A Meta-Analysis of Response Rates in Web- or Internet-Based Surveys

Colleen Cook, Fred Heath and Russel L. Thompson

Educational and Psychological Measurement 2000; 60; 821
DOI: 10.1177/00131640021970934

A META-ANALYSIS OF RESPONSE RATES IN WEB- OR INTERNET-BASED SURVEYS

COLLEEN COOK, FRED HEATH,
AND RUSSEL L. THOMPSON
Texas A&M University

Response representativeness is more important than response rate in survey research. However, response rate is important if it bears on representativeness. The present meta-analysis explores factors associated with higher response rates in electronic surveys reported in both published and unpublished research. The number of contacts, personalized contacts, and precontacts are the factors most associated with higher response rates in the Web studies that are analyzed.

During each election cycle, we are bombarded with the results of national polls updating us on the views of millions of potential voters. These surveys are usually based on responses of only an infinitesimal proportion (e.g., 2,000/150,000,000 = 0.000013) of the total population. Yet these portrayals are often stunningly accurate.

Election polls make clear that the *representativeness* of our samples is much more important than the response rate we obtain. A sample of fewer than 1% of the population can be more representative, indeed much more representative, than a sample of 50% or 60% of the population. Thus Krosnick (1999) emphasized in his recent survey of the paper-and-pencil response-rate literature,

> But it is not necessarily true that representativeness increases monotonically with increasing response rate . . . recent research has shown that surveys with very low response rates can be more accurate than surveys with much higher response rates. (p. 540)

Nevertheless, we remain concerned about our response rates if we are uncertain with regard to sample representativeness. We know that ultimately, if

Educational and Psychological Measurement, Vol. 60 No. 6, December 2000 821-836

we capture all or almost all of the population, our samples must be representative. These assurances are particularly important when we employ samples of convenience. Furthermore, we also remain concerned about sample representativeness, even in the only 5% of studies using random samples (Ludbrook & Dudley, 1998), unless *all* of the selected participants provide all requested data.

Typical survey response rates and the survey features that predict higher response rates in paper-and-pencil surveys have been subjected to meta-analytic study (cf. Heberlein & Baumgartner, 1978). However, the creation of the Web has brought the halcyon days of survey research because Web-based administration is so fast, flexible, and hugely cost saving.

Web-Based Survey Administration

The rapid rise in the use of the Internet and the World Wide Web is widely recognized. Within 4 years of its introduction, 50 million people were using the Web worldwide. This market penetration is impressive, given that it took radio almost 30 years to achieve this level of saturation and television almost 13 years. It is projected that one billion of the Earth's population could be Web-savvy by 2005 (Sheehan & Hoy, 1999b). As Dillman and Bowker (2000) recently noted, the impact of the Web has been seemingly immediate and, to some extent, has caught survey methodologists unprepared:

> We are witnessing an explosion in the use of web surveys to collect sample survey information that was previously collected by other modes of surveying. Only a few years ago the use of web questionnaires as a data collection device was not a matter that received research attention from specialists in survey research. Rather than being at the forefront of this latest innovation in the conduct of social surveys, survey methodologists are playing catch-up as they learn to master these new survey development tools. (p. 1)

The breakthrough occurred in the mid-1990s. With the introduction of HyperText Markup Language (HTML), the Web became an interactive medium in which targeted participants could interact with the surveying entity directly. Data collection became computer-enabled, easy, and nonthreatening. Although still in their infancy, electronic mail and Web-based polls have been noted for their potential to reach very large audiences inexpensively and to secure rapid replies (Kehoe & Pitkow, 1996; Schmidt, 1997).

The question remains whether survey methodologists are ready to accept the electronic survey as a standard vehicle. Today, survey methodology calls for systematic sampling, as well as high response rates and statistical weighting procedures to ensure representativeness and to avoid sampling bias

(Krosnick, 1999, pp. 538-539). Hox and deLeeuw (1994) explained this succinctly as follows:

> Research results can be biased if the nonresponse is nonrandom, and if it is in some way correlated with the variables measured in the survey. Since the process leading to nonresponse is usually unknown, it is often optimistically assumed that when the response is high, there is no serious nonresponse bias. Thus, a high response rate is viewed not only as desirable, but also as an important criterion by which the quality of the survey is judged. (p. 330)

But, in fact, all field methods, including face-to-face interviews, have been affected by substantial increases in nonresponse rates since the 1950s because "response rates for most major American national surveys [of all types] have been falling during the last four decades" (Krosnick, 1999, p. 539).

> Interviewers making personal visits to sample households have a harder time doing their job in urban settings. Potential respondents are less likely to be at home and are more likely to speak foreign languages; neighborhoods are more threatening to enter after dark; and multiple-unit apartment buildings with security arrangements are more prevalent. . . . Heightened concern about privacy and confidentiality, a disillusionment with the uses of survey results, and overexposure to the survey process have . . . led to higher refusal rates. (Steeh, 1981, p. 53)

According to Krosnick (1999), if it can be shown that there are other effective means of survey research, there are immediate benefits to be realized. New methodologies can potentially improve the validity of results (p. 538).

For methodological and economic reasons, electronic surveys are attracting considerable interest. If, by employing new methods of electronic survey research, very large or representative numbers of a population can be reached, then concerns with regard to response rate and response bias could be placed in a new context.

From the outset of e-mail surveys, even before the advent of the Web, people seemed to find the technology easy to use (Parker, 1992). Like a mail survey, electronic surveys can be completed at the pace the respondents choose. Unlike a mail survey that can be easily mislaid, an electronic contact with a potential respondent remains in place until purposefully deleted (Sheehan & Hoy, 1999b, p. 7).

New Web formats offer especially appealing possibilities. The graphics capabilities of HTML and Java Script permit more innovative interfaces than the limited options of paper surveys or telephone interviews, an aspect that practitioners find promising (Schillewaert, Langerak, & Duhamel, 1998). Respondents also find electronic surveys appealing. In a University of Colorado survey, for example, 55% of the respondents cited ease of use as one of

the things they liked most about answering a Web survey (University of Colorado at Boulder, 1996).

Problem Statement

Although no in-depth analysis has been conducted, a number of smaller studies suggest that response rates for e-mail and Web-based surveys may not yet match those of other methods (Mehta & Sivadas, 1995; Schaefer & Dillman, 1998; Sheehan & McMillan, 1999; Sheehan & Totten, 1994; Weible & Wallace, 1998). Accepting that high response rates are generally considered to be desirable, all things equal, the purpose of the present study was to ascertain the factors affecting response rates in the electronic environment.

Method

The study followed the meta-analytic methodology of Heberlein and Baumgartner (1978), who investigated factors affecting response rates to paper-and-pencil questionnaires. In meta-analyses, data from each study are coded and quantitative comparisons are made across studies. The approach provides "a clearer, more parsimonious review than previous qualitative discussions. The results are quantitative so a researcher gets a sense of the possible impact of a procedure against all published studies, rather than an illustrative few selected by a reviewer" (p. 448).

Heberlein and Baumgartner (1978), Dillman (2000), Baruch (1999), and others have cataloged many factors affecting responses to postal mail surveys. The present coding was based on the findings of meta-analyses of response rates in traditional formats. In those studies, the number of contacts, salience, incentives, and nature of the sponsoring agency were among the factors analyzed as affecting response rates.

Meta-Analytic Sample

In the present study, the methodologies of Hunter, Schmidt, and Jackson (1982) and Fox, Crask, and Kim (1988) were employed. Here, core journals were referenced manually (*Public Opinion Quarterly*, *Journal of Marketing Research*, and *American Sociological Review*) from their most current issues to the origins of the World Wide Web in 1994. Earlier studies (Kiesler & Sproull, 1986; Parker, 1992) that examined response rates within the context of e-mail messages to selected corporate employees were excluded, as these corporate employee surveys tended to elicit mandatory responses (and atypically high response rates), thus shedding no light on variables affecting response rates.

In addition, keyword searches were employed across a range of databases important in sociometric, psychometric, and public opinion research. The *Web of Science* citation index served as a particularly powerful tool, permitting retrieved sources to be traced to other useful citations. To locate sources not yet indexed in the traditional tools, the *Google* Web search engine was also employed. The primary keywords employed in the searches were *electronic*, *surveys*, and *response rates*. Finally, the bibliographies of each of the retrieved studies were themselves carefully searched for further leads.

The methodology of electronic surveys is increasingly employed in many areas of research, but few electronic surveys to date have employed entire known targeted populations or samples randomly drawn from the larger set. More common is the approach used by Kehoe and Pitkow (1996) and others where a survey is posted to a listserv (or other outlet), and where those who visit are invited to respond. Although these surveys can obtain large numbers of responses, no information can be gathered about response rates because, in such studies, a distinct population is not defined. Accordingly, surveys of this ilk were excluded from the present meta-analysis, as were pop-up marketing surveys and others for which insufficient information with regard to the targeted populations and response rates were available.

We coded 49 studies using electronic surveys. However, some of the 49 studies reported multiple surveys, and thus a total of 68 surveys were available for the meta-analysis. Notwithstanding the newness of the Web, this number of studies compares favorably with those used, for example, by Hox and deLeeuw (1994) in their meta-analysis of response rate factors in paper-and-pencil surveys.

Predictor Variables

The prior Web surveys were rated independently by two raters with regard to 15 predictor variables. Of these 15 variables, 12 were dummy coded 0 (no) and 1 (yes). For example, some studies only measured attitudes, some only sought factual information, and some did both. This variable was first dummy coded "more than only attitudes measured" (73% yes, either information only or both information and attitudes) and was also dummy coded "only information sought" (36% only information sought).

Survey salience was judged on a 3-point scale by the two independent raters, using three categories similar to those employed by Heberlein and Baumgartner (1978):

> A [1] salient topic was one which dealt with important behavior or interests that were also current. . . . Topics judged [2] possibly salient were important issues or behaviors that were not necessarily current or timely. . . . Topics judged to be [3] nonsalient to the respondent were those that neither concerned important issues or behaviors nor were current. (p. 449)

Here the two raters evaluated the salience of each survey using a 1 (*not salient*) to 3 (*very salient*) scale. After the independent ratings were compared, the two raters discussed ratings that were inconsistent until consensus was achieved.

Results

Bivariate Comparisons

Response rate was scored as a percentage of the target population. Following the recommendations of the APA Task Force on Statistical Inference (Wilkinson & APA Task Force on Statistical Inference, 1999), graphical techniques were employed to investigate and summarize bivariate results. Figures 1 through 5 present comparisons of response rates across several of our predictor variables.

Regression Analysis

Table 1 presents means, standard deviations, and product-moment correlation coefficients for the 15 predictor variables and the response rate outcome variable. This analysis involves scores on 16 variables. Because cases were deleted listwise for this analysis, the results involved 56 surveys reported in 39 articles.

Table 2 reports the regression coefficients from the analysis. The R^2 was .604 ($F = 4.07$, $p = .0002$). The effect size adjusted for shrinkage was 45.6%. Both the so-called standardized regression coefficients or beta weights from the analysis and the structure coefficients (Thompson & Borrello, 1985) are reported, given that the simultaneous interpretation of both sets of results (or of beta weights and correlations of predictors with the criterion) is essential to correct result interpretation (Courville & Thompson, 2000).

Discussion

Baruch (1999) set the average response rate to paper surveys at 55.6% (p. 429). Dillman (2000) suggested that with careful attention to design "response rates of 70% could be produced consistently for general public populations" (p. 5). However, meta-analyses of only published studies may result in an overestimation of typical response rates because studies with smaller response rates may not be submitted for publication in some disciplines or they may not be published when they are submitted. Kerlinger (1986) suggested that with regard to mail surveys "returns of less than 40 or 50 percent are common" (p. 380).

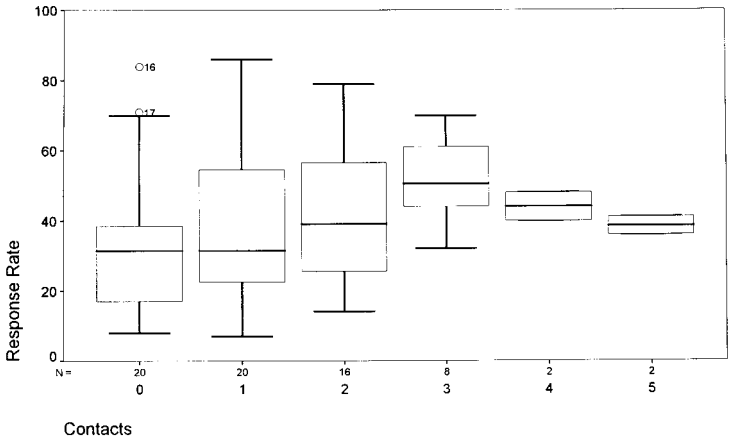

Figure 1. Box-and-whisker plot of response rate as a function of *number of contacts*.
Note. *Contacts* was counted as the sum of all pre- and follow-up contacts.

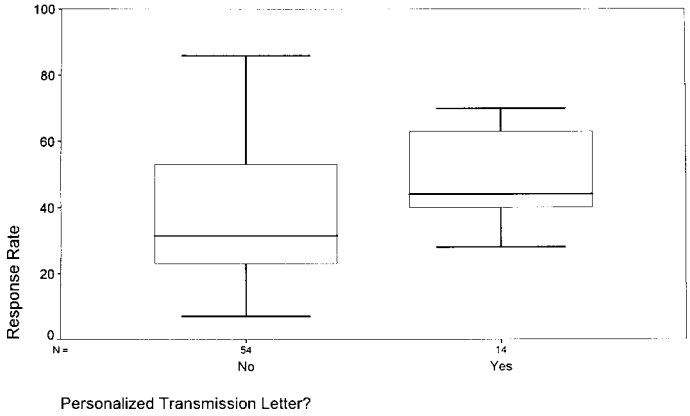

Figure 2. Box-and-whisker plot of response rate as a function of *use of a personalized transmission letter.*

In meta-analyses of postal surveys, various design features have been found to contribute to higher response rates (cf. Heberlein & Baumgartner, 1978). For example, university sponsorship and prenotification were found in one study to be important (Fox et al., 1988). To these, salience and follow-up contacts were among the helpful factors identified by Heberlein and Baumgartner (1978). According to the latter study, there was no correlation between survey length and response rate. The average questionnaire in their

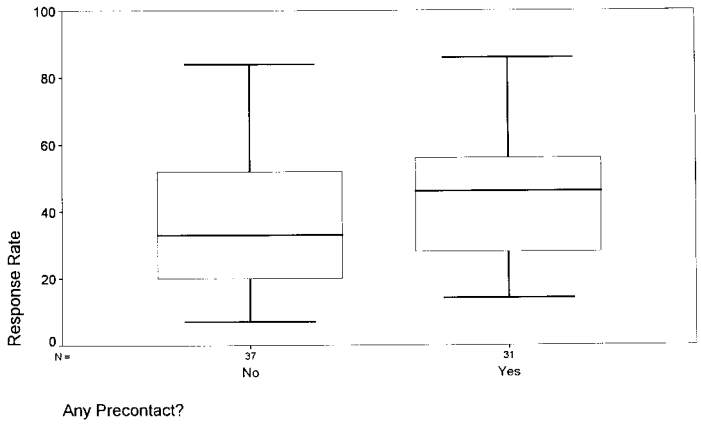

Figure 3. Box-and-whisker plot of response rate as a function of *precontact*.

Figure 4. Box-and-whisker plot of response rate as a function of *rated survey salience*.

sample of nonelectronic surveys had 72 questions on seven pages and took approximately half an hour to complete (p. 452).

Results from studies of nonelectronic surveys may generalize to Web applications, but it must be remembered that the current household penetration of the Internet is probably only marginally greater than that of the telephone in 1936. In that year, *Literary Digest* polled a million homes and erroneously predicted Landon's defeat of Roosevelt—another example that sample representativeness is more important than sample size. Yet, although it may not

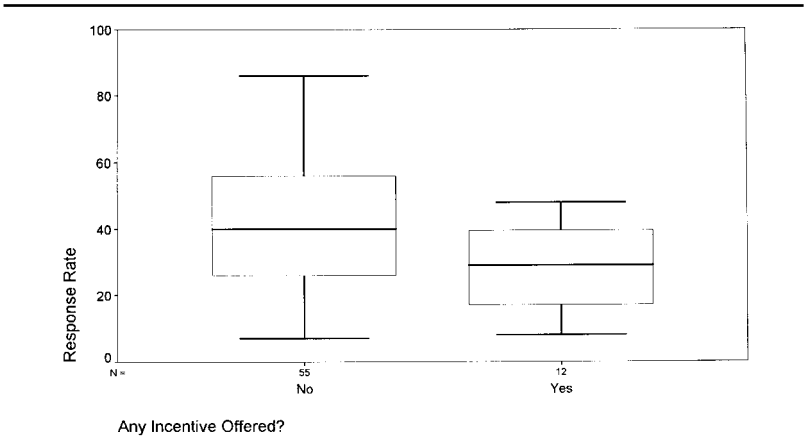

Figure 5. Box-and-whisker plot of response rate as a function of *incentive being offered*.

yet be possible to generalize Web survey results to the population at large, there are already environments in which electronic survey methodology may be appropriate and for which the lessons drawn from the present meta-analysis may be helpful.

> Certain populations, such as university professors, federal government employees, workers in many companies and corporations, and members of some professional organizations, generally have Internet address and access. For these populations, e-mail and Web surveys may have only minor coverage problems. (Dillman, 2000, p. 356)

Noteworthy Factors

In our analysis, the mean response rate for the 68 surveys reported in 49 studies was 39.6% (*SD* = 19.6%). As reported in Table 1, the mean response rate for the 56 surveys reported in 39 studies with no missing data on 16 variables was 34.6% (*SD* = 15.7%).

Our results for electronic surveys support those of Heberlein and Baumgartner (1978) for mail surveys in several ways but in other ways differ from those results. As indicated in Table 1 and Figures 1 through 3, the number of contacts, personalized contacts, and precontacts were the dominant factors affecting response rates for our study.

Contacts. Kittleson (1997) was assertive in emphasizing the effectiveness of follow-up notices to electronic survey efforts, maintaining that "one can

Table 1
Means, Standard Deviations, and Product-Moment Correlation Coefficients

			Predictor Variable													
Variable	Mean	*SD*	Letter	Precontact	Incentives	Prof.	Sali.	Offic.	Academic Setting	Sens.	Educ.	Att.	Res.	Info.	Pass.	Length	Response Rate
Number of contacts	1.46	1.32	.548	.630	.114	–.276	.296	–.043	–.001	.098	–.042	.153	.014	.049	.511	.553	.435
Personalized letter?	0.23	0.43		.378	.022	–.142	–.003	–.067	.199	–.190	–.023	.046	.228	.032	.273	.409	.407
Any precontact?	0.43	0.50			.075	–.116	.173	–.228	–.134	.283	–.113	.116	.075	.032	.108	.298	.255
Incentive offered?	0.21	0.41				.372	–.188	.055	–.287	.101	–.504	.021	.045	–.208	.294	.374	–.207
Professional population?	0.27	0.45					–.336	.332	–.333	–.210	–.342	.093	.175	.054	–.048	–.152	–.205
Salience	1.46	0.60						–.095	–.144	–.270	.267	.065	–.115	.170	.176	.208	.186
Official sponsorship?	0.29	0.46							–.067	–.091	.023	–.153	.055	–.141	.218	–.133	.157
Academic population?	0.23	0.43								–.054	.570	–.527	–.287	–.233	–.024	–.055	–.141
Topic sensitive?	0.11	0.31									–.219	.079	–.181	–.017	–.108	–.097	–.132
Education?	0.48	0.50										–.223	–.330	.250	–.051	–.227	.100
More than only attitudes?	0.73	0.45											.119	.451	.189	.028	.100
Results promised?	0.21	0.41												–.208	–.011	.014	.075
Only information sought?	0.36	0.48													.159	.161	–.038
Password required?	0.09	0.29														.595	.003
Survey length	4.88	10.65															.001
Response rate	34.66	15.68															

Note. Variables with labels ending in question marks were dummy coded 0 (no) and 1 (yes). Thus, the means of these variables represent the proportions of "yes" answers on a given variable. Survey length was reported inconsistently in either number of pages, screens, or questions; therefore, we converted all survey length measures to a page metric, estimating that 15 questions or 3 computer screens would fit on a page.

Table 2
Regression Coefficients

Variable	β	*t*	r_S
Number of contacts	*.530*	*2.84*	*.560*
Personalized letter?	*.429*	*2.78*	*.524*
Any precontact?	–.097	–0.61	*.328*
Incentive offered?	–.192	–1.24	–.266
Professional population?	.201	–1.18	–.264
Salience	–.183	–1.28	.239
Official sponsorship?	.173	1.26	.202
Academic population?	*–.719*	*–3.43*	–.181
Topic sensitive?	–.173	–1.10	–.169
Education?	.327	1.62	.129
More than only attitudes?	–.030	–0.21	.129
Results promised?	–.193	–1.52	.097
Only information sought?	–.269	–1.54	–.049
Password required?	–.222	–1.42	.004
Survey length	–.140	–0.77	.001

Note. In modeling, the *t* statistics for a parameter estimate are also sometimes called *Wold statistics*, or *critical ratios*. The β weights with *t* ratios greater than |2| are italicized, as are the structure coefficients greater than |.3|. Variables with labels ending in question marks were dummy coded 0 (no) and 1 (yes). Thus, the means of these variables represent the proportions of "yes" answers on a given variable.

expect between a 25 and 30% response rate from an e-mail survey when no follow-up takes place. Follow-up reminders will approximately double the response rate for e-mail surveys" (p. 196).

However, response rates may not be appreciably affected by larger numbers of reminder notices, and in fact a slight decrease among those receiving the largest number of reminders has been observed. This may be due "to individuals reaching a saturation point in reading their e-mail messages, or they may have been resistant to being reminded more than once about the survey—a common trait among individuals who receive too many reminders" (Kittleson, 1997, p. 196).

The phenomenon of diminishing returns from numbers of contacts is suggested by our Figure 1 results. However, as with mail surveys, using personalized correspondence is apparently associated with higher response rates for electronic surveys, as shown in Figure 2.

As regards prenotification, Sheehan and McMillan (1999) highlighted the differences between findings for nonelectronic surveys, noting that "Fox, Crask, and Kim (1988) found that prenotification led to increases in response rates for postal mail surveys. However, Heberlein and Baumgartner (1978) found little or no effect associated with prenotification" (p. 47). Our Figure 3 results suggest that precontact results in slightly higher and slightly less variable response rates.

Salience. Sheehan and McMillan (1999) noted that in "postal mail surveys, the salience of an issue to the sampled population has been found to have a strong positive correlation with response rate" and recalled earlier studies that found that "issue salience had a stronger impact on response rate than did any other issue or research-design decision including advance notice, follow-up contacts, or monetary incentives" (p. 47). As suggested by Figure 4, when Web survey results are less salient, response rates tend to be both slightly lower and also more highly variable.

Incentives. Our results were particularly interesting with regard to the use of incentives. As reported in Figure 5, the use of incentives in Web surveys actually seemed to be associated with more homogeneous and lower response rates. This paradox may have occurred because persons implementing disproportionately long or tedious surveys may have recognized the necessity of providing substantial rewards for survey completions.

Academic setting. As reported in Table 2, whether respondents were faculty or students versus nonacademics had a large beta weight (–.719) in the regression analysis. However, the squared structure coefficient (–.1812 = 3.3%) was relatively small, thus indicating that this dummy-coded variable was a suppressor variable (Horst, 1966). This predictor was primarily indirectly useful because the variable removed extraneous variance from other predictors.

Less relevant factors. Our results also suggested some survey features that were not particularly associated with response rates. Included among these factors were survey length and whether a password was required. The lack of relationship for survey length is consistent with the results reported by Heberlein and Baumgartner (1978) for nonelectronic surveys.

Summary

As Sheehan and McMillan (1999) observed, there are many reasons for survey methodologists to concern themselves with raising the response rates of electronic surveys:

> To date, response rates for e-mail surveys appear to be somewhat lower than those of traditional mail surveys. . . . Therefore to begin to assess ways to increase this rate should be of key importance to researchers wishing to utilize this new mode of survey delivery. . . . And because most researchers can send multiple e-mail messages for little or no cost, the impact of multiple contacts on response becomes a highly relevant subject in the analysis of e-mail surveys. (p. 48)

Our results suggest that the number of contacts, personalized contacts, and precontacts were the factors most associated with higher response rates in the Web studies we analyzed. Our search for Web surveys to incorporate in our meta-analysis was quite far-reaching and included use of several search engines and the examination of studies that themselves were also only reported on the Web. Nevertheless, it must be acknowledged that only a limited number of such studies has been reported to date. Thus, our results must be regarded as somewhat preliminary.

As one group of researchers recently observed, the potential of the electronic survey is too great to be ignored. As Aoki and Elasmar (2000) argued, "Though there are still limitations to be overcome if the Web is used for general population survey, the Web will present advantages over traditional modes of data collection if it is used for specific populations that are known to be Internet savvy" (p. 3).

References

*Studies used in the meta-analyses are designated by asterisks. Studies with a single asterisk were used in conducting the bivariate analyses, whereas studies with double asterisks were also used in the regression analysis.

**Anderson, C. M. (1998, May). The use of computer technology by academics to communicate internationally: Computer mediated communication and the invisible college. (Doctoral dissertation, University of Massachusetts, Amherst). *Dissertation Abstracts Digital Dissertations*, AAT98-41,836.

**Anderson, S. E., & Gansneder, B. M. (1995). Using electronic mail surveys and computer-monitored data for studying computer-mediated communication systems. *Social Science Computer Review*, *13*(1), 33-46.

**Aoki, K., & Elasmar, M. (2000, May). *Opportunities and challenges of conducting Web surveys: Results of a field experiment*. Paper presented at the annual meeting of American Association for Public Opinion Research, Portland, Oregon.

**Bachmann, D., Elfrink, J., & Vazzana, G. (1996). Tracking the progress of e-mail vs. snail mail. *Marketing Research*, *8*(2), 31-35.

**Bachmann, D., Elfrink, J., & Vazzana, G. (1999/2000). E-mail and snail mail face off in a rematch. *Marketing Research*, *11*(4), 10-15.

Baruch, Y. (1999). Response rates in academic studies—a comparative analysis. *Human Relations*, *52*, 421-434.

**Bertot, J. C., & McClure, C. R. (1996). Electronic surveys: Methodological implications for using the World Wide Web to collect survey data. *Proceedings of the ASIS Annual Meeting*, *33*, 173-185.

**Bullen, N., & Mills, T. (1996, July 4). *The MIDAS scene: 1996 MIDAS user forum*. Report of the 2nd MIDAS user forum, Manchester, U.K. [Online]. Available: http://www.mimas.ac.uk/newsletters/9607/960702.htm

**Comley, P. (1996). *The use of the Internet as a data collection method. SGA ESOMAR paper. SGA market research*. Available: http://www.sga.co.uk/esomar.html

Courville, T., & Thompson, B. (2000, April). *Use of structure coefficients in published multiple regression articles*. Paper presented at the annual meeting of the American Educational Research Association, New Orleans. (ERIC Document Reproduction Service No. ED forthcoming)

Dillman, D. (2000). *Mail and Internet surveys: The total design method* (2nd ed.). New York: Wiley.

Dillman, D. A., & Bowker, D. K. (2000). *The Web questionnaire challenge to survey methodologists* [Online]. Available: http://survey.sesrc.wsu.edu/dillman/papers.htm

**Dillman, D. A., Tortora, R. D., Conradt, J., & Bowker, D. (1998, August). *Influence of plain vs. fancy design on response rates for Web surveys*. Paper presented at Joint Statistical Meetings, Dallas, Texas [Online]. Available: http://survey.sesrc.wsu.edu/dillman/papers.htm

**Division of Information Technology, University of Wisconsin-Madison. (1999a, February 9). *1999 UW online computing survey* [Online]. Available: http://www.doit.wisc.edu/research/99online/

**Division of Information Technology, University of Wisconsin-Madison. (1999b, June 3). *1999 student computing survey—trends* [Online]. Available: http://www.doit.wisc.edu/research/99student/trends/trends.html

**Drommeyer, C. J., & Moriarty, E. (2000). Comparing two forms of an e-mail survey: Embedded vs. detached. *International Journal of Market Research*, *42*(1), 39-50.

*Eley, S. (1999). Nutrition discussion forum: Nutrition research using electronic mail. *British Journal of Nutrition*, *81*, 413-416.

*Fisher, S. L. (1998). The role of goal orientation in a self-regulation framework. (Doctoral dissertation, Michigan State University). *Dissertation Abstracts Digital Dissertations*, AAT 98-39,639.

Fox, R., Crask, M., & Kim, J. (1988). A meta-analysis of selected techniques for inducing response. *Public Opinion Quarterly*, *52*, 467-491.

**Hallowell, C.M.P., Patel, R. V., Bales, G. T., & Gerber, G. S. (2000). Internet and postal survey of endourologic practice patterns among American urologists. *The Journal of Urology*, *163*, 1779-1782.

Heberlein, T., & Baumgartner, R. (1978). Factors affecting response rates to mailed questionnaires: A quantitative analysis of the published literature. *American Sociological Review*, *43*, 447-462.

**Hertz, K., Zook, E., Chitwood, K. S., & O'Carroll, P. W. (1996). *E-mail versus phone: Is there a winner? Experiences from the field*. Paper presented at Survey 1996 conference [Online]. Available: http://www.ai.mit.edu/projects/iiip/conferences/survey96/hertz/wonder.html

Horst, P. (1966). *Psychological measurement and prediction*. Belmont, CA: Wadsworth.

Hox, J. J., & deLeeuw, E. D. (1994). A comparison of nonresponse in mail, telephone, and face-to-face surveys—Applying multilevel modeling to metaanalysis. *Quality and Quantity*, *28*, 329-344.

Hunter, J., Schmidt, F., & Jackson, G. (1982). *Meta-analysis: Cumulating research findings across studies: Studying organizations*. Beverly Hills, CA: Sage.

**Jones, R., & Pitt, N. (1999). Health surveys in the workplace: Comparison of postal, e-mail and World Wide Web methods. *Occupational Medicine*, *49*, 556-558.

**Kawaura, Y., Kawakami, Y., & Yamshita, K. (1998). Keeping a diary in cyberspace. *Japanese Psychological Research*, *40*, 234-245.

Kehoe, C., & Pitkow, J. (1996). Surveying the territory: GVU's five WWW user surveys. *The World Wide Web Journal* [Online], *1*(3). Available: http://www.w3j.com/3/s3.kehoe.html

Kerlinger, F. N. (1986). *Foundations of behavioral research* (3rd ed.). New York: Holt, Rinehart & Winston.

**Kerns, I. (2000, February). E-survey quality ranks higher than print. *ASBPE Newsletter* [Online]. Available: http://www.asbpe.org/archives/2000/02esurveys.htm

Kiesler, S., & Sproull, L. (1986). Response rates in the electronic survey. *Public Opinion Quarterly*, *50*, 402-413.

**Kittleson, M. (1995). An assessment of the response rate via the postal service and e-mail. *Health Values*, *18*(2), 27-29.

**Kittleson, M. (1997). Determining effective follow-up of e-mail surveys. *American Journal of Health Behavior*, *21*(3), 193-196.

Krosnick, J. (1999). Survey research. *Annual Review of Psychology*, *50*, 537-567.

Ludbrook, J., & Dudley, H. (1998). Why permutation tests are superior to *t* and *F* tests in medical research. *The American Statistician*, *52*, 127-132.

*Marsh, J., Jones, J., & Boehnker, D. (1999). Development of a system for on-line evaluation of teaching. *ESEP Series* [Online]. Available: http://www.cityu.edu.hk/pdqs/esep/ha.html

**Mavis, B., & Brocato, J. (1998). Postal surveys versus electronic mail surveys: The tortoise and the hare revisited. *Evaluation and the Health Professions*, *21*, 395-408.

**Mehta, R., & Sivadas, E. (1995). Comparing response rates and response content in mail versus electronic surveys. *Journal of the Market Research Society*, *37*, 429-440.

**Muhumuza, R., Moles, D. R., & Bedi, R. (1999). A survey of dental practitioners on their use of electronic mail. *British Dental Journal*, *186*(3), 131-134.

**Paolo, A. M., Bonaminio, G. A., Gibson, C., Partridge, T., & Kallail, K. (2000). Response rate comparisons of e-mail and mail-distributed student evaluations. *Teaching and Learning in Medicine*, *12*(20), 81-84.

Parker, L. (1992, July). Collecting data the e-mail way. *Training and Development*, 52-54.

**Parks, M. R., & Floyd, K. (1996). Making friends in cyberspace. *Journal of Communication*, *46*(1), 80-97.

*Pease, P., Zuniga, R., & Dailey, D. (1998, May). *Evaluating the virtual institution: The flashlight project evaluation of International University.* Paper presented at the Association for Institutional Research Annual Forum, Minneapolis, MN.

**Schaefer, D., & Dillman, D. (1998). Development of a standard e-mail methodology: Results of an experiment. *Public Opinion Quarterly*, *62*, 378-397.

**Schillewaert, N., Langerak, F., & Duhamel, T. (1998). Non-probability sampling for WWW surveys: A comparison of methods. *Journal of the Market Research Society*, *40*, 307-322.

Schmidt, W. (1997). World-Wide Web survey research: Benefits, potential problems and solutions. *Behavior Research Methods, Instruments, & Computers*, *29*, 274-279.

**Schuldt, B., & Totten, J. (1994). Electronic mail vs. mail survey response rates. *Marketing Research*, *6*, 36-39.

*Sell, R. L. (1997). Research and the Internet: An e-mail survey of sexual orientation. *American Journal of Public Health*, *87*(2), 297.

**Shaw, D., & Davis, C. H. (1996). The Modern Language Association: Electronic and paper surveys of computer-based tool use. *Journal of the American Society for Information Science*, *47*, 932-940.

**Sheehan, K. B., & Hoy, M. G. (1999a). Flaming, complaining, abstaining: How online users respond to privacy concerns. *Journal of Advertising*, *28*(3), 37-51.

**Sheehan, K. B., & Hoy, M. G. (1999b, March). Using e-mail to survey internet users in the United States: Methodology and assessment. *Journal of Computer-Mediated Communication* [Online], *4*(3). Available: http://www.ascusc.org/jcmc/vol4/issue3/sheehan.html

**Sheehan, K., & McMillan, S. (1999). Response variation in e-mail surveys: An exploration. *Journal of Advertising Research*, *39*, 45-54.

**Shermis, M. D., & Lombard, D. (1999). A comparison of survey data collected by regular mail and electronic mail questionnaires. *Journal of Business and Psychology*, *14*, 341-354.

**Skarlicki, D. P., Lucas, C., Procuik, T., & Latham, G. P. (2000). Factors explaining why people join, remain in, or leave a scholarly society: The Canadian Psychological Association. *Canadian Psychology*, *41*(1), 69-74.

**Slevin, J., & Chisholm, J. (1997). *CustomerSat.com: Billion technology firm conducts worldwide customer satisfaction survey via the Internet* [Online]. Available: http://www.customersat.com/bsp/008bmain.html

**Smith, C. (1997). Casting the net: Surveying an Internet population. *Journal of Computer-Mediated Communication* [Online], *4*(3). Available: http://www.ascusc.org/jcmc/vol3/issue1/smith.html

*Smith, T. (1996, May). *Uniform resource locators (URLs): Powerful reference tools for librarians and information*. East Lansing, MI: National Center for Research on Teacher Learning. (ERIC Document Reproduction Service No. ED 401 942)

Steeh, C. (1981). Trends in nonresponse rates, 1952-1979. *Public Opinion Quarterly*, *45*, 40-57.

**Swoboda, W., Muhlberger, N., Weitkunat, R., & Schneeweib, S. (1997). Internet surveys by direct mailing. *Social Science Computer Review*, *15*, 242-255.

*Taulois-Braga, W., & Marcenes, W. (1995). Electronic mail: A new tool for data collection in dental public health. *Community Dentistry and Oral Epidemiology*, *23*, 379-380.

Thompson, B., & Borrello, G. M. (1985). The importance of structure coefficients in regression research. *Educational and Psychological Measurement*, *45*, 203-209.

**Treadwell, J. R., Soetikno, R. M., & Lenert, L. A. (1999). Feasibility of quality-of-life research on the Internet: A follow-up study. *Quality of Life Research*, *8*, 743-747.

**Tse, A.C.B. (1998). Comparing the response rate, response speed and response quality of two methods of sending questionnaires: E-mail vs. mail. *Journal of the Market Research Society*, *40*, 353-362.

University of Colorado at Boulder. (1996). *Senior and alumni survey data collection: Sampling methodology and response rates* [Online]. Available: http://www.colorado.edu/SARS/srsurvey/sample.htm

**Weible, R., & Wallace, J. (1998). The impact of the Internet on data collection. *Market Research*, *10*(3), 19-23.

Wilkinson, L., & APA Task Force on Statistical Inference. (1999). Statistical methods in psychology journals: Guidelines and explanations. *American Psychologist*, *54*, 594-604. [reprint available through the APA Home Page: http://www.apa.org/journals/amp/amp548594.html]

*Witte, J. C., Amoroso, L. M., & Howard, P.E.N. (2000). Research methodology: Method and representation in Internet-based survey tools—mobility, community, and cultural identity in Survey2000. *Social Sciences Computer Review*, *18*, 179-195.

*Zelwietro, J. (1998). The politicization of environmental organizations through the Internet. *Information Society*, *14*, 45-56.

*Zhang, Y. (1999). Using the Internet for survey research: A case study. *Journal of the American Society for Information Science*, *51*(1), 57-68.