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Response Rates to Mail Surveys Published in Medical Journals

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with higher response rates, response rates to published mail surveys tend to be moderate. However, a survey's response rate is at best an indirect indication of the extent of non-respondent bias. Investigators, journal editors, and readers should devote more attention to assessments of bias, and less to specific response rate thresholds. J CLIN EPIDEMIOL 50;10:1129–1136, 1997. © 1997 Elsevier Science Inc.

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INTRODUCTION

spondent bias, or the possibility that respondents are not a representative sample. Third, journal editors and readers may interpret the response rate as an indicator of the possible extent of non-respondent bias.

Given these concerns, what are the typical response rates

And third, we wanted to evaluate the contribution of various techniques used by investigators to enhance response rates.

METHODS

TABLE 1. Respondents of 321 mail surveys

Respondent	Number of surveys in data set using these respondents	Mean response rate (±SD) among surveys using these respondents (%)	Comparison with surveys not using these respondents (p)[a]
Physician	68	54 ± 17	0.001
Dentist	25	65 ± 9	0.8
Nurse	24	61 ± 23	0.8
Other health-care worker	41	56 ± 24	0.1
Administrator or official representative	43	72 ± 18	0.002
Patient or parent of patient	42	60 ± 21	0.01
Health-care worker student	3	79 ± 13	0.1
Other	75	60 ± 22	0.6
Total	321	62 ± 21	

Abbreviation: SD = standard deviation.
[a]By t-test.

distributed; 197 (61%) indicated how many surveys were received; and 176 (55%) indicated both how may were distributed and how many were received so that a response rate could be calculated independently by a reader. All together, 96 surveys (30%) provided neither a report of the response rate nor the information necessary to calculate one. Some of these surveys may have represented minor elements of the manuscript: for example, pre-tests of surveys. However, these proportions were little better when these minor elements were ignored and only the major or sole survey within the 178 manuscripts was considered. For example, only 141 of these surveys (79%) included a report of the response rate and in only 135 (76%) could a response rate be calculated; a total of 21 manuscripts (12%) provided neither a report of a response rate nor the means to calculate one.

TABLE 2. Journals publishing three or more mail surveys in 1991

Journal	Frequency
American Journal of Hospital Pharmacy	9
Journal of the American Board of Family Practice	9
Academic Medicine	8
Journal of Family Practice	6
Annals of Emergency Medicine	5
Journal of the American Geriatrics Society	5
American Journal of Epidemiology	4
American Journal of Public Health	4
Epidemiology	4
Annals of Internal Medicine	3
Family Medicine	3
Journal of the American Medical Association	3
Journal of General Internal Medicine	3
Journal of Nursing Education	3
Pediatrics	3

Among the 192 surveys that reported a response rate, the mean response rate was 59% ± 20% (median 59%). When additional information provided by authors was included, 210 surveys had a mean response rate of 59% ± 20% (median 58%). When information from all sources was examined (the manuscript's reported response rate, the author's additional information on response rates, or the calculated response rate from information provided either in the manuscript or by the author), 236 surveys had a mean response rate of 62% ± 21% (median 62%). Figure 1 reveals the distribution of these response rates.

As described with our methods, we used a hierarchical approach to assign a response rate to a survey. Response rates reported in manuscripts often differed from the response rate calculated by dividing the number of surveys received by the number distributed. Many of these differences reflected adjustments to account for surveys considered unusable—either because they were returned by the post-office as undeliverable, or because the subjects failed to meet study criteria. However, there was also great inconsistency and confusion about how to make these adjustments. Some authors deleted unusable surveys from the numerator, effectively lowering their reported response rate. Others deleted unusable surveys from the denominator, raising their reported response rate. For example, one manuscript described 249 responses to a survey of 764 surgeons as a response rate of 65% (rather than 33%) by using a denominator of 384 representing a subset of the original sample with certain desired practice characteristics. Similarly, another survey described 488 responses to a survey of 1100 emergency medicine trainees as a response rate "conservatively estimated to between 50% and 55%," because the mailing list used was old and included subjects not of interest.

Eighty-two of 321 surveys (26%) explicitly reported

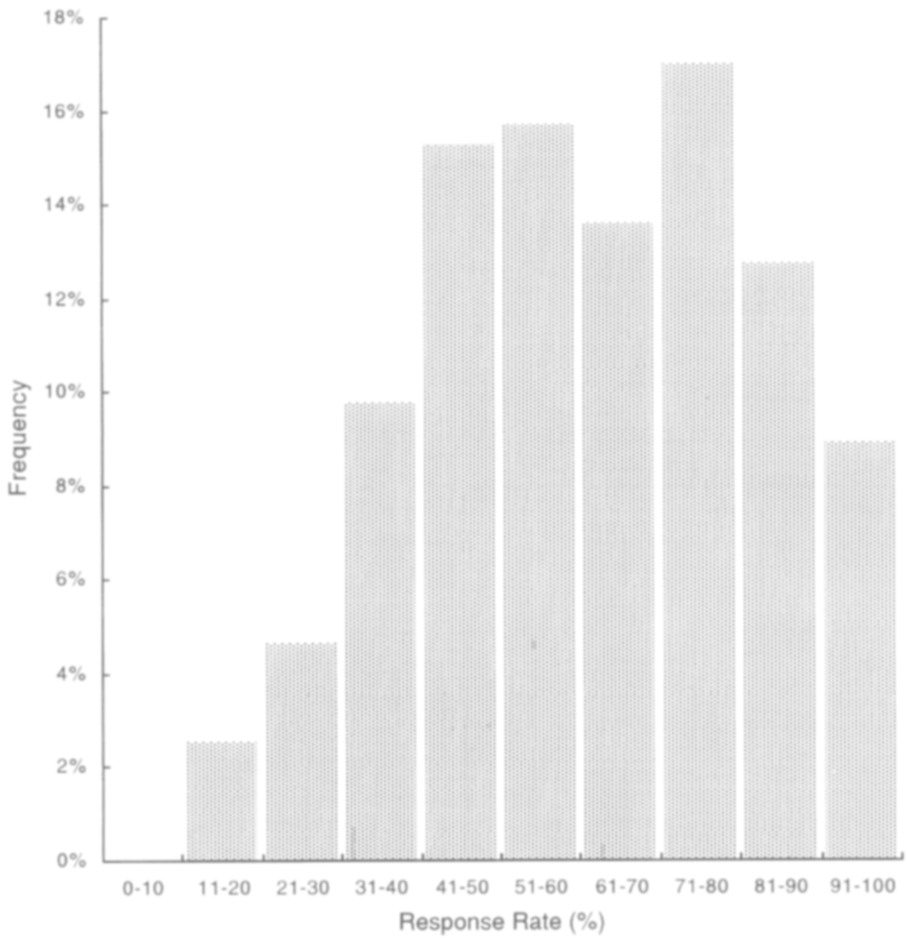

FIGURE 1. Histogram of response rates from subject studies.

whether a test for non-respondent bias was performed, and authors provided information for another 41 surveys. Of these 123 surveys, 30 (24%) did not test for non-respondent bias; 66 (54%) compared information from responders with known information about the underlying sample; 13 (11%) tested for bias directly (for example, by performing a focused re-survey of a sample of initial non-responders and comparing results with those from the original respondent group); and 11 (9%) used both techniques.

Factors Associated with Response Rates

Table 3 reports bivariable associations of survey characteristics with response rates. Higher response rates were associated with surveys of non-physicians, as shown also in Figure 2. As shown in Table 1, physicians had the lowest mean response rate among all groups examined. In addition, response rates were lower in surveys if the surveys were anonymous, and were higher if they used any written reminder with an instrument or any telephone reminder. Although, surprisingly, surveys with more pages had *higher* response rates ($\rho = 0.253$, $p = 0.008$), this effect was not significant when length was measured in number of questions ($\rho = 0.349$, $p = 0.08$) or number of minutes required for completion ($\rho = -0.013$, $p = 0.9$). Similarly, written reminders provided *without* an instrument were not associated with higher response rates.

No associations with response rates were found for several other variables, including presence or amount of a financial incentive, mean age of respondents, proportion of female respondents, or type of outgoing or return postage. However, because so few surveys used financial incentives, and because so few manuscripts provided information about postage, we had limited power to detect differences in response rates associated with these variables.

Table 4 reports the results of a regression model predicting response rate as a function of several independent variables suggested in the bivariable analyses. The model reveals that surveys of physicians have a response rate that is 9.5 percentage points lower than surveys of non-physicians, adjusting other factors ($p < 0.001$). Providing one or more written reminders with an instrument, or one or more telephone reminders, increases the response rate by 13.8 ($p = 0.001$) and 13.8 ($p = 0.003$) percentage points, respectively.

TABLE 3. Bivariable associations of selected characteristics with mean response rates

Characteristic	Mean response rate: With this characteristic (*n*)	Without this characteristic (*n*)	p^a
Physician subject	54% (56)	68% (180)	<0.001
Anonymous survey	52% (71)	68% (20)	0.002
Any mailed reminder without an instrument	60% (59)	54% (50)	0.154
Any mailed reminder with an instrument	64% (90)	48% (41)	<0.001
Any telephone reminder	77% (33)	53% (60)	<0.001
Any financial incentive	64% (6)	60% (70)	0.660

[a]By *t*-test.

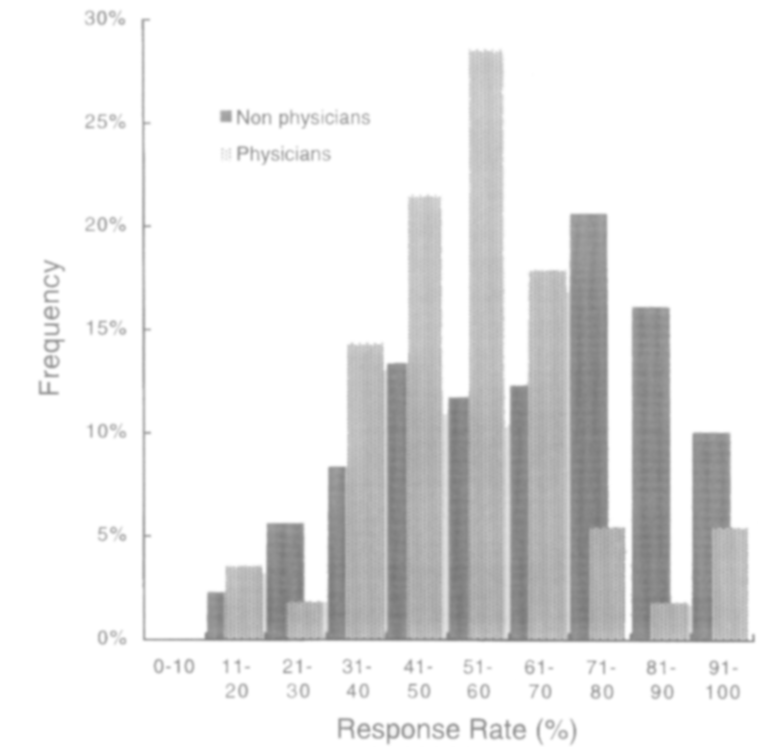

FIGURE 2. Comparison of response rates from surveys of physicians and non-physicians.

TABLE 4. Multivariate regression model of response rate[a]

Variable	Coefficient	95% CI	R^2	*p*
Physician subject	−9.5	−15.1, −3.9	0.036	0.001
Anonymous survey	−9.0	−18.3, 0.4	0.054	0.06
Any mailed reminder with an instrument	13.8	6.1, 21.6	0.062	0.001
Any telephone reminder	13.8	4.8, 22.7	0.117	0.003

Abbreviation: CI = confidence interval.

[a]The intercept and dummy variables used to code for missing data are not shown. The R^2 for this model is 0.27.

Anonymous surveys had response rates 9.0 percentage points lower than non-anonymous surveys ($p = 0.06$). After adjusting for other factors, the number of pages in the survey was no longer associated with response rate, and this variable was excluded from the model presented in Table 4. These results were largely unchanged when a logit transformation was applied to the dependent variable (to adjust for its truncated distribution), except that the effect of anonymity which was previously marginally significant became significant at the $p < 0.05$ level. When the same variables were included in a model to predict response rates in surveys of physicians, only the use of a reminder with an instrument was significantly associated with an increased response rate—again, of about 13%.

Authors' Comments about Response Rates

Authors of only 15 of 130 surveys (12%) felt those surveys had response rates inadequate for their purposes. The mean response rate for the eight of these surveys for which a response rate was determinate was 35%, which was significantly lower than the mean response rate of 59% for the 93 articles felt by authors to have adequate response rates ($p = 0.002$). When only the major or sole survey of a manuscript was considered, authors of only 5 of 83 surveys (6%) felt those surveys had inadequate response rates.

Fifty-six authors responding to the author survey felt their study was published in a journal they rated as in the top third of its field. These studies had a mean response rate of 59%. Twenty-six authors felt the journal was in the middle or bottom third. These studies had a mean response rate of 50% ($p = 0.073$ for the comparison).

Seventy-six authors reported receiving editorial or reviewer comments regarding their manuscript prior to publication. Of these, 46 (61%) received no comments about their response rate; 8 were told it was low; 9 were told it was adequate; and 7 were told it was high. Six received conflicting comments from different individuals in the review process.

Sixty-seven of 81 authors (83%) reported that their manuscript was published in the first journal to which they submitted it. The remaining 14 reported that their manuscript was published in the second journal they tried. Of these 14, only 3 authors attributed their manuscript's initial rejection to a poor response rate. There was no difference in the mean response rates of manuscripts accepted on the first or second try.

DISCUSSION

In this study, we have described the response rates reported in articles published in medical journals. This study has several important findings.

First, although there is wide variation in the response rates for mail surveys published in medical journals, the mean response rate is approximately 62%. Surveys of physicians have lower response rates, with a mean of 54%, and those of non-physicians have higher response rates, with a mean of 68%.

Second, certain techniques and survey characteristics are associated with higher response rates. Previous research has demonstrated that response rates increase if subjects are offered monetary incentives [2–4] or if surveys are delivered by certified mail or non U.S. Postal Service carriers [5]. These strategies, however, can be implemented only by increasing costs. Other investigators have demonstrated that response rates can be improved by using stamped rather than metered return envelopes [6,7], different types of outgoing envelopes [8] or prepaying financial incentives rather than paying subjects on completion [9–11]. These techniques may improve response rates without increasing costs.

Several published meta-analyses, typically using pooled results from a number of survey design experiments, have catalogued these techniques [12–15]. In contrast, our study involved the review of actual survey results from a variety of settings. This method allows us to adjust for the effects of multiple variables. We found that telephone reminders and written reminders provided with an instrument were associated with higher response rates. Of note, both interventions raised response rates by about 13%. This result may be of particular value since mailed reminders are often much cheaper and easier on investigators and subjects than are telephone reminders. Unlike one prior study that concluded that longer surveys yield lower response rates [16], but similar to another [17], we found no consistent association between survey length and response rate after adjusting for other factors. Moreover, unlike several prior studies reporting that financial incentives improve response rates [18–20] we did not find such association; however, we had a trend in this direction, and limited power.

We did find that anonymous surveys had lower response rates. Although one might think that anonymity would make target subjects more comfortable in responding, and therefore enhance response rates, target subjects might also feel more comfortable *not* responding if they know their failure to respond will remain undetected. Moreover, anonymous surveys are likely to be those that are more sensitive in the first place, and those more prone to non-response.

Third, the information an article provides about response rates is in part a function of the editorial review process. The finding that so many published studies contained insufficient information to calculate a response rate identifies an area for improvement in editorial standards.

Fourth, calculating a response rate is more difficult than it may appear. The crudest measure divides the number of surveys received by the number sent. However, this measure ignores several other factors that may be important in interpreting the results. Such factors include the number of surveys undeliverable because of bad addresses, the number considered unusable because the subjects fail to meet study criteria, and the number considered unusable because they are incomplete. Authors of the surveys we studied variously ignored these terms, or subtracted them from the denominator or the numerator of the response rate calculation. In different circumstances, each of these approaches might seem appropriate.

There are a number of methods to compute the "true" response rate in such a mail survey. All seek to take advantage of the fact that not all non-respondents were actually eligible for the study. Typically, information about individuals known to be ineligible is used to revise the denominator for response rate computation [21].

For example, consider a mail survey of 1000 subjects in which 50 instruments are returned by the post office as undeliverable and 600 completed surveys are returned by respondents. In most cases, the best measure of the response rate would reflect that only 950 subjects had the opportunity to respond, and so the response rate could be reported as $600/(1{,}000 - 50) = 63\%$. However, this adjustment might misrepresent the circumstances if the targets of those 50 undeliverable surveys were systematically different from the others.

Similarly, what if only 400 of the 600 completed instruments were completed by subjects meeting study criteria? Reporting a figure of $400/950 = 42\%$ would seem to understate the response rate. On the other hand, reporting a figure of $600/950 = 63\%$ would be appropriate only given reason to believe that the proportion of ineligibles ($1/3$ in this case) was the same in both respondent and non-respondent pools. Investigators might know otherwise. For example, if women are the population of interest, and the investigators know that women represent half of the surveyed pool, a better figure to report might be $400/(950 \times 50\%) = 94\%$.

Finally, while it is customary to present a response rate for a survey as a whole, when many questionnaires are incomplete it may be appropriate to report separate response rates for individual questions of special importance or those that might be extremely susceptible to non-respondent bias.

The level of art and interpretation in calculating response rates reflects the indirect and therefore limited use of the response rate in evaluating survey results. So long as one has sufficient cases for statistical analyses, non-response to surveys is a problem only because of the possibility that respondents differ in a meaningful way from non-respondents, thus biasing the results [22,23]. Although there are more opportunities for non-response bias when response rates are low than high, there is no necessary relationship between response rates and bias. Surveys with very low response rates may provide a representative sample of the population of interest, and surveys with high response rates may not.

Nevertheless, because it is so easy to measure response rates, and so difficult to identify bias, response rates are a conventional proxy for assessments of bias. In general, investigators do not seem to help editors and readers in this regard. As we report, most published surveys make no mention of attempts to ascertain non-respondent bias. Similarly, some editors and readers may discredit the results of a survey with a low response rate even if specific tests limit the extent or possibility of this bias.

Fairer questions to ask when evaluating survey research are whether or not bias is likely to be present, whether the researchers investigated this possibility, and whether any bias that could be present might meaningfully affect the conclusions. Focusing on these questions, rather than on reports of response rates, is particularly important for surveys of physicians and other groups who are especially difficult to recruit.

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