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Comparing Two Web/Mail Mixed-mode Contact Protocols to a Unimode Mail Survey

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Abstract

Recent research has shown mixed-mode surveys are advantageous for organizations to use in collecting data. Previous research explored web/mail mode effects for four-contact waves. This study explores the effect of web/mail mixed-mode systems over a series of contacts on the customer satisfaction data from the Florida Cooperative Extension Service during 2012–2013. The experimental design involved a group of clients who provided e-mail and mail contact information randomly assigned to two mixed-mode treatment groups and a mail-only control. Demographic and service utilization data were compared to assess response rates and nonresponse bias. Logistic regression showed the treatment groups had similar response rates and nonresponse bias. The fifth contact was statistically significant in increasing response rates but did not reduce nonresponse bias. Future research should continue exploring optimizing the number of contacts in mixed-mode survey methodology.

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Introduction

Web surveys have grown as a method of collecting information in comparison to other survey modes, but their response rates are generally lower than those of mail surveys (Cook et al. 2000; Manfreda et al. 2008; Shih and Fan 2008). Low response rates, among other factors, have led some researchers to explore mixed-mode surveys. Recently, the combination of respondent-administered web and mail surveys has become a popular mixed-mode survey system (de Bernardo and Curtis 2012; de Leeuw 2005; Dillman et al. 2009; Dillman et al. 2014).

A limited number of studies involving web/mail mixed-mode surveys have explored the number of contacts and its effect on response rates (Dykema et al. 2013; Israel 2013a; Kaplowitz et al. 2012; Millar and Dillman 2011; Shih and Fan 2008). We are not aware of any that have tested the effects of adding a fifth contact to the typical four-contact sequence on response rate or data quality for such surveys. Understanding the effectiveness of the contact sequence with participants in a web/mail survey is important to maximizing response rates while not antagonizing respondents. The goal of this study is to determine the effects of implementing a series of contacts for a survey of Florida Cooperative Extension clients. We compare the effect of two alternative web/mail data collection protocols on response rate, potential nonresponse biases, and data quality after three-, four-, and five-contact attempts with a mail-only protocol.

Web Surveys

Conducting web surveys can save money by sending e-mails instead of postal mail and can increase response time speed (Dillman et al. 2014; Fan and Yan 2010; Groves et al. 2009; Medway and Fulton 2012). But web surveys also have disadvantages. Although 70% of Americans have web access, the remaining 30% do not (National Telecommunications and Information Administration, & Economics and Statistics Administration 2013), thereby introducing coverage bias because households without Internet access are not represented in the results (Stern et al. 2014). In addition, some people who have access may lack the skills to use it properly (Millar and Dillman 2011; Stern et al. 2014). And with the increased amount of unsolicited e-mails, the administration of legitimate survey e-mails may be treated as spam and blocked (Fan and Yan 2010; Porter and Whitcomb 2007). Finally, web surveys face the issue of achieving high response rates. Few e-mail-only studies have achieved high response rates (Manfreda et al.

2008; Millar and Dillman 2011; Shih and Fan 2008), which may reflect the general trend of declining response rates (Groves 2006).

Mixed-mode Surveys

Unimode surveys have several real or potential weaknesses. Mail surveys have high postage costs, while phone surveys have increasingly declining response rates (Dillman et al. 2014). Also, Israel (2013a) found the use of a web-only option for surveys had a statistically lower response rate than mixed-mode options. Mixed-mode surveys can, however, be used to mitigate some of these weaknesses. Reasons for using mixed-mode surveys include increasing the response rate, improving the representativeness of the sample, and reducing nonresponse error and survey system costs (Baines et al. 2007; de Bernardo and Curtis 2012; de Leeuw 2005; Dillman et al. 2014; Groves et al. 2009; Israel 2013a, 2013b; Stern et al. 2014). The cost per complete survey in a web/mail system would decline without the expense of mailed letters (Dykema et al. 2013; Israel 2013b). Yet, even with mixed-mode surveys, the contact methods must fit the target population in order to increase response rates while maintaining or enhancing data quality. Medway and Fulton (2012) conducted a meta-analysis and found that a concurrent mixed-mode option (postal letter with a web link and withholding a paper survey until the last contact) also resulted in a significant reduction in response rates.

Number of Contacts in Survey Implementation

Several meta-analyses have shown that the number of contacts is one of the most important factors for response rates (Cook et al. 2000; Fan and Yan 2010; Manfreda et al. 2008; Shih and Fan 2008). Meta-analyses also indicate that individuals receiving multiple e-mail reminders quickly reach a saturation point, thereby limiting the effectiveness of the number of contacts for web surveys (Cook et al. 2000; Manfreda et al. 2008; Shih and Fan 2008). Consequently, Manfreda et al. (2008) found that, by increasing the number of contacts, the response rate difference between web and other survey modes gets larger, from approximately a 5% disadvantage for the web mode (for one to two contacts) to 16% on average (for three to five contacts).

Mixed-mode studies vary on the number and type of contacts used for implementation. Furthermore, multiple contacts are essential for maximizing response to mixed-mode surveys (Dillman et al. 2014; Israel 2013a;

Lesser et al. 2011; Messer and Dillman 2011; Millar and Dillman 2011; Porter and Whitcomb 2007; Smyth et al. 2010). For example, Holmberg et al. (2010) conducted experiments using two paper-intensive and three web-intensive survey strategies, each containing four postal contacts in survey implementation and provided respondents with two response mode options (mail and web) in the third and fourth contacts. At the completion of the survey, the proportion of web responses was higher in all of the web-intensive strategies, and the resulting response rate was not substantially different from the mail-intensive treatments (Holmberg et al. 2010). Messer and Dillman (2011) found that the sequential use of a mail follow-up in a set of web/mail mixed-mode protocols improved overall response rates by 12–19 percentage points over the initial response rate for the web mode.

Similarly, Israel (2013a) compared the response rates and percentage of undeliverable surveys between a web/mail mixed-mode survey group (after a mailed preletter, two contacts were made by e-mail with the fourth and final contact made via postal mail) and two web unimode survey groups. The percentage of undeliverable surveys for the mail preletter/two e-mail/mail mixed-mode group (1.4%) was lower than the percentage for the two web unimode groups (14% and 17%, respectively) because postal mail was substituted when an e-mail invitation bounced in the mixed-mode group (Israel 2013a). Furthermore, this study showed that the use of a fourth contact by mail increased the overall response rates of mail preletter/two e-mail/mail mixed-mode group by 21 percentage points over the rate for the first three contacts in comparison to web unimode survey groups (2.2% and 2.9%). This study further supports that using mail and e-mail contacts can create a complementary relationship superior to e-mail-only surveys by providing opportunities for more people to act on mode preferences (Israel 2013a, 2013b; Millar and Dillman 2011).

It is a common practice to use five contacts in an effort to increase response rates, but many surveys have used fewer to balance sample size and other design features with costs (Dykema et al. 2013; Israel 2013a; Kaplowitz et al. 2012; Lesser et al. 2011; Messer and Dillman 2011; Millar and Dillman 2011). We found a number of researchers reported the additive effect of an additional contact on response rates and respondent characteristics (Dykema et al. 2013; Kaplowitz et al. 2012; Messer and Dillman 2011; Millar and Dillman 2011; Porter and Whitcomb 2007), but it was rare for the analysis to address other issues related to data quality and representativeness. Thus, our study begins to fill this gap in the literature by addressing some of the trade-offs in adding a fifth contact to a web/mail

survey by examining nonresponse bias, item response rates, and response distributions as well as response rates.

Method

We used data collected for the Florida Cooperative Extension Service (FCES) annual survey from 2012 and 2013. The FCES is a public-funded partnership between the federal government and state and county governments in Florida to provide scientific knowledge, nonformal education, and expertise to the public (Seevers and Graham 2012). We surveyed a sample of clients who were selected from a population that had some type of contact with the FCES (e.g., attended a workshop, called or visited the extension office, or exchanged e-mails with an agent). The survey was used to collect feedback about the clients' experiences with the FCES and included questions on clientele's satisfaction on four dimensions of quality, outcomes of the use of extension service, overall satisfaction with the services provided by extension, and respondents' demographic attributes.

This customer satisfaction survey has been conducted annually since 1997 but began using web hosted and mixed modes in 2008 (Israel 2013a; Israel and Lamm 2012). Each county goes through a five-year rotation of being surveyed. Once a county is selected for receiving the survey, a random sample of participants is generated from the list of FCES clients recorded in the selected county.

A sample of 2,641 from extension client lists in 13 of Florida's 67 counties for the 2012 survey and 2,579 clients from 12 counties in 2013 was used, totaling 5,220 clients in the sample. Extension clients represent a quasi-general population sample, but they differ from the state's population in several ways (Israel 2013a; see also Table B15 in the Online Supplemental information). To address the objectives of this study, we selected 2,907 clients who provided both an e-mail and a postal address.

We then randomly assigned these clients into three groups detailed below:

1. Mail only (control group): Five contacts consisting of a postal preletter, followed by a postal letter and questionnaire, then a reminder postcard, a second postal letter and questionnaire, and a final postal letter and questionnaire.
2. One mail + two e-mail + two-mail questionnaire (treatment group): Five contacts using postal and e-mail invitations. The first invitation was sent via a postal preletter. The second and third contacts were

made using e-mail letters containing a link to the survey. The fourth and fifth contacts switched back to a postal letter and questionnaire.

3. Three e-mail + two-mail questionnaire (treatment group): The first three contacts were sent by e-mail, with each message including a link to the survey. The final two contacts each included a postal letter and questionnaire.

The postal and e-mail contacts (e.g., invitation letters and reminders) were created to provide the same verbal and visual presentation to clients, as recommended by Dillman and colleagues (2014). Several clients in groups 2 and 3 had the e-mail bounce, so postal invitations were substituted. Likewise, some clients in group 1 had the postal invitation returned, so an e-mail invitation was sent. These clients remained in the study because their responses were pertinent to the customer satisfaction survey and we wanted to track outcomes of clients when one avenue of contact failed. This survey experiment was executed in part with the implementation of the annual FCES customer satisfaction survey. The sample size for the control and two treatment groups was about equal by design.

We constructed the questionnaires to follow Dillman and colleagues' (2014) unified mode design principles. These principles included using the same questions and question order and, more importantly, working to minimize differences in visual design (as illustrated in Israel 2010) that could impair accurate measurement (Dillman et al. 2014; Groves et al. 2009). Similarly, the web survey presented questions in groups or singly on a separate screen (a practice widely used in the construction of web surveys; see Messer and Dillman 2011; Millar and Dillman 2011; Smyth et al. 2010). The web survey used the Qualtrics software (2015). Clients who had received the invitation via e-mail could click on the link to access the URL and then enter the personal identification number. Upon entry, the informed consent information was presented. When the "Agree to participate" button was selected, the screen containing the initial questions was presented.

The two-page mail questionnaire contained 16 closed-ended items, three numeric open-ended items, and two descriptive open-ended items. It utilized gray shading to distinguish between blocks of related questions. The web version of the surveys displayed the items over 17 screens and used skip logic to route respondents to appropriate follow-up questions. The single question per screen design of the web surveys involves trade-offs (e.g., more time needed to complete but less scrolling), which may have affected the responses (Dillman et al. 2014). On the other hand, due to the

short length and items not needing to be grouped to help respondents process them (Dillman et al. 2014), we believe the web survey format was appropriate.

We combined survey responses with survey implementation and administrative records to complete the data set. For administrative records, extension staff recorded the type of contact and topic, as well as gender and race, when interacting with clients. We also used records from Florida's voter registration file to fill in missing data on clients' gender and race. The topic of information provided to a client was coded into FCES administrative program areas. We also used multiple imputation for the remaining 6.3% of cases with missing administrative data to estimate plausible values across 10 data sets (Schafer and Graham 2002). Imputation was conducted with SAS's Proc MI (Yuan 2010). Afterward, we conducted the nonresponse bias analysis with logistic regression using SAS for Windows version 9.4 and analyses of item response rates with weighted data. We calculated weights using Izrael and colleagues' (2009) weight and trim macro for SAS, which also incorporates sampling design weights (Biemer and Christ 2008). We also conducted analysis of item response rate with SAS's SurveyFreq and SurveyReg procedures. Finally, we included data from the third contact due to the mode switch in the mail + two e-mail + two mail and three e-mail + two-mail mixed-mode groups (e.g., switching from e-mail invitations to online questionnaires to mail questionnaires). This allowed us to detect any changes that might be attributed to the mode switch.

Findings

Table 1 displays the sample size and response rate of each group by contact point. The overall response rate was 57.8% (American Association for Public Opinion Research 2016, Response Rate 2), with 1,694 partial and complete responses. χ^2 analyses showed the response rates after the third, fourth, and fifth contacts were not significantly different between the treatment and control groups. Meanwhile, χ^2 tests showed the response rate increase from the third to the fourth and fourth to the fifth contact waves in all three groups was statistically significant. In sum, the addition of a fifth contact significantly increased response rate of each group in this study. The Supplemental Material Online contains the response rates and χ^2 analyses after each contact (Table A1).

While the final response rate did not differ between the treatment groups, the cost per completed questionnaire and data entry did. The combined

Table 1. Response Rate by Contact and Treatment Group.

Response Rate After	Mail Only, $n = 976$ (%)	Mail + Two e-mail + Two Mail, $n = 972$ (%)	Three e-mail + Two Mail, $n = 980$ (%)	Between-Group χ^2 (p Value)
Third contact	28.2	26.7	28.4	0.760 ($p = .684$)
Fourth contact	46.2	43.3	44.1	1.777 ($p = .411$)
Fifth contact	58.8	57.8	56.9	0.703 ($p = .703$)

Note: *Z*-tests for proportions also show the increase in response rate with each additional contact is significant, with $p < .001$, for every instance across all three treatment groups.

costs (postage cost and data entry cost) of mail-only questionnaires was the highest at US$4.45 per completed questionnaire. The combined costs of questionnaires in the mail + two e-mail + two-mail group was lower, at US$2.70 per completed questionnaire. Finally, the three e-mail + two-mail group reported the lowest cost between the treatment groups per questionnaire at US$1.97 per completed questionnaire.

Assessment of Nonresponse Bias

We used the demographic and service utilization items from administrative data to compare respondents and nonrespondents. This comparison revealed several sources of bias. Moreover, the pattern of bias was similar across the treatment groups. The initial sample and respondents were overrepresented by whites relative to minority groups, those who attend a planned program, and clients who obtained information related to residential horticulture (detailed information is available online in Table A3).

We also used binary logistic regression to estimate the effect of demographic and service utilization attributes on response behavior after three, four, and five contacts in all groups. Table 2 displays the odds ratios of nonresponse bias factors by each group after the third through fifth contact. After the fifth contact in the mail-only group, significant nonresponse bias was detected for males, the black and Hispanic categories of race, and all categories of the program area except for the natural resources (Table 2). Statistically significant nonresponse bias appeared after the fifth contact (compared to the fourth) for males and the 4-H, agriculture, and community development categories of program area.

After the fifth contact in the mail + two e-mail + two-mail group, significant nonresponse bias was detected in the black and Hispanic

Table 2. Odds Ratios of Nonresponse Bias Factors by Treatment Group after Third, Fourth, and Fifth Contacts.

	Third Contact			Fourth Contact			Fifth Contact		
Factor	Mail Only (*Rs* = 275, 93.8% via Mail)	Mail, Two E-mail, Two Final Mail (1 + 2 + 2; *Rs* = 260, 88.4% via web)	Three E-mail Plus Two Mail (3 + 2; *Rs* = 278, 89.2% via Web)	Mail Only (*Rs* = 451, 95.8% via mail)	Mail, Two E-mail, Two Final Mail (1 + 2 + 2; *Rs* = 421, 56.1% via Web)	Three E-mail Plus Two Mail (3 + 2; *Rs* = 432, 58.8% via Web)	Mail Only (*Rs* = 574, 96.5% via Mail)	Mail, Two E-mail, Two Final Mail (1 + 2 + 2; *Rs* = 562, 52.8% via Web)	Three E-mail Plus Two Mail (3 + 2; *Rs* = 558, 53.0% via Web)
Male	0.996	0.807	1.059	0.826	0.761	0.917	0.686*	0.774	0.978
Race[a]									
Black	0.781	0.629	0.254**	0.456**	0.601	0.280**	0.374***	0.473*	0.257***
Hispanic	0.441*	0.426*	0.205**	0.553*	0.536*	0.217***	0.429**	0.482***	0.651***
Type of contact with extension[b]									
E-mail	2.393*	0.781	0.508	1.554	0.667	0.428*	1.278	1.386	0.945
Field visit	1.622	0.537	1.131	1.197	0.467	2.509	1.797	0.406*	1.715
Office visit	1.088	0.819	0.605*	0.964	1.007	0.835	0.956	1.115	1.105
Phone	1.144	0.595*	0.674	1.396	0.599*	0.966	1.230	0.681	1.027
Program area (subject)[c]									
4-H	0.540*	1.005	0.726	0.632	0.702	0.543**	0.410***	0.793	0.734
Agriculture	0.830	0.741	0.434***	0.771	0.798	0.504***	0.549**	0.837	0.748
Community development	0.000	1.366	0.560	0.199	0.979	0.714	0.099*	0.540	0.434
EFNEP	0.138	0.105*	0.077*	0.118**	0.105**	0.135**	0.081***	0.317*	0.306**
Family and Consumer Science	0.675	0.385***	0.416***	0.456***	0.460***	0.360***	0.342***	0.413**	0.416***
Natural resources	2.218*	2.839**	1.191	1.806	1.779	0.626	1.567	1.494	0.917

Note: EFNEP = Expanded Food and Nutrition Education Program.

[a]Reference category is white. [b]Reference category is planned program. [c]Reference category is residential horticulture.

*$p < .05$.

**$p < .01$.

***$p < .001$.

categories, field visit category for the type of contact with extension, and in the Expanded Food and Nutrition Education Program (EFNEP) and Family and Consumer Science categories of program area (Table 2). Statistically significant nonresponse bias appeared after the fifth contact (compared to the fourth) for blacks and the field visit category for the type of contact with extension variable while nonresponse bias was no longer significant for the phone contact category.

After the fifth contact in the three e-mail + two-mail group, significant nonresponse bias was detected in the black and Hispanic categories and in the EFNEP and Family and Consumer Science categories (Table 2). For this treatment, there was generally less nonresponse bias after the fifth contact as compared to the fourth, with the e-mail contacts with extension, as well as 4-H and agriculture categories of program area becoming nonsignificant.

We also examined the substantive responses to the survey questions across the three survey systems and found there were a few differences (see Tables B1–B14 in the Online Supplemental information). Regarding the four service quality measures, there was evidence by the fifth contact that the mail-only group was more likely to be "very satisfied" and less likely to be "satisfied" than the two mixed-mode groups. Meanwhile, after the fifth contact, the mail-only group had an older mean age than the mixed-mode groups. Generally, differences between the three experimental groups were substantively unimportant, which suggests that all three groups were equally biased or unbiased by nonresponse.

We also used binary logistic regression to assess whether nonresponse bias increased or decreased between the third and fourth as well as fifth contact during the sequence of contacts. This analysis showed that all of the confidence intervals for each variable overlapped among the third, fourth, and fifth contact points, thus a significant increase or decrease in nonresponse bias between the contact points was not detected (the detailed results are available online).

Evaluation of Item Response Rates

Table 3 displays the aggregate item response rates by treatment and mode after three, four, and five contacts. There was a minimal difference seen between the three treatment groups for those who responded via mail. Similarly, there was little difference found between the mail-only and mail + two e-mail + two-mail groups for those who responded to questionnaires via the web, with the three e-mail + two-mail mixed-mode group resulting in slightly lower response rates after the third, fourth, and fifth contact

Table 3. Item Response by Treatment Group and Mode after Three, Four, and Five Contacts.

	Contact Information Available								
	After Three Contacts			After Four Contacts			After Five Contacts		
	Mail Only (*Rs* = 275, 93.8% by Mail; %)	Mail, Two E-mail, Two Final Mail (*Rs* = 260, 88.4% by Web; %)	Three E-mail Plus Two Mail (*Rs* = 278, 89.2% by Web; %)	Mail Only (*Rs* = 451, 95.8% by Mail; %)	Mail, Two E-mail, Two Final Mail (*Rs* = 421, 56.1% by Web; %)	Three E-mail Plus Two Mail (*Rs* = 432, 58.8% by Web; %)	Mail Only (*Rs* = 574, 96.5% by Mail; %)	Mail, Two E-mail, Two Final Mail (*Rs* = 562, 52.8% by Web; %)	Three E-mail Plus Two Mail (*Rs* = 558, 53.0% by Web; %)
Aggregate item response rate									
Mail	94.1	94.5	96.0	93.0	93.6	94.3	92.2	92.5	92.9
Web[a]	95.0	95.3	94.2	95.6	95.3	93.9	95.7	95.5	93.3
Total	94.1	95.2	94.4	93.1	94.5	94.1	92.4	94.1	93.2

Note: *Z*-tests for differences in proportions for the total aggregate item response rate between treatment groups and contact points are all nonsignificant.
[a]Sample size for web responses in mail-only group after three contacts was $n = 17$; after four contacts, $n = 19$; and after five contacts, $n = 20$.

points (Table 3). A comparison of the mail and web aggregate item response rates shows that the web questionnaires yielded slightly higher item response rates across all groups except for the three e-mail + two-mail group after three and four contacts. After the fifth contact, the mail item response rate dropped more than the web item response rate. This suggests that, at this stage, more mail respondents skipped items than web respondents. When exploring the total aggregate item response rates, there are minimal differences in percentage points between the response rates of the groups. Overall, the analysis indicates that item nonresponse is slightly higher for the fourth contact than the third and, likewise, higher after the fifth contact than the fifth, but none of these differences proved to be statistically significant.

Finally, we also used χ^2 analysis to examine response distributions between contacts for the demographic variables and several items pertinent to the FCES annual customer satisfaction survey (e.g., overall satisfaction with the FCES). The overall pattern of change from one contact to another in terms of the percentages in each category of a variable was not statistically significant (Tables B1–B13 in the Supplemental Online Material). The inclusion of a fifth contact did not show a significant influence on any of the response distributions.

Discussion

The results we discussed above indicate that mixed-mode systems utilizing web/mail surveys are able to achieve response rates comparable to the response rate for a unimode mail survey. These results are consistent with prior research (Dillman et al. 2014; Israel 2013a; Lesser et al. 2011; Stern et al. 2014). The use of web/mail mixed-mode surveys can help researchers reduce costs by sending e-mail invitations and collecting responses via the web (de Leeuw 2005; Israel 2013b), while the sequential use of modes provides an opportunity for respondents to act on their mode preferences. Moreover, the web/mail system realizes cost savings over postal-only surveys while obtaining higher response rates than those from web-only surveys (Israel 2013a; Millar and Dillman 2011).

The inclusion of a fifth contact resulted in significantly higher response rates within each treatment, while the difference between the groups was not significant. This becomes important when the cost per questionnaire is considered. The cost for surveys becomes dependent on the survey mode. Researchers and practitioners could save money in regard to postage and data entry costs if e-mails are emphasized in the mixed-mode system in

comparison to a mail-only or a mixed-mode system that emphasized postal contacts and mail questionnaires (see Holmberg et al. 2010).

In relation to nonresponse bias, the inclusion of a fifth contact did not result in a significant difference in nonresponse bias in all treatments. Given that this is one of the cornerstones for generalizing samples (Dillman et al. 2014; Groves et al. 2009), this was disappointing but consistent with previous studies (Groves 2006). We found that the three e-mail + two-mail group showed some decrease in bias occurrences from after the third contact to after the fifth contact. This group also reported the fewest categories of variables with bias after the fifth contact when compared to the other treatment groups. The mode switch to a paper contact at the fourth contact could have influenced some respondents to finally send in a completed questionnaire (as seen with the response rates increasing by dramatically between the third and fourth as well as fourth and fifth contact). While we have assessed patterns of nonresponse across four factors, we also note that there could be nonresponse bias in the other variables (e.g., satisfaction with services) measured in the survey; however, we do not have the data to test for nonresponse bias or any reduction in it.

With the slight reduction of bias detected in the mixed-mode groups, we argue that mixed-mode survey systems are an adequate survey methodology option for researchers. At the same time, it is important for researchers and practitioners to decide whether the use of a fifth contact is beneficial. One must determine whether the use of a fifth contact is worth the cost of sending out a questionnaire (e.g., postage in the case of mail surveys) and providing additional burden to participants since it did not significantly affect response distribution in this study. On the other hand, a high response rate increases the credibility of a survey for some stakeholders (Groves 2006), so we suggest that the fifth contact has some practical significance.

We observed a decline in the item response rates from the third to the fifth contacts within item response rates by treatment. This could have occurred due to the open-ended and descriptive items in the questionnaire. This finding is consistent with Messer et al. (2012), who found that question formats that require more effort than single-item, close-ended scale questions (e.g., open-ended questions) obtain higher rates of item nonresponse, regardless of the mode of response. We also can infer that respondents were less motivated to complete the item since they did not respond early.

We found that the unimode mail-only group had a lower total item response and lower aggregate item response rate when comparing them

to the mixed-mode groups after all points of contact observed, which is consistent with previous literature (Israel and Lamm 2012; Lesser et al. 2012; Messer et al. 2012). The mixed-mode groups had an advantage in yielding higher total item and aggregate item response rates because a large proportion of surveys were completed via the web before switching survey modes. The switch to mail likely influenced some nonrespondents to complete the survey even though their motivation was low or they perceived e-mailed survey invitations as dangerous (Groves et al. 2009).

It is also important to consider the balance between unit nonresponse bias and item response rates. The findings of this study showed that increasing the number of contacts and survey mode switching can encourage nonrespondents to complete surveys but at the price of weakening the data quality due to item nonresponse. Mason et al. (2002) found that their efforts to convert survey refusals (e.g., callbacks) produced higher item nonresponse, making the effort less effective in terms of estimates (as cited in Dixon 2005). The decline in item response rates in this study was minimal but still should be factored into survey methodology when considering the number of contacts.

Conclusion

We believe this study contributes to the literature discussing the number of contacts to use in a survey system. As this study shows, the use of a fifth contact is likely to increase unit response rates but may have little or no effect on reducing nonresponse bias. On the other hand, data quality, in terms of item response rates and item distributions, was generally unaffected. We suggest more research be conducted to assess the effects of using a fifth contact in survey methodology, especially with the use of mixed-mode survey systems when surveying an organization's clients. This may become crucial as costs for survey research continues to increase, budgets become tighter, and respondents become more difficult to reach.

In addition, our findings support previous literature that mixed-mode survey systems using web/mail surveys are a viable option to use in collecting data (Baines et al. 2007; de Bernardo and Curtis 2012; de Leeuw 2005; Dillman et al. 2009; Groves et al. 2009; Israel 2013a, 2013b; Stern et al. 2014). Mixed-mode survey systems can obtain comparable response rates to unimode mail survey systems and yield higher item response rates. In addition, an advantage of a mixed-mode survey over a unimode system is that it provides an opportunity for people who may be less likely to respond via one mode to participate using another (see Smyth et al. 2010).

One limitation of our study is that the intended mode did not work for some participants when implementing the survey. This led us to redefine the experimental treatment groups to retain individuals who could not be contacted via the designated mode. In our study, several clients in the mixed-mode groups had their e-mail invitations bounce and were sent paper questionnaires via postal mail. At the same time, some clients from the unimode contact group had their postal invitations returned and were sent e-mail invitations as a result. We think this makes sense if you are trying to maximize the coverage of your sample.

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