



Understanding Society
Working Paper Series

No. 2018 – 05

May 2018

**Adaptive push-to-web: experiments in a
household panel study**

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Non-technical summary

This paper reports on a series of tests in Wave 8 of the Understanding Society panel study that were designed to test the cost-effectiveness of survey design features aimed at increasing the proportion of households where everyone completes their survey online, before face-to-face interviewers are sent to interview the remaining non-respondents.

The features tested include offering a bonus for web completion within a specified time period, extending the length of that period, making the bonus conditional on everyone in the household completing online versus individual completion, adding reminder letters, and increasing the length of the web only fieldwork period. Some features were tested experimentally with randomised allocations to treatments, other features were tested quasi-experimentally, by varying the designs between sample months. In all cases the testing was adaptive in that the more successful design was carried forward into the following test.

The results show that the combination of several design features is highly effective: increasing the web only fieldwork period, additional reminders, and offering a bonus for web completion in the first weeks increased the proportion of households where all adults complete their interviewing online from 19% to 42%. The analyses also show that these adaptations of the fieldwork protocol were cost effective: although each measure carried additional costs to implement it, the savings of not having to send a face-to-face interviewer to the household outweighed the additional costs.

Adaptive push-to-web: experiments in a household panel study

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Abstract

We use an adaptive design implemented in Wave 8 of the Understanding Society panel study to test the cost-effectiveness of several survey design features aimed at increasing the proportion of households where everyone completes their survey online. The features tested include offering a bonus for web completion within a specified time period, extending the length of that period, making the bonus conditional on everyone in the household completing online versus individual completion, adding reminder letters, and increasing the length of the web only fieldwork period.

Keywords: mixed modes, response rates, respondent incentive, fieldwork protocols.

JEL Classification: C83

Acknowledgements: This work was funded by the ESRC grant for Understanding Society: the UK Household Longitudinal Study ([ES/N00812X/1](#)). The authors are grateful to Professor Annette Jäckle for her help in improving the draft of this paper.

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Introduction

Push-to-web survey designs are increasingly popular (see Dillman, 2017). Using web for interviews promises reductions in fieldwork costs, in particular compared to interviewer-administered surveys. Using web only, however, still produces highly selected samples. With push-to-web designs sample members who do not complete the survey online are therefore followed up in other modes. The extent of savings depends on the uptake of the web option: the larger the proportion who respond online, the larger the savings. In household surveys, where more than one person is interviewed, cost savings in addition depend on all household members completing their survey online. If interviewers are required to visit or telephone even just one member of the household, cost savings are diminished.

We use an adaptive design implemented in Wave 8 of the *Understanding Society* panel study to test the cost-effectiveness of several survey design features aimed at increasing the proportion of households where everyone completes their survey online. The features tested include offering a bonus for web completion within a specified time period, extending the length of that period, making the bonus conditional on everyone in the household completing online versus individual completion, adding reminder letters, and increasing the length of the web only fieldwork period. Some features are tested experimentally with randomised allocations to treatments, other features are tested quasi-experimentally, by varying the designs between sample months. In all cases the testing is adaptive in that the more successful design is carried forward into the following test.

Data

Sample design and following rules

Understanding Society is the UK Household Longitudinal Study (UKHLS).¹ At the core is an annual survey of individuals, located within households. At each wave the sample is issued as 24 monthly samples. The fieldwork therefore has an over-lapping design, with the second year of a wave being in the field at the same time as the first year of the next wave. The adaptive design discussed in this paper was implemented on the first year of fieldwork for Wave 8 (2016).

The initial, stratified and clustered, probability samples of residential addresses in Great Britain were drawn from the Postcode Address File in 2009. In Northern Ireland, an unclustered sample was drawn using the Land and Property Services Agency national list of domestic properties (Lynn, 2009). The original samples in 2009/10 comprised a general population sample (GPS), and an ethnic minority boost sample (EMB, see Berthoud et al, 2009). At the second wave of the survey (2010/11) the British Household Panel Survey (BHPS) sample was incorporated into the study.² At Wave 6 (2014/15), a new sample was

¹ <https://www.understandingsociety.ac.uk/>

issued to field to include recent immigrants to the country. This new sample is however not included in the present analyses, as it is part of the year-two sample of each wave and the adaptive design was tested on the year-one sample.

All individuals living in the selected households at Wave 1 are original sample members.³ These are the individuals who are the focus of the study, and it is they – and anyone they are living with – who are eligible for interviews each year. When an original sample member moves house within the UK, they are interviewed in their new address, along with anyone else they are living with. When someone joins a household with an original sample member, they are interviewed as long as they are living with an original sample member.

Survey instruments

At each issued address, every year, a household grid is completed to enumerate who is living in the household, adding new members and accounting for those who have moved out. There is a household questionnaire, which is asked once per household and generally to the person or people responsible for paying the household-level bills (e.g., mortgage, rent, utilities). Then, each adult (defined as being aged 16 or over), is eligible for a full adult interview. A proxy interview may be taken on behalf of an adult who does not want to, or is not capable of responding. Children aged 10-15 are asked to complete a paper questionnaire themselves. A “fully complete” household is defined as one in which every adult completes their survey. A household where at least one adult participates and at least one adult does not, is defined as a “partial” household. The definition of full/partial, therefore, does not take into account the youth self-completion instrument. The median length of the enumeration grid is about 5 minutes, the household questionnaire is about 10 minutes, and the adult questionnaire is about 40 minutes.

The data used in this paper are taken from the sample and outcome files which are generated within Kantar Public as a process of implementing the survey. That is, they are data sources that could be used to monitor the effect of each adaptive design during fieldwork.

Mode of interview

The primary mode of interview on *Understanding Society* has been face-to-face. In year 2 of Wave 3, a telephone mop-up was introduced towards the end of each fieldwork period to try to contact and interview non-respondents by telephone. At Wave 7, adults in households that had not responded at Wave 6 were initially invited to complete their interview online. After two weeks, non-respondents were issued to face-to-face interviewers who would try to contact and interview the sample members in person. These sample members are referred to as ‘web-first’. Adults in households that had participated at Wave 6 were issued,

³ Except for individuals in ethnic minority boost households who did not identify as being an ethnic minority nor reported having parents or grandparents who were ethnic minorities.

as usual, to interviewers. This sample group is referred to as 'CAPI first': during the reissue phase, those sample members who had not yet responded were invited to complete their survey online. From week 20, all non-respondents (except those who had adamantly refused or were considered to be incapable of responding) were eligible for the telephone mop-up. At Wave 8 the proportion of the web-first sample was increased: adults in around 40% of households were invited to participate online, with non-respondents followed up in-person. This group included both previous-wave participants and non-participants. Adults in the remaining 60% of households were issued, as previously, directly to CAPI-first.

The allocation of households to the web-first mode was not done randomly. Aside from 20% of the sample that were ring-fenced as face-to-face, the remaining sample was allocated using a model created using the *Understanding Society* Innovation Panel (IP). The IP had been mixed-mode, with randomly allocated web-first and CAPI-first samples, since the fifth wave (IP5). The IP data were used to estimate a model which aimed to maximise the probability of a household fully responding online whilst minimising the chance that non-responders to the web invite would then refuse to participate face-to-face. The model built using the IP was then applied to the main-stage sample to generate a web propensity score. Those households with the lowest propensity to respond by web were issued to face-to-face interviewers (16%). The remaining sample was randomly allocated between web-first (40%) and CAPI-first (24%).

Adaptive push to web: design features and results

In the first year of Wave 8 of *Understanding Society* we implemented an adaptive design, in which we manipulated aspects of the fieldwork design to try to increase the proportion of households that fully completed online before being issued to face-to-face interviewers. After each manipulation, the 'successful' adaptation was carried through to subsequent months. Where the difference in the treatment groups were not statistically significant, we still implemented the treatment which achieved the highest web completion rate, on the assumption that the treatment was not worse than the control.

One initial constraint on the experimental allocation was that the sample for the early months had already been sent to the fieldwork agency and invitation letters had already been produced. This meant that we were not able to adapt the standard design for the first month of the wave. The first month therefore serves as a base, or benchmark, against which to measure subsequent sample months. Figure 1 summarises the results for each successive design.

January

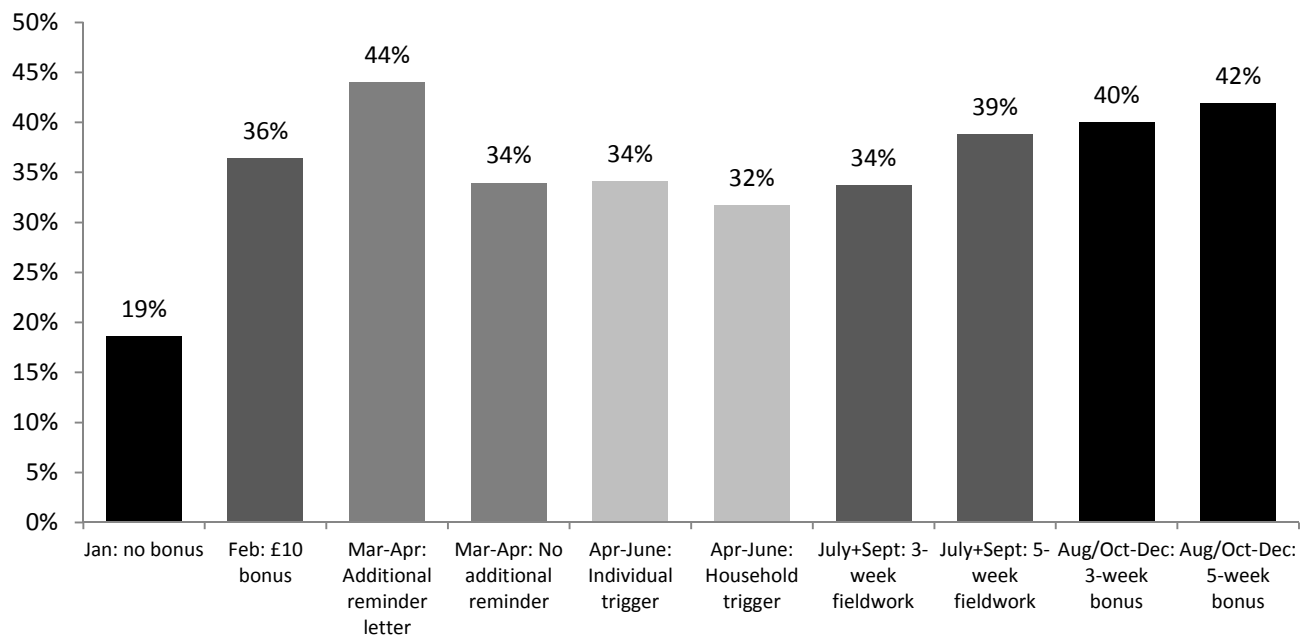
In the first month of Wave 8 the standard protocol for the web-first sample was used. Sample members would first receive an invitation letter, which contained their incentive and information on how to access their online interview: the URL, their unique username,

and password. The incentive was an unconditional £10 Love2Shop gift voucher (redeemable in many high street shops) for all adults who had participated at Wave 7. For adults who had not participated at Wave 7, the incentive was conditional on taking part at Wave 8. The value of the incentive differed, however, depending on the household-level outcome at Wave 7. For households that had partially responded the incentive was £10 and for non-responding households it was £20, per adult. Invitation letters were sent to each adult, rather than to the household. The letter included a sentence to reassure people who did not want to take part online that an interviewer would also be available to carry out the survey.⁴ Adults for whom we had an email address were also sent an email which included a direct link to the questionnaire. The email was sent the day after the letter was despatched, so that they would have arrived on the same day.

One week later, those who had not yet responded online were sent a reminder email. Another reminder email was sent one week after that. Then a week later, three weeks after the start of the web fieldwork, non-responding adults were issued to interviewers.

At the point at which the non-responding sample were issued to face-to-face interviewers, 19% of the web-first households had fully completed online (Figure 1).

Figure 1: Proportion of households that fully completed online by treatment group



February: Bonus for early completion

To increase the proportion of web-first households that completed online, we introduced a conditional bonus of £10 for each adult who completed their individual interview within the

⁴ “If you are unable to complete your questionnaire online, an interviewer will soon be in touch with you to arrange a convenient time for an interview.”

first two weeks of the web fieldwork. This was mentioned in the invitation letter and email. This was not implemented experimentally, the whole of the web-first sample were offered the bonus. This means that whilst we can compare the February web-completion rate with that achieved in January, we cannot definitively state that any change was due solely to the additional bonus. There may be other factors which we cannot control for which may affect the web completion rate. However, the web-completion rate in February was almost twice as high, at 36%. The bonus for early completion was therefore retained for the subsequent months.

March-April: Reminder letters

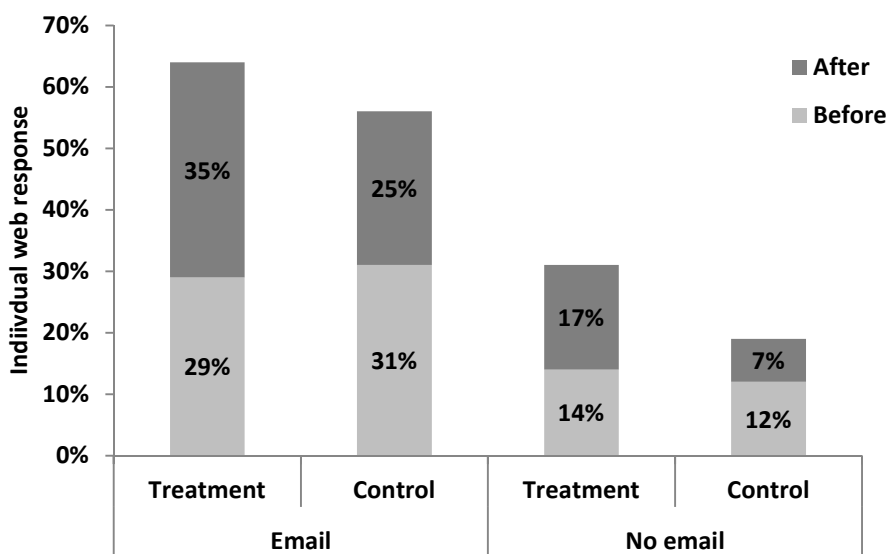
In March and April we were able to randomly allocate households into a treatment and a control group. The allocation was stratified by household outcome at Wave 7 (responding/non-responding) and whether the household was reported to have an internet connection at Wave 7. We introduced an additional reminder letter, one week after the start of the web fieldwork. Up to this point, sample members for whom we did not have an email address, or where the email was undeliverable, received just the initial invitation letter, whereas those sample members for whom we had a working email address received the letter, an email, and then two reminder emails. The introduction of the reminder letter enabled us to remind those for whom we did not have a working email address to complete online. Although it is referred to as a 'reminder' letter, because of the need to print and despatch the letters to arrive one week after the initial invitation, they were sent to all web-first sample members. The opening text of the letter thanked the sample member if they had already completed online. The letter also included a reminder about the early completion bonus, and included the login details.

After one week of web fieldwork, before any reminder was sent, there was no difference in the proportion of households who had fully completed online; 16% in the control group, 17% in the treatment group. By the end of the web-only fieldwork period, another 18% of the households in the control group had fully completed online, bringing the total to 34%. For households in the treatment group, the additional letter increased the proportion of households who fully completed online by 27 percentage points, bringing the total to 44%. This was statistically significant at the $p < 0.01$ level using a two-tailed t-test. The proportion of households which were partially complete was not different between the groups (24% in the control group, 23% in the treatment group).

The increase in the proportion of households that fully completed online in the treatment group is also reflected if we look at the individual-level completion rate. For adults, we can look at whether we had a working email address for them, or we had no email or an invalid email address. We might expect the effect of the reminder letter to be greater for those who did not receive the initial invitation email, because the letter was the only reminder they received. For both groups, those with and those without valid emails, the treatment group was around 10 percentage points more effective than the control group. Figure 2

shows that for those with a valid email address, the treatment group had a similar web completion rate to the control group before the reminder was sent. By the end of fieldwork, the completion rate increased by 35 percentage points for the treatment group, compared to 25 points for the control group. Similarly for those with no valid email address, the pre-reminder proportion of web completions was similar – although lower than those with a valid email address. The increase in web completes by the end of the web-only fieldwork was also less than those with an email address – the latter group having received more (email) reminders overall. However, the difference between the treatment and the control group was also 10 percentage points.

Figure 2: Effect of an additional reminder letter on individual web-completion, by valid email address



April-June: Trigger for bonus for early completion

From April the deadline for the early completion bonus was shifted from two weeks to almost three weeks; to the end of the web-only period (19 days after the start of fieldwork). This was done because we found that relatively few people completed their survey between the deadline and the end of the web-only period.

For the April-May-June sample months we experimented with the ‘trigger’ for the early completion bonus. In February and March this had been paid if the adult completed online before the deadline. However, the activity that we wanted to incentivise was full household completion. So the experiment in this quarter randomly allocated households to an individual trigger or to a household trigger for the bonus. The individual trigger was the same as in February and March, the activity that triggered the bonus was the individual adult completing online. Adults in the household trigger group were offered the additional

bonus to be paid to each adult only if all adults in the household completed online before the deadline.

We did not find a significant difference in the proportion of households that were fully complete online at the end of the web-only period; 34% of households in the individual-trigger group, and 32% of those in the household-trigger group were fully completed online. However, there was a significant effect of *some* interviewing being done in the household. In the individual-trigger group, 60% of households had some web interviewing, either just the household-level elements (3%) or at least one adult interview but not fully complete (23%), or fully complete (34%). This compares to 54% of households in the household-trigger group (2% household elements, 20% at least one adult, 32% all adults). Thus, when the non-complete households were issued to interviewers, those in the individual-trigger households had slightly fewer adults to interview.

July and September: Length of web-only fieldwork period

Up to this point, the web-only fieldwork period had been three weeks, at which point non-responders were issued to face-to-face interviewers. The plan for the third quarter (July-September) was to experiment with a slightly longer web-only fieldwork period; 5 weeks. Again the households were randomly allocated to the treatment (5-week) or control (3-week) groups. Both groups would end on the same day, to make it easier to issue the non-responding cases to interviewers. This meant that the 5-week group were sent their invitation letters and emails two weeks earlier than the 3-week group. However, in August there was an error in the despatch of the invitation emails, and both groups were sent the invitation emails at the earlier date, and so both were in the field for 5 weeks before being issued to interviewers. The analysis of this experiment just uses July and September.

The experiment did not just affect the length of the fieldwork period, but also the number of reminders. We wanted to treat each group as we would if it was not an experiment, and in a 5-week fieldwork period we would expect to use more reminders than in a 3-week period. So this is not just a direct comparison of fieldwork length, but the whole fieldwork protocol involved in a 5-week versus a 3-week fieldwork length.

The table below shows the fieldwork protocol for both groups. They are the same for the first three weeks until the deadline for the early completion bonus. The 5-week group then gets two additional reminders.

Table 2: Fieldwork protocol for the 5-week and 3-week fieldwork periods

5-week web period	3-week web period
<ul style="list-style-type: none">• Invitation letter/email• Email/letter reminder after 1 week• Email reminder after 2 weeks• Early bird bonus ends after 19 days• Email/letter reminder after 3 weeks• Email reminder after 4 weeks• Face to face fieldwork starts after 5 weeks	<ul style="list-style-type: none">• Invitation letter/email• Email/letter reminder after 1 week• Email reminder after 2 weeks• Early bird bonus ends after 19 days• Face to face fieldwork starts after 3 weeks

We found that there was no statistically significant difference between the two groups. In the 5-week group, 39% of households were fully complete by the end of the period, compared to 34% in the 3-week group. Partial households, with at least one adult completing online, were also no different between the groups (22% in the 5-week group, 21% in the 3-week group).

August, October to December: 3-week versus 5-week deadline for bonus

After the July and September experiment a 5-week web-only fieldwork period was adopted. In those months, the deadline for the bonus was 19 days after the start of fieldwork, even though there was still a couple of weeks of web-only fieldwork left. In August, October, November, and December, we experimented with adults in households in half the sample being given a 5-week deadline to complete online, compared to the control group which retained the 3-week bonus deadline. In both groups, the web-only fieldwork period was 5 weeks, and they received the same number of reminders. The last two reminders for the 5-week bonus deadline group still mentioned the bonus for online completion.

We found no statistically significant difference between the two groups. In the 3-week bonus deadline group, 40% of households fully completed online within the five weeks, with another 21% of households partially completing online. For the 5-week bonus deadline group, these proportions were 42% fully, and 23% partially, complete. There is evidence that the deadline did encourage some participants to complete their survey to get their bonus. Of those adults in the 3-week deadline group, 45% completed their survey by the deadline, whereas 40% of those in the 5-week deadline group had completed after three weeks.

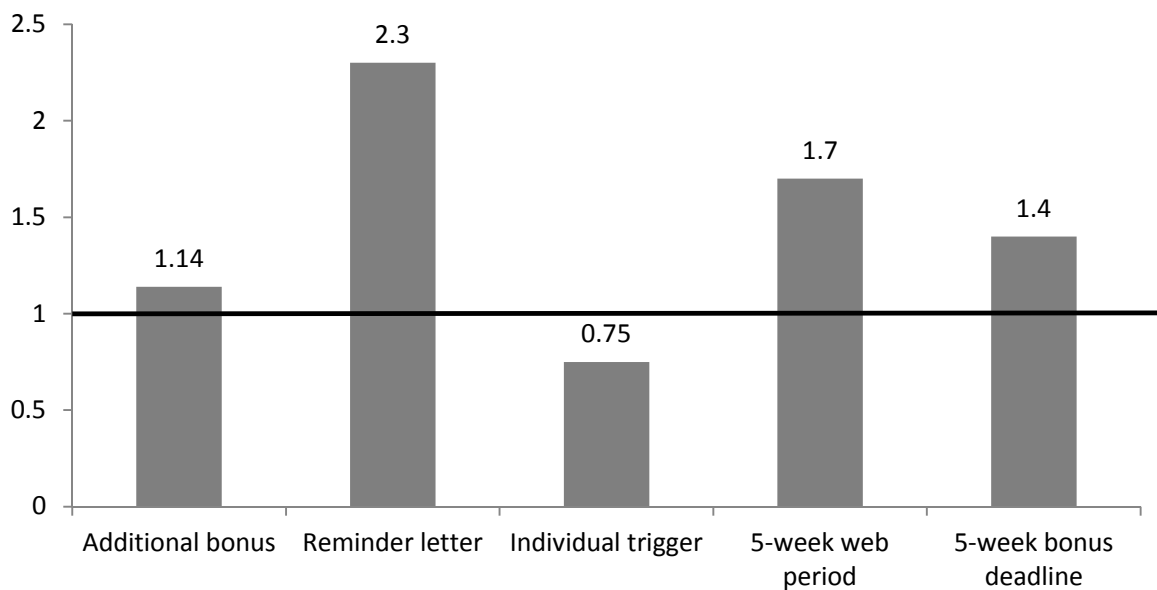
Costs

The following section examines whether those adaptations that were successful at increasing take-up of the online survey were cost-effective. That is, did the fieldwork cost savings associated with a household completing online rather than being issued to a face-to-face interviewer outweigh the costs of implementing the fieldwork adaptation.

Calculating the costs is not straightforward. As more households fully complete online, interviewers have fewer households in their allocation to work. This may mean that interviewers are not able to work as efficiently: we have found that the cost per CAPI interview has increased as the proportion of households that complete online increases. There are also costs related to the implementation of the new fieldwork protocols: the additional incentives, the cost of printing and posting additional letters. These protocols also require extra administration time in the survey agency office.

However, early cost analyses indicate that all but one of the design adaptations saved more than the cost of implementing that adaptation. The saving is calculated as the reduction in costs due to not issuing a household to an interviewer. Figure 3, below, shows the ratio of the saving (bars) to a unit of spending (the horizontal line at $y=1$). For every £1 spent to implement the additional bonus in February and May, there is a cost saving of £1.14. The cost saving of the additional reminder letters is £2.30 for every £1 spent. For every £1 spent, the 5 week web period saves £1.70, and the 5 week bonus deadline saves £1.40.

Figure 3: Indicative cost savings of the fieldwork adaptations



The only experiment which has an additional cost over saving is targeting the bonus at the individual rather than the household. For every £1 spent, the cost saving is only 75 pence when the bonus is triggered by the individual completion, rather than the household-level completion. This is because in the household-trigger group 30% of adults who complete online within the deadline but do not receive the bonus, as other adults in their household do not meet the deadline. Not having to pay these additional bonuses is a cost saving. However the household-trigger group also incurs some additional costs compared to the individual-trigger group. The administration time for this protocol is greater, requiring additional checks by the fieldwork agency to see whether other adults in the household have completed. These rules are complicated by the presence of new entrants into the

household, who may not be identified until close to the deadline, and the presence of within-household adamant refusal individuals, who are issued to field, but not sent a letter or email and not followed up by interviewers. By contrast the individual target was associated with a slightly higher household completion rate (although not statistically significant), and we also felt that this is fairer to participants: their bonus was not dependent on the behaviour of someone else in the household who may not be willing or able to complete online. The individual bonus still saves money over not having a bonus; this was shown in the February-March figure of a £1.14 saving against a £1 cost.

Conclusion

Using an adaptive experimental and quasi-experimental design, we provide evidence of effective ways of pushing whole households to complete their interviewing by web. With the original Understanding Society fieldwork protocol, the proportion of households where everyone completed their interviewing online was just 19%. After successive rounds of adaptive testing, 42% of households completed all their interviewing before the end of the web only fieldwork period.

The fieldwork protocol at the start of Wave 8 was:

- Web fieldwork start (letter + email)
- Email reminder (+1 week)
- Email reminder (+1 week)
- Face-to-face fieldwork starts after 3 weeks

By the start of Wave 9, and Wave 8 year 2, this had been adapted to be:

- Web fieldwork start (letter + email)
- Letter + Email reminder (+1 week)
- Email reminder (+1 week)
- Letter + Email reminder (+1 week)
- Email reminder (+1 week)
- Bonus deadline (34 days)
- Face-to-face fieldwork starts after 5 weeks

The set of fieldwork adaptations that achieved the highest proportion of whole household web completes was carried over to the second year of Wave 8, and to the first year of Wave 9. In the first seven months of Wave 9, the high whole household web-completion rates have been replicated, ranging from 42% to 50%.

Our analyses also show that the adaptations to increase whole household web take-up are cost effective. We note, however, that the calculations of the costs are complicated. The indicative costs used in this analysis uses the average variable cost of issuing an additional household to an interviewer, rather than the actual incurred costs of issuing these particular households. We also note that activities to try to increase response also incur costs both in terms of consumables (incentives, letters) and person-time (administration).

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