial results see Löchl, Schönfelder, Schlich, Buhl, Widmer and Axhausen, 2005). Finally, the data could be used to calibrate activity scheduling models, as information about the planning horizons is for the first time available for such long durations.

## 5 Acknowledgements

The study was supported by a grant of the Swiss Department for Environment, Transport, Energy and Telecommunications administered and initiated by the Swiss Association of Transport Engineers (SVI). This and the support and suggestions of the Advisory Group chaired by Dr. G. Abay is gratefully acknowledged.

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