

# Predicting Response Rate: A Natural Experiment

Kay W Axhausen\*, Claude Weis†

Keywords: survey practice

DOI: [10.29115/SP-2010-0009](https://doi.org/10.29115/SP-2010-0009)

---

## Survey Practice

Vol. 3, Issue 2, 2010

---

### Predicting Response Rate: A Natural Experiment

---

When conducting mail and mail-back surveys, market research firms need to estimate response rates in advance to be able to estimate the total expected reusable sample size resulting from a number of mailed questionnaires, and hence budget their study. We attempted to find an efficient and objective way of rating the response burden in order to assess the expected response burden from a given survey in advance.

Over the past decades, there has been a vast body of literature discussing response rates, the factors influencing them, and the various impacts on survey quality. While the literature on survey methods (see Richardson et al. 1995 or Dillman 2000 for relevant textbooks) discusses response burden, there seems to be very little literature on its ex-ante assessment, nor on predicting response rates from the burden.

Heberlein and Baumgartner (1978) present several factors that were found to influence response rates to mailed questionnaires. They find that response burden, approximated by the number of pages (or questionnaire length), has a significant influence on response rate (a similar approach is used in Bruvold and Comer 1988). However, they do not further differentiate the response burden by accounting for the complexity of the posed questions. They also find that other factors, such as the saliency of the survey content and incentives given to the respondents, all have an influence on the outcome (for a description of the so called leverage-saliency theory, see Groves et al. 2000).

Leverage-saliency theory, which suggests that non-results in biased study results, if the decision to participate in a survey is influenced by the respondents' interest in the survey topic, plays a major role in the assessment of such studies (Groves, Presser, and Dipko 2004). However, the degree of this effect and its influence on the actual response rates that are the subject of discussion here are difficult to quantify. As the studies used in our

---

\* **Institution:** IVT- ETH Zürich

† **Institution:** IVT- ETH Zürich

meta-analysis all stem from the same research field (transportation), we expect saliency to have influenced them all to the same degree, thus not biasing the results that will be discussed here.

Other meta-analyses of survey response rates include:

- Fox et al. (1988), who explore ways of increasing response rates, among others by reducing questionnaire length and providing the respondents with incentives;
- Church (1993), who also attempts to estimate the effect of incentives;
- Asch et al. (1997), who examine response to mail surveys in the medical field and find differences across disciplines and a positive effect of mail, respectively telephone, reminders;
- Cook et al. (2000), who examine response rates of Internet based surveys and find that survey length does not have a significant effect;
- Kaplowitz et al. (2004), who compare response rates of Web and mail based surveys.

All the abovementioned meta-analyses lack the assessment of response burden. If at all, they merely consider questionnaire length as an aggregate variable without taking the actual complexity of the survey into account. However, it seems clear that the specific effort demanded from the respondents will influence the outcome.

The studies that will be described in the subsequent sections were all conducted at the Institute for Transport Planning and Systems (IVT), ETH Zürich, most involving colleagues of the authors. Thus, we had the opportunity to examine and rate each questionnaire in detail, a benefit that meta-analyses resulting from mere literature reviews evidently do not possess.

### **A NATURAL EXPERIMENT**

Using a point system for face-to-face interview budgeting of the Zurich-based Gesellschaft für Sozialforschung (Table 1), Ursula Raymann and later the authors rated a series of self-administered surveys (Table 2) of the Institute for Transport Planning and Systems (IVT). As will be shown in this article, the resulting response burden indicator can be used to quickly infer expected response rates. However, the sample size of studies used in the present meta-analysis is still quite small, thus not allowing a clear statement on the statistical significance of the relationship between response burden and rate.

**Table 1** Response burden: Points by question type and action.

Item	Points
Question or transition (upto 3 lines)	2
Each additional line	1
Closed yes/no answers	1
Simple numerical answer (e.g., year of birth)	1
Rafting with up to 5 possibilities	2
Rating with more than 5 possibilities	3
Left, middle, right rating	2
Scales with 3 and more grades	2
Best of ranking with cards	4
Second and each additional best ranking	3
Answers to subquestions of up to 5 words	1
Answers to subquestion of up to 2 lines	2
a) Response to half-open question with =8 possibilities	2
Each additional one	2
b) Response to half-open question with =8 possibilities	4
Each additional one	3
Answer to "please specify"	2
First answer to an open question	6
Each additional answer to the open question	3
Mixing showcards	6
Giving/showing a card to the respondent	1
Per response category on a showcard	1
Filter	0.5
Branching	0.5

© Gesellschaft für Sozialforschung, Zürich, 2006

**Table 2** Base populations, sample sizes, ex-ante assessment of response burden and response rates.

Content of the self-administered surveys	Location/Base population	Sample size	Response burden	Response rate* [%]		With recruitment
				No prior recruitment		
				Motivation call	No motivation call	
Mobility plan: Zurich University Hospital	Visitors to the hospital	1615	57.00		25.88	
National SP survey on railway services	Residents of French and German speaking Switzerland	1561	84.00			67.71
Regional mode and route choice SP	Residents of the Canton Zurich	1229	84.00			70.87
National SP on value of travel time savings	Swiss residents	2317	152.90			52.74
Fuel price and rail usage	Residents of French and German speaking Switzerland	1036	170.00			58.31
Regional SR on value of statistical life	Residents of Canton Ticino	500	197.00	41.00		
Mobility plan: University of Zurich	Employees of the university	372	219.00		19.83	
Regional SR on value of statistical life	Residents of German speaking Switzerland	2000	223.60		33.91	
Home ownership and use of local facilities	Residents in a quota sample of municipalities in the Zurich region	9330	230.70		36.08	
National SP on the impacts of road pricing	Residents of French and German speaking Switzerland	2249	264.79			46.69
Modelling mountaineers' travel behaviour	Members of the Swiss Alpine Club	530	276.00		46.04	
Mobility biographies and regular travel	Residents of Basel, Bern and Zurich	3500	521.00		8.36	
Mobility biographies	Residents of Canton Zurich	1763 + 1537	529.00	30.90	14.70	
Mobility biographies and home ownership	Residents of Canton Zurich	300	655.40		19.87	
Social networks and mobility biographies	Residents of Zurich	4350	991.75	11.25	4.35	

Content of the self-administered surveys	Location/Base population	Sample size	Response burden	Response rate* [%]		
				No prior recruitment		With recruitment
				Motivation call	No motivation call	
Ego-centric social networks	Residents of Canton Zurich	761 + 91	900.00		17.35	36.88

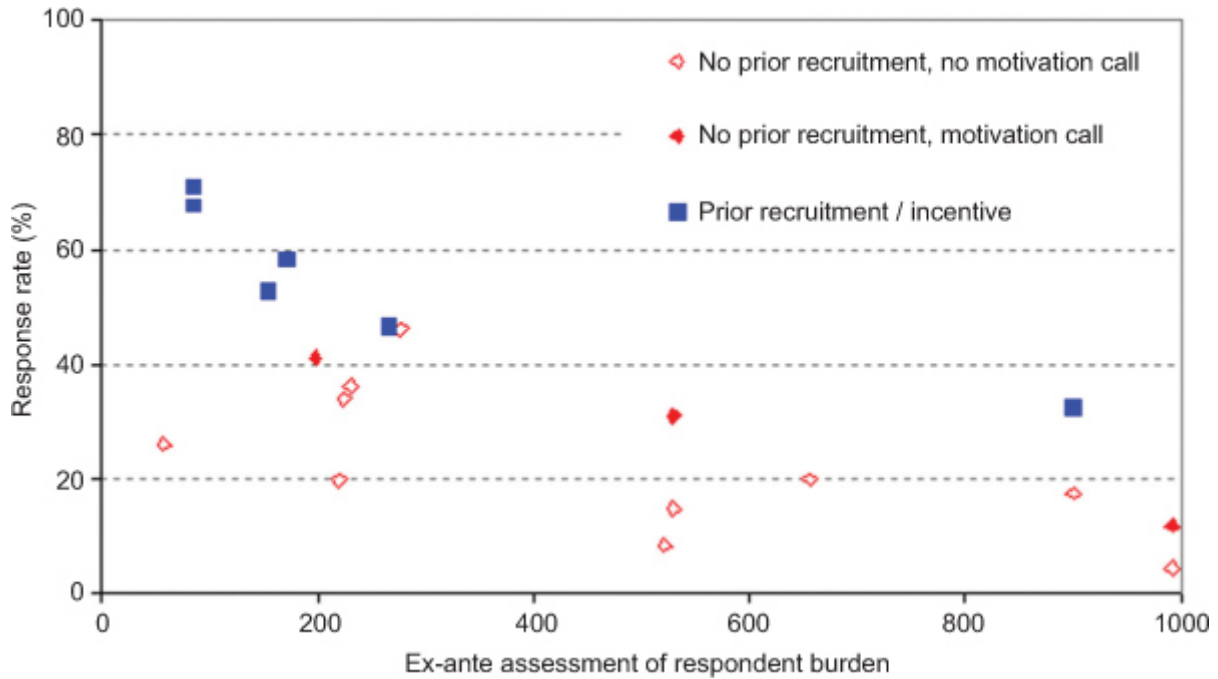
Sources (in the order listed): Axhausen et al. (2006); Axhausen et al. (2007); Beige (2004); Beige and Axhausen (2005) (main study and pre-test) (also Beige, 2006); Jäggle (2006); Kowald et al. (2009) (Note that the study by Kowald et al. (2009); Locatelli (2004); Schiffmann (2005); Stäubli (2009); Vrtic and Axhausen (2004); Vrtic and Fröhlich (2006); Vrtic et al. (2007); Waldner et al. (2005); Weis et al. (2008); Weis and Axhausen (2009) involved a monetary incentive, phone contact with the interviewers and a personal post card from a member of the social network to which the respondents belong, inviting them to participate in the survey.)

\*The figures correspond to the COOP4 cooperation rate as defined by the American Association for Public Opinion Research (AAPOR, 2008). It is calculated as the number of returned questionnaires, divided by the difference of the total sample size and sample loss (deaths, wrong address, respondent moved).

The surveys (see Table 1) range from simple and short stated preference (SP)/conjoint surveys, via longer stated response (SR) surveys to extensive surveys of the respondent's social network or moving behaviour. They form a natural experiment as they were not designed as a survey methods experiment, but arose from the on-going work of the IVT.

All surveys were sent with cover letters on ETH letterhead and included pre-stamped return envelopes to an ETH address. The name and contact details for the respective person in charge were given. The forms were photocopied or laser-printed, if customised for a specific respondent, on good quality paper. The name of the client or of the sponsor of the study was given in the cover letter. The surveys are therefore comparable in their social context and benefit from the credibility of the institution as the most prominent academic institution of the country (see <http://www.fc.ethz.ch/facts/ir/rankings> for a collection of the relevant rankings).

The range of respondent burden is unusually large as the sample contains both experimental work, especially that on social networks and mobility biographies, as well as quasi-commercial work, for which the response rate and therefore a focus on essential questions are crucial, here the various SP experiments. In a number of cases, the respondents were recruited as part of a computer-aided telephone survey undertaken for the Swiss Federal Railroads by a local market research firm. This prior recruitment will increase response for equal response burdens, as the respondents have shown a willingness to participate. In three cases, subsamples of the respondents were reached by phone for a motivation call explaining the purpose, answering any questions and stressing the importance of the survey to the research projects. For this small sample of self-administered surveys, there is a very strong linear link between the independent ex-ante assessment of respondent burden and the response rate (Figure 1). Two trends are visible (*visible in a regression of response rate on response burden, motivation call and prior recruitment, but not reported due to small sample size*): the response rate declines with the ex-ante estimate of the response burden and prior recruitment seems equivalent to a motivation call in gaining commitment from the respondents. The authors are not aware of any similar results in the literature.



**Figure 1** Response rate and ex-ante assessment of response burden.

## OUTLOOK

If these results were to be confirmed with a much larger set of self-administered surveys, it would be a breakthrough in the planning and design of self-completion surveys. It would allow the designer to trade-off detail versus response and would improve the budgeting substantially.

In many other surveys, the response burden varies from respondent to respondent as the number of units to be reported varies between respondents. Prominent examples are trips in travel diary surveys, spells of unemployment in labour market surveys, incidents of sickness, and moves between firms. In this context, these results could be used to estimate the number of non-reported units, which is crucial in these contexts. Still, one should not forget that the content of a survey itself has an impact, as shown for example by the differential response rates to different sets of Stated Preference experiments in a recent Swiss value of travel time savings study (Axhausen et al. 2007), where there were significant differences by task and the preferred mode of the traveller. Still, confirmed results would allow the designer to formulate expectations.

The results presented ask for replication across fields, countries, and survey organizations. Otherwise it will be very difficult to obtain the range of response burdens that is necessary to see its effect in the first place. This will be more than a meta-analysis, as the calculation of the ex-ante response burdens will need to be performed for the first time. We would be happy to undertake this effort if the survey forms and the associated AAPOR response rates were made available to us.

## **ACKNOWLEDGEMENT**

The authors are very grateful for the rating of the first set of surveys by Ursula Raymann, GfS Zürich, and for making the system available to us.



## REFERENCES

- Asch, D.A., M.K. Jedrzejewski, and N.A. Christakis. 1997. "Response Rates to Mail Surveys Published in Medical Journals." *Journal of Clinical Epidemiology* 50 (10): 1129–36.
- Axhausen, K.W., A. Frei, and T. Ohnmacht. 2006. "Networks, Biographies and Travel: First Empirical and Methodological Results." Presented at the 11th International Conference on Travel Behaviour Research (IATBR 2006). Kyoto.
- Axhausen, K.W., S. Hess, A. König, G. Abay, M. Bierlaire, and J.J. Bates. 2007. "State of the Art Estimates of the Swiss Value of Travel Time Savings." Presented at the 68th Annual Meeting of the Transportation Research Board (TRB 2007). Washington, D.C.
- Beige, S. 2004. "Ownership of Mobility Tools in Switzerland." Presented at the 4th Swiss Transport Research Conference (STRC) 2004). Ascona.
- . 2006. "Long-Term Mobility Decisions during the Life Course." Presented at the 6th Swiss Transport Research Conference (STRC) 2006. Ascona.
- Beige, S., and K.W. Axhausen. 2006. "Long-Term Mobility Decisions during the Life Course: Experiences with a Retrospective Survey." Presented at the 11th International Conference on Travel Behaviour Research (IATBR) 2006. Kyoto.
- Bruvold, N.T., and J.M. Comer. 1988. "A Model for Estimating the Reponse Rate to a Mailed Survey." *Journal of Business Research* 16 (2): 101–16.
- Church, A.H. 1993. "Estimating the Effect of Incentives on Mail Survey Response Rates: A Meta-Analysis." *Public Opinion Quarterly* 57 (1): 62–79.
- Cook, C., F. Heath, and R.L. Thompson. 2000. "A Meta-Analysis of Response Rates in Web- or Internet-Based Surveys." *Educational and Psychological Measurement* 60 (6): 821–36.
- Dillman, D.A. 2000. *Mail and Internet Surveys: The Tailored Design Method*. New York: John Wiley and Sons.
- Fox, R.J., M.R. Crask, and J. Kim. 1988. "Mail Survey Response Rate: A Meta-Analysis of Selected Techniques for Inducing Reponse." *Public Opinion Quarterly* 52 (4): 467–91.
- Groves, R.M., S. Presser, and S. Dipko. 2004. "The Role of Topic Interest in Survey Participation Decisions." *Public Opinion Quarterly* 68 (1): 2–31.
- Groves, R.M., E. Singer, and A. Corning. 2000. "Leverage-Saliency Theory of Survey Participation: Description and an Illustration." *Public Opinion Quarterly* 64 (3): 299–308.
- Heberlein, T.A., and R. Baumgartner. 1978. "Factors Affecting Reponse Rates to Mailed Questionnaires: A Quantitative Analysis of the Published Literature." *American Sociological Review* 43 (4): 447–62.
- Jäggle, B. 2006. "Was Ist Den Schweizern Ein Verhinderter Verkehrstoter Wert?" MSc Thesis, Vienna: Universität für Bodenkultur. (Written under the supervision of the author at the IVT, ETH Zürich.).
- Kaplowitz, M.D., T.D. Hadlock, and R. Levine. 2004. "A Comparison of Web and Mail Survey Response Rates." *Public Opinion Quarterly* 68 (1): 94–101.
- Kowald, M., A. Frei, J.K. Hackney, J. Illenberger, and K.W. Axhausen. 2009. "The Influence of Social Contacts on Leisure Travel: A Snowball Sample of Personal Networks." Presented at the 12th International Conference on Travel Behaviour Research (IATBR) 2009. Jaipur.

- Locatelli, G. 2006. "Valuation of a Statistical Life Saved: Experimental Results from the Ticino." MSc. Thesis., Milan: Politecnico di Milano.
- Richardson, A.J., E.S. Ampt, and A.H. Meyburg. 1995. *Meyburg Survey Methods for Transport Planning*. Melbourne: Eucalyptus Press.
- Schiffmann, S. 2005. "Mobilitätsbiographie: Verkehrserzeugung Im Alltag." MSc Thesis, Zurich: IVT, ETH Zürich.
- Stäubli, A. 2009. "Matterhorn Retour – Modellierung Des Mobilitätsverhaltens von Alpinisten." Term Paper, Zurich: IVT, ETH Zürich.
- Vrtic, M., and K.W. Axhausen. 2004. "Forecast Based on Different Data Types: A before and after Study." Presented at the 10th World Conference on Transport Research (WCTR) 2004. Istanbul.
- Vrtic, M., and P. Fröhlich. 2006. "Was Beeinflusst Die Wahl Der Verkehrsmittel?" *Der Nahverkehr* 24 (4): 52–57.
- Vrtic, M., N. Schüssler, A. Erath, and K.W. Axhausen. 2007. "Route, Mode and Departure Time Choice Behaviour in the Presence of Mobility Pricing." Presented at the 86th Annual Meeting of the Transportation Research Board (TRB) 2007. Washington, D.C.
- Waldner, U., M. Löchl, M. Bürgle, and K.W. Axhausen. 2005. "Haushaltsbefragung Zur Wohnsituation Im Grossraum Zürich - Feldbericht." In *Arbeitsberichte, Polyprojekt Zukunft Urbane Kulturlandschaften 1. NSL, ETH Zürich*. Zurich.
- Weis, C., and K.W. Axhausen. n.d. *Benzinpreis Und Bahnnutzung*. Bern: Swiss National.
- Weis, C., A. Frei, K.W. Axhausen, T. Haupt, and B. Fell. 2008. "A Comparative Study of Web- and Paper-Based Travel Behaviour Surveys." Presented at the European Transport Conference (ETC) 2008. Noordwijkerhout.