

# Share of immobiles in travel diary surveys

## A review

**Working Paper**

**Author(s):**

Axhausen, Kay W. ; Madre, Jean-Loup

**Publication date:**

2002-07

**Permanent link:**

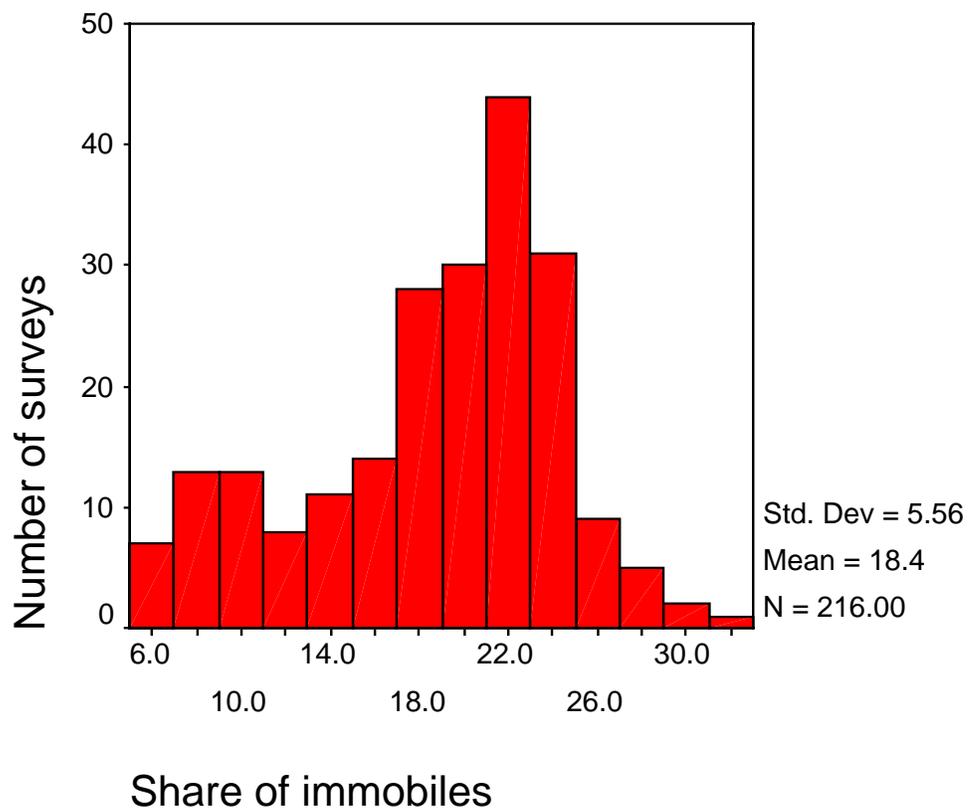
<https://doi.org/10.3929/ethz-a-004403602>

**Rights / license:**

In Copyright - Non-Commercial Use Permitted

**Originally published in:**

Arbeitsberichte Verkehrs- und Raumplanung 133



## Share of immobiles in travel diary surveys: A review

**KW Axhausen**

**JL Madre**

**Arbeitsbericht Verkehrs- und Raumplanung 133**

**July 2002**

**IVT** *Institut für Verkehrsplanung und Transportsystem*  
*Institute for Transport Planning and Systems*

**ETH**

**Eidgenössische Technische Hochschule Zürich**  
**Swiss Federal Institute of Technology Zurich**

Arbeitsbericht Verkehrs- und Raumplanung

## Der Anteil Immobiler in Tagebüchern zum Verkehrsverhalten

KW Axhausen  
IVT  
ETH  
CH – 8093 Zürich

JL Madre  
INRETS  
2 Ave. du Général Malleret-  
Joinville  
F – 94114 Arcueil

Telefon: +41-1-633 3943  
Telefax: +41-1-633 1057  
axhausen@ivt.baug.ethz.ch

Telefon: +33-1- 47407269  
Telefax: +33-1- 45475606  
madre@inrets.fr

July 2002

### Kurzfassung

Text

### Schlagworte

Immobilie, Verkehrstagebuch, Antwortverhalten

### Zitierungsvorschlag

Axhausen, K.W. und J.-L. Madre (2002) Share of immobiles in travel diaries: A review, *Arbeitsberichte Verkehrs- und Raumplanung*, **132**, Institut für Verkehrsplanung und Transportsysteme, ETH Zürich, Zürich.

Working paper

## Share of immobiles in travel diary surveys: A review

KW Axhausen  
IVT  
ETH  
CH – 8093 Zürich

JL Madre  
INRETS  
2 Ave. du Général Malleret-  
Joinville  
F – 94114 Arcueil

Telefon: +41-1-633 3943  
Telefax: +41-1-633 1057  
axhausen@ivt.baug.ethz.ch

Telefon: +33-1- 47407269  
Telefax: +33-1- 45475606  
madre@inrets.fr

July 2002

### Abstract

Text

### Keywords

Response behaviour, immobiles, travel diary

### Preferred citation style

Axhausen, K.W. und J.-L. Madre (2002) Share of immobiles in travel diaries: A review, *Arbeitsberichte Verkehrs- und Raumplanung*, **132**, Institut für Verkehrsplanung und Transportsysteme, ETH Zürich, Zürich.

# 1 Motivation

Persons, who have been approached for a survey, say a travel diary, have a range of alternatives for their response:

- To refuse consistently
- To refuse initially, but to participate partially/fully in a later *initial refuser - survey*<sup>1</sup>
- To refuse initially, but to participate partially or fully later, still to the original instrument
- To participate partially, i.e. omitting certain objects/items on purpose
- To participate fully, while maybe omitting some objects/items by chance, forgetfulness or lack of understanding<sup>2</sup>.

Travel diaries surveys are a group of related surveys including:

- a **household survey** addressing the description of the household and its resources
- **person survey(s)** covering the socio-demographic and mobility-related characteristics of each household member, plus their work and school locations
- a **vehicle survey** describing the vehicles of the household and their usage

and finally

- Diaries for each household member requesting a report of the activities/movements of each person for a specified period.

The response burden implied in the first three surveys is mainly determined by the survey designer and the number and difficulty of the items requested, in particular as the number of vehicles and persons to be described does not vary so greatly. This is not true for the diaries, as the respondent has to decide, how many activities or movements (objects), he or she wants to report. The number and complexity of the items requested for each object should have an influence on this decision (see for example Axhausen, Köll, Bader and Herry, 1997). The

---

<sup>1</sup> The alternative term *non-response-survey* is confusing and therefore not used.

<sup>2</sup> Lack of understanding by the respondent is a problem of the designer not of the respondent.

complexity is defined by both the number of items and, in particular, the requested format of the report: tours, trips, stages or activities; here then also the definition of activity and the thereby implied number of activities and in turn trips (Axhausen, Forthcoming).

A respondent, who reports to have been immobile on the reporting day, is a problem for the survey analyst. Has this person indeed not left the house or is the person using this as a way to reduce the response burden ?

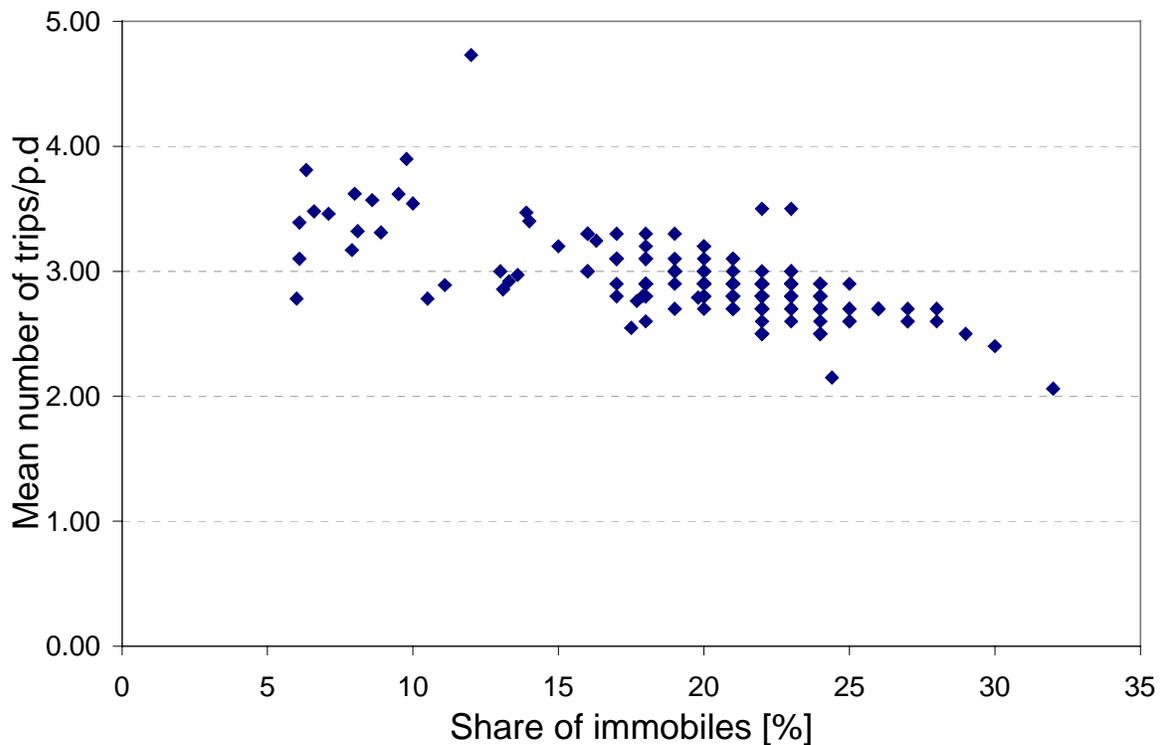
The problem is actually more general, as the analyst has always to consider the question, whether the respondent has omitted objects (tours, trip/activities) or whether the respondent has aggregated activities into larger groups, thereby omitting trips. Examples are the tour to the restaurant for lunch during a working day, the drop-off activity during the morning commute or the shopping tour, actually involving a range of stops/activities during the 90-120 minutes of its duration; strictly speaking each a trip/activity in its own right.

If these decisions are taken at random by the respondents, in particular, are unrelated to the number of objects they would have to report, then modelling results are unbiased (see Polak and Han (Forthcoming)), although the constants will always be biased downwards; as one has to assume that no – very few - respondents invent and report additional, not actually performed trips/activities.

The share of immobiles has a special importance in this context, as it has an immediate and strong impact on the mean number of reported objects (trips/activities) (See Figure 1). A number of recent multiday surveys, mostly involving the payment of incentives has raised the issue, what a reasonable share of immobiles should be: 7-10% or 15-20% person-days ?

The German Panel (7 day diary) reports about 8% (Chlond, Lipps, Manz and Zumkeller 1999), the 6-week Mobidrive – survey 6% (Axhausen, Zimmermann, Schönfelder, Rindsfuser und Haupt, 2002), a 12-week diary in Zürich 10% (Schlich, Kluge, Lehmann and Axhausen, 2002). Finally a sample of GPS-tracked cars in a small Swedish town was not moved in the study area for 23% of the 50'000 observed days, which includes stays out-of-town or days when the car owner only used other modes.

Figure 1 Mean number of trips/person-day by share of immobiles in the sample



Source: Current sample of surveys

The purpose of this paper is to document current knowledge about immobility rates and to relate them to characteristics of the surveys involved. Clearly, as with all meta – analyses, these characterisation will be rougher and less complete than one would like, but in the absence of a proper public data archive more is not possible.

## 2 Expectations

Based on the general understanding of the response processes in general, and in travel diaries in particular, one would expect certain relationships to hold, at this point some of them contradictory, or at least in need of reconciliation:

- Postal – based surveys should have higher rates of immobility, as the respondents can assess their response burden reasonably accurately in advance and can consider their response strategy

- Surveys with higher response rates should produce higher shares of immobiles, as they involve both more true immobiles and persons, which use immobility as a soft non-response.
- Long-duration surveys should be more attractive to more active persons, thereby reducing reported immobility rates
- Incentive payments should reduce the rate of false immobiles, as the gift places a stronger social obligation of full reporting on the recipient
- Activity-based surveys, which cover in-home activities, should reduce the share of immobiles, as something has to be reported in any circumstance
- Activity-based surveys, which cover only out-of-home activities, should not differ from movement-based surveys
- Surveys involving personal contact during data retrieval (CATI, face-to-face) should have a higher share of omitted objects (tours, trips, activities), rather than immobility
- Surveys with higher shares of older people should have higher shares of immobiles (See Figure 2)
- Surveys during the winter months should report higher shares of immobility
- Weekend only surveys, respectively surveys involving weekend days should report higher shares of immobility
- Countries with longer statutory vacations and more legal holidays should report higher shares, as some analyses do not separate these categories of no out-of-home activity.

### 3 Upper and lower limits

Travel diary survey exclude normally as a matter of policy a number of groups, because their sampling is difficult:

- Persons in common accommodation, such as hotels, hostels etc.
- Persons living in communal quarters, military barracks, student dormitories, retirement homes etc.
- Persons staying in hospitals and similar institutions.
- Persons living in prisons or other closed and semi-closed institutions

Figure 2 Share of immobiles by age for selected surveys

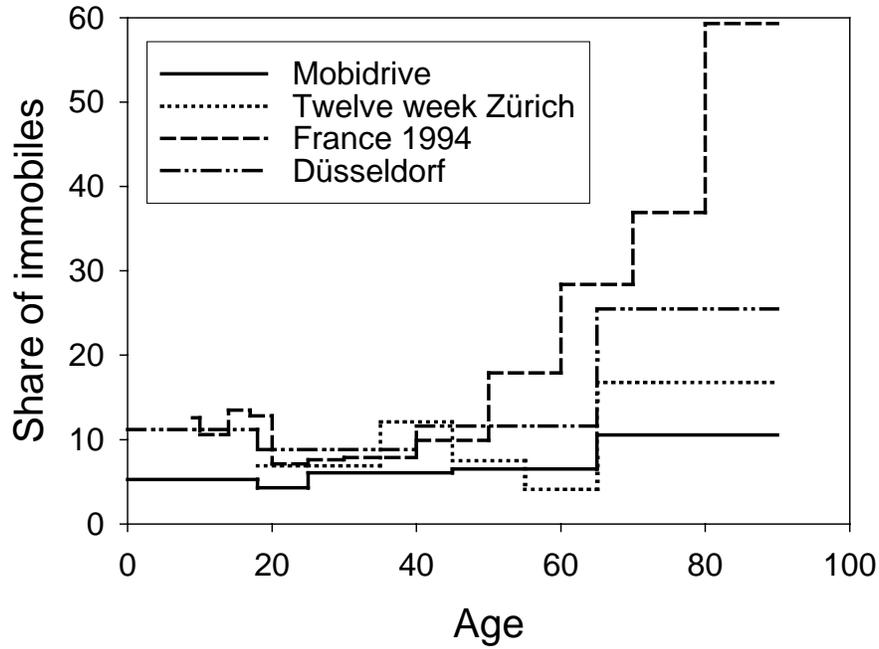
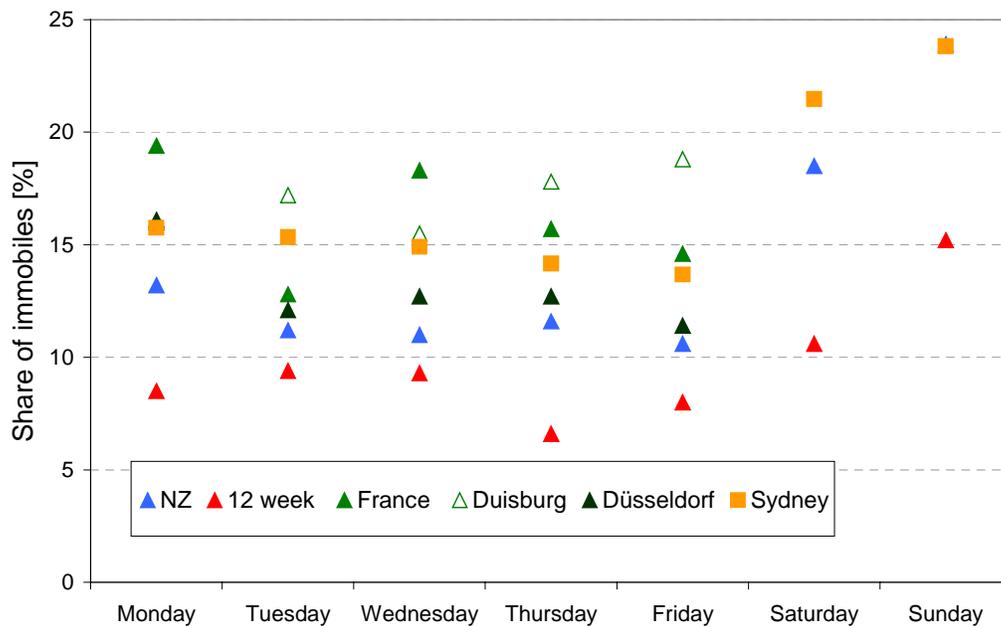


Figure 3 Share of immobiles by age for selected surveys



It is unclear at this point, what impact these omissions have on the estimate of the share of immobile travellers in an area. The balance will depend on the relative share of persons in the last two categories in comparison with the first two categories. Still, it is important to realise that the numbers derived from a travel diary exclude certain – by definition – immobile people systematically: people staying in hospitals and people living in closed institutions<sup>3</sup>.

The sampling frame is, as implied before, limited to residential addresses. For an estimate of and upper or lower bound one would need to know, how many persons living at residential addresses are not able to leave the house. Gant (2002) cites UK evidence for this share: 8% of the disabled population is housebound according to an official national survey. The definition of disability used covers 11% of the UK population, which would result in estimate of 1% of the residential population being homebound. Adding another 1% for people with long-term illnesses plus the low estimate of 6% immobiles found in the long-duration surveys, we would obtain a lower bound of 8% for the share of immobiles.

Assuming conservatively that in addition to the homebound the 40% of UK disabled using wheel chairs and walking aids leave the house only every second day, one would obtain a share of 3%. Again adding 2% for long-term illness and a high estimate of 10% from the long-duration surveys, one obtains an upper bound of 15%<sup>4</sup>.

The range of 8-15% suggested by these rough estimates is well below the majority of the studies collated for this paper. If true, it would indicate a substantial share of hidden non-response, which would need to be corrected for to obtain correct estimates of trip making or activity participation.

## 4 Data set

---

<sup>3</sup> See [http://www.kcl.ac.uk/depsta/rel/icps/worldbrief/highest\\_prison\\_population\\_rates.html](http://www.kcl.ac.uk/depsta/rel/icps/worldbrief/highest_prison_population_rates.html) for details on prison population. The US rate of 0.7% nationally is noticeable.

<sup>4</sup> Similar shares can be deduced from other international statistics on disability (see [www.loegd.nrw.de/](http://www.loegd.nrw.de/) for Nordrhein-Westfalen, ABS (2001) for Australia, McNeill (2001) for the USA or CBS (2001) for Israel).

## 5 Analysis

## 6 What now ?

## 7 Acknowledgements

The authors would like to thank the following colleagues for providing information about their surveys:

- Bill Frith (Government of New Zealand, Auckland)
- Werner Brög and Erhard Erl (both Socialdata, München)
- Patrick Bonnel (LET, Lyon)
- Günter Harloff (HHS, Aachen)
- Grace Corpuz (Government of New South Wales, Sydney)
- Bernhard Fell (PTV, Karlsruhe)
- Carlos Arce (NuStats, Austin)
- < I hope that we can add more names later >

Mr. Ashish Agarwal helped with the initial collation of the data base.

## 8 Literature

Axhausen, K.W. (Forthcoming) Definitions and measurement problems, in K.W. Axhausen, J.L. Madre, J.W. Polak and P. Toint (eds.) *Capturing Long Distance Travel*, Research Science Press, Baldock.

Axhausen, K.W., H. Köll, M. Bader and M. Herry (1997) Workload, response rate and data yield: experiments with long-distance diaries, *Transportation Research Record*, **1593**, 29-40.

- Axhausen, K.W., A. Zimmermann, S. Schönfelder, G. Rindsfuser and T. Haupt (2002) Observing the rhythms of daily life: A six-week travel diary, *Transportation*, **29** (2) 95-124.
- Central Bureau of Statistics (2001) The elderly in Israel: Survey Findings, *Statistilite*, **11**, Central Bureau of Statistics, Jerusalem.
- Australian Bureau of Statistics (2001) Australian Social Trends 2001: Health - Health Status: Disability among adults, ABS, Canberra.
- Chlond, B., O. Lipps, W. Manz and D. Zumkeller (1999) [Auswertung zum Deutschen Mobilitäts-Panel 1998 / 1999](#): Haushaltsbefragung zur Alltagsmobilität in verschiedenen Raumtypen, Final report FE-Projekt 70569/98 to the Bundesminister für Verkehr, Institut für Verkehrswesen, Universität Karlsruhe, Karlsruhe.
- Gant, R. (2002) Shopmobility at the milenium: "Enabling" access in town centres, *Journal of Transport Geography*, **10** (2) 123-133.
- Han, X.L. and J.W. Polak (Forthcoming) Imputation with non-ignorable missing values: A stochastic approach, in K.W. Axhausen, J.L. Madre, J.W. Polak and P. Toint (eds.) *Capturing Long Distance Travel*, Research Science Press, Baldock.
- McNeill, J. (2001) American with Disabilities, *Current Population Reports*, Census Office, Washington,
- Reno, A.T. and B. Douglas (2002) Characteristics of urban travel demand, *TCRP Report*, **73**, Transportation Research Board, Washington.
- Schlich, R., B. Kluge, S. Lehmann and K.W. Axhausen (2002) Durchführung einer 12-wöchigen Langzeitbefragung, *Stadt Region Land*, **73**, 141-154.

Table 1      Beschriftung

---

Tabellenkopf	Tabellenkopf	Tabellenkopf	Tabellenkopf
Tabellentext links	Tabellentext rechts	Tabellentext rechts	Tabellentext rechts

---

Quelle: ..... (Diese und die vorherige Zeile können gelöscht werden, falls nicht notwendig)

---