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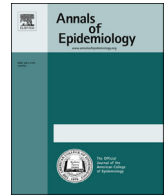### Recommended Citation

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Brief communication

Internet and telephonic IVR mixed-mode survey for longitudinal studies: choice, retention, and data equivalency ☆

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ABSTRACT

Purpose: This study examined data equivalency and loss to follow-up rates from Internet and interactive voice response (IVR) system surveys in a prospective-cohort study.
Methods: 475 limited-service restaurant workers participating in the 12-week study were given a choice to report their weekly slipping experience by either IVR or Internet. Demographic differences, loss to follow-up, self-reported rates of slipping, and selection of first and last choices were compared.
Results: Loss to follow-up rates were slightly higher for those choosing the IVR mode. Rates of slipping and selection of first and last choices were not significantly different between survey modes. Propensity to choose an Internet survey decreased with increasing age, and was the lowest among Spanish speakers (5%) and those with less than a high school education (14%).
Conclusions: Studies relying solely on Internet-based data collection may lead to selective exclusion of certain populations. Findings suggest that Internet and IVR may be combined as survey modalities within longitudinal studies.

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Introduction

Telephonic interactive voice response (IVR) systems and Internet surveys have provided new and efficient methods of longitudinal data collection. Several longitudinal studies have used either Internet or IVR surveys to collect follow-up data [1–11]. However, few longitudinal studies have used a mixed-mode of Internet and IVR surveys to follow participants [12]. Using only one survey mode may lead to biased sample selection, due to technological barriers for certain participants, and/or biased results.

Providing a choice of multiple survey modes (Internet and IVR) has been shown to increase the response rate in cross-sectional surveys [13,14]; however, retention and data equivalency between the two methods for longitudinal studies has not been well studied.

In a 12-week prospective cohort study of risk factors for slipping, we used Internet and IVR surveys to collect participants' weekly self-reported slip experiences and other key information related to slipping and falling. We present a comparison of participant survey mode selection by sociodemographic characteristics. We also examined self-reported rates of slipping, loss to follow-up, and primacy/recency effects by survey mode.

Methods

Four hundred seventy-five workers were recruited from 36 limited-service restaurants across the United States in the years

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2007 and 2008. Study methods have been previously described in detail [15].

Weekly survey

After completing an in-person baseline survey at the restaurant, participants were asked to report their slip experience weekly over the following 12 weeks. Participants were given a choice of reporting their weekly experience by IVR, Internet, or by mailing postal questionnaire forms. All study materials were made available in English, Spanish, and Portuguese.

Each week after the enrollment, participants reported the number of hours worked and their slip experience in the previous week at work. If they experienced one or more slips in the previous week, they also reported the circumstances around the first four of those slips, including the time and presence of contamination on the floor.

Survey modes

Participants choosing IVR were provided with a toll-free telephone number, a unique identifier and instructions on how to use the IVR system. Each week an e-mail was sent to participants choosing Internet with a link to their weekly survey that included their unique identifier and the language of choice. For both IVR and Internet surveys, numerical responses were quality-checked against preset ranges and data were automatically time- and date-stamped and entered into a spreadsheet. These data were checked daily and, if a participant did not complete their weekly survey on the due date, a reminder call was made, typically the next business day, by a study team member to remind the participant to report the data through the chosen survey mode.

Paper forms and stamped envelopes were given to participants who were not comfortable with either IVR or Internet. Participants who chose paper surveys were excluded from further analysis due to small sample size ($n = 6$).

Statistical analysis

Generalized estimating equations models with compound symmetry covariance structure were used to compare (1) choice of Internet versus IVR mode by selected demographic characteristics and (2) survey completion (the percent who completed at least one survey and the mean number of completed surveys among these participants), the reported rate of slipping, and selection of the first and the last choice among those who chose Internet and IVR surveys.

Results

Of the 475 participants, 315 chose the IVR (66.3%), 154 chose the Internet survey (32.4%). Choice of the Internet survey mode over the IVR mode decreased with increasing age ($P < .05$, See Appendix 1). Spanish speakers (as compared with English speakers), Black non-Hispanic (as compared with White non-Hispanic), and participants without any college education were less likely to choose the Internet over the IVR ($P < .05$). No significant difference was observed by gender.

The proportion of participants completing at least one weekly survey was slightly higher among the Internet survey group (proportion ratio, 1.08; 95% confidence interval, 1.02–1.14; Table 1). Rate of slipping did not differ significantly by survey method in either the univariate or multivariable model. Selection of the first and the last choice (primacy or recency effect) also did not differ significantly by survey mode.

Table 1
Loss to follow-up, rate of slipping, and probability of choosing the first choice and the last choice by survey mode—results from multivariable generalized estimating equations models

	Multivariable model	
	Effect estimate*	95% Confidence interval
Participants completing at least one weekly survey		
Internet	1.08†	1.02–1.14
Telephone (IVR)	1	
Difference in the mean number of weekly surveys for those who completed at least one survey		
Internet	0.49‡	0.02–0.97
Telephone (IVR)	0	
Rate of slipping		
Internet	0.84§	0.63–1.13
Telephone (IVR)	1	
Floor contaminants, first choice (liquid)		
Internet	1.15†	0.94–1.42
Telephone (IVR)	1	
Floor contaminants, last choice (do not know/other)		
Internet	0.95†	0.60–1.49
Telephone (IVR)	1	
Time of slip, first choice (6–11 AM)		
Internet	1.42†	0.95–2.13
Telephone (IVR)	1	
Time of slip, last choice (9 PM to 6 AM)		
Internet	1.09†	0.58–2.03
Telephone (IVR)	1	

* Adjusted for age, gender, education, language, and ethnicity.
† Proportion ratio.
‡ Difference in mean.
§ Rate ratio.

Discussion

Choice

In this study, young adults, those with some college education and those who spoke English or Portuguese, were more likely to choose the Internet survey. Similar results were reported by Bexelius et al. [16]. The availability of the Internet has increased significantly in recent years, and many studies have used or are planning to use online surveys to collect longitudinal data [1–3]. However, approximately 19% of American adults still do not use the Internet according to the Pew Internet and American Life Survey 2012 data [17]. The Pew report also found that Internet use was lower among older adults, African American and Hispanics, and those with no high school education [17]. A similar digital divide along the lines of age, education level, and socioeconomic status exists in Europe [18]. Thus, a longitudinal study relying solely on an Internet survey mode may have lower participation from these groups. The IVR is also a survey method of choice for participants who have difficulty reading and writing, as receptive vocabulary typically exceeds reading vocabulary [19,20].

Retention and data equivalency

Loss to follow-up was slightly higher for the IVR mode as compared with the Internet mode. However, the difference was small and the increase in the response rate due to choice between multiple modes may outweigh this marginal disadvantage of the IVR mode. Sinadinovic et al. [21], in 2011, found that higher response rates resulted when the respondents were given a choice between both Internet and IVR (43.2% and 46.6%, respectively) as compared with when only the Internet or the IVR mode was offered (38.1% and 33.9%, respectively).

We did not observe a significant difference in the reported rate of slipping by survey mode. Other studies using both the Internet

and IVR have similarly found no difference in responses by survey mode [14,16]. However, some questions may be more sensitive to modal differences. For example, one study found that respondents to the aural modes were more likely than were respondents to the visual modes to give extreme positive responses to scale-type questions [22].

Response choices for nominal variables may differ by visual and aural survey mode due to primacy or recency effect [22,23]. However, the probability of selecting the first or the last choice did not differ by survey mode in this study. Similarly, a review of 82 experiments found no consistent pattern for primacy or recency effects [24].

Studies relying solely on the Internet may lead to selective exclusion of older adults, lower educational groups, and racial-ethnic minorities. For a short repetitive survey, we did not find any evidence suggesting lack of data equivalency between the two modes, and it should be possible to combine data collected using the IVR and Internet surveys in longitudinal studies.

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Appendix 1

Number of participants in each category of selected demographic characteristics, proportion of participants choosing the Internet-based method, and proportion ratio and 95% confidence intervals showing propensity to choose Internet-based method versus IVR-based method

Demographic Characteristics	n	Internet (%)	Univariate model PR (95% CI)	Multivariable model PR (95% CI)
Age (y)				
14–19	115	46.96	1	1
20–29	152	32.24	0.70 (0.51–0.96)	0.54 (0.38–0.76)
30–39	79	24.05	0.52 (0.33–0.82)	0.44 (0.29–0.67)
40–49	78	34.62	0.74 (0.48–1.13)	0.55 (0.37–0.82)
50+	44	11.36	0.23 (0.08–0.68)	0.17 (0.06–0.49)
Gender				
Women	310	32.58	0.98 (0.74–1.29)	1.04 (0.79–1.36)
Men	159	33.33	1	1
Education				
Less than high school	80	13.75	0.29 (0.16–0.53)	0.35 (0.21–0.61)
High school student	78	46.15	0.94 (0.66–1.34)	0.50 (0.36–0.70)
High school graduate	184	24.46	0.50 (0.36–0.70)	0.51 (0.37–0.70)
Some college or above	127	48.82	1	1
Ethnicity				
Black non-Hispanic	91	24.18	0.62 (0.41–0.93)	0.56 (0.38–0.82)
Hispanic	77	20.78	0.55 (0.29–1.06)	0.93 (0.53–1.64)
Other	42	35.71	0.92 (0.55–1.53)	0.78 (0.46–1.30)
White non-Hispanic	259	39.00	1	1
Language				
Spanish survey	40	5.00	0.13 (0.06–0.30)	0.21 (0.08–0.59)
Portuguese survey	13	53.85	1.54 (1.07–2.21)	1.76 (1.33–2.34)
English survey	416	34.86	1	1