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Text messages to incentivise response in a web-first sequential mixed-mode survey

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Non-technical summary

In longitudinal studies, wave nonresponse and panel attrition threaten data quality since they can lead to biased estimates if participants not responding or dropping out of the study are different from those who continue to participate. Different strategies can minimise the impact of nonresponse during the fieldwork. For instance, survey incentives or increasing the number of calls have been successful in increasing response rates. This paper explores one such strategy: the use of text messages as an additional contact mode in a mixed-mode longitudinal study.

Understanding Society, the United Kingdom Household Longitudinal Study (UKHLS), is a sequential mixed-mode survey where participants are invited to a web survey and nonrespondents followed using an interviewer-administered mode. Every year, participants are invited to the web survey using a combination of letters and emails. In this research, we explore the effect of adding text messages to the usual contact strategy on survey response. The expectation is that adding the SMS would increase response rates at the web stage, reducing the number of cases issued to the interviewers. This reduction in the fieldwork efforts could translate into cost savings.

An experiment was embedded in wave 11 of Understanding Society to gauge the effect of the additional messages. In the experiment, the sample was randomly allocated to four groups: the control group received the usual letters and emails; the second group, in addition to the standard contact strategy, received an SMS invite with the survey link; the third group received two SMS reminders, and the fourth group received the SMS invite and the two reminders. The analysis of the results focuses on the impact of adding this new contact mode on survey response and fieldwork efforts at the interviewer-administered stage. We also examine the impact on device selection, time passed between the invite and response, and sample balance.

The results show that adding the text messages to the contact strategy had a small effect on the response propensities of those who had agreed to provide their contact details – email and mobile number. Moreover, the positive effect observed at the web stage remained at the end of the fieldwork for some subgroups. This positive effect did not significantly reduce fieldwork effort overall, though it may have been helpful for some subgroups, notably those aged 16-29 and those with degree-level qualifications.

Text messages to incentivise response in a web-first sequential mixed-mode survey

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Abstract: This working paper reports research exploring the benefits of adding text messages to the contact strategy in the context of a sequential mixed-mode design where telephone interviewer administration follows a web phase. We present results from a survey experiment embedded in wave 11 of Understanding Society. Effects of the text messages on survey response and fieldwork efforts were assessed. We also investigated the effect on the device selected to complete the survey, time to response, and sample balance. The results show a weak effect of the SMS reminders on response during the web fieldwork. However, this positive effect did not significantly reduce fieldwork effort.

Keywords: panel attrition, response maximisation, contact modes, text messages, sequential mixed-modes.

JEL classification: C81, C83.

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INTRODUCTION

In recent decades, the steady decline in response rates has prompted research into strategies for maximising survey response. The response maximisation strategies propose to modify survey design features, like calling patterns, contact modes, or incentives, to prompt location, contact and cooperation. This paper investigates the benefits of adding text messages to the contact strategy in a sequential mixed-mode survey that combines a web stage followed by an interviewer-administered mode. Supplementing the contact strategy with text messages can positively affect response propensities at the web stage. Moreover, in a sequential mixed-mode survey with web as the first mode, the increase of response rates at the web stage can help reduce the number of sample members issued to the interviewer-administered mode and, consequently, reduce survey costs.

Text messages have features that make them attractive for inclusion in a survey contact strategy. First, most of the population has mobile phones and is familiar with text messages. Second, an increasing proportion of mobile phones are smartphones with an internet connection, enabling the use of survey links to access the questionnaire in web surveys. This appeal explains why several experiments have gauged the effect of text messages on survey response in cross-sectional web surveys in the last decade. However, there is a lack of evidence about the effect of text messages on survey response and fieldwork efforts in the context of a sequential mixed-mode survey. Moreover, to our knowledge, there is a lack of research on the use of SMS to prompt web response in longitudinal surveys, where most participants have been interviewed before, and previous survey experience could shape the effect of the messages.

This paper presents the results of an experiment embedded at wave 11 of *Understanding Society*, a sequential mixed-mode longitudinal survey. We tested three different ways of augmenting the standard mail and email invite and reminder communications with different types – invites and reminders – and numbers – one, two and three – of SMS: 1) adding an SMS invite, 2) adding two SMS reminders, and 3) adding both the SMS invite and two reminders. Results show that two SMS reminders increase survey participation at the web stage among those who had provided their mobile number in the previous waves. However, the increase in individual response does not significantly reduce fieldwork efforts. Also, smartphone completion increased among those receiving SMS reminders, and no effect was observed in the time mediating between the contact and the response or sample composition.

In this paper, first, we present a literature review about the use of text messages in survey research. Second, we outline the research questions. Third, the methodology section covers a brief description of *Understanding Society*, the design of our experiment, and the analysis methods. Finally, we report and discuss the analysis results and present the main conclusions.

Text messages and response mechanisms

Four mechanisms can explain the link between adding a new mode to the contact strategy – text messages – and response in a web survey: 1) reinforcing the messages delivered by other modes; 2) reaching sample members who are not contacted by other modes; 3) facilitating access to the take-part message and survey, and 4) building trust in the message and survey.

First, text messages can reinforce the message delivered by other modes. This mechanism does not rely on the unique characteristics of SMS compared to other contact modes but on the use of multiple mediums to contact participants. Receiving consistent messages through different modes would reinforce the effect of the message and can help boost response propensities (Dillman et al., 2014).

Second, an additional contact mode – text messages – can help reach participants that cannot be contacted by other modes. Contact is a crucial stage in the response process; sample members need to be contacted before taking part in the survey (Groves et al., 1998). The failure to contact a sample member will hurt response propensities and can bias the estimates if those contacted are different from the uncontacted with regards to the target variable. This failure can happen because the contact details do not exist (e.g. individuals with no email account), the contact details are wrong (e.g. failure to update contact details), or the sample members overlook or deliberatively ignore the contact attempt (e.g. message identified as spam). Using an alternative contact mode to reach the sample members can mitigate this issue. Text messages can serve this purpose given that most of the population have mobile phones and are familiar with them. For instance, 45% of European and 68% of British adults receive or send SMS daily (European Commission, 2016).

Third, SMS can facilitate access to the message and the survey compared to other modes, especially emails. Compared to the effortless access to text messages that reach the personal phone and can be read immediately, emails may require further actions to reach the message (e.g. log on to the account). Moreover, some individuals have more than one email account that checks at

irregular intervals, while most people have just one personal mobile number (Bandilla et al., 2012). Another relevant feature of text messages is that they can contain a link to the questionnaire. This is a shared feature by emails as opposed to letters, where the participants need to type a link and, sometimes, a code to reach the survey landing page.

Fourth, SMS can help build trust in the message and the study. The directness of SMS can help to ensure that the full content of the message is read. Text messages combine brevity and direct contact (Rettie, 2009); they reach the mobile phone, do not require further logging, and can be read in a few seconds. The brevity and transience of SMS reduce the chances of overlooking or ignoring the message. These characteristics have made SMS a valuable instrument for behavioural interventions (Suffoletto, 2016), with positive results in the area of public health (Bobrow et al., 2014; Sallis et al., 2019; Vidal et al., 2014). Moreover, compared to emails, the prevalence of unsolicited messages is lower for text messages, making it more unlikely to identify the survey invite as spam mistakenly (Bandilla et al., 2012).

The use of text messages poses several legal and logistic challenges. First, it requires the survey organisation to have access to the sample members' mobile phone numbers and the right to use them. Local regulations impose restrictions on using SMS for research or commercial purposes in some countries, for example, the United States Telephone Consumer Protection Act and the European General Data Protection Regulations (Kim & Couper, 2020). Second, to effectively access the survey, the respondent's mobile needs to have an internet connection, and the survey has to be usable from a smartphone. Third, text messages allow for a significantly lower number of characters than emails and letters, which prevents the survey organisation from adding information or persuasive arguments. Likewise, their brevity and call for immediate action can also make the effect of SMS ephemeral (Mavletova & Couper, 2014).

Text messages and response

Some experiments have explored the effect of SMS on response propensities. Yet none of these studies are in the context of a web-first mixed-mode design, the object of this paper. Also, none of these experiments was conducted in a longitudinal study where participants are familiar with the survey. In these experiments, text messages have played different roles, such as prenotifications, invitations, or reminders. In the context of web surveys, the use of SMS as a contact mode results in lower response when substituting emails. However, the combination of both modes achieves

better results than when used separately. Bosnjak and his colleagues (2008) found in a web survey that email invitations resulted in a higher response rate than SMS invitations, especially if led by an SMS prenotification. Mavletova and Couper (2014), who experimented with email and SMS invites and reminders in a survey from an opt-in web panel, concluded that email performed better than SMS at the invitation stage. However, combining the email invitation with an SMS reminder achieved the highest response rate. In the Gallup Panel and the US Daily Tracking panel, Marlar (2017) found that combining SMS and email for the survey invitation and reminder outperformed using these modes individually. In the General Practitioner Patient Survey, they experimented with sending SMS reminders instead of postcards, achieving a similar overall response rate (Barry et al., 2020). More recently, Kim and Couper (2020) reported an experiment comparing the response rates of an RDD sample invited to take part in a web survey using SMS and a similar sample contacted and interviewed by phone. The results show that the sample receiving the SMS invites and reminders achieved a considerably lower response rate than the CATI sample. In contrast, other experiments found no effect of the text messages on response, such as Brujine and Wijnant (2014), Crawford et al. (2013), DuBray (2013), McGeeney and Yan (2016), and Toepoel and Lugtig (2018).

The beneficial effect of using SMS as a prenotification mode has also emerged in mail and telephone surveys. Virtanen, Sikïa, and Jokiranta (2007) used SMS to substitute a postcard in three mail surveys in Finland, finding a positive effect on the response rates in two of them. In the Australian Workplace Barometer, a random digit dialling sample, Dal Grande et al. (2016) found that sending SMS prenotifications improved the response rate compared to the group that just received a phone call. In contrast, the experiments that tested the impact of SMS on response rates carried out by Brick and his colleagues (2007) and Steeh, Buskirk, and Callegaro (2007) found no effect.

In addition to boosting response propensities, text messages can alter the respondents' decision on the device used to complete the questionnaire in web surveys. The main concern is that SMS can increase the smartphone completion rate, which could have a detrimental impact on data quality. Although recent research has shown no negative effect of smartphone completion on data quality (Maslovskaya et al., 2020), the questionnaire design should be adapted to minimise adverse effects. Some of the experiments embedded in cross-sectional surveys have looked at device selection.

The results show a consistent trend: those receiving an SMS with a link to a web questionnaire are more likely to complete it on a smartphone (Barry et al., 2020; Crawford et al., 2013; De Bruijne & Wijnant, 2014; Mavletova & Couper, 2014; Megan E Patrick et al., 2020). For instance, McGeeney and Yan (2016) found that receiving a text message invitation in addition to an email increased the percentage of smartphone completion from 33% to 51%. This trend is expected to grow as smartphone use spreads among the general population (Peterson et al., 2017). This push-to-mobile effect requires that the SMS invitation contains a link to the survey and that the respondent's device meet the technical requirements to navigate the questionnaire.

Other outcomes likely to be affected by text messages are the time to response and sample composition. The importance of the time passed between the survey invite or reminder reaching the sample member and questionnaire completion is relevant for survey costs (Carpenter & Burton, 2017). Earlier participation would prevent the survey organisation from sending additional letters, emails or texts. The evidence from cross-sectional web surveys says that those who receive a text message with the survey link tend to complete the questionnaire faster compared to those who get an email (De Bruijne & Wijnant, 2014; Mavletova & Couper, 2014; McGeeney & Yan, 2016). The effect of text messages on response propensities can also affect sample composition. This effect has been studied once. Bosnjak et al. (2008), who experimented with email and SMS prenotifications and invitations in a web survey, compared the sample profile of the experimental groups. They found no differences with regards to some sociodemographic characteristics and attitudinal questions.

Moderators

The effect of text messages on response can be moderated by four types of factors: survey and contact strategy features, SMS features, individual characteristics, and social norms and context as shown in Figure 1. The heterogeneous effects of SMS are of interest to identify the groups that are more likely to increase their response rate and target them at the design stage of future surveys.

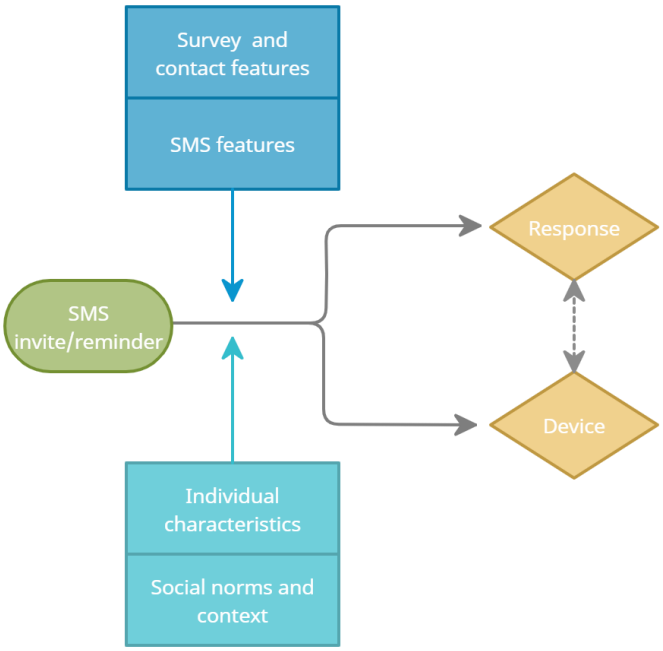

Figure 1. SMS as a contact mode in web surveys

Survey and contact strategy characteristics can modify the effect of text messages on response or device choice. Some relevant characteristics include survey mode or the topics covered, which have been shown to affect response rates in several studies (Edwards et al., 2014; Groves et al., 2012). The research team can, to some extent, control these features to maximise the effect of the intervention.

The SMS characteristics, also under the research team control, cover the number and frequency of SMS and the content of the message, including the appeal, level of personalisation, and format (Sahin et al., 2019). The effect of modifying these features on different outcomes has been explored in the context of behavioural sciences to, for instance, improve the uptake of health checks or diabetes self-management (Sallis et al., 2019; Suffoletto, 2016). In survey research, Respi and Sala (2017) tested the personalisation of the SMS, including a salutation with the participant's name. They found that the personalisation of the text message increased the response rate. In the experiment reported in this paper, we test two features: the number – one, two or three – and the type – invite or reminder – of messages.

The sociodemographic characteristics of the individuals can also shape the effect of the SMS on response or device choice. Several studies have shown that younger respondents are more likely to complete surveys on smartphones (Gummer et al., 2019; Toepoel & Lugtig, 2014), revealing how this group interacts with technology. This evidence suggests that SMS invites including a link to the questionnaire might have a higher impact among younger respondents. Having a smartphone can be essential if the objective of the SMS is to push the respondent to the web questionnaire. It is expected that smartphone users are more likely to respond after receiving the text message, given that they just need to follow the link to complete the survey. Moreover, the use and understanding of SMS vary across cultural backgrounds (Tan et al., 2014). Ethnicity is a proxy of cultural background, correlated with response in longitudinal surveys (Watson & Wooden, 2009), which could alter how sample members react to SMS. Other demographics such as gender, urbanicity, or education that have been found useful in explaining the effect of other response maximisation strategies on response could also help explore the effect of text messages. In the context of a longitudinal study, the sample member's participation record can also modify the effect of text messages on response (Watson & Wooden, 2009).

Social norms and context can modify the effect of text messages. Users perceive text messages as a more personal and intrusive mean of communication than emails (Tan et al., 2014; Taylor and Vincent, 2005). Participants with deeper privacy concerns who are less likely to cooperate with different aspects of research (Sala et al., 2012; Struminskaya et al., 2021; Wenz et al., 2019) could react differently to text messages. Also, the immediate social context, the household where the sample member lives, can influence how they react to the SMS. For instance, Cernat and Lynn (2018) found that sending emails in addition to letters was more effective for sample members whose partner had also provided their email and, therefore, received the email communications.

Research questions

The main objective of this paper is to assess whether adding text messages to a contact strategy can increase response propensities at the web stage of a sequential mixed-mode survey. Hence, first, we address the effect of the SMS on response and explore the variations in the effect over sample subgroups.

- Does adding text messages to a web-first mixed-mode survey result in a higher response rate at the web stage of the fieldwork?

- Does adding text messages to the contact strategy affect the final survey response rates (after both the web and telephone phases)?
- What is the optimal number and type –invite or reminders– of text messages to boost response rates?
- Does the effect of the SMS on response propensities vary across the levels of the moderators?
- Does the SMS effect differ between those issued to the web at the previous wave and those previously issued to CAPI?

Second, we explore whether SMS invitations at the web stage reduce the fieldwork efforts at the CATI stage.

- Do text messages during the web stage modify the fieldwork efforts at the interviewer-administered stage?

Third, we examine the effect of SMS on device selection, time to response and sample composition.

- Are the panel members who receive text messages with the survey link more likely to respond on a smartphone?
- Is the effect of SMS on device choice affected by any moderator?
- Do the respondents who received the SMS take less time to start or complete the questionnaire?
- Does the use of SMS in the contact strategy affect the final sample composition?

DATA AND METHODS

Understanding Society

Understanding Society: The United Kingdom Household Longitudinal Study (UKHLS) is a national probability survey started in 2009 that, since wave two, includes the former British Household Panel Survey (BHPS). The target population of the UKHLS is individuals of all ages residing in the United Kingdom. The fieldwork at wave 1 covered more than 100,000 persons from 40,000 households. The panel, which is representative of the United Kingdom, includes two boost samples, the Ethnic Minorities Boost (wave 1) and the Immigrant and Ethnic Minority Boost (wave 6) (Lynn, 2009; Lynn et al., 2018). At wave 11, where the SMS experiment was embedded, Kantar and NatCen Social Research, the research agencies responsible for the fieldwork, issued 22,400 households.

The design of the UKHLS has changed over time. Most of the interviews were face-to-face from wave 1 to 6, with just a few completed on the phone during a mop-up period following the face-to-face fieldwork. At wave 7, the web mode was offered for the first time, but only to wave 6 nonrespondents. Since wave 8, an increasing number of participants have been moved to a sequential mixed-mode design in which they are invited to a web questionnaire, and after five weeks, the nonrespondents are issued to face-to-face interviewers. Seventy percent of the main sample households were part of the sequential mixed-mode fieldwork strategy ("web-first") at wave 10. The remaining sample is issued face-to-face either because the household is predicted to have a low response propensity in web mode (10%) – the "low web propensity" subsample – or because they are part of the 20% of households randomly selected to form the "ring-fenced CAPI" subsample. Adults aged 16 or over are invited to participate in the survey every year alongside other household members. Besides the adult interview to all household members aged 16 or older, there is a household grid and questionnaire, and children aged 10 to 15 are invited to respond to a self-completion questionnaire.

Experimental design

Understanding society sample is issued on a monthly basis. The SMS experiment covered six months of fieldwork, from April to September 2020. At this time, due to the outbreak of the COVID-19 pandemic, all sample households were issued web-first with web nonrespondents followed up by telephone (Burton et al., 2020). Only those who had previously provided a valid

mobile number received the text messages. The fieldwork protocols of *Understanding Society* wave 10 (i.e. web-first, low web propensity and ring-fenced) offer the opportunity to test the effect of SMS for the group that was already being issued to the web (web-first) and those transitioning from a face-to-face to a web approach due to the COVID-19 pandemic (low web propensity and CAPI ring-fenced).

All household members were randomly allocated to the same control or treatment conditions for the experiment. Table 1 summarises the contact strategy implemented for each group during the web fieldwork that lasted five weeks. The control group received the usual contact strategy that combines letters and emails. In addition to the usual contact strategy, the "invite" group received an SMS invite. The "reminders" group got two SMS reminders one and three weeks after the fieldwork onset. Finally, the sample members of the "invite & reminders" group received the SMS invite and the two reminders.

Table 1. Contact strategy for the experimental groups

Experimental group	Survey invite (week 0)	Reminder (week 1)	Reminder (week 2)	Reminder (week 3)	Reminder (week 4)
Control	Letter + email	Letter + email	Email	Letter + email	Email
Invite	Letter + email + **SMS**	Letter + email	Email	Letter + email	Email
Reminders	Letter + email	Letter + email + **SMS**	Email	Letter + email + **SMS**	Email
Invite & reminders	Letter + email + **SMS**	Letter + email + **SMS**	Email	Letter + email + **SMS**	Email

Although all household members were allocated to an experimental group, a substantial proportion of them either did not have a mobile phone or had failed to provide a valid mobile number or email. Therefore, we differentiate between the full sample, which includes all adults eligible for an interview at wave 11, and the treated sample restricted to those who had provided both a valid mobile number and email address before the start of the wave 11 fieldwork. Figure 2 represents the full sample included in the experiment and the different reasons behind non-compliance.

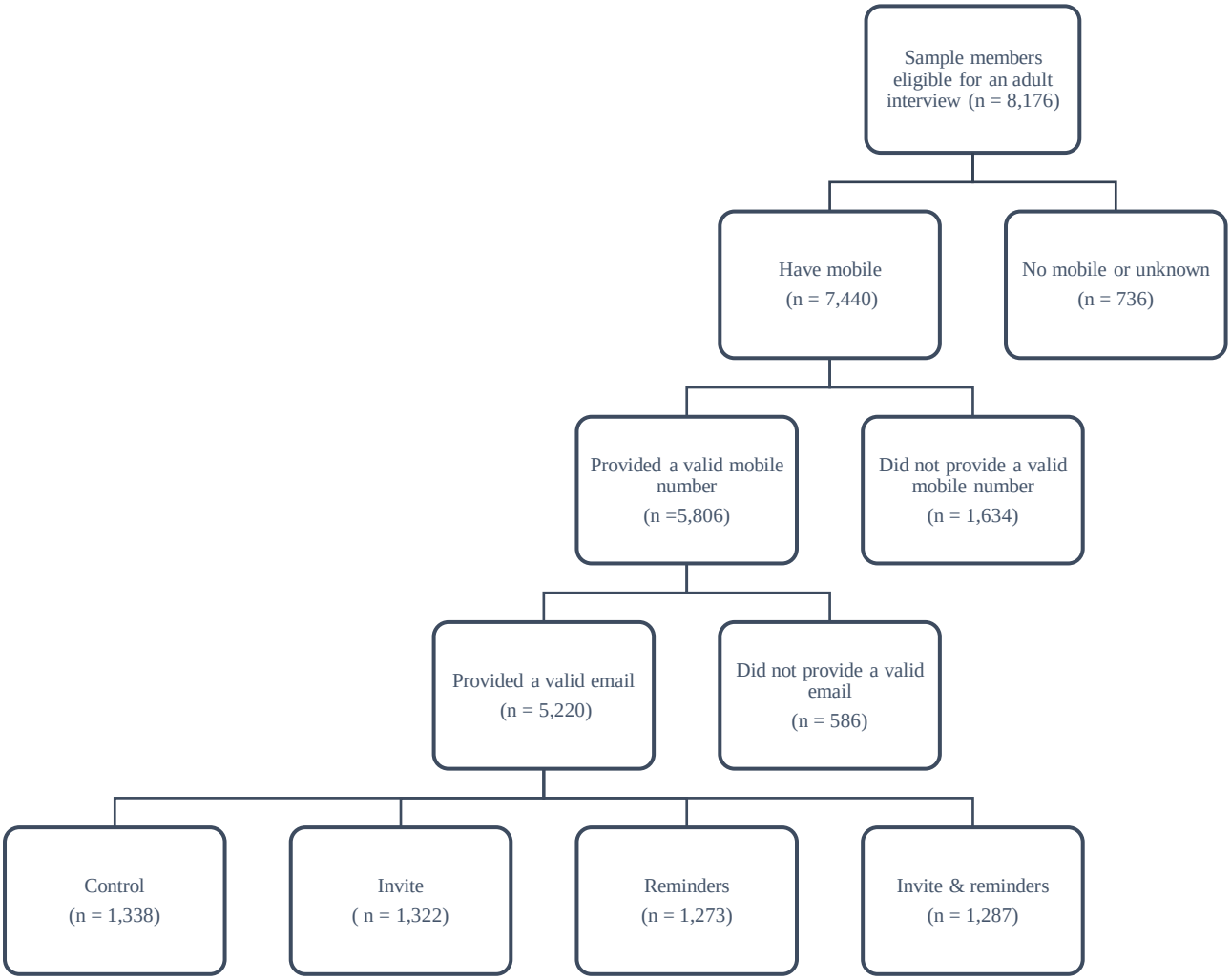

Figure 2. Sample selection into the experiment

The text messages, which were dispatched right after the emails, contained a brief personalised salutation and a link to the questionnaire. The link directed the participants to a landing page where they had to enter their date of birth to access the questionnaire. The invitation letter, which was supposed to reach the participant earlier than the text message, informed about the use of this new contact mode. The SMS also allowed replying with the word 'STOP' in order to opt-out from receiving further text messages. A total of 43 sample members opted out during the fieldwork.

SMS invitation
Hello [first name], please click the link below to access your annual Understanding Society interview. Thank you for your help. [Personalised link]
To opt out of receiving further SMS messages, reply STOP

SMS reminder
Hello [first name], this is a reminder that you can complete your Understanding Society interview using the link below. Thank you. [Personalised link]
To opt out of receiving further SMS messages, reply STOP

Figure 3. Text of SMS invite and reminder sent to participants

Methods and variables

The experiment was carried out during the early months of the COVID-19 pandemic and the consequent lockdown in the United Kingdom. Hence we should be cognisant of possible effects of the health and social consequences of the pandemic on how participants reacted to the text messages. For example, panel members could have been more attentive than usual to text messages and more inclined to cooperate with the survey given that many activities were suspended and they were instructed to remain at home for most of the time.

Due to the COVID-19 pandemic, participants allocated to different fieldwork protocols at wave 10 (i.e. low web propensity, ring-fenced CAPI, web-first) were issued to a web-first design where the nonrespondents at the web were followed up by telephone. Although the three groups defined by the fieldwork protocols at wave 10 are relevant for this analysis, we acknowledge that in the context of *Understanding Society*, the low web propensity group is unlikely to be invited to a web survey in the future. This group was excluded from a web-first protocol at wave 10 due to its lower likelihood to respond to a web survey. Anticipating a future post-pandemic scenario where the implementation of the text messages would be considered only for sample members allocated to the web-first protocol, we have also analysed the experiment excluding the low web propensity group. Hence we present two different analyses: while the analysis in the results section covers the full sample, appendix A contains the analysis excluding the low web propensity group. The main differences between these two analyses are pointed out in the results section.

The analysis of response propensities used three approaches. The first approach uses the full sample to estimate the intention-to-treat effect. However, a significant part of the sample (36.2%) had not given a valid mobile number or email before the fieldwork. The second approach, which focuses on the treated sample, allows us to gauge the effect for those who received email and text messages, conditional on giving their contact details. The third approach uses a weight that takes into account the selection into the treated sample (i.e. having and sharing mobile and email details). This approach aims to identify what would have happened if those who did not share their details had done so. The analysis of the remaining outcomes – fieldwork efforts, device selection, time to start the questionnaire and sample balance – are based on the treated sample (i.e. those who had shared their mobile number and email address with the survey organisation). All analyses reported in this paper have been weighted to account for the unequal selection probabilities, panel attrition, and selection into the six-monthly samples (April to September 2020) of year 2 of wave 11.

Logistic regression models were used to analyse the effect of the SMS on response propensities for the whole sample and the subgroups defined by the moderators. The analysis used two outcomes: response after the web fieldwork phase and at the end of the CATI data collection. The dependent variable of the first set of logistic regression models is a dummy indicator that takes 1 for those responding to the web survey during the first five weeks of fieldwork and 0 otherwise. The second set has a dummy variable that takes 1 if the sample member responded to the survey at any fieldwork stage and 0 otherwise. To explore the effect of the SMS across the levels of the moderators, multivariate models were fitted, including all the moderators and their interactions with the experimental allocation indicator. These multivariate models were used to predict the response propensities and compute the treatment effects for the different samples and the subgroups defined by the moderators. All tests presented in this work are two-sided.

The effect of the SMS on the fieldwork effort has been measured using three variables: the household response rate, the average number of calls per household and the average duration of the calls in minutes. The main route to cost saving is likely to be via a reduction in the number of households issued to interviewers. This applies when fieldwork is face-to-face, as whole journeys to an address can be avoided. The analysis of "full household response" speaks to this. However, even in the absence of an effect of SMS on full household response rates, an effect on individual response rates could reduce the effort needed by interviewers in some households. This should be

reflected in a reduction in one or both of the number of calls per household and average call duration.

The effect of the text messages on device selection was tested using logistic regression models conditional on response during the web stage of the fieldwork. To explore the effect of the SMS on smartphone completion across the levels of the moderators, a multivariate model including all the moderators and their interactions with the experimental allocation indicator was fitted. The analysis of time to response used two outcomes: time to interview start and time to interview end. To compare response times across groups two linear regression OLS models were fitted. Finally, crosstabulations and chi-square tests were used to compare the sample composition across experimental groups.

The SMS effects on response and smartphone completion have been tested for different population subgroups to identify participants more likely to react to the intervention. These moderators include demographics, variables related to social norms, technology use, and sample members' past participation. The demographic variables are sex, age, urban-rural indicator, ethnic background and education. These variables are related to survey response and technology use and could influence how the text messages affect the outcomes (Gummer et al., 2019; Tan et al., 2014; Toepoel & Lugtig, 2014). Social norms cover the influence of the social context and whether the sample member has data security and privacy concerns. To measure the influence of the social context, we derived a variable that indicates whether another household member had shared their mobile number with the survey organisation before the respondent did. This variable is a proxy of the cooperative attitudes of the household towards data sharing. Privacy and data security concerns is another variable that could modify the effect of the text message on response or device selection. For instance, evidence has shown that those with privacy concerns are less likely to consent to data linkage or sharing digital trace data for research purposes (Sala et al., 2012; Wenz et al., 2019). The operationalisation of privacy concerns was based on the sample members' past behaviour when asked to consent on administrative data linkage. We used a measure of individual refusal rate to data linkage based on the work of Jäckle *et al.* (2021) as a proxy of privacy concerns. Having an smartphone was used a proxy of technology use. Finally, we used several variables related to survey participation, such as whether the sample member is a regular respondent and

last wave mode of issue. The definition of a regular respondent refers to the sample members that participated at least in two-thirds of the waves for which they were eligible.

RESULTS

In this section, we first present findings regarding the effects of the SMS on total survey response and on fieldwork efforts at the CATI phase. Then, we explore whether sending an SMS affects the probability of using a smartphone to complete the survey, the response time and sample composition.

Effect of SMS on response and fieldwork effort

The main objective of this research is to assess the effect of adding an SMS to the contact strategy on response in a sequential mixed-mode design. Table 2 presents the response rates for each treatment group for the full and treated samples and for the treated sample adjusted for selection. The differences between the treatment group and the full sample show that although the treatment groups present slightly higher response rates than the control condition, none of these differences is statistically significant. For the treated sample, at the end of the web fieldwork, those who received the SMS reminders presented higher response rates (61.0%) compared to the control group (55.0%). This difference fades after the CATI fieldwork to 4 p.p. and is no longer significant. Also, the response rate of the group receiving the invite and reminders is 5.2 p.p. higher than the control group after the web stage, although this difference is not significant. The analysis of the treated sample adjusted for selection shows estimated response rates if all sample members had given their mobile number and email address to the survey organisation. An additional weight was computed to control differences between those who provided their contact details and those who did not. The results show a similar pattern to the unadjusted treated sample analysis. The reminders and invite & reminders groups show higher responses compared to the control group, but these differences are not significant.

The analysis excluding the low web propensity subsample is presented in Appendix A. This analysis allows us to focus on the participants more likely to be issued with a web-first design in the future. The results show that two or three SMS were effective to raise the response propensity of those in the treated sample at the end of the web stage. The response propensity was also higher for the reminders group of the adjusted treated sample at the end of the web stage, suggesting that

the treatment extension to those who had not given their mobile number or email could be effective. For the adjusted sample, the SMS invite increased the response rate at the end of the fieldwork.

Table 2. Response rates and standard errors at different stages of the fieldwork for the full, treated, and treated adjusted samples

	Control	Invite	Reminders	Invite & reminders
Full sample				
Web	48.1	49.3	49.2	49.3
	(1.8)	(1.8)	(1.8)	(1.9)
Web + CATI	67.3	69.4	68.4	68.2
	(1.8)	(1.7)	(1.7)	(2.0)
Treated sample				
Web	55.0	57.3	**61.0***	60.2
	(2.0)	(2.1)	**(2.1)**	(2.0)
Web + CATI	74.1	77.4	78.1	76.2
	(1.9)	(1.7)	(1.7)	(1.8)
Treated sample (adjusted)				
Web	55.3	56.7	60.7	58.9
	(2.1)	(2.4)	(2.2)	(2.4)
Web + CATI	73.7	77.4	78.5	75.4
	(2.1)	(1.9)	(1.9)	(2.2)
Full sample (N)	2,087	2,049	1,983	2,057
Treated sample (N)	1,338	1,322	1,273	1,287

The subsequent analysis step is to identify sample subgroups for which the SMS are more likely to affect response propensities. Table 3 contains the average treatment effects, which compare the average predicted response propensities for the treatment and control groups for the treated sample. A multivariate model containing all the moderators and the interaction terms with the experimental allocation was fitted to predict the heterogeneous treatment effects.

Regarding the demographic moderators, the youngest sample members (16-29) increased their response propensities 15.1 p.p. and 11.2 p.p. after receiving the two reminders or the reminders in addition to the invite, respectively. Also, for participants aged 30-44 the invite & reminders treatment increased their response propensity by 12.7 p.p. compared to the control condition. After the CATI fieldwork, participants aged 45-64 receiving two reminders show an 8.3 p.p. higher

response propensity. In terms of education level, participants with a university degree were more likely to respond to the survey at the web stage (13.4 p.p.) if in the invite & reminders treatment group. The white British receiving SMS reminders increased their response propensities after the web stage by 5.7 p.p. Finally, the positive effect of the SMS reminders on response during the web fieldwork observed for the whole sample was restricted to smartphone users (6.6 p.p.). We did not detect differences among the experimental groups for the groups formed by the urbanicity variable.

Table 3. Heterogeneous average treatment effects and standard errors for the treated sample after the five-week web fieldwork

	Web			Web + CATI		
	I vs. C	**R vs. C**	**I&R vs. C**	**I vs. C**	**R vs. C**	**I&R vs. C**
Sex						
Male	0.047	0.067	0.031	0.053	0.043	0.030
	(0.035)	(0.034)	(0.032)	(0.032)	(0.032)	(0.031)
Female	-0.003	0.055	0.060	0.012	0.037	0.007
	(0.032)	(0.032)	(0.032)	(0.026)	(0.027)	(0.027)
Age						
16-29	0.028	**0.151****	**0.112***	0.037	0.065	0.043
	(0.052)	**(0.053)**	**(0.054)**	(0.054)	(0.054)	(0.056)
30-44	0.066	0.048	**0.127***	0.059	0.006	0.035
	(0.054)	(0.055)	**(0.053)**	(0.051)	(0.048)	(0.048)
45-64	0.033	0.054	0.004	0.057	**0.083***	0.026
	(0.041)	(0.043)	(0.043)	(0.034)	**(0.035)**	(0.038)
65+	-0.071	-0.003	-0.042	-0.060	-0.031	-0.047
	(0.049)	(0.049)	(0.048)	(0.032)	(0.031)	(0.032)
Urbanicity						
Urban	0.033	0.057	0.039	**0.053***	0.036	0.012
	(0.031)	(0.030)	(0.030)	**(0.026)**	(0.027)	(0.026)
Rural	-0.018	0.071	0.072	-0.037	0.050	0.035
	(0.050)	(0.057)	(0.048)	(0.048)	(0.049)	(0.049)
Education						
Less than a degree	0.029	0.057	0.008	0.040	0.035	0.005
	(0.031)	(0.031)	(0.031)	(0.027)	(0.027)	(0.028)
Degree	0.002	0.069	**0.134*****	0.012	0.050	0.046
	(0.042)	(0.045)	**(0.040)**	(0.037)	(0.040)	(0.036)
Ethnicity						
Ethnic minorities	0.016	0.082	0.129	0.067	0.064	0.051
	(0.074)	(0.064)	(0.066)	(0.065)	(0.061)	(0.066)
White British	0.021	**0.057***	0.034	0.026	0.036	0.012
	(0.027)	**(0.028)**	(0.028)	(0.024)	(0.024)	(0.024)

Have smartphone						
No	0.008	0.004	0.045	0.048	0.028	0.043
	(0.087)	(0.082)	(0.083)	(0.069)	(0.070)	(0.069)
Yes	0.022	**0.066***	0.047	0.030	0.040	0.015
	(0.027)	**(0.028)**	(0.027)	(0.024)	(0.025)	(0.025)
Social context						
Non-cooperative	-0.042	0.024	0.016	-0.034	0.025	-0.014
	(0.037)	(0.036)	(0.037)	(0.032)	(0.031)	(0.031)
Cooperative	**0.075***	**0.093****	**0.073***	**0.089****	0.052	0.046
	(0.035)	**(0.035)**	**(0.034)**	**(0.030)**	(0.032)	(0.031)
Privacy concerns						
Low	0.012	**0.070***	0.040	0.028	0.048	0.022
	(0.028)	**(0.028)**	(0.028)	(0.025)	(0.024)	(0.024)
High	0.070	0.009	0.081	0.049	-0.005	-0.008
	(0.060)	(0.057)	(0.059)	(0.050)	(0.050)	(0.051)
Regular respondent						
Irregular respondent	**0.181****	0.101	**0.157***	**0.217*****	0.113	0.108
	(0.064)	(0.057)	**(0.064)**	**(0.064)**	(0.065)	(0.073)
Regular respondent	-0.003	0.055	0.030	0.004	0.029	0.004
	(0.027)	(0.029)	(0.027)	(0.023)	(0.024)	(0.023)
Last wave mode of issue						
Low web propensity	-0.110	-0.008	-0.080	**-0.175***	-0.044	-0.101
	(0.090)	(0.092)	(0.079)	(0.085)	(0.075)	(0.076)
Ring-fenced CAPI	0.060	0.065	0.033	0.040	-0.011	-0.007
	(0.064)	(0.063)	(0.064)	(0.055)	(0.051)	(0.052)
Web-first	0.026	**0.068***	**0.065***	**0.054***	**0.062***	0.038
	(0.031)	**(0.032)**	**(0.030)**	**(0.026)**	**(0.028)**	(0.027)

Participants' perceptions about social norms can also modify the effect of text messages on response. Individuals living in a pro-sharing environment, where another household member was willing to give their mobile phone number first, are positively affected by the text messages during the web fieldwork. The three treatment groups show higher response rates compared to the control condition: the SMS invite increased response propensity by 7.5 p.p., reminders by 9.3 p.p., and invite & reminders by 7.3 p.p. The effect observed for the SMS invite group remains after the CATI fieldwork (8.9 p.p.). Another factor that moderates the effect of text messages is privacy and data security concerns. The effect of SMS reminders was higher for the group with a low level of concerns, measured as refusing less than six in ten data linkage requests. The average treatment

effects indicate that this group exhibits a positive effect of 7.0 p.p. at the end of the web fieldwork compared to the control condition.

Survey past participation in a longitudinal study can also modify how the panel members react to a new contact mode. There is a positive effect of the SMS for the irregular respondents, who missed more than a third of the previous waves. The irregular respondents receiving the invite or the invite and the reminders showed 18.1 p.p. and 15.7 p.p. higher response propensities compared to the absence of SMS. This effect did not erode after the CATI fieldwork for those in the SMS invite group; the response propensity was 21.7 p.p. higher. The pandemic caused a substantial part of the sample (low web propensity and ring-fenced subsamples) that had been interviewed face-to-face to be moved to a web-first strategy. The positive effect of the SMS is only detected for the web-first group, which presents a response propensity 6.8 points higher if in the reminders condition and 6.5 p.p. higher when receiving the SMS invite and reminders. After the CATI fieldwork, the invite and reminders groups show response propensities of 5.4 p.p. and 6.2 p.p. higher than the control condition, respectively. An additional finding is that the low web propensity group had an adverse reaction to the SMS. After the telephone stage of the fieldwork, those receiving an SMS invite present a 17.5 p.p. lower response propensity compared to the absence of the SMS.

After excluding the low web propensity group from the analysis, most of the effects presented in Table 3 slightly intensify while others emerge (Appendix A). For instance, in the full sample analysis, the 30-44 age group receiving two text messages has a response propensity 12.7 points higher than the control group after the web stage while, after removing the low web propensity group from the analysis, this rises to 16 percentage points. The SMS invite positively affects response at the end of the fieldwork for some subgroups such as irregular respondents, males, those living in urban areas or having less of a degree.

Transitioning from CAPI to a web-first sequential mixed-mode design could alter how participants react to the text messages. **Error! Reference source not found.** compares the average treatment effects of the low web propensity, CAPI-only ring-fenced and web-first fieldwork sample subgroups across the moderators. This comparison uses the treated sample and is restricted to the SMS reminders group[1] at the end of the web fieldwork. The plot shows that due to the relatively

[1] The results are similar for the invite and reminders and invite groups are omitted from the paper.

small sample size of the groups, most of the treatment effects are not statistically significant, and the 95% confidence intervals of the web-first and the other groups tend to fully overlap in most comparisons.

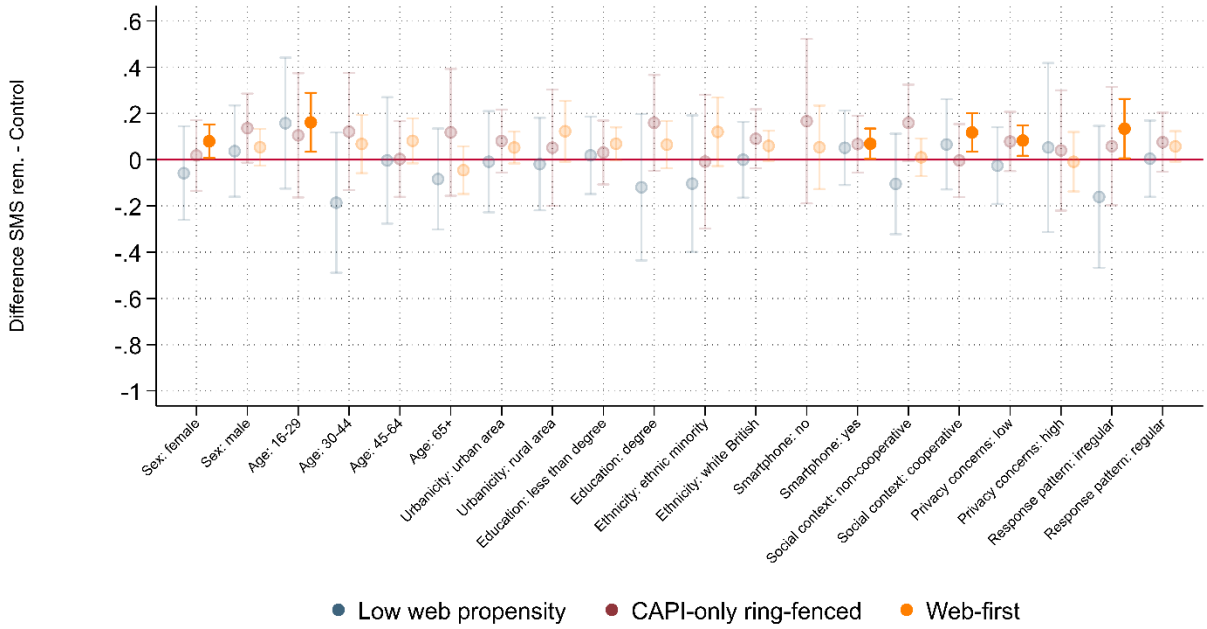

Figure 4. Heterogeneous average treatment effects for the treated sample at the end of the web fieldwork by last wave fieldwork protocol

The effect of the text messages on survey response in a web-first design could also reduce fieldwork efforts and, consequently, survey costs. Table 4 presents the household response rates and two indicators of fieldwork effort to assess whether the slight increase in response rates observed at the web stage for the treated sample translates into a lower survey effort at the CATI stage. The first indicator is the full household response at the web stage. In *Understanding Society*, a full household response occurs if the household questionnaire and all the individual questionnaires are completed. If all household members complete their questionnaires and the household questionnaire during the first five weeks of the fieldwork, that household is not issued to interviewers. The full household response is slightly higher for the reminders group (1.5 p.p.), but this difference is small and far from significant.

Table 4. Fieldwork effort indicators for the treated sample of households

	Control	Invite	Reminders	Invite & reminders
Household response after web				
Household response	63.9	61.7	63.1	64.5
	(2.0)	(2.3)	(2.2)	(2.2)
Full household response	41.9	41.3	43.4	42.1
	(2.0)	(2.2)	(2.2)	(2.2)
Average number of calls per household	4.5	4.3	4.3	4.6
	(0.3)	(0.2)	(0.3)	(0.3)
Average duration of calls to the household (minutes)	21.2	23.1	24.7	22.7
	(1.9)	(2.4)	(2.4)	(2.4)
Sample of treated households (N)	831	820	814	816

The base for the calculations is treated households, i.e. those where at least one household member had provided their email and mobile phone number before the wave 11 fieldwork.
The average number of calls per household is the total number of calls to the households in the sample divided by the total number of treated households.
The average duration of calls to the household in minutes results from dividing the sum of the duration of all calls to the households by the total number of treated households in the sample.

The two indicators of fieldwork effort, summarised in Table 4, are the average number of calls per household, and the average duration of the calls. Both measures show a similar pattern: no differences between the control group and the experimental conditions. From these results, we can conclude that the slight positive effect of the text messages on survey response did not translate into lower levels of fieldwork efforts and possible cost savings. The fieldwork efforts indicators show a similar pattern if the low web propensity group is excluded (Appendix A).

Device selection, time to response and sample balance

Text messages are also expected to affect the decision about the device used to complete the survey. Receiving an SMS with a survey link can encourage completion on a smartphone rather than a laptot, desktop or tablet. Table 5 presents the device used to complete the household and individual questionnaires during the web fieldwork for the treated sample. A similar pattern is observed for the household and individual questionnaires: the percentage of those completing the questionnaire on a smartphone increases when they receive an SMS with a survey link, while tablet

completion decreases in a similar proportion. Moreover, the increase in the proportion of smartphone completion in the treatment groups does not imply a reduction in the number of sample members responding to the survey on their computers – desktop or laptop, which remained stable.

Table 5. Device used to complete the questionnaire and standard errors for compliant respondents during the web fieldwork

	Control	Invite	Reminders	Invite & reminders
Household questionnaire				
Desktop or laptop	49.0	49.3	50.0	45.6
	(2.7)	(2.9)	(2.9)	(2.9)
Tablet	13.2	8.9	9.4	**8.1***
	(1.8)	(1.6)	(1.5)	**(1.5)**
Smartphone	37.8	41.8	40.7	**46.3***
	(2.7)	(2.8)	(2.9)	**(3.0)**
Web respondents - household interview (N)	433	443	435	436
Individual questionnaire				
Desktop or laptop	50.1	50.3	47.3	49.3
	(2.4)	(2.7)	(2.4)	(2.6)
Tablet	14.0	**8.7***	10.2	**7.3****
	(1.6)	**(1.4)**	(1.3)	**(1.3)**
Smartphone	35.9	41.0	**42.5***	**43.3***
	(2.4)	(2.6)	**(2.5)**	**(2.5)**
Web respondents – individual interview (N)	715	736	749	730

The base for the analysis are households that completed the household questionnaire and adults that completed the individual questionnaire during the web fieldwork (5 weeks).

Excluding the low web propensity group from the analysis leads to similar results (Appendix A). However, the increase in smartphone use in the treatment groups compared to the control condition was not significant.

As seen with response propensities, some subgroups could be more likely to complete the survey on their smartphones. Table 6 shows the change in the predicted propensity to complete the questionnaire on the smartphone after receiving one or more text messages. A logistic regression model including all the moderators and the interaction effect with the experimental indicator was fitted to predict the probabilities of smartphone completion for each sample subgroup.

The average treatment effects show that males were more likely to complete the questionnaire on their smartphone if sent the SMS reminders or the invite plus reminders, with differences of 8.7 and 9.5 p.p. respectively relative to the control group. The propensity of respondents aged 16-29 to complete by smartphone increased by 16.9 p.p. – invite group – and 21.2 p.p. – reminders – if

sent SMSs. Respondents aged 45-64 receiving an SMS invitation increased their likelihood of smartphone completion by 13.0 p.p., while those receiving three text messages increased by 11.6 p.p. In contrast to the expected effect of the SMS on smartphone completion, the web respondents aged 30-44 receiving an SMS invite showed a significantly lower (-16.6 p.p.) smartphone completion propensity compared to the control group.

Those living in urban environments were more likely to complete the survey on their smartphone if sent SMS reminders (7.9 p.p.) or the invite and reminders (9.8 p.p.). Likewise, those who do not hold a university degree in the reminders (6.9 p.p.) or invite & reminders (8.0 p.p.) group were more likely to complete the individual questionnaire on a smartphone. Participants with a white British background receiving three SMS showed a higher propensity to complete the questionnaire on the smartphone (6.5 p.p.). Those taking part regularly in the study in the invite & reminders group were more likely to respond on their smartphones (6.7 p.p.). Finally, participants allocated to the web-first fieldwork protocol at wave 10 receiving three text messages – invite & reminders – showed a 7.2 p.p. higher propensity to complete the questionnaire on their smartphone. No differences were found for the groups defined by social context and privacy concerns.

Table 6. Heterogenous average treatment effects of the text messages on smartphone completion for the treated sample of web respondents

	Web respondents		
	I vs. C	**R vs. C**	**I&R vs. C**
Sex			
Male	0.032	**0.087***	**0.095***
	(0.039)	**(0.038)**	**(0.041)**
Female	0.057	0.018	0.039
	(0.038)	(0.038)	(0.039)
Age			
16-29	**0.169***	**0.212****	**0.186***
	(0.085)	**(0.078)**	**(0.079)**
30-44	**-0.166***	-0.034	-0.051
	(0.070)	(0.067)	(0.069)
45-64	**0.130****	0.066	**0.116***
	(0.048)	(0.046)	**(0.049)**
65+	0.044	0.002	0.016
	(0.045)	(0.047)	(0.045)
Urbanicity			
Urban	0.067	**0.079***	**0.098****

	(0.037)	**(0.034)**	**(0.036)**
Rural	-0.014	-0.037	-0.034
	(0.058)	(0.057)	(0.058)
Education			
Less than a degree	0.069	**0.069***	**0.080***
	(0.037)	**(0.034)**	**(0.037)**
Degree	0.002	0.009	0.032
	(0.048)	(0.046)	(0.048)
Ethnicity			
Ethnic minorities	-0.098	-0.038	0.052
	(0.108)	(0.096)	(0.101)
White British	0.062	0.058	**0.065***
	(0.032)	(0.030)	**(0.031)**
Social context			
Non-cooperative	0.056	0.019	0.070
	(0.041)	(0.041)	(0.041)
Cooperative	0.036	0.078	0.057
	(0.046)	(0.041)	(0.044)
Privacy concerns			
Low	0.053	0.043	0.057
	(0.032)	(0.030)	(0.032)
High	0.006	0.080	0.100
	(0.069)	(0.077)	(0.077)
Regular respondent			
Irregular respondent	-0.024	0.040	0.022
	(0.106)	(0.099)	(0.107)
Regular respondent	0.052	0.049	**0.067***
	(0.031)	(0.030)	**(0.032)**
Last wave mode of issue			
CAPI-first	0.064	0.065	0.125
	(0.095)	(0.100)	(0.103)
CAPI-only	0.046	0.060	0.000
	(0.077)	(0.075)	(0.079)
Web-first	0.044	0.045	**0.072***
	(0.036)	(0.034)	**(0.035)**

Text messages are a transient mode of contact as they call for immediate action. In survey research, this feature can diminish the time between the survey invitation and the final response. Table 7 presents the average time elapsed in days between the survey invite and the start or end of the household and individual questionnaires. Compared to the control group, participants receiving

three text messages showed a quicker reaction, although these differences are not significant. For example, while participants in the control group take 8.7 days to start the household questionnaire, the invite and reminders group time is 8 days. The rest of the treatment groups exhibit slightly higher times than the control group, but these differences are not significant.

Table 7. Average number of days elapsed between survey invite and completion for respondents

	Control	Invite	Reminders	Invite & reminders
Household questionnaire				
Time to start	8.7	9.2	9.6	8.0
	(0.5)	(0.6)	(0.5)	(0.6)
Time to end	9.0	9.4	9.8	8.3
	(0.5)	(0.6)	(0.5)	(0.6)
Web respondents - household interview (N)	433	443	435	436
Individual questionnaire				
Time to start	9.6	10.0	10.4	8.9
	(0.5)	(0.5)	(0.5)	(0.4)
Time to end	10.1	10.5	11.1	9.4
	(0.5)	(0.5)	(0.5)	(0.4)
Web respondents – individual interview (N)	715	736	749	730

The base for the analysis are households that completed the household questionnaire and adults that completed the individual questionnaire during the web fieldwork (5 weeks).

A possible countereffect of a response maximisation strategy is that it worked better for some sample groups than others, affecting sample balance. We tested a selection of wave 11 variables covering various topics, including demographics or political attitudes, to assess the level of sample balance after the web fieldwork. Table 8 shows that none of the eleven variables included in the analysis present differences across experimental groups. The use of SMS in this mixed-mode contact strategy did not produce any change in the sample composition, partly due to the modest impact of the intervention on response propensity.

Table 8. Sample profile of the respondents during the 5-week web fieldwork by experimental group

	Control	Invite	Reminders	Invite & reminders	Chi-square test
Urbanicity					*Chi-square(3)= 13.643*
Urban area	74.2	76.5	74.0	71.5	*p = 0.521*
Rural area	25.8	23.5	26.0	28.5	
Sex					*Chi-square(3)= 1.745*
Male	44.0	45.3	43.5	43.6	*p = 0.875*
Female	56.0	54.7	56.5	56.4	
Age					*Chi-square(9)= 61.817*
16-29	13.0	13.2	17.0	14.6	*p = 0.201*
30-44	20.2	23.8	21.8	26.8	
45-64	39.5	37.4	39.7	36.5	
65+	27.3	25.6	21.5	22.1	
Ethnicity					*Chi-square(9)= 37.606*
White British	91.9	90.4	89.3	88	*p = 0.497*
Black	1.1	1.6	1.3	0.7	
Asian	3.1	3.1	4.6	5.2	
Other	3.9	5	4.7	6.1	
Marital status					*Chi-square(12)= 25.963*
Single or civil partnership	24.8	28.5	30	27.2	*p = 0.945*
Married or civil partnership	57.7	56.7	53.9	57.2	
Separated or divorced	12.2	9.5	11.1	11.1	
Widowed	3.7	3.6	3.5	3.5	
Missing	1.6	1.6	1.5	0.9	
Number of own children in household					*Chi-square (9)= 70.521*
0	78.4	77	75.1	75.3	*p = 0.250*
1	7.1	8.8	13	7.9	
2	11	10.6	9.5	13.3	
3+	3.5	3.5	2.4	3.5	
Highest qualification					*Chi-square(15)= 83.357*
Degree	30.9	31.3	34.2	40	*p = 0.152*
Other higher	15.2	15.8	13.2	13.6	
A level etc	22.8	20.2	21.6	16.7	
GCSE etc	18.1	19.3	16.8	18.5	
Other or no qual	12.1	12.4	13.9	10.6	
Missing	1	0.9	0.3	0.5	
Long-standing illness or disability					*Chi-square(6)= 126.044*
Yes	35.5	38.4	32	32.8	*p = 0.000*
No	64.3	61.3	67.8	64.6	

Missing	0.2	0.3	0.2	2.6	
General health					*Chi-square(15)= 63.318*
Excellent	10.5	7.5	10.8	11.9	*p = 0.271*
Very good	33.6	35	29.4	36.2	
Good	36.7	36.6	37.3	34.3	
Fair	14.9	15.9	18.0	13.8	
Poor	4.2	5.0	4.4	3.7	
Missing	0	0	0.1	0.2	
Voting intention					*Chi-square(15)= 74.680*
Conservatives	35.7	35.7	29.9	31.1	*p = 0.404*
Labour	28.4	23.9	27.8	28.2	
Liberal Democrat	5.9	5.5	6.9	7.8	
Other	9.8	10.4	9.2	9.8	
Won't vote	14.8	19.5	21.9	17.7	
Missing	5.4	4.9	4.2	5.3	
Benefit recipient					*Chi-square(6)= 44.923*
Benefits recipient	29.1	31.5	32.7	29.2	*p = 0.159*
No benefits	70.3	68.2	66.4	68.9	
Missing	0.6	0.3	0.9	1.9	
Web respondents (N)	715	736	749	730	

DISCUSSION

This paper explored the benefits of adding text messages to the contact strategy in a sequential mixed-mode design where an interviewer-administered phase follows a web questionnaire. The expected benefits of SMS in this context are interrelated. First, the text message with a survey link can increase response at the web stage. Second, the increase in response at the web phase could diminish the fieldwork efforts at the interviewer-administered stage, reducing survey costs. In addition, other possible effects of the SMS on participants' behaviour include an increase in the smartphone completion rate or a reduction in the time to response. In order to test these aspects, we presented the results of an experiment embedded in wave 11 of *Understanding Society*, a longitudinal study that uses a web-first sequential mixed-mode design.

The results show that adding text messages to the contact strategy that includes letters and emails slightly improves the web survey response rates for those who shared a valid mobile number and email at previous waves. In this experiment, three different configurations were tested: an invite, two reminders, and a combination of both. The two reminders resulted in a higher response rate at

the web stage. The experimental groups receiving the invite or the invite plus reminders also exhibited higher response propensities, but these increases were not found significant. The magnitude of the effect sizes indicates that adding the text messages produced a modest return in response rates in exchange for a modest investment, given the relatively low price of the SMS and the logistics compared to other response maximisation strategies. This finding corroborates the conclusion reached by other experiments involving the use of text messages in web surveys. Text messages combined with other contact modes can produce a modest increase in response rates (Barry et al., 2020; Bosnjak et al., 2008; Jenny Marlar, 2017; Mavletova & Couper, 2014). The positive effect of the texts on response faded after the CATI stage of the fieldwork.

The positive effect of SMS on response rates and the optimal number and type of messages vary across sample subgroups. This information is helpful to plan future targeted designs in which some subgroups of the sample would receive SMS given their beneficial effect. The SMS reminders were the most effective treatment to increase response rates at the web stage for most sample subgroups. Females, younger sample members (16-44), those with a degree, or smartphone users show an above-average positive effect of the SMS reminders. Also, participants with lower data security and privacy concerns and those living in cooperative environments where other members gave their mobile numbers were more likely to participate in the survey after receiving two SMS reminders. In turn, only two groups had a higher response rate after receiving only the survey invite by SMS: irregular respondents, who refused to participate on more than 2-in-3 occasions, and participants living in a cooperative environment.

For some subgroups, the effect of the SMS observed during the web stage did not erode with the telephone fieldwork. The invite text message worked well for participants living in a household where other members gave their mobile numbers, irregular respondents and those allocated to a web-first fieldwork strategy at the previous wave. The reminders were useful to increase the response propensity of the web-first subgroup. Thus, for some subgroups, inclusion of text messages improved overall response rates.

Another valuable insight of this analysis is that some sample subgroups could suffer an adverse effect from including the SMS in the contact strategy. Two subgroups show a negative trend in response propensity after receiving the SMS: older participants and, particularly, the low web propensity group allocated to a CAPI-only fieldwork protocol at the previous wave. When sent

text messages, participants over 65 years old exhibit lower response propensity after both the web and the telephone fieldwork stages, although none of these negative differences was found significant. The low web propensity group shows a consistent negative effect of the SMS, which is significant for the SMS invite condition at the end of the fieldwork. A likely explanation of this finding is that people reluctant or unable to take part online might feel frustrated when invited to complete the questionnaire in a mode that, in some cases, is not a real possibility for them due to technical barriers (e.g. no internet connection) or a lack of skills.

In the context of a sequential mixed-mode survey, the expectation is that an increase in response rates during the web stage would result in a lower workload for the interviewers, reducing survey costs. The results of the experiment could not confirm this hypothesis. Two factors can explain this finding: the household nature of the survey and the modest increase in individual response rates. *Understanding Society* is a household survey where all household members aged 16 and older are invited to participate in the study at each wave. Survey costs will only be substantially reduced when all household members complete their questionnaires online, so the interviewer does not need to contact the household. The modest rise in individual response propensities did not increase the proportion of households completed before the start of the CATI phase of the fieldwork. Hence the reduction in survey efforts was insignificant.

The use of text messages to contact participants could have shaped participants' behaviours in other ways, such as the decision about the device used to complete the web survey and the time to response. Text messages with a survey link pushed some respondents to complete the survey on their smartphones. This finding was expected in view of the previous research about the use of SMS invites in cross-sectional web surveys (Barry *et al.*, 2020; Crawford *et al.*, 2013; Mavletova & Couper, 2014). However, two patterns emerged that are unique to this study: 1) the percentage of participants completing the survey on a desktop or laptop did not vary across experimental groups (smartphone completion appears instead to have substituted tablet completion), and 2) the increase in smartphone completion was lower than has been observed in other experiments. An important distinctive feature of this experiment is that it was conducted in a longitudinal survey where participants already knew about the complexity and length of the questionnaire from previous waves. This accumulated knowledge could play a critical role in the decision about whether to complete the questionnaire on a smartphone. The past survey experience also explains

that the number of participants completing the survey on a desktop or laptop remained stable; they probably assumed that using a smaller device (i.e. tablet or smartphone) would have increased their burden.

Another aspect that text messages can affect is the speed of response following receipt of the invite. Quicker responses could help reduce survey costs if, for instance, they prevent reminder letters from being sent. In this study, we did not find that sending text messages in addition to letters and emails resulted in quicker responses. This finding contradicts the empirical literature that showed a systematic earlier completion for those receiving SMS (De Bruijne & Wijnant, 2014; Mavletova & Couper, 2014; McGeeney & Yan, 2016). The reason behind this contraction could also lie in the previous knowledge about the survey. This accumulated experience could refrain participants from accelerating their participation in the study since they know that completing the questionnaire might take a significant amount of time and prefer to wait for a more convenient moment. Finally, the increase in response propensities caused by the text messages could affect sample composition. However, the analysis employing 11 demographic, behavioural, and attitudinal variables shows that the sample is balanced across experimental groups, in line with the modest effect found in the response propensity analysis.

The analysis of the experiment was replicated without the participants identified to be less likely to take the web questionnaire at wave 10, the low web propensity group. This analysis, presented in appendix A, allowed us to focus on the participants who are more likely to be invited web-first after the pandemic. As expected, after excluding the low web propensity group, the effects of SMS on response slightly increased, and some of them became significant. This trend was also observed in the analysis of the sample subgroups defined by the moderators. The rest of the analysis – fieldwork effort, device selection, time to response and sample profile – showed similar results regardless of the exclusion of the low web propensity group.

This experiment has some limitations. First, the survey experiment was conducted during the COVID-19 pandemic. The social and psychological consequences of the pandemic could have affected how participants reacted to the text messages and the invitation to participate in the survey, so findings may not be fully generalisable to non-pandemic conditions. Second, the sequential mixed-mode design of *Understanding Society* combined web and CATI. The impact of the text messages on fieldwork efforts and survey costs could differ if a CAPI mode were used instead, not

least because CAPI is more costly than CATI and has a different cost structure. More research is needed on the effect of text messages on survey costs in a sequential mixed-mode design. Finally, this experiment was embedded in a longitudinal study, and nothing guarantees that the observed effect would remain unaltered in subsequent waves.

REFERENCES

Bandilla, W., Couper, M. P., & Kaczmirek, L. (2012). The Mode of Invitation for Web Surveys. *Survey Practice*, *5*(3), 1–5. https://doi.org/10.29115/sp-2012-0014

Barry, B. J., Mori, I., & Williams, R. (2020). *Text to push-to-web*. 2020.

Bobrow, K., Brennan, T., Springer, D., Levitt, N. S., Rayner, B., Namane, M., Yu, L.-M., Tarassenko, L., & Farmer, A. (2014). *Efficacy of a text messaging (SMS) based intervention for adults with hypertension: Protocol for the StAR (SMS Text-message Adherence suppoRt trial) randomised controlled trial*.

Bosnjak, M., Neubarth, W., Couper, M. P., Bandilla, W., & Kaczmirek, L. (2008). Prenotification in web-based access panel surveys: The influence of mobile text messaging versus email on response rates and sample composition. *Social Science Computer Review*, *26*(2), 213–223. https://doi.org/10.1177/0894439307305895

Brick, J. M., Brick, P. D., Dipko, S., Presser, S., Tucker, C., & Yuan, Y. (2007). Cell phone survey feasibility in the US: Sampling and calling cell numbers versus landline numbers. *Public Opinion Quarterly*, *71*(1), 23–39. https://doi.org/10.1093/poq/nfl040

Burton, J., Lynn, P., & Benzeval, M. (2020). How Understanding Society: The UK Household longitudinal study adapted to the COVID-19 pandemic. *Survey Research Methods*, *14*(2), 235–239. https://doi.org/10.18148/srm/2020.v14i2.7746

Carpenter, H., & Burton, J. (2017). *Moving the UK Household Longitudinal Study to mixed mode: Effects on response and attrition*. European Survey Research Association confernece, Lisbon.

Cernat, A., & Lynn, P. (2018). The Role of Email Communications in Determining Response Rates and Mode of Participation in a Mixed-mode Design. *Field Methods*, *30*(1), 70–87. https://doi.org/10.1177/1525822X17726205

Crawford, S. D., Mcclain, C. A., O'brien, S., & Nelson, T. F. (2013). Examining the Feasibility of SMS as a Contact Mode for a College Student Survey. *AAPOR*.

Dal Grande, E., Chittleborough, C. R., Campostrini, S., Dollard, M., & Taylor, A. W. (2016). Pre-survey text messages (SMS) improve participation rate in an Australian mobile telephone survey: An experimental study. *PLoS ONE*, *11*(2). https://doi.org/10.1371/journal.pone.0150231

De Bruijne, M., & Wijnant, A. (2014). Improving response rates and questionnaire design for mobile web surveys. *Public Opinion Quarterly*, *78*(4), 951–962. https://doi.org/10.1093/poq/nfu046

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, Phone, Mail, and Mixed-Mode Surveys. The Tailored Design Method.* (4th ed.). Wiley & Sons.

Dubray, P. (2013). *Use of Text Messaging to Increase Response Rates*.

Edwards, M. L., Dillman, D. A., & Smyth, J. D. (2014). An experimental test of the effects of survey sponsorship on internet and mail survey response. *Public Opinion Quarterly*, *78*(3), 734–750. https://doi.org/10.1093/poq/nfu027

European Commission. (2016). E-Communications and the Digital Single Market. In *Special Eurobarometer 438, DG Communication, European Commission* (Issue October 2015).

Groves, R. M., Couper, M., & Couper, M. P. (1998). *Nonresponse in household interview surveys*. Wiley.

Groves, R. M., Presser, S., Tourangeau, R., West, B. T., Couper, M. P., Singer, E., & Toppe, C. (2012). Support for the survey sponsor and nonresponse bias. *Public Opinion Quarterly*, *76*(3), 512–524. https://doi.org/10.1093/poq/nfs034

Gummer, T., Quoß, F., & Roßmann, J. (2019). Does Increasing Mobile Device Coverage Reduce Heterogeneity in Completing Web Surveys on Smartphones? *Social Science Computer Review*, *37*(3), 371–384. https://doi.org/10.1177/0894439318766836

Jäckle, A., Beninger, K., Burton, J., & Couper, M. P. (2021). *Understanding Data Linkage Consent in Longitudinal Surveys*.

Jenny Marlar. (2017). *Using Text Messaging to Reach Survey Respondents*.

Kim, S., & Couper, M. P. (2020). Feasibility and Quality of a National RDD Smartphone Web Survey: Comparison With a Cell Phone CATI Survey. *Social Science Computer Review*. https://doi.org/10.1177/0894439320964135

Leeuw, E. D., Callegaro, M., Hox, J., Korendijk, E., & Lensvelt-Mulders, G. (2007). The Influence of Advance Letters on Response in Telephone Surveys: A Meta-Analysis. *Public Opinion Quarterly*, *71*(3), 413–443. https://doi.org/10.1093/poq/nfm014

Lynn, P. (2009). *Sample Design for Understanding Society—Understanding Society Working Paper 2009-01*.

Lynn, P., Nandi, A., Parutis, V., & Platt, L. (2018). Design and implementation of a high-quality probability sample of immigrants and ethnic minorities: Lessons learnt. *Demographic Research*, *38*(1), 513–548. https://doi.org/10.4054/DemRes.2018.38.21

Maslovskaya, A. O., Peter, P., Smith, W. F., & Durrant, P. G. (2020). *Do respondents using smartphones produce lower quality data? Evidence from the UK Understanding Society mixed-device survey*. https://doi.org/10.5255/UKDA-SN-6614-12

Mavletova, A., & Couper, M. P. (2014). Mobile web survey design: Scrolling versus paging, sms versus email invitations. *Journal of Survey Statistics and Methodology*, *2*(4), 498–518. https://doi.org/10.1093/jssam/smu015

McGeeney, K., & Yan, H. Y. (2016). *Text Messages Notifications for Web Surveys*. Pew Reseach. https://www.pewresearch.org/methods/2016/09/07/text-message-notification-for-web-surveys/

Millar, M. M., & Dillman, D. A. (2011). Improving Response to Web and Mixed-Mode Surveys. *Public Opinion Quarterly*, *75*(2), 249–269. https://doi.org/10.1093/poq/nfr003

Rettie, R. (2009). SMS: EXPLOITING THE INTERACTIONAL CHARACTERISTICS OF NEAR-SYNCHRONY. *Information, Communication & Society*, *12*(8), 1131–1148. https://doi.org/10.1080/13691180902786943

Sala, E., Burton, J., & Knies, G. (2012). Correlates of Obtaining Informed Consent to Data Linkage. *Sociological Methods & Research*, *41*(3), 414–439. https://doi.org/10.1177/0049124112457330

Sallis, A., Sherlock, J., Bonus, A., Saei, A., Gold, N., Vlaev, I., & Chadborn, T. (2019). Pre-notification and reminder SMS text messages with behaviourally informed invitation letters to improve uptake of NHS Health Checks: A factorial randomised controlled trial. *BMC Public Health*, *19*(1). https://doi.org/10.1186/s12889-019-7476-8

Steeh, C., Buskirk, T. D., & Callegaro, M. (2007). Using text messages in US mobile phone surveys. In *Field Methods* (Vol. 19, Issue 1, pp. 59–75). https://doi.org/10.1177/1525822X06292852

Struminskaya, B., Toepoel, V., Lugtig, P., Haan, M., Luiten, A., & Schouten, B. (2021). Understanding Willingness to Share Smartphone-Sensor Data. *Public Opinion Quarterly*. https://doi.org/10.1093/poq/nfaa044

Suffoletto, B. (2016). Text message behavioral interventions: From here to where? In *Current Opinion in Psychology* (Vol. 9, pp. 16–21). Elsevier. https://doi.org/10.1016/j.copsyc.2015.09.012

Tan, C. H., Sutanto, J., Phang, C. W., & Gasimov, A. (2014). Using personal communication technologies for commercial communications: A cross-country investigation of email and sms. *Information Systems Research*, *25*(2), 307–327. https://doi.org/10.1287/isre.2014.0519

Toepoel, V., & Lugtig, P. (2014). What Happens if You Offer a Mobile Option to Your Web Panel? Evidence From a Probability-Based Panel of Internet Users. *Social Science Computer Review*, *32*(4), 544–560. https://doi.org/10.1177/0894439313510482

Toepoel, V., & Lugtig, P. (2018). Modularisation in an Era of Mobile Web: Investigating the Effects of Cutting a Survey Into Smaller Pieces on Data Quality. *Social Science Computer Review*. https://doi.org/10.1177/0894439318784882

University of Essex, Institute for Social and Economic Research. (2022). Understanding Society: Waves 1-11, 2009-2020 and Harmonised BHPS: Waves 1-18, 1991-2009. [data collection]. 15th Edition. UK Data Service. SN: 6614, DOI: 10.5255/UKDA-SN-6614-16

Vidal, C., Garcia, M., Benito, L., Milà, N., Binefa, G., & Moreno, V. (2014). Use of text-message reminders to improve participation in a population-based breast cancer screening program. *Journal of Medical Systems*, *38*(9). https://doi.org/10.1007/s10916-014-0118-x

Virtanen, V., Sirkiä, T., & Jokiranta, V. (2007). Reducing nonresponse by SMS reminders in mail surveys. *Social Science Computer Review*, *25*(3), 384–395. https://doi.org/10.1177/0894439307299588

Vogl, S., Parsons, J. A., Owens, L. K., & Lavrakas, P. J. (2019). Experiments on the Effects of Advance Letters in Surveys. In P. Lavrakas, M. Traugott, C. Kennedy, A. Holbrook, E. de Leeuw, & B. West (Eds.), *Experimental Methods in Survey Research* (1st ed., pp. 89–110). Wiley. https://doi.org/10.1002/9781119083771.ch5

Watson, N., & Wooden, M. (2009). Identifying factors affecting longitudinal survey response. *Methodology of Longitudinal Surveys.*

Wenz, A., Jäckle, A., & Couper, M. P. (2019). Willingness to use mobile technologies for data collection in a probability household panel. *Survey Research Methods*. https://doi.org/10.18148/srm/2019.v13i1.7298

APPENDIX A. ANALYSIS EXCLUDING THE LOW WEB PROPENSITY SUBSAMPLE

This appendix replicates the analysis of the experiment excluding participants allocated to the low web propensity fieldwork protocol at wave 10. This group was not included in the web-first sequential mixed-mode design at wave 10 given its lower propensity to complete the web questionnaire. Participants reluctant to take part in the web are unlikely to be issued to a web-first design after the pandemic. Anticipating a post-pandemic scenario, the following tables focus on the participants more likely to be included in a web-first design and therefore potentially to receive text messages in the future.

Table A 1. Response rates and standard errors at different stages of the fieldwork for the full, treated, and treated adjusted samples excluding the low web propensity group

	Control	Invite	Reminders	Invite & reminders
Full sample				
Web	49.8	52.0	52.4	53.1
	(2.0)	(2.0)	(2.0)	(2.1)
Web + CATI	67.7	71.3	69.8	70.1
	(1.9)	(1.8)	(1.8)	(2.1)
Treated sample				
Web	55.5	58.6	**62.2***	**62.2***
	(2.1)	(2.2)	**(2.1)**	**(2.1)**
Web + CATI	73.9	78.9	78.8	77.4
	(2.0)	(1.7)	(1.8)	(1.9)
Treated sample (adjusted)				
Web	55.8	59.1	**62.6***	61.7
	(2.3)	(2.5)	**(2.3)**	(2.5)
Web + CATI	73.3	**79.2***	79.2	77.4
	(2.3)	**(1.8)**	(2.0)	(2.2)
Full sample (N)	1,825	1,843	1,790	1,792
Treated sample (N)	1,200	1,223	1,173	1,151

Table A 2. Heterogeneous average treatment effects and standard errors for the treated sample after the five-week web fieldwork

	Web			Web + CATI		
	I vs. C	**R vs. C**	**I&R vs. C**	**I vs. C**	**R vs. C**	**I&R vs. C**
Sex						
Male	0.058	0.070	0.034	**0.071***	0.048	0.028
	(0.036)	(0.036)	(0.034)	(0.033)	(0.033)	(0.032)
Female	0.014	**0.068***	0.081*	0.037	0.050	0.027
	(0.033)	**(0.033)**	(0.034)	(0.027)	(0.029)	(0.029)
Age						
16-29	0.043	**0.157****	**0.126***	0.043	0.059	0.028
	(0.057)	**(0.059)**	**(0.062)**	(0.059)	(0.059)	(0.062)
30-44	0.090	0.072	**0.160****	**0.105***	0.050	0.085
	(0.057)	(0.059)	**(0.055)**	**(0.052)**	(0.052)	(0.049)
45-64	0.047	0.063	0.011	**0.084***	**0.089***	0.031
	(0.043)	(0.044)	(0.045)	**(0.036)**	**(0.038)**	(0.040)
65+	-0.066	-0.007	-0.038	-0.063	-0.038	-0.050
	(0.051)	(0.052)	(0.049)	(0.034)	(0.032)	(0.033)
Urbanicity						
Urban	0.039	**0.062***	0.046	**0.065***	0.047	0.017
	(0.032)	**(0.031)**	(0.030)	**(0.026)**	(0.027)	(0.027)
Rural	0.019	0.093	0.105	0.011	0.057	0.066
	(0.055)	(0.062)	(0.055)	(0.052)	(0.056)	(0.055)
Education						
Less than a degree	0.046	0.061	0.021	**0.069***	0.049	0.017
	(0.032)	(0.032)	(0.033)	**(0.028)**	(0.029)	(0.029)
Degree	0.010	0.087	**0.143*****	0.018	0.049	0.052
	(0.045)	(0.046)	**(0.042)**	(0.039)	(0.042)	(0.037)
Ethnicity						
Ethnic minorities	0.026	0.095	**0.153***	0.073	0.077	0.061
	(0.078)	(0.069)	**(0.071)**	(0.070)	(0.066)	(0.072)
White British	0.036	**0.065***	0.044	**0.050***	0.045	0.023
	(0.029)	**(0.030)**	(0.029)	**(0.025)**	(0.025)	(0.026)
Have smartphone						
No	0.069	0.053	0.078	0.100	0.070	0.059
	(0.092)	(0.086)	(0.087)	(0.072)	(0.073)	(0.073)
Yes	0.032	**0.070***	**0.057***	**0.049***	0.047	0.025
	(0.028)	**(0.030)**	**(0.028)**	**(0.025)**	(0.027)	(0.026)
Social context						
Non-cooperative	-0.017	0.040	0.044	-0.009	0.039	0.002
	(0.039)	(0.038)	(0.038)	(0.033)	(0.033)	(0.033)
Cooperative	**0.080***	**0.094***	**0.072***	**0.107*****	0.058	0.050
	(0.037)	**(0.037)**	**(0.036)**	**(0.032)**	(0.035)	(0.033)

Privacy concerns						
Low	0.024	**0.080****	0.052	0.047	**0.055***	0.028
	(0.030)	**(0.030)**	(0.029)	(0.026)	**(0.026)**	(0.026)
High	0.092	0.006	0.099	0.084	0.019	0.024
	(0.062)	(0.058)	(0.061)	(0.051)	(0.051)	(0.054)
Regular respondent						
Irregular respondent	**0.195****	**0.130***	**0.184****	**0.250*****	**0.153***	**0.151***
	(0.065)	**(0.059)**	**(0.067)**	**(0.066)**	**(0.068)**	**(0.076)**
Regular respondent	0.011	**0.060***	0.040	0.024	0.034	0.010
	(0.029)	**(0.030)**	(0.029)	(0.025)	(0.026)	(0.025)
Last wave mode of issue						
CAPI-only	0.060	0.067	0.034	0.040	-0.011	-0.009
	(0.064)	(0.063)	(0.064)	(0.055)	(0.051)	(0.052)
Web-first	0.028	**0.069***	**0.065***	**0.056***	**0.064***	0.037
	(0.031)	**(0.032)**	**(0.030)**	**(0.026)**	**(0.028)**	(0.027)

Table A 3. Response rates and standard errors at different stages of the fieldwork for the full, treated, and treated adjusted samples

	Control	**Invite**	**Reminders**	**Invite & reminders**
Household response after web				
Household response	64.5	63.0	64.1	66.4
	(2.2)	(2.3)	(2.2)	(2.3)
Full household response	42.6	42.9	44.5	45.0
	(2.2)	(2.3)	(2.2)	(2.3)
Average number of calls per household	4.5	4.1	4.3	4.3
	(0.3)	(0.2)	(0.3)	(0.4)
Average duration of calls to the household (minutes)	20.0	22.7	25.1	20.5
	(1.9)	(2.5)	(2.6)	(2.4)
Sample of treated households (N)	812	833	835	810

Table A 1. Device used to complete the questionnaire and standard errors for compliant respondents during the web fieldwork

	Control	Invite	Reminders	Invite and reminders
Household questionnaire				
Desktop or laptop	49.5	49.9	51.3	47.4
	(2.8)	(2.9)	(2.9)	(3.1)
Tablet	13.8	9.2	9.3	**8.1***
	(2.0)	(1.7)	(1.5)	**(1.5)**
Smartphone	36.8	41.0	39.3	44.4
	(2.8)	(2.8)	(2.9)	(3.2)
Web respondents - household interview (N)	394	416	410	404
Individual questionnaire				
Desktop or laptop	50.1	51.2	48.4	50.3
	(2.5)	(2.7)	(2.4)	(2.8)
Tablet	14.7	**8.5****	**10.2***	**7.5****
	(1.7)	**(1.5)**	**(1.3)**	**(1.3)**
Smartphone	35.2	40.3	41.4	42.2
	(2.5)	(2.6)	(2.6)	(2.7)
Web respondents – individual interview (N)	650	695	702	677

Table A 2. Heterogenous average treatment effects of the text messages on smartphone completion for the treated sample of web respondents

	Web respondents		
	I vs. C	**R vs. C**	**I&R vs. C**
Sex			
Male	0.037	**0.082***	**0.087***
	(0.041)	**(0.040)**	**(0.043)**
Female	0.047	0.017	0.040
	(0.041)	(0.040)	(0.041)
Age			
16-29	0.155	**0.210***	**0.174***
	(0.093)	**(0.085)**	**(0.086)**
30-44	**-0.160***	-0.025	-0.054
	(0.073)	(0.070)	(0.073)
45-64	**0.116***	0.057	**0.118***
	(0.052)	(0.049)	**(0.051)**
65+	0.056	0.002	0.018
	(0.046)	(0.047)	(0.045)
Urbanicity			
Urban	0.064	**0.078***	**0.109****
	(0.038)	**(0.036)**	**(0.037)**
Rural	-0.026	-0.057	-0.094
	(0.064)	(0.063)	(0.061)
Education			
Less than a degree	0.066	0.066	**0.085***
	(0.040)	(0.037)	**(0.039)**
Degree	-0.003	0.007	0.016
	(0.051)	(0.048)	(0.051)
Ethnicity			
Ethnic minorities	-0.132	-0.051	0.041
	(0.113)	(0.104)	(0.109)
White British	0.062	0.057	0.063
	(0.034)	(0.032)	(0.033)
Social context			
Non-cooperative	0.044	0.017	0.081
	(0.044)	(0.045)	(0.042)
Cooperative	0.041	0.074	0.040
	(0.048)	(0.043)	(0.046)
Privacy concerns			
Low	0.051	0.042	0.052

	(0.035)	(0.032)	(0.034)
High	-0.005	0.064	0.109
	(0.070)	(0.079)	(0.078)
Regular respondent			
Irregular respondent	-0.050	0.027	0.050
	(0.116)	(0.109)	(0.115)
Regular respondent	0.050	0.047	0.062
	(0.033)	(0.032)	(0.033)
Last wave mode of issue			
CAPI-only	0.049	0.059	0.009
	(0.076)	(0.075)	(0.078)
Web-first	0.041	0.043	
	(0.036)	(0.034)	**(0.035)**

Table A 3. Average number of days elapsed between survey invite and completion for respondents

	Control	Invite	Reminders	Invite & reminders
Household questionnaire				
Time to start	9.2	10.0	10.4	8.7
	(0.5)	(0.6)	(0.5)	(0.5)
Time to end	9.7	10.5	11.1	9.2
	(0.5)	(0.6)	(0.5)	(0.5)
Web respondents - household interview (N)	394	416	410	404
Individual questionnaire				
Time to start	8.4	9.1	9.5	7.9
	(0.6)	(0.6)	(0.5)	(0.7)
Time to end	8.7	9.3	9.7	8.2
	(0.6)	(0.6)	(0.5)	(0.7)
Web respondents – individual interview (N)	650	695	702	677

Table A 4. Sample profile of the respondents during the 5-week web fieldwork by experimental group

	Control	Invite	Reminders	Invite and reminders	Chi2 test
Urbanicity					*χ2 (3) = 13.054*
Urban area	77.7	77.6	75.5	73.6	*p = 0.553*
Rural area	22.3	22.4	24.5	26.4	
Sex					*χ2 (3) = 1.338*
Male	43.6	45.2	44	43.8	*p = 0.918*
Female	56.4	54.8	56	56.2	
Age					*χ2 (9) = 68.634*
16-29	12.4	13.2	16.8	14.2	*p = 0.184*
30-44	20.3	23.8	21.4	27.5	
45-64	39.1	36.6	39.5	35.2	
65+	28.1	26.4	22.3	23	
Ethnicity					*χ2 (9) = 47.226*
White British	92	90.6	89.5	87.5	*p = 0.394*
Black	1.1	1.7	1.4	0.8	
Asian	3.1	3	4.7	5.3	
Other	3.7	4.8	4.4	6.5	
Marital status					*χ2 (12) = 33.961*
Single or civil partnership	24.5	28.3	29.9	27.4	*p = 0.888*
Married or civil partnership	59.2	57.7	53.7	57.2	
Separated or divorced	11.1	8.8	11.3	11.1	
Widowed	3.8	3.7	3.6	3.6	
Missing	1.4	1.5	1.4	0.6	
Number of own children in household					*χ2 (9) = 75.096*
0	79.1	77	76.6	75.8	*p = 0.255*
1	7.5	8.6	12.8	7.6	
2	10	10.6	8.6	12.9	
3+	3.4	3.7	2.1	3.8	
Highest qualification					*χ2 (15) = 90.627*
Degree	31.1	31.7	35.4	40.1	*p = 0.121*
Other higher	15.1	16.5	13	13.3	
A level etc	22.9	19.9	21.4	16.7	
GCSE etc	18.5	19.7	16.2	18.7	
Other or no qual	11.4	11.7	13.7	10.6	
Missing	1	0.4	0.4	0.5	
Long-standing illness or disability					*χ2 (6) = 118.808*
Yes	34.9	37.4	32.3	33.9	*p = 0.000*
No	64.9	62.2	67.4	63.4	
Missing	0.2	0.3	0.3	2.7	
General health					*χ2 (15) = 63.903*

Excellent	10.4	7.3	11	11.8	*p = 0.293*
Very good	34.3	35.8	29.9	35.3	
Good	37.4	37.2	36.8	35.1	
Fair	13.5	15	17.9	13.8	
Poor	4.5	4.8	4.3	3.9	
Missing	0	0	0.1	0.1	
Voting intention					*χ2 (15) = 89.694*
Conservatives	35.5	36.1	29.6	29.7	*p = 0.289*
Labour	28.5	23.3	28.2	28.8	
Liberal Democrat	6	5.7	6.9	7.8	
Other	10.4	10	9.6	9.9	
Won't vote	13.9	19.8	21.3	18.1	
Missing	5.7	5.2	4.3	5.6	
Benefit recipient					*χ2 (6) = 48.008*
Benefits recipient	27.1	30.5	30.9	29.2	*p = 0.166*
No benefits	72.5	69.3	68.2	68.9	
Missing	0.4	0.2	0.9	1.9	
Web respondents (N)	650	695	702	677	