

A comparison of reliability between telephone and web-based surveys

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Abstract

The purpose of the present study was to compare a methodologically sound telephone interviewing technique to the most promising web survey technique. Specifically, the web survey conducted for the present study randomly selected respondents who were members of a consumer panel whereas the telephone survey used a “cold-calling” method to randomly selected respondents. Two waves of each telephone surveys and web-panel surveys were conducted. The present study is one of the first to empirically show that web panels can produce more reliable data estimates than telephone surveys. Further, web panels are cheaper and less time consuming to conduct than telephone surveys. Even though web panels might not be appropriate for all survey research endeavors, the results show that they can be a viable alternative to telephone surveys that allows researchers to conduct high-quality research.

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1. Introduction

During the last decade, researchers utilizing telephone surveys to collect data have been faced with a dilemma. On one hand, the increase in telephone ownership in the United States to current levels, with 97.6% of all households having telephones (SSI, 2003), has made telephone surveys very popular in marketing research practice as a method of data collection (Link and Oldendick, 1999). On the other hand, telephone surveys have been found to have limitations. Due to the tremendous increase in telemarketing and telemarketing fraud, certain groups of prospective telephone survey respondents (e.g., the most affluent, households with older children) are employing gatekeeper technologies (i.e., Caller-ID and answering machines) to screen and eliminate callers (Tuckel and

O’Neill, 2002), and those who answer their phones are quick to hang up if they suspect a caller might be trying to sell something (Elvin, 2000; Remington, 1992).

As a result, telephone interviewers often do not even get a chance to explain that they are conducting a survey (Council for Marketing and Opinion Research, 2003), and response rates have steadily declined (Keeter et al., 2000) to reported lows of 7% (Council for Marketing and Opinion Research, 2003). This decrease presents a problem because not only does it increase the cost of conducting telephone surveys, but it also leads to questions concerning the generalizability of the results (Struebbe et al., 1986; Tuckel and O’Neill, 2002). In addition, telephone surveys, due to a perceived lack of anonymity, have been found to lead to decreased completeness of reporting (Cooley et al., 2000) and higher levels of respondent editing than certain other types of survey modes (Johnson et al., 2000). Further, the immediate attention these surveys require has been suggested to make potential respondents reluctant to participate (Melymuka, 1997).

In recent years, the focus has shifted to web surveys which can overcome some of the limitations of telephone surveys, are lower in acquisition cost and time (Krasilovsky, 1996), and allow access to high numbers of potential respondents (Couper, 2000). Online

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research has been estimated to account for approximately 50% of all marketing research revenues by the year 2005 (James, 2003). Web surveys, however, have been suggested to be far from perfect (Gorman, 2000). That is, nonresponse rates can be just as high when using web surveys as they are with telephone surveys, coverage error (i.e., a function of the difference between the defined target population of interest and the population frame obtained used to study this target) may be high (Couper, 2000), and respondents may falsify their demographic information and thus undermine the accuracy of the results and the validity of conclusions drawn from the research. The use of panels specifically recruited for online research, though, can mitigate these weaknesses of web surveys (James, 2003).

To summarize, prior research shows that both telephone and web surveys offer a number of advantages and also suffer from a number of limitations. Little research, however, formally compares telephone and web surveys in terms of resultant data reliability. The uniqueness and critical importance of the present study is that it is one of the first attempts to empirically investigate this issue by comparing a methodologically sound and commonly used telephone interviewing technique to the most promising web survey technique. That is, the web survey conducted for the present study randomly selected respondents who were members of a consumer panel (i.e., web panel) whereas the telephone survey used a “cold-calling” method to randomly selected respondents. Further, the present study is unique in that it is, to the best of our knowledge, the only one so far that utilizes two waves of data collection for both telephone surveys and web panels, and thus allows to examine test–retest reliability (McDaniel and Gates, 2005).

2. Literature review

2.1. Research comparing survey methods

Much research comparing different survey methods has been published. Due to the relative newness of web surveys, much of this research has focused on comparing personal interviews to mail surveys (e.g., Abdel-Aty, 2003), telephone to mail surveys (e.g., Walker and Restuccia, 1984), and mail to e-mail surveys (e.g., McDonald and Adam, 2003). So far, little research has compared web-based surveys to telephone surveys. To the best of our knowledge, the only exception to date was published in Europe by the International Journal of Market Research. In terms of sample characteristics, the authors Roster et al. (2004) find their U.S. telephone respondents, in comparison to their U.S. web-panel respondents, to be older, more likely to be Hispanic, and to be better educated. With regard to cost, a comparison shows that each telephone survey cost, on average, \$30, whereas the price tag for each web-based survey was, on average, \$14.00. In terms of response effects, the authors report that web-panel respondents, as compared to telephone survey respondents, have a tendency to give more neutral or negative attitudinal evaluations, to use a more simplistic cognitive response style, and for their responses to be slightly more reliable. The authors further report that the web panels, in comparison to the telephone surveys, result in more nonresponses to some of the questions. Thus, the design

apparently failed to incorporate one of the benefits of web surveys, namely the possibility to not permit respondents to skip items (see Couper, Traugott, and Lamias, 2001). Considering that web surveys where skips are not permissible feature a built-in check that can reduce respondent errors (Dillman, 2000; McCullough, 1998), this appears to be a design flaw which points to the need for more research in this area.

2.2. Representativeness of respondents

Even though 97.6% of all households have telephones (SSI, 2003), the above discussion shows that telephone survey respondents might not be representative of a marketer’s population of interest, and telephone survey results might thus suffer from a lack of generalizability. Internet research has been suggested to suffer from the same problems due to coverage error (Couper, 2000). A closer look at this issue, however, shows that access to the Internet has been rapidly increasing and is available to anywhere from 67.9% to 75% of the U.S. population (Fadner and Mandese, 2004). Further, some of the demographic differences in terms of access to the Internet that were observed during the 1990s (i.e., gender, rural/urban population) have vanished by now (Zhang, 2000). Since certain groups are still underrepresented – including lower income groups, the less educated, African Americans and Hispanics (Chaudhuri et al., 2005) – online researchers utilizing panels have to make sure that panel members are representative of the defined target population of interest. In other words, even though some suggest that “with telephone-based surveys it is possible to obtain a representative national sample, whereas internet surveys are by definition restricted to respondents with internet access” (Roster et al., 2004, p. 360), the evidence shows that researchers using either need to ensure representativeness of their samples.

2.3. Use of interviewers

The major advantage of using interviewers to conduct surveys is that conversational interviewing techniques can make sure respondents understand the questions, thus ensuring uniform interpretation of the intent of each question which should lead to more accurate responses (Conrad and Schober, 2000). On the downside, this technique can lead to biased results (Beatty, 1995) unless each interviewer handles and interprets each question in the exact same manner. This interviewer bias or effect, which has been defined as the “tendency for answers provided by the respondent and recorded in a questionnaire to vary depending on which interviewer is assigned to the respondent” (Johnson et al., 2000, p. 77), has been detected in telephone surveys (Johnson et al., 2000; Lueptow et al., 1990). Evidence shows that interviewer gender and race are likely to have an impact in telephone surveys (Johnson et al., 2000; Lueptow et al., 1990), as does the technique used and the behavior displayed by the telephone interviewer (Beatty, 1995; Keeter et al., 2000).

Another problem related to interviewers is termed “misbehavior by interviewers” (Kiecker and Nelson, 1996) which refers to activities that are dishonest, the product of low morale, interviewer lack of understanding of the importance of the interviewing process, and/or an interviewer’s attempt to “improve” research

quality. Kiecker and Nelson (1996) report the outcome of a self-report study where telephone interviewers employed by U.S. firms listed as suppliers of Interviewing Services were questioned in terms of their interviewing behavior. The results show that both fabrication of item response and entire interviews are relatively rare (.8% and .4%, respectively). However, Kiecker and Nelson's (1996) subsequent field experiment that made use of "planted" respondents who were interviewed by 33 research firms unaware of the purpose of the experiment shows a more worrisome picture. The actual incidence of telephone interviewer misbehavior is much higher than indicated by self-report data. Actual incidence of fabrication item response was 23.6% and the incidence of entire interview fabrication was 4.9%.

3. Hypothesis

3.1. Data reliability

As indicated by the above discussion, the elimination of interviewers in web-based surveys is likely to lead to some very significant advantages. That is, because web surveys are self-administered and the data entered by respondents are generally automatically fed into a spreadsheet without any further human intervention (McDaniel and Gates, 2005), they are free of interviewer bias and misbehavior, provide privacy to the respondent and thus are likely to lead – as compared to telephone surveys – to increased completeness of reporting of some types of

behaviors and are further likely to reduce certain types of response errors, such as social desirability and prestige (Cooley et al., 2000; Hair et al., 2003; Johnson et al., 2000). Web surveys are thus likely to produce more stable measures than telephone surveys, as shown by Roster et al. (2004) who report that using the coefficient theta to assess the reliability of their factor analyses shows that web survey respondents produce data that are slightly more reliable (theta = .92) than those generated by telephone survey respondents (theta = .84) (see Carmines and Zeller, 1979).

In addition, web-based surveys are expected – in comparison to telephone surveys – to produce more consistent results over time. Consistency over time is an indicator of reliability (McDaniel and Gates, 2005), and thus web-based surveys are expected to generate more reliable results than telephone surveys due to the lack of interviewers. This expectation will be tested in the following hypothesis. Considering that the current study is comparing telephone surveys to a very specific form of web-based surveys – namely web-based panel surveys – the terminology from this point on will reflect this peculiarity:

H1. Web-based panel surveys show a significantly higher level of data reliability than telephone surveys.

4. Methods

As mentioned earlier, the purpose of the present study is to compare a commonly used and methodologically sound

Table 1
Details about response rates

	Wave 1		Wave 2		
	N	Percentage	N	Percentage	
<i>Telephone</i>					
Attempted to reach	2733		100.00	2810	100.00
Never reached	434		15.88	298	10.61
Reached	2299		84.12	2512	89.39
Initial refusal	562	Percentage of those attempted to reach	20.56	493	Percentage of those attempted to reach
		Percentage of those reached	24.45		Percentage of those reached
Qualified for survey	1129	Percentage of those attempted to reach	41.31	1272	Percentage of those attempted to reach
		Percentage of those reached	49.11		Percentage of those reached
		Percentage of those reached who did not initially refuse	64.98		Percentage of those reached who did not initially refuse
Refused after qualified	327	Percentage of those attempted to reach	11.97	471	Percentage of those attempted to reach
		Percentage of those reached	14.22		Percentage of those reached
		Percentage of those reached who did qualify	28.96		Percentage of those reached who did qualify
Completed survey (usable)	802	Percentage of those attempted to reach	29.34	801	Percentage of those attempted to reach
		Percentage of those reached	34.88		Percentage of those reached
		Percentage of those reached who did qualify	71.04		Percentage of those reached who did qualify
<i>Web panel</i>					
Invited to participate	2217		100.00	2323	100.00
Clicked through survey	1636		73.79	1758	75.68
Qualified for survey	1038	Percentage of those invited to participate	46.82	1155	Percentage of those invited to participate
		Percentage of those who clicked through survey	63.45		Percentage of those who clicked through survey
Did not complete survey	185	Percentage of those invited to participate	8.34	226	Percentage of those invited to participate
		Percentage of those who clicked through survey	11.30		Percentage of those who clicked through survey
		Percentage of those who qualified for survey	17.82		Percentage of those who qualified for survey
Completed survey (usable)	853	Percentage of those invited to participate	38.48	929	Percentage of those invited to participate
		Percentage of those who clicked through survey	52.14		Percentage of those who clicked through survey
		Percentage of those who qualified for survey	82.17		Percentage of those who qualified for survey

Table 2
Respondent demographics

Categories	Wave 1		Wave 2	
	Phone surveys	Web surveys	Phone surveys	Web surveys
<i>Age — percentage distribution</i>				
18–24	4.4	5.6	5.1	5.1
25–34	24.9	26.6	24.2	23.1
35–44	40.9 ^a	26.5	42.5 ^a	27.8
45–54	17.5 ^a	26.4	18.1 ^a	27.1
55–64	8.3 ^b	12.7	7.4 ^a	14.9
65 or older	4.0 ^c	2.1	2.8	2.0
<i>Marital status — percentage distribution</i>				
Married/living with partner	53.3	53.5	51.1	52.2
Single	34.4	34.4	36.6	34.4
Divorced	7.9	10.0	9.2	11.7
Widowed	4.4 ^b	2.1	3.2	1.7
<i>Number of children under the age of 18 — percentage distribution</i>				
No children	51.5 ^a	63.3	51.5 ^a	62.2
1 child	25.2 ^a	16.4	21.1 ^c	16.1
2 children	15.7	14.8	16.0	15.1
3 children	6.5 ^c	4.1	9.6 ^a	4.2
4 children	.9	.9	1.0	2.0
5 children	.3	.5	.8	.3
<i>Income — percentage distribution</i>				
Less than \$35,000	11.2	12.1	13.2	11.6
\$35,000 to \$49,999	25.0 ^a	16.4	30.7 ^a	16.4
\$50,000 to \$74,999	34.9 ^b	26.9	35.6 ^b	26.5
\$75,000 to \$99,999	21.9	21.6	12.4 ^a	22.8
100,000 or more	7.1 ^a	23.1	8.0 ^a	22.8

^a Significant at .0001 level.

^b Significant at .005 level.

^c Significant at .05 level.

telephone interviewing technique (i.e., random digit dialing) to a promising web survey technique (i.e., web panel). The focus of the comparison is on the data reliability of these two specific interviewing methods.

4.1. Data collection

To obtain the necessary data for testing the study's hypothesis, a "two-wave" data collection framework was incorporated using both the telephone and Internet as communication media. The initial wave of research for both survey methods was conducted in June–July 2002, and the second wave for both survey methods was completed in early September 2002. In efforts of maintaining control in the data collection tasks, the same commercial research house was retained to conduct both web-panel and telephone surveys for both time periods. In addition, all data were collected in the northeast region of the United States.

The questionnaire consisted of a total of 21 questions designed to assess current and previous health insurance coverage, how desirable certain attributes of insurance provider are, and demographic characteristics. The content of both web-panel and telephone surveys was identical.

4.1.1. Telephone data collection

A random sampling procedure was used to draw respondents for both waves of telephone interviewing. A screening question was used to make sure only qualified respondents participated and answered the survey (i.e., adults who have private group health insurance through an employer). All interviews were conducted from a central location, and for control purposes the interviewing process was unobtrusively monitored by supervisory personnel. Approximately 30 interviewers were used for this project. All were professional telephone interviewers who were well-trained and work on a regular basis for the research company that conducted the interviewing. The sampling list was purchased from a major provider of such lists. Contact procedures included four contacts (i.e., the initial contact and three callbacks) to individual respondents, if necessary. Usable responses were 802 for Wave 1, and 801 for Wave 2 (see Table 1 for information on response rates).

4.1.2. Web-panel data collection

The web-panel list was obtained from the same supplier of the telephone sampling lists; however, there was no overlap between the sampling lists for telephone and web panels. All members of the web panel had previously agreed to participate in research projects. The panel list included a total of 1.5 million households that were demographically matched to the defined target population of the geographic area in question. The respondents for Wave 1 and Wave 2 were randomly drawn from the panel. The protocol for panel members in the targeted area included four contacts (i.e., the initial invitation, and three reminders). Usable responses were 853 for Wave 1, and 929 for Wave 2 (see Table 1 for information on response rates).

5. Data analyses and results

5.1. Demographic profiles of the samples

Demographic profiles of all samples can be found in Table 2. Table 2 shows some demographic differences between the web-panel and telephone survey respondents, which are not an unusual observation (see Roster et al., 2004).

To further compare the random telephone and web-panel samples, respondents were asked about the type of their current private health insurance coverage. The results for both the web

Table 3
Type of current health insurance coverage

Categories	Percentage Distribution				Secondary data
	Telephone surveys		Web surveys		
	Wave 1	Wave 2	Wave 1	Wave 2	
HMO	40.6	50.4	39.0	36.6	34.0
PPO	28.7	29.4	37.4	42.8	42.8
POS	20.9	14.7	16.3	16.7	16.5
Traditional/indemnity/ fee-for-service	8.2	5.2	6.9	5.4	5.4
Defined contribution plan	1.5	.2	.4	.5	.5

Table 4
Desirability attribute ratings — means and standard deviations

Attribute	Telephone surveys				Web surveys			
	Wave 1		Wave 2		Wave 1		Wave 2	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Trustworthy	4.251	.9030	4.074	.8565	4.502	.8079	4.572	.7705
Easy to work with	4.151	.8949	3.953	.8497	4.456	.8290	4.542	.8085
Knowledgeable	4.197	.9023	4.003	.8686	4.463	.7866	4.500	.8252
Well-respected by physician	4.211	.8988	4.064	.8230	4.305	.8779	4.363	.8961
Accessible and responsive	4.227	.9013	3.943	.8770	4.527	.8003	4.576	.7988
Reliable	4.294	.8742	4.078	.8880	4.561	.7631	4.597	.7554
Fast and accurate claims processing	4.129	.9066	3.854	.9319	4.462	.8657	4.467	.8738
Good value for the money	4.166	.8979	3.992	.9031	4.430	.8842	4.479	.8461
Access to the best physicians	4.226	.9217	4.061	.9008	4.591	.7961	4.625	.8041
Quickly resolves problems/issues	4.091	.9180	3.881	.9132	4.516	.8329	4.549	.8293

panels and the telephone surveys in both data collection waves can be found in Table 3. The data provided in the “secondary data” column of Table 3 were developed from information available through InterStudy (2003). Comparison of this information with the telephone survey and web-panel results shows that the web-panel results are more consistent with the results from secondary data in that health insurance coverage results for the web panels more closely conform to the estimates developed from secondary data than the results from the telephone surveys. Further, the web-panel results also appear to

be more congruent between waves 1 and 2 than the telephone survey results.

5.2. Hypothesis testing

The hypothesis postulates that web-based panel surveys lead to significantly more reliable results than telephone surveys. To test this hypothesis, respondents were asked to rate carriers of health insurance on ten attributes in terms of the desirability of each attribute (see Table 4; five-point scales from 1 = not

Table 5
ANOVA results: telephone survey desirability attribute differences across waves 1 and 2

Attributes		Sum of squares	df	Mean square	F	Significance
Trustworthy	Between groups	12.389	1	12.383	15.993	6.65E–05
	Within groups	1218.708	1574	0.774		
	Total	1231.091	1575			
Easy to work with	Between groups	15.703	1	15.703	20.637	5.97E–06
	Within groups	1212.082	1593	0.761		
	Total	1227.784	1594			
Knowledgeable	Between groups	14.921	1	14.921	19.032	1.37E–05
	Within groups	1233.229	1573	0.784		
	Total	1248.150	1574			
Well-respected by physicians	Between groups	8.445	1	8.445	11.337	.000778
	Within groups	1165.781	1565	0.745		
	Total	1174.226	1566			
Accessible and responsive	Between groups	32.391	1	32.391	40.989	2.01E–10
	Within groups	1261.205	1596	0.790		
	Total	1293.595	1597			
Reliable	Between groups	18.689	1	18.688	24.086	1.02E–06
	Within groups	1233.648	1590	0.776		
	Total	1252.336	1591			
Fast and accurate claims processing	Between groups	29.730	1	29.730	35.205	3.65E–09
	Within groups	1324.178	1568	0.845		
	Total	1353.908	1569			
Good value for the money	Between groups	11.925	1	11.925	14.716	.00013
	Within groups	1281.204	1581	0.810		
	Total	1293.130	1582			
Access to the best physicians	Between groups			10.821	13.038	.000315
	Within groups	1308.832	1577	0.830		
	Total	1319.653	1578			
Quickly resolves problems	Between groups	17.388	1	17.388	20.754	5.62E–06
	Within groups	1326.306	1583	0.838		
	Total	1343.695	1584			

desirable to 5 = extremely desirable). One-way ANOVA results show statistically significant differences on all ten attributes when comparing the ratings of the telephone survey waves 1 and 2 (see Table 5), whereas a statistically significant difference shows on only one of the ten attributes across web-panel waves 1 and 2 (see Table 6). Thus, the hypothesis can be confirmed because web-panel results are more congruent across waves, and thus more reliable, than telephone survey results.

Table 6
ANOVA results: web survey desirability attribute differences across waves 1 and 2

Attributes		Sum of squares	df	Mean square	F	Significance
Trustworthy	Between groups	2.187	1	2.187	3.518	.608820
	Within groups	1093.185	1758	.622		
	Total	1095.373	1759			
Easy to work with	Between groups	3.234	1	3.234	4.828	.028134
	Within groups	1179.515	1761	.670		
	Total	1182.749	1762			
Knowledgeable	Between groups	.603	1	.603	.926	.335999
	Within groups	1138.348	1748	.651		
	Total	1138.951	1749			
Well-respected by physicians	Between groups	1.465	1	1.465	1.861	.172745
	Within groups	1371.192	1741	.788		
	Total	1372.657	1742			
Accessible and responsive	Between groups	1.016	1	1.016	1.589	.207663
	Within groups	1124.376	1759	.639		
	Total	1125.391	1760			
Reliable	Between groups	.546	1	.546	.947	.330547
	Within groups	1011.805	1756	.576		
	Total	1012.351	1757			
Fast and accurate claims processing	Between groups	.015	1	.015	.020	.886971
	Within groups	1314.560	1737	.757		
	Total	1314.575	1738			
Good value for the money	Between groups	1.096	1	1.096	1.466	.22614
	Within groups	1310.232	1753	.747		
	Total	1311.328	1754			
Access to the best physicians	Between groups	.469	1	.469	.732	.392264
	Within groups	1127.109	1760	.640		
	Total	1127.578	1761			
Quickly resolves problems	Between groups	.460	1	.460	.666	.414426
	Within groups	1207.118	1748	.691		
	Total	1207.578	1749			

6. Discussion, implications, and suggestions for future research

6.1. Comparing data reliability

A major contribution to the literature provided by this study is that it provides empirical evidence that shows that web panels display higher levels of data *reliability* than telephone surveys. As hypothesized, this effect is likely to be due to the lack of interviewers in web-panel administration, which cancels out the interviewer effect or bias and affords more privacy to the respondents. Prior research suggests that many individuals consider information on health issues to be of a private nature and are more likely to search the Internet for such information rather than ask their healthcare providers to furnish it (Fox and Rainie, 2002). Similarly, many of the respondents included in the current study might very well perceive information about their health insurance, the topic of the present survey, to be equally private and hesitant to discuss such information with an interviewer. Hesitant respondents feel justified to give inaccurate information to an interviewer to protect their privacy (Tourangeau and Smith, 1996), resulting in lower levels of data *reliability* than such information assessed through a self-administered survey. A critical need for more empirical research on investigating the types of information consumers are hesitant (versus comfortable) to disclose to interviewers can be identified. More research is also needed to gain clearer understanding and insight to the extent to which telephone survey respondents unduly rely on their memories when asked to provide information, whereas, web-panel respondents have the luxury of checking relevant information before answering specific survey items. In addition, more empirical research is needed to investigate whether knowledge questions place an undue burden on telephone respondents, unless of course, the survey's focus is to assess top-of-the-mind knowledge. Further, future research should investigate the impact of survey approach (web versus telephone) versus sampling procedures (panel versus cold-calling) on response rates and data accuracy (see James, 2003). Here, it is also of interest to investigate to what extent respondents to web-panel surveys, when compared to those of telephone surveys, experience an increased sense of privacy.

6.2. Comparing the cost and time of data collection

The figures for calculating overall data acquisition costs do not include the costs for designing the survey, programming the survey, or analyzing the data, because these costs are the same for both approaches. Since the data for both waves of telephone and web-panel surveys were collected by the same commercial research house, the overall data acquisition costs for telephone surveys are based on interviewer wages, plus an allocation for overhead and profit. For the web panels, overall data acquisition costs include the cost of contacting panel members and directing them to the survey site, plus an allocation for overhead and profit. Accordingly, the cost of each telephone survey totaled \$22.75, whereas the cost of conducting each web-panel survey

totalled \$6.50. That is, in terms of overall data acquisition costs, the cost of each web-panel survey amounted to only 29% of the cost of each telephone survey.

With regard to the telephone surveys, the figures for calculating overall data acquisition time are based on the use of 30 CATI stations and a contact procedure that included up to three callbacks to individual respondents, if necessary. For the web panels, overall data acquisition time is based on the actual time it took to send invitations to the web panelists, and the time it took panelists to visit the survey site and complete the survey. Accordingly, each web-panel survey was completed in an average of 3 days while each telephone survey took nearly 2 weeks to complete, on average. In other words, in the present study, each web-panel survey was completed, on average, in about 21% of the time it took to complete each telephone survey, on average.

6.3. Differences in attitude?

A closer look at Table 4 shows that web-panel respondents, in comparison to telephone survey respondents, have a tendency to be more demanding in terms of the requirements they place on their health insurance provider. These differences are statistically significant on 8 out of 10 attribute ratings. This is in line with Roster et al.'s findings (2004) that web-panel respondents, when compared to telephone survey respondents, tend to display more neutral or negative attitudinal evaluations. Future research is needed to investigate whether these findings can be replicated. Future research also needs to address that the answers given by telephone survey respondents display higher levels of variability (see Table 4) than those given by web-panel respondents. This is an issue of data validity and research needs to investigate which survey approach is more valid under what circumstances.

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