The Role of Email Communications in Determining Response Rates and Mode of Participation in a Mixed-mode Design

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Abstract

This article is concerned with the extent to which the propensity to participate in a web-face-to-face sequential mixed-mode survey is influenced by the ability to communicate with sample members by email in addition to mail. Researchers may be able to collect email addresses for sample members and to use them subsequently to send survey invitations and reminders. However, there is little evidence regarding the value of doing so. This makes it difficult to decide what efforts should be made to collect such information and how to subsequently use it efficiently. Using evidence from a randomized experiment within a large mixed-mode national survey, we find that using a respondent-supplied email address to send additional survey invites and reminders does not affect survey response rate but is associated with an increased proportion of responses by web rather than face to face and, hence, lower survey costs.

Introduction

This article concerns sequential mixed-mode surveys in which the first phase (mode) is web and the second is face-to-face interviewing and in which the first communication with sample members is by mail and includes an invitation to participate online. This is a common type of design (Lynn 2013; Millar and Dillman 2011) and therefore a context of interest to many researchers. Our focus is the use of email for *additional* communications (invitation or reminders) during the first (web) phase of field work, *not to substitute* mail communications. We investigate whether these additional communications affect propensity to participate in the survey (participation propensity) and propensity to respond online rather than face-to-face (mode of participation). It is important to establish whether these additional communications have beneficial effects, because they are not cost free.

There is often a cost associated with initial collection of email addresses, as these are typically not available on the sampling frame. In longitudinal surveys, researchers can ask sample members to provide an email address to contact them at subsequent waves. A similar opportunity may also arise in some types of one-time web surveys such as visitor surveys, where visitors may be handed a card or letter asking them to go online and complete a survey. At the same time, they could be asked to supply an email address. However, the request may be seen as intrusive and the information as sensitive and private (though Bandilla et al. [2014] found no effect of asking for an email address on participation in a follow-up survey). Furthermore, resources are required to capture, clean, and manage the collected email addresses. Researchers should therefore be assured of the value of asking for an email address before doing so.

There are at least two potential advantages of additional communications by email. First, they may increase participation propensity. Second, they may reduce data collection costs if a higher proportion of respondents participate online rather than face to face. The mechanisms that could bring about each of these two effects are discussed in the next sections. Aside from response propensity and cost, speed of response can also be an advantage of email communication (Mehta and Sivadas 1995; Schaefer and Dillman 1998), but this consideration only applies to single-mode web surveys in which all sample members can be contacted by email. To our knowledge, no study has investigated the effect of additional email communications on response propensity in either a mixed-mode or longitudinal context. This article therefore addresses important methodological questions that have yet to be tackled. Furthermore, the use of a nationally representative sample and a semi-experimental design provides a strong basis for inference and a context from which a degree of generalizability can be assumed.

Background

Email Contact and Participation Propensity

There are at least three mechanisms through which additional email communications could increase participation propensity compared to mail alone. First, emails could reduce the risk of failing to make contact with the sample member. Non-contact is a major component of survey nonresponse (Groves and Couper 1998) and the probability of it occurring depends on the number, nature, and timing of contact attempts (Lynn 2008). Email communications are different than mail communications in a number of ways that are relevant to contact propensity. They tend to arrive in a personal inbox, checked only by the intended recipient, whereas mail is delivered to a letterbox that may be shared by other residents. Consequently, mail can be removed by another person before the intended recipient sees it, whereas email generally cannot (with the exception of spam filters). Also, many people check their email inbox several times a day and may do so from multiple locations, whereas checking a mail box requires physical presence and may not be done often. For these reasons, additional email communications may be seen by some sample members who would not otherwise have seen it.

The second mechanism by which additional email communications could increase response propensity is by reducing the burden of participation. Respondent burden (Bradburn et al. 1978; Sharp and Frankel 1983) encompasses several features of the task of survey participation, including the time it takes to perform survey tasks and the associated disruption to other activities. Greater burden can reduce the probability that a sample member will initiate, or continue with, survey tasks. Sending a survey invitation by email enables the recipient to participate by simply clicking on a link while already online, whereas if the invitation is received by regular mail the recipient must retain the letter until it is convenient to go online and must then type in a URL and enter a passcode. The latter takes more time and requires more effort: The additional burden is somewhat analogous to that involved in surveys that attempt to switch respondents from telephone interviewing to web, a design feature that has been shown to reduce participation propensity (Kreuter et al. 2008).

The third mechanism by which additional email communications could increase response propensity is not specific to the mode (email) of the communications. The extra communications could simply serve as reminders that prompt some sample members to participate.

Millar and Dillman (2011) found that adding two email communications in a single-mode cross-sectional web survey that otherwise involved three mail communications

significantly increased response rate, though their study was of undergraduate students, all of whom had email addresses and were assumed to be web users. Several other studies have examined aspects of the use of email communications in the single-mode web context, but none of these studies assessed the effect of email communications additional to mail communications.

The effect of substituting email communications for mail communications was tested by Porter and Whitcombe (2007), Millar and Dillman (2011), and Kaplowitz et al. (2012), all of whom found no effect. Bandilla et al. (2012) found higher response rates with mail rather than email invitations (in the absence of a mailed prenotification letter). Kaplowitz et al. (2004) compared different combinations of email and mail communications, but all treatments included an email communication so their study cannot be used to compare designs with and without email communications. Bosnjak et al. (2008) found higher response rates with email invitations rather than SMS invitations. A meta-analysis carried out by Manfreda et al. (2008) found that web surveys achieved a higher response rate when the invitation was delivered by email rather than mail, but they, too, did not assess the marginal effect of email communications additional to mail contacts. Muñoz-Leiva et al. (2009) found that additional email reminders could increase response rates when previous communications had also been by email, but did not compare treatments that involved mail communications. Bosnjak et al. (2008) compared mode of prenotification, but not of invitation or reminders.

In single-mode self-completion surveys, additional communications tend to increase response rates regardless of whether the communication is a pre-notification or a reminder and for both web and paper surveys (Cook et al. 2000; Dillman 2000; Dillman et al. 1995).

Email Communications and Mode of Participation

In a sequential mixed-mode design where sample members are first invited to complete the survey online and subsequently approached for interview (either face to face or by telephone) only if the web survey has not been completed, additional email communications could increase the propensity to complete the survey online, even if overall participation propensity (as discussed in the previous section) is not affected. In other words, conditional on participation, respondents may be more likely to participate in web mode rather than interviewer mode. The mechanisms through which this shift in the distribution of mode of participation could occur are essentially the same ones outlined above: The email invitation may increase the probability of the sample member being aware of the invitation (contact) or may make online participation easier (burden). Whether the outcome of these mechanisms increases the overall participation propensity or the proportion of responses made online

depends on the extent to which sample members who only participate online as a result of the email communications would otherwise not have participated at all (overall participation propensity) or would have participated by interviewer mode in the second phase of the field work (mode of participation).

Moderating Factors

Any effects of email communications may be moderated by other factors. Three types of factors are of interest: socio–demographic characteristics, reactions to earlier requests to provide an email address, and survey characteristics. A wide range of socio–demographic characteristics have been found to moderate the effectiveness of survey design features intended to increase participation propensity. In the longitudinal survey context, reviews of such effects can be found in Watson and Wooden (2009) and Uhrig (2008). Nonresponse theory does not posit that these characteristics have a direct causal effect, but rather that they act as markers for variations in at-home patterns, time availability, psychological dispositions, and relevant attitudes (Groves and Couper 1998; Groves et al. 2000). Knowledge of the moderating effects of socio–demographic characteristics can be useful to researchers implementing longitudinal surveys as design features can then be targeted at subgroups for whom they are expected to be effective (Lynn 2014b).

Two aspects of sample members' reactions to requests for email addresses can be of operational interest. The first is how recently an email address was provided. Any moderating effect of this on the effect of email communications may have implications for how frequently researchers should ask sample members to provide an (updated) email address and/or for whether email communications should be restricted to sample members who provided/confirmed an email address relatively recently. The second aspect is the reaction of other household members to the request to provide an email address. (This applies only to surveys that collect data from multiple members of a household.) Other household members may influence a sample member's survey participation decision, and this may be particularly likely in the case of spouses and partners, whose relationship will tend to be the closest.

A survey characteristic pertinent to design decisions for longitudinal surveys is time spent in the sample (Kalton and Citro 1995). Some features are more effective for recently joined sample members, while others work better among long-term sample members (see, e.g., Couper and Ofstedal 2009; Lynn 2014a). The effect of additional email communications, too, could be moderated by time in sample.

Research Questions

Based on the discussion above, we hypothesize that additional email communications will increase participation propensity and the proportion of responses submitted online. We do not have specific hypotheses regarding the nature of moderators, but we wish to identify the extent and nature of any moderating effects as these may have implications for survey design. Our research questions are:

1. Do additional email communications affect overall participation propensity?
2. Are effects on participation moderated by how recently the sample member provided an email address or by whether their partner has provided an email address?
3. Are any of the effects in (1) or (2) moderated by characteristics of sample members or by time in sample?
4. Do additional email communications affect mode of participation (propensity to participate in web mode rather than interviewer mode)?
5. Are effects on mode of participation moderated by how recently the sample member provided an email address or by whether their partner provided an email address?
6. Are any effects in (4) or (5) moderated by characteristics of sample members or by time in sample?

Study Design

We use data from wave 5 of the Understanding Society Innovation Panel, a household panel designed specifically for methodological development and testing (Uhrig 2011). The Innovation Panel is based on a stratified, clustered, probability sample of residential addresses in Great Britain (Lynn 2009). All current residents at sample addresses in April to June 2008, when interviewers carried out wave 1 of the survey, were designated panel members and were followed up for subsequent waves at one-year intervals. A refreshment sample, selected through the same design, was added at wave 4. At each wave, data are collected from all adult household members, even though not all such people are themselves panel members. At each wave, respondents are asked to provide a range of contact information, including email addresses. Waves 1, 3, and 4 involved single-mode computer-assisted personal interview (CAPI) data collection, while wave 2 had an experimental computer-assisted telephone interview—CAPI mixed-mode design (Lynn 2013).

Wave 5 fieldwork took place from May to July 2012. A random two-thirds of sample households were allocated to a web-CAPI sequential mixed-mode design, while the other one-third was administered single-mode CAPI. This randomized allocation to mode treatment

allows identification of the effect of additional email communications on participation rates. We discuss how we do this in the next section. In the mixed-mode treatment, each sample member aged 16 or over was sent a letter inviting him or her to take part by web. The letter included the URL and a unique user ID, to be entered on the welcome screen. A version of the letter was additionally sent by email to all sample members who had previously supplied an email address (around half of the sample; email = 1 in Table 1) with a live link to the survey.

[TABLE 1 ABOUT HERE]

For the 20% of respondents who had indicated at previous waves that they do not use the Internet regularly for personal use, the letter informed them that they would be able to do the survey with an interviewer. Up to two email reminders were sent at three-day intervals. Sample members who had not completed the web interview after two weeks were sent a mail reminder and interviewers then started visiting to attempt CAPI interviews. The interviewer visits began in the same week that the reminder letter would have been received. The web survey remained open throughout the fieldwork period.

In the single-mode CAPI treatment, each sample member was sent a letter explaining that an interviewer would soon visit their address. The design and content of the letter was identical aside from the paragraph that mentioned an interviewer visit instead of inviting online participation (see annex). The contact sequence for each sample group is summarized in Table 1.

The present study is based on sample members issued to the field for the wave 5 survey (N = 3,059). These constitute around 45.7% of all potentially eligible panel members, due to nonresponse at previous waves. The survey outcomes are our dependent variables of interest.

Variables and Methods

Our dependent variables are indicators of whether the sample member completed the individual interview at wave 5 and, if so (for the mixed-mode sample), whether they completed it in web mode or by CAPI. Key independent variables are dichotomous, taking the value 1 if a characteristic or design feature applies and 0 otherwise. Mode treatment indicates whether the sample member was allocated to the mixed-mode treatment rather than single-mode CAPI; Time in sample indicates membership of the original sample rather than the wave 4 refreshment sample. Email indicates whether an email address was supplied by the sample member prior to wave 5. Note that this is independent of Mode treatment: The

request to provide an email address was made of all sample members at waves 1 to 4 without knowledge of the mode treatment to which they would be assigned at wave 5.

For sample members with Email = 1, Email wave is a categorical variable that indicates the (most recent) wave at which an email address was supplied. Partner's email indicates whether an email address was supplied by the sample member's partner. Fourteen additional variables are included in our models as controls for the selectivity effect in supplying email addresses. These include socio–demographic indicators such as age, gender, education, and ethnicity, and a set of variables expected to be associated with propensity to respond in web mode, such as having home broadband, regular internet use, and stated mode preference. All 14 variables are described in the appendix.

Three logistic regression models are developed:

Model 1 predicts participation based on the full sample. Here we exploit the random allocation into mode designs to test the interaction between Email and Mode treatment. This coefficient indicates whether the extra Email contact actually aids the response process. To understand why this is the case, Figure 1 presents the expected relationships in the two randomized groups: single mode and mixed mode. If a relationship between Email and Survey response is found in the single mode design then this is due to a common cause, for example, a general tendency to be cooperative. This is because people in the single mode were not contacted by email, so no direct causal effect of Email on Survey response is possible. On the other hand, any difference in the effect of Email between single mode and mixed mode can only be due to the effectiveness of additional email communications. Thus, if a main effect of Email on participation is found, but no interaction with Mode treatment, then Email simply indicates a tendency to be cooperative, whereas an interaction in which the effect of Email on participation is stronger for the mixed-mode group would suggest that email communications enhance response propensity.

[FIGURE 1 ABOUT HERE]

Model 2 predicts survey participation conditional on being in the mixed-mode treatment. This allows us to test the effect of Email, and interactions between this and other respondent characteristics, in the mixed-mode context of interest. Model 3 predicts mode of participation conditional on participation based on the mixed-mode group alone. In each model, we test interactions of Email and Partner's email with Time in sample as a test of whether any effect of email communications depends on time in sample. We also test whether Email wave is significant, as a test of whether effects depend on how long ago the email address was supplied. All results below are presented in odds ratios. An effect of 1

means no relationship between independent variable and outcomes (survey participation), while an effect larger (smaller) than 1 indicates the extent to which the chances of participating increase (decrease) when the independent variable increases by 1.

Results

(1): Effect of Additional Email Communications on Survey Participation

Our main research question concerns the effect of additional communications by email on overall participation propensity in the web-CAPI sequential mixed-mode survey context. Results from Model 1 (Table 2) show that the overall effect on participation, in the entire sample, of the respondent having supplied an email address is positive (OR 1.72, $p < 0.01$). As mentioned previously, this confounds unobserved characteristics, such as general cooperativeness, with the direct effect of additional communications by email. To separate the two we must look at the interaction between Email and Mode treatment in Model 1. This is not significant (OR 0.7, $p > 0.1$), indicating no evidence that the effect on propensity to participate differs between the mixed-mode treatment (where the email address was used for additional communications) and the single mode CAPI treatment (where it was not used).

(2) and (3): Moderators of the Effect of Additional Email Communications on Survey Participation

Though no average effect of additional email communications was found, it is possible that effects may operate differentially across subgroups. To test for such moderating effects, we test interactions between each potential moderating variable and the randomly allocated mode treatment. We find a significant interaction between Mode treatment and Partner's email (Table 2). In the mixed-mode context, those whose partners had supplied an email address were significantly more likely to have participated, whereas in the single-mode CAPI context no such effect was observed. This is confirmed by a significant main effect of Partner's email in Model 2 ($p < 0.01$) but not in Model 1. There is no evidence that any effect of Email or Partner's email acts differentially between sample subgroups or is moderated by whether the sample member has broadband internet access at home or whether they are a regular internet user. Furthermore, interactions with Time in sample or replacing Email with Email wave are not significant in Models 1 or 2.**[**

[TABLE 2 ABOUT HERE]

(4): Effect of Additional Email Communications on Mode of Participation

In Model 3, we model the propensity to answer by web as opposed to CAPI conditional on participating in the mixed-mode survey. The significant main effect of email indicates that sample members who had provided email addresses were more likely to respond in web mode rather than face to face (OR 1.77, $p < 0.01$). It should be noted that in this model we cannot take advantage of an experimental design, as there was no further randomization to treatment (receiving additional email communications) within the mixed-mode group. Instead, we rely here on the inclusion of the other 15 independent variables to provide a control for non-random supply of an email address. The result suggests that additional email communications increase the propensity to respond by web rather than by face-to-face interview, thus reducing survey costs.

(5) and (6): Moderators of the Effect of Additional Email Communications on Mode of Participation

In extensions of Model 3 (results not shown), we investigated interactions between email and time in sample and between email and each of the 14 control variables. Two significant interactions were found: The effect of email is stronger for those in urban areas (email * urban $\hat{\beta} = 0.48$; $p = 0.04$) and for those who do not own their own house (email * own $\hat{\beta} = 0.30$; $p = 0.01$). Also, we note that the main effect of partner's email is not significant in Model 3. This indicates that being able to communicate with the partner by email is not associated with mode of participation over and above the effect of being able to communicate with the respondent by email.

Discussion

We find no evidence that additional email communications (invitation and reminders) in the first phase of a web-CAPI sequential mixed-mode survey affect participation propensity. However, such additional email communications appear to be associated with a higher propensity to respond in web mode as opposed to CAPI, an outcome that brings cost savings.

Previous studies have generally found additional communications of any sort to improve response rates (Cook et al. 2000; Dillman et al. 1995). One might question whether our failure to find such an effect is caused by our study being based on a panel, whereas previous studies were cross-sectional. Panel members may be relatively committed respondents and consequently less sensitive to influences on their participation propensity. However, we doubt this explanation for two reasons. First, the proportion of persons issued to

field at wave 5 who completed the individual interview was only 70.6% (see Table 3 in the supplemental online material), suggesting some scope for influence. Second, the absence of an interaction between email and time in sample implies that our results hold equally at the second and fifth annual waves of a survey.

An alternative explanation may be that encountering URLs while offline and having to retain them until a suitable occasion when one is online, and entering passwords, may have become common and routine activities that are not a big barrier to participation. The extra convenience of being able to click a link may be rather trivial. Additionally, we do not know how many sample members actually received our emails. Some emails may have been diverted by spam filters (Fan and Yan 2010) and others may simply have been left unopened. The email addresses provided by respondents may, in some cases, relate to accounts set up primarily for receipt of commercial mailings and the like. At wave 6, only 30% of our invitation emails were opened by the recipient (Wood and Kunz 2014). We suspect that a more important difference between our context and that of earlier studies is the sequential mixed-mode design. In our design, the control treatment included not only two mailings but also extensive face-to-face contact attempts. Most of the other studies discussed earlier in this article took place in contexts where the control treatment did not include any in-person contact attempts (telephone or face to face).

Intriguingly, additional email communications with the sample member's partner appears to increase response propensity in the mixed-mode context. This may indicate that email communications with both members of a couple has a positive effect (from the researcher's perspective) on both (recall that in most cases, the partner of a sample member will themselves be a sample member too in our design), whereas email communication with just one person has no effect on the response behaviour of that person.

With regard to the mode of participation in a sequential web-CAPI design, we find that additional email communications during the web phase increase the propensity of respondents to respond by web rather than CAPI (conditional on participation). This can help reduce survey costs. However, the effect is not observed in rural areas or among home owners. The identification of heterogeneous effects across socio–demographic groups such as these might be useful for future research and for targeting (Lynn 2014b). Our findings regarding mode of participation require replication, preferably with an experimental allocation of email communications. We have tried to counter the possible selectivity in the process that leads to provision of an email address by controlling for relevant respondent characteristics and by interacting email with all the controlling variables, but the possibility remains of unobserved heterogeneity.

In conclusion, to our knowledge, this study provides the first evidence of the effects of additional email communications in a sequential mixed-mode panel survey context. The benefits may be less than in the context of single-mode web surveys. Researchers should evaluate carefully whether the intrusion and effort implied by a request to supply an email address are warranted. In a mixed-mode context, as a means to improve participation rates, collecting email addresses may not be worthwhile. However, as a means to save costs by increasing the proportion of respondents who participate in web mode, the use of emails could be effective. Further research is required to replicate our findings in different populations, to better identify the determinants of mode of participation in sequential mixed-mode designs and to learn more about the circumstances in which additional email communications are worthwhile.

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Note

1. Those who chose "Definitely would not" for the item: "And if next year we asked you to complete a questionnaire on the Internet, how likely is it that you would complete the questionnaire?"

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Table 1: Survey contact sequence for each sample group

Treatment	Email address provided by respondent	Day 1: Mail invite	Day 2: Email invite	Day 5: Email reminder	Day 8: Email reminder	Day 14: Mail advance letter	Day 14: Mail reminder	Day 15-35: CAPI fieldwork	N	AAPOR RR1 (%)
Single-mode CAPI (MODE=0)	Yes or No (Email*=1 or 0)					✓		✓	1047	66.86
Mixed mode web-CAPI (MODE=1)	Yes (Email*=1)	✓	✓	✓	✓		✓	✓	922	72.45
	No (Email*=0)	✓					✓	✓	1090	55.14

Table 2: Odds ratios (standard errors) from logistic regression models of response and mode of response

Model	1	2	3
Dependent variable	Response	Response	Response by web
Analysis base	Total sample	Mixed mode sample	Mixed mode respondents
Mode treatment	0.75+ (.12)		
Email	1.72** (.33)	1.17 (.17)	1.77*** (.29)
Mode treatment * Email	0.70 (.16)		
Partners email	0.79 (.16)	1.63** (.27)	1.27 (.23)
Mode treatment * Partners email	2.01** (.47)		
Education			
A levels	0.85 (.16)	0.84 (.19)	1.44 (.39)
GCSE or CSE	0.97 (.14)	0.89 (.16)	0.98 (.19)
Vocational/none	0.77+ (.11)	0.76 (.14)	0.65* (.13)
Missing	0.74 (.47)	0.33 (.25)	0.29 (.42)
Urban	1.12 (.13)	1.36* (.19)	1.3 (.22)
Female	1.13 (.12)	1.1 (.13)	1.02 (.15)
Age	1.05** (.02)	1.03+ (.02)	1.03 (.03)
Age[1]	1.00* (.00)	1.00 (.00)	1.00 (.00)
In couple	1.16 (.16)	1.06 (.17)	1.82** (.38)
White British	1.44* (.21)	1.40* (.24)	1.12 (.26)
Employed	0.72** (.09)	0.79 (.12)	0.86 (.15)
Own house	1.43** (.17)	1.33* (.19)	2.43*** (.46)
Household size	0.85*** (.03)	0.84*** (.04)	0.87* (.05)
Has mobile	1.26 (.26)	1.61* (.39)	1.46 (.58)
Broadband	1.73*** (.27)	1.63** (.29)	3.60*** (1.02)
Daily internet	1.08 (.14)	1.02 (.16)	1.70** (.28)
Mode preference			
CATI	0.97 (.47)	0.87 (.49)	1.18 (.75)
Postal	0.69* (.11)	0.79 (.15)	1.48+ (.33)
Web	0.61*** (.09)	0.62** (.11)	1.88** (.37)

No preference	0.12*** (.02)	0.14*** (.03)	1.63+ (.49)
Not by web[i]	1.32+ (.22)	1.02 (.20)	0.54** (.11)
Pseudo R-squared	0.18	0.16	0.24
N. of cases	2,522	1,665	1,142

Notes: For education, the reference category is higher degree; for mode preference the reference category is CAPI;

*** $p < 0.001$; ** $0.001 \leq p < 0.01$; * $0.01 \leq p < 0.05$; + $0.05 \leq p < 0.10$

[i] Those that chose "Definitely would not" to the item: "And if next year we asked you to complete a questionnaire on the internet, how likely is it that you would complete the questionnaire?"

Figure 1: The link between the experimental data collection design and analysis strategy