

Original Research Article

Comparison of Two Survey Methods based on Response Distribution of Pediatricians in India: Mail versus Telephone

ABSTRACT

Introduction: The use of telephone and mail surveys raises the question of to what extent the results of different data collection methods deviate from one another.

Aim: To determine if there is any difference in the response distribution between telephone and mail surveys of vaccination related-attitudes.

Methods: A random sample of 400 pediatricians who are members of the India Academy of Pediatrics and work at various locations in India was selected. Mantel-Haenszel chi-square test was applied; significance level was $\alpha=0.05$. Difference in percentage points of the majority response was calculated in the following way $\Delta=\text{telephone}\% - \text{mail}\%$.

Results: Only 36% responded to mail surveys and 57% responded to telephone surveys. Pediatricians in both telephone and mail surveys agreed for the majority of survey questions but to a different degree on particular items. More pediatricians in the telephone arm responded that measles eradication is important with a $p=0.0006$ and $\Delta\approx 8$. More mail than telephone respondents reported that it is parents' responsibility to ensure child is vaccinated ($\Delta\approx -8$, $P=0.002$) and that they would refer parents to a facility of their choice to get vaccines ($\Delta=14$, $P=0.008$).

Conclusion: The results show evidence of the interviewer and/or social desirability bias and its influence on response choices. This suggests that mode of administration should be standardized or carefully adjusted for during analysis. Alternatively, further question development may minimize the sensitivity of items to mode of data collection.

Keywords: Survey mode; attitudes; vaccines; India; pediatricians.

1. INTRODUCTION

One of the main primary data collection instruments in social, health and epidemiological research is the survey questionnaire. Modes of data collection by questionnaire vary in the method of contacting respondents, in the vehicle of delivering of the questionnaire, and in the way in which questions are administered. These variations can have different effects on the accuracy and quality of the data obtained. In addition to the traditional range of paper and pencil methods, there is increasing academic interest in tools commonly used in market and public opinion research, e.g. the use of computer assisted

24 face-to-face interviewing, computer-assisted telephone interviewing, self-administered
25 computer methods, audio computer-assisted self-administered interviewing, and interactive
26 voice response telephone methods. With any mode of administration, there are many
27 potential influences on responses. These differences, at different levels, can make it difficult
28 to separate out the effects of each on the quality of the data obtained.

29 Broadly, these sources of error in surveys can be summarized as (i) non-measurement
30 errors: survey design, sampling frame and sampling, non-response and item non- response;
31 and (ii) measurement errors: survey instrument and data collection processes. Mode of
32 questionnaire administration has effects on elements of both of these sources.

33 Different response rates between mail and phone surveys could result in biased samples
34 that impact the data quality. Methodological research comparing different methods of
35 administering questionnaires has focused on the issue of response rates, item response,
36 and on methods of increasing these, in particular in relation to postal surveys [1]. Non-
37 response is thus likely to be influenced by mode of questionnaire administration. The lower
38 the response rate to a study, the greater the danger that the responders may differ from non-
39 respondents in their characteristics, which affects the precision (reliability) of the survey's
40 population estimates, resulting in study bias, and weakening the external validity
41 (generalizability) of the survey results. A number of studies have since reported differences
42 between response rates to telephone, face-to-face and postal questionnaires [2].

43 Differences in results between telephone and mail surveys have been demonstrated in
44 numerous areas of interest, such as surveys of patient satisfaction [3, 4], alcohol and drug
45 abuse [5, 6] or mental health [7, 8]. Interviews involve social interaction with another person,
46 which can lead to respondents taking social norms into account when responding, resulting
47 in social desirability bias (the desire of respondents to present themselves in the best
48 possible light), resulting in the over-reporting of desirable behaviors, and under-reporting of

undesirable behaviors (confounding associations between variables by attenuating, inflating or moderating relationships). This impact, however, is dependent on the actual content of the questions. Previous studies have found that face-to-face or telephone surveys may result in a tendency toward less reported morbidity, health care utilization or socially inadequate behavior (e.g., drug use, sexual behaviors, illegal behaviors) compared with mail surveys [6, 9-11]. These results were mainly attributed to the reduced anonymity of face-to-face or phone surveys. Similarly, other studies have found more positive assessments of mental health dimensions of health-related quality of life when gathered by telephone rather than by mail survey [12-14].

Any excess of positive responses in interview, compared to self-administration situations, could also be due to increased 'yes-saying' or acquiescence bias: a culturally based tendency to agree with others because it is perceived to be 'easier' to agree than disagree. Although 'yes-saying' can also be evident on self-administered questionnaires, it appears to be less pronounced than in interviews. The potential for a different type of reporting bias due to 'ease' exists in self-administered questionnaires, based on evidence from classic psychological experiments. These respondents tend to check the nearest response choices to the questions. Commonly used attempts to control for this include switching the order of responses periodically in a measurement scale (e.g. from 'Strongly agree – Strongly disagree' to 'Strongly disagree – Strongly agree' [15]). Research has yielded inconsistent results in relation to differences between mode of questionnaire administration and 'yes-saying'. A meta-analysis on this issue by De Leeuw failed to detect any differences between postal, face-to-face and telephone interviews [16].

The presence of an interviewer can be distracting to respondents. If an excess of positive or socially desirable responses in interview situations is found, this could be due to interviewer bias (due to characteristics of the interviewer [15, 17] or because people may be reluctant to reveal beliefs unlikely to be endorsed by the interviewer; see earlier, social desirability bias).

75 In addition, interviewers can vary in their ability to appear or sound neutral, to listen, to probe
76 adequately, to use techniques to aid recall and to record responses. Careful training and
77 monitoring of interviewers can minimize this, and analysis of responses by interviewer
78 (where more than one is used) can check for inter-viewer bias. Self-administration modes
79 obviously avoid this source of bias.

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81 The goal of this study is to provide an evidence-based statistical comparison of two survey
82 methods (mail versus telephone) in an international setting that controls for survey design
83 and target population and determine whether there is a difference in the response
84 distribution between the two survey modes. We hypothesize that those taking the survey by
85 telephone will be more likely to report favorable attitudes towards vaccines, compared to
86 those taking the mail survey.

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88 **2. METHODS**

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90 **2.1 Sample Size and Sample Design**

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92 Participants were members of the Indian Academy of Pediatrics (IAP). IAP members are
93 predominately in private practice. The list of eligible participants from throughout India was
94 provided by the Indian Academy of Pediatrics. The initial desired sample sizes of 400 for
95 each survey group were determined based on variance estimates for vaccine efficacy and
96 importance. The sample design was a dual-frame simple random sample. Pediatricians with
97 telephone numbers in the full frame were separated from the rest of the list, and a simple
98 random sample of 400 pediatricians was selected for the phone sample from this list.

99 Pediatricians who were not selected for the telephone sample were included in the
100 remainder of the original frame and were potentially available for the mail survey. From this
101 augmented sampling frame, a simple random sample of 400 pediatricians was selected for
102 the mail survey.

103 **2.2 Survey Procedures**

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105 Two separate samples of pediatricians were surveyed, one by telephone and the other
106 sample through mail. An identical questionnaire was used in both samples. Survey items
107 were guided by the Health Belief Model (HBM) [18]. The survey instrument was designed to
108 assess attitudes and practices associated with vaccines included in the Government of
109 India's Universal Immunization Program (UIP) and vaccines that are potential candidate for
110 inclusion in UIP. The instrument also included questions on barriers to immunization and
111 interventions to improve immunization coverage. Based on focus group discussions and pilot
112 studies, the questions were based on a three-point Likert scale. The instrument consisted of
113 27 questions, took approximately 30 min to complete, and was conducted in English. An
114 experienced Indian survey team conducted the survey and an interviewer obtained verbal
115 consent for the phone survey by reading a standard script. Confidentiality and anonymity
116 were maintained by not recording any identifying information on the survey form or in the
117 database. Records of participants and survey responses were not recorded or stored
118 together. The study period was June 2009–June 2010.

119 **2.3 Measures**

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121 The items that were of particular interest were the views on disease susceptibility, vaccine
122 delivery, and disease eradication. The comparison for disease susceptibility was on “How
123 likely do you think a child in India under 5 years of age who has received no vaccine when
124 recommended is to get the following diseases within the next year” (“likely”, “neither likely or
125 unlikely”, “not likely”). Attitudes toward polio and measles eradication were assessed (e.g.,
126 How important is polio eradication? and How important is measles eradication?) (“important”,
127 “neither important nor unimportant”, or “not important”), and (e.g., How likely is it that polio
128 will be eradicated from India? and How likely is it that measles will be eradicated from
129 India?) (“likely”, “neither likely nor unlikely”, or “not likely”). Another item that was compared
130 was the viewpoint on who should be held accountable for getting a child vaccinated (“In your
131 opinion, who is primarily responsible for ensuring that children are immunized”). Lastly, the

132 participants were asked about who should provide the vaccination service ("If you identify a
133 child who has not received all or some vaccines appropriate for his/her age, what do you do
134 most frequently?").

135 **2.4 Data Analysis**

136
137 The main focus of this paper was to compare the two sampling methods, mail versus
138 telephone, based on response distribution. In order to do so, particular questions (items)
139 focusing on physicians' expectations were selected and statistically tested for significant
140 differences in proportions. For the items analyzed, the response variables were multi-
141 categorical. Any non-response counts were categorized as missing. Difference in
142 percentage points of the majority response was calculated by subtracting the majority
143 percentage response in the mail survey from the majority percentage response in the
144 telephone survey ($\Delta = \text{telephone\%} - \text{mail\%}$). The Mantel-Haenszel chi-square test was used
145 and significance levels were set prior to analysis as $\alpha = 0.05$. The statistical software used for
146 the analysis was SAS®9.2 (SAS Institute, Inc.). In the analysis, each question item response
147 was analyzed in two areas: (1) Which response choice did the majority select for each
148 question in the two survey modes. (2) Were there any statistically significant differences
149 between the observed responses compared to the expected responses, and if so, by how
150 many percentage points.

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153 **3. RESULTS**

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155 **3.1 Response Rate**

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157 For each survey mode, a sample size of 400 was selected; the number of returned mail
158 surveys was 144 (36%), while the number of respondents who answered the telephone
159 survey was 228 (57%).

160 **3.2 Disease Susceptibility**

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163 diseases (Table 1), pediatricians via telephone were more likely to report disease
 164 susceptibility than mail respondents for hepatitis B ($\Delta = 25.8$, $P = 0.001$). For rotavirus more
 165 mail respondents reported likely disease susceptibility ($\Delta \approx -7.1$, $P = 0.02$), Table 1 shows the
 166 diseases in the order of the largest percentage point difference to the smallest difference.
 167 While not statistically significant, pediatrician responses showed large differences ($\Delta > 10$) in
 168 percentage points with telephone respondents reporting rate for susceptibility higher for
 169 pneumonia ($\Delta = 16.2$, $P = 0.14$), tetanus ($\Delta = 14.4$, $P = 0.29$), polio ($\Delta = 13.9$, $p = 0.55$), hepatitis
 170 A ($\Delta = 12.5$, $P = 0.48$), rubella ($\Delta = 11.1$, $P = 0.34$), diphtheria ($\Delta = 11$, $P = 0.79$) and Hib
 171 disease ($\Delta = 10.9$, $P = 0.81$).

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174 **Table 1. Comparison between mail and telephone response on “Likelihood of child**
 175 **contracting disease”**

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Question	Majority response from choices (Likely, Neither likely nor unlikely, or unlikely)	Difference in majority response (telephone% - mail%)	P-value
Hepatitis B	Likely	25.8	0.001
Pneumonia	Likely	16.2	0.14
Tetanus	Likely	14.4	0.29
Polio	Likely	13.9	0.55
Hepatitis A	Likely	12.5	0.48
Rubella	Likely	11.1	0.34
Diphtheria	Likely	11.0	0.79
Hib	Likely	10.9	0.81
Typhoid	Likely	8.0	0.08
Varicella	Likely	5.7	0.86
Mumps	Likely	4.7	0.93
Pertussis	Likely	2.0	0.31
Measles	Likely	-0.2	0.55

For the importance of eradicating measles (Table 2), more telephone respondents indicated eradication was important ($\Delta \approx 8$, $P = 0.001$). When pediatricians were asked about the importance of eradicating polio and likelihood of eradicating polio no significant differences were found between the mail and telephone responses (Table 2). On the other hand, for the item regarding the likelihood of eradicating measles, respondents were divided and showed a significant difference ($\Delta = 22$, $P = 0.003$) (Table 3).

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205 When pediatricians were asked what they would do if they were treating a child whose 206

vaccination status was not up-to-date, they were divided on advising the parents to

207 vaccinate at a facility of their choice with more telephone participants selecting this option

208 (Table 5, $\Delta \approx 14$, $P = 0.008$). There were more respondents in the telephone survey choosing

209 to deliver the service themselves compared to the mail survey response ($\Delta \approx 6.5$, $P = 0.24$).

210 There were no significant differences on recommending vaccination be done at a

211 UIP/Government facility ($\Delta \approx 5$, $P = 0.16$), referring vaccination be done by another physician

212 ($\Delta < 1$, $P = 0.48$), and doing nothing ($\Delta = 0.2$, $P = 0.15$).

213 **Table 4. Comparison between mail and telephone response on “Responsibility for**
214 **child vaccination”**

Question	Majority response	Difference in majority response (telephone%- mail%)	P-value
ASHA workers	Selected ¹	0.4	0.94
PHC physicians	Selected	0.4	0.95
GPs	Selected	-0.7	0.90
ANMs	Selected	-1.7	0.74
Pediatricians	Selected	-2.4	0.55
Anganwadi workers	Selected	-2.4	0.64
Parents	Selected	-7.9	0.002

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216 ¹ Indicates this response choice was marked

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218 **Table 5. Comparison between mail and telephone response on “Delivery of child**
219 **vaccination”**

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Question	Majority response	Difference in majority response (telephone%- mail%)	P-value
Vaccinate them	Selected ¹	6.6	0.24
yourself			
UIP/Government facility	Not selected	4.8	0.16
Refer to another physician	Not selected	0.7	0.48

Do nothing	Not selected	0.2	0.15
Advise parents to vaccinate at facility of their choice	Selected	-13.8	0.008

221 [†] Indicates this response choice was marked

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223 4. DISCUSSION

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225 This study is unique in that it is one of the few that focuses on survey mode comparison in
 226 an international setting. In this study we found that the mail survey had a lower response
 227 rate than the phone survey. Lower response rates for mail surveys compared to phone
 228 surveys have been seen in other mixed-mode survey collection [19, 20]. In addition, we
 229 found that pediatricians, in both surveys, agreed on most of the questions relating to disease
 230 risk and eradication along with vaccination responsibility and delivery. However, 6 of the 30
 231 question items analyzed had significant differences in majority responses between the two
 232 survey modes. Since random samples were taken, the differences in the responses to these
 233 instruments ascertained in this study can therefore be attributed to the different methods of
 234 administration and to their interactions with other properties.

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236 Overall, there is some evidence of mode effects in this analysis. In general, telephone
 237 respondents were more likely than mail respondents to give positive responses. This is
 238 consistent with previous studies [3, 21, 22] and implies that some pediatricians, in an
 239 interview, tend to (1) make the current situation seem more dire, (2) place greater
 240 importance on the role that pediatricians should have in child vaccination, and (3) answer the
 241 question with a sense of social appeasement to the interviewer. What is clear is that the
 242 interviewer's presence resulted in a larger difference in degree of agreements and
 243 disagreements between the mail and telephone surveys. This evidence suggests that social
 244 desirability (e.g., being socially accepted) bias is at work in the telephone interviews. A
 245 tendency for telephone respondents to prefer extreme response categories has also been
 246 reported in other studies [13].

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248 The cognitive demands on telephone respondents are higher than the cognitive demands on
249 questionnaire respondents [23]. One reason for the differences in response may be that the
250 mail survey allows the respondent to (1) answer the entire questionnaire in the order that the
251 respondent desires and (2) visualize the scale on paper which may have influenced
252 respondents in the self-administered mode to choose the less extreme categories; (3) the
253 mail survey is self-administered, so it lacks the presence of an interviewer and other social
254 effects (i.e. social compliance), (4) the respondent can dictate the pace of completing the
255 mail survey, but for the telephone survey that pace is dictated by the interviewer, and (5) the
256 mail respondents are not subjected to response order effect, since they can view all the
257 response choices before choosing one, while the telephone respondents receive the
258 response choices in the order that they were given by the interviewer.

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260 Regarding the question concerning the likelihood of an unvaccinated child contracting polio,
261 both the mail and telephone respondents showed agreement that it was likely; however, the
262 difference in the degree of agreement was larger than 10 percentage points. A larger
263 percentage of telephone respondents chose "likely" compared to the mail respondents. This
264 large gap in percentage points seems unexpected in the sense that at the time of the survey
265 polio was still endemic in India. More pediatricians in the mail survey believed that parents
266 should have a greater role compared to those who answered in the telephone survey. This
267 suggests that the pediatricians might have placed a greater importance on their social
268 responsibility as a physician to deliver care to their patients, in the presence of an
269 interviewer.

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271 5. STRENGTHS AND LIMITATIONS OF THE STUDY

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273 The main strengths of this study were the identical sampling methods and contemporaneous
274 conduct of the two surveys in the same region and at the same time. In addition, the study
275 was based on random samples, eliminating the concern of other factors like differences

276 between settings or genuine differences between respondents. The first limitation is that the
277 sample came directly from the membership of the Indian Academy of Pediatrics; this sample
278 does not take into account the characteristics of pediatricians and other immunization
279 providers not associated with this Academy. The majority of Indian Academy of Pediatrics
280 members are in private practice so these results are not generalizable to pediatricians or
281 physicians outside of private practice. Also, knowing that only 36% of the sample size 400
282 responded to the mail surveys might lead to a less representative sample. This can
283 potentially omit certain characteristics that the true population might have, which might also
284 explain certain large percentage point differences between the mail and telephone survey
285 responses. We were unable to compare characteristics of pediatricians who completed
286 surveys with those who refused since no information was collected for refusals.

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288 **4. CONCLUSIONS**

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290 This research provides valuable insight into the impact of mode on response to a number of
291 commonly asked vaccine-related questions. This suggests that mode of administration of a
292 survey should be held constant as far as possible or carefully adjusted for in statistical
293 analysis. Alternatively, further question development may minimize the sensitivity of
294 questions to mode of data collection. Adjusting scores for mode could control for any
295 differences. Other measures such as efficiency and cost-effectiveness of the mode should
296 also be considered when determining the most appropriate form of data collection.

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298 **ETHICAL APPROVAL**

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300 Emory University's Institutional Review Board and Maulana Azad Medical College, New
301 Delhi, Institutional Ethics Committee both determined that this study did not meet the
302 definition of "Human Subjects Research" and was classified as "Quality Improvement", not
303 requiring review.

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