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Mixing modes in longitudinal surveys: an overview

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Introduction

Longitudinal and cross-sectional studies in the UK and internationally are making increasing use of mixed mode data collection strategies (Jackle, Gaia, and Benzeval, 2017; De Leuw, 2018), especially strategies which involve the web. The main drivers of this trend are concerns about falling response rates and increasing survey costs for face-to-face surveys, and rising levels of internet coverage and usage in the general population. The 'promise' of mixed-mode data collection is that high quality data can potentially be collected at lower cost, and that mixed-mode may have benefits in terms of improved measurement (particularly for some types of questions), higher response rates and lower non-response bias. However, one of the main potential drawbacks is the risk of measurement differences by mode i.e. respondents' answers being influenced by data collection mode.

There are relatively few examples in the UK as yet of major cross-sectional surveys which have adopted a mixed-mode approach, with Community Life (DCMS) and Active Lives (Sport England) being exceptions. Many 'flagship' government surveys e.g. British Crime Survey, Health Survey for England are retaining a face-to-face approach. The lack of an individual-level sampling frame and the need to maintain comparable population trend data are some of the main barriers to greater use of mixed-mode in cross-sectional surveys in the UK. However, the ONS has a stated aim of conducting all future surveys using a 'digital by default', that is online first, mixed mode approach, and are moving one of their major surveys Labour Force Survey online as well as the 2021 Census. Another recent trend has been the establishment in the UK and many other countries of online panels based on probability samples to rival the online commercial panels which do not use probability samples.

Longitudinal surveys, particularly after the initial data collection wave, are generally well-placed to move to a mixed-mode approach because they have the contact details, including email addresses, of their sample members which allows them to write to them directly to ask them to go online. Additionally, many sample members in longitudinal studies are highly committed and do not need to presence of an interviewer to persuade them to take part. In the UK, Understanding Society, a large-scale longitudinal household panel survey, has now successfully adopted a mixed-mode approach using web followed by face-to-face (following extensive testing over a number of years on their innovation panel), and many other panel surveys internationally are following suit e.g. Health and Retirement Study (HRS), Panel Study of Income Dynamics (PSID), German Socio-Economic Panel study and Swiss Household Panel (SHS). At CLS, we have also used mixed-mode involving web successfully for the core interview on the 1958 British Cohort Study age 55 sweep and on Next Steps. We have also used web or mixed-mode for particular instruments i.e. mixed-mode time-use diary at MCS age 14, web cohort member and parent questionnaires at MCS age 17, web dietary diaries on BCS70 age 46 and NCDS age 62. However, in this review, we focus on mixed-mode designs in which different modes are offered to respondents to complete the same data collection instrument at the same sweep, and where this is used for the core interview, rather than when different modes are used for different instruments (sometimes called multi-mode) or when different modes are used at different sweeps.

There are important scientific and methodological implications of the choice of data collection mode, which must be considered carefully in any survey design decisions. Such issues include how to secure sufficiently high response rates, in a cost-effective manner; whether a mixed-mode approach improves or depresses overall response rates, and/or the representativeness of response; mode effects on measurement and data quality, such as accuracy, reliability and item missingness; how to account for mode effects in analysis

including providing guidance to users, and the extent of any cost-saving that a mixed mode approach can deliver, and whether this justifies the potential impact on measurement and non-response. For longitudinal studies, there are a number of specific additional considerations including the longer-term impact on attrition (i.e. response in future sweeps); longitudinal mode effects on measurement including estimates of change and data quality, and how to account for mode effects in complex longitudinal analysis. Moreover, there are additional specific issues regarding the use of the web in complex, longitudinal surveys such as whether long and complex questionnaires, cognitive assessments, bio-markers and data linkage consents can optimally be collected on the web.

In this report, we will give an overview of the most relevant literature and evidence on the use mixed-mode involving web in longitudinal surveys. Evidence on the use of mixed mode data collection within longitudinal surveys is limited, in part as relatively few studies have to-date adopted this approach. In this review, we have focused on reviewing findings primarily from the CLS cohorts and Understanding Society, as these are most applicable and relevant to future design decisions regarding mode for our cohorts. CLOSER have also produced a report covering mixing modes in longitudinal studies (Jackle, Gaia, and Benzeval, 2017).

Findings

Impact of mixed-mode on response rates, attrition and response bias

Survey mode can impact on participants' willingness to take part in surveys. Generally speaking, face-to-face surveys are most effective at maximising response rates, with interviewers being highly effective at contacting and persuading people to take part, particularly in person. Interviewer administered modes (face-to-face and telephone) generally have higher response rates than self-administered modes (web and paper). However, many respondents do not need an interviewer to call or visit them to persuade them to take part, particularly in longitudinal studies, and some may prefer to take part in other modes. It is argued that mixed-mode data collection approaches should lead to response rates which are at least as high as would be expected if only the 'best' mode was used e.g. a mixed-mode design involving face-to-face, should lead to a response rate that it is as high as face-to-face only. A mixed-mode approach may actually lead to a higher response rate as offering multiple modes may mean that participants who prefer other modes are more likely to take-part, and if these types of respondents differ in their characteristics then a mixed-mode approach could also improve sample representation and reduce non-response bias.

The experiment embedded into the NCDS Age 55 Survey, which compared a sequential web>telephone approach with telephone-only found showed a higher response rate for the mixed mode approach than the telephone-only approach (82% compared with 77%). 82% is a response rate which exceeds the face-to-face response rate achieved, in the previous face-to-face sweep at age 50, though of course it cannot be known what response rate could have been achieved with a face-to-face approach at 55. The impact of the mixed mode approach on subsequent attrition is yet to be known for NCDS, as there has not yet been another sweep. In NCDS, amongst the mixed mode group, the composition of the sample who completed the interview via web was a highly selected group (more advantaged, more frequent computer users etc.) but after the telephone follow-up phase the composition of all those interviewed did not differ from the composition of those interviewed in the telephone only approach, suggesting the mixed mode approach had little impact on non-response bias.

In relation to Next Steps, a sequential mixed-mode approach with web, telephone and face-to-face has been used on all sweeps since adulthood. This has been effective, with a high proportion of respondents interviewed by web at all sweeps, and by telephone at many. As this approach was used for the whole sample, we are not able to compare the effectiveness of a mixed-mode to a face-to-face only approach.

Understanding Society have published a wide-range of evidence in relation to mixed-mode design and implementation, primarily from their innovation panel and more recently from the main sample. In the innovation panel, they experimentally compared a sequential mixed mode web>face-to-face approach with a face-to-face only approach. In relation to response rates, while initially at wave 5 they found that the mixed mode approach resulted in a lower response rate, this difference reduced in wave 6 and reversed at wave 7, with the mixed-mode group having higher response rates – 81% compared with 74% - although higher incentives were required amongst mixed mode respondents (Bianchi, Biffingnandi, and Lynn, 2017). They have also observed a higher proportion of cases issued to web-first responding online over subsequent waves of the innovation panel – from 30% in IP5 to 59% in IP11 - as they have further optimised fieldwork procedures to boost web-response (Burton, 2019). They began incorporating this mixed-mode approach into the main study at wave 7, have increased the proportion of cases issued to mixed-mode at subsequent waves, and plan to continue this. They have continued to refine their approach to boosting web-response through experimentation in the main sample. They have also found some evidence that a mixed-mode approach leads to higher response rates among prior wave non-responders (Bianchi, Biffingnandi, and Lynn, 2017). Evidence from Understanding Society Innovation Panel is also that mixed-mode does not have a negative impact on subsequent attrition (Gaia, 2017).

Overall, it is not always possible to fully evaluate the impact of mixed-mode on response rates, response bias and attrition, as this requires that different approaches are tested experimentally, and over a period of time in relation to longer-terms impacts such as attrition. However, the evidence reviewed here suggests that mixed-mode approaches, with optimised fieldwork procedures to boost web-response, do not necessary depress response rates, and may indeed improve them. Similarly there is a little evidence for a negative impact of mixed-mode on attrition. The evidence also indicates that mixed-mode is unlikely to have a negative impact on sample composition and response bias, and that it may be more effective at bringing back previous wave non-respondents.

Impact of mixed-mode on item non-response and measurement

Mixed-mode strategies involving the web are susceptible to data quality issues, including item non-response and differential measurement errors. Item non-response tends to be higher in web and other self-administered modes and in interviewer-administered modes. In the Understanding Society wave 5 innovation panel, across 1055 items, item non-response rates were around 65% higher in the mixed-mode group than in the face-to-face group (Jackle et. al, 2015). In the NCDS Age 55 Survey experiment, differences in item non-response rates between mixed mode participant and ‘telephone only’ participants for numeric questions relating to wealth and income, e.g. 13% of mixed mode home owners did not provide an estimate of the value of their home compared to 5% of those in the telephone only group. The comparable figures for gross weekly income were 14% and 11%.

Survey mode can significantly impact the way in which people answer survey questions. The largest differences are between interviewer administered modes (face-to-face and

telephone) and self-administered modes (web and paper). Interviewer administered modes are more prone to social desirability and positivity bias; self-completion modes tend to result in more item non-response; interviewer administered modes present questions orally whereas self-completion modes present questions visually which can result in presentation effects e.g. recency bias in interviewer modes and primacy bias in self-completion modes; complex questions involving detailed instructions and/or definitions can be more challenging to administer in self-completion modes. Careful questionnaire design aiming to maximise equivalence between modes can reduce the potential for mode effects but they cannot be fully designed away. We should also note that self-completion elements are often incorporated into mainly face-to-face approaches i.e. with respondents being asked to complete some parts of the interview, usually the most sensitive questions, by self-completion on the interviewer's computer.

In Understanding Society, web responses differed from face-to-face responses for 18% of questions (Jäckle, A., 2016). Much of this is however driven by differences in the characteristics of those who completed by web (selection effects). Web responders are typically better educated, from higher social class groups etc. Comparing the responses of all those who participated via mixed mode with those in the randomly assigned single mode comparison group, Understanding Society find there were differences for 3% of variables.

Estimating and adjusting for mode effects is complicated by the need to disentangle the selection effects from the mode measurement effects. The identification of mode measurement effects, as distinct from selection effects, is made more feasible if the survey is designed to have a randomly assigned single mode control group but this adds complexity and expense to data collection. The existence of mode measurement effects is a complication for analysts, as analyses using variables affected by mode may be biased. Guidance on how to adjust for mode effects should be provided, but the statistical techniques needed to do this can be challenging and in addition, there is not yet a consensus or an established approach for dealing with mode effects in the literature, particularly in complex and dynamic models using longitudinal data from multiple sweeps.

Overall, although mode effects can be minimised by design, and may only affect a relatively small proportion of variables, the existence of mode effects on measurement is a concern as it can lead to biased estimates if appropriate adjustments are not made. For longitudinal studies, where respondents may participate in different modes at different sweeps, longitudinal mode effects can lead to bias in estimates of change over time.

Length and content of questionnaires

The use of the web within a mixed mode context may place some restrictions on the length of the questionnaire, as generally speaking web surveys tend to be shorter than interviewer-administered surveys, particularly face-to-face. Restricting the length of a questionnaire obviously limits the breadth of information which can be collected which in turn restricts the volume of research likely to be conducted. Given that many longitudinal studies, particularly cohort studies, tend to have relatively long questionnaires, this is a potential concern for adopting a mixed-mode approach.

The success of the NCDS Age 55 mixed mode approach, in terms of response rate, may have been related to the fact that the questionnaire was short at just 25 minutes. Break-offs were rare (1% broke off prior to the end of the first module and a further 1% did so later in the survey) and most web responders completed the survey in one session. Understanding Society also has a relatively short questionnaire c. 35 minutes. The Next Steps questionnaire was longer, at 45 minutes, and break-offs were a little more common (1%

broke off before the end of the first module and a further 6% did so later). Moreover, HRS is currently successfully administering a two-hour interview via mixed-mode (web and telephone), and relatively high rate rates of compliance and low break-off rates, though completing in more than one session is common (Couper, 2019). This evidence thus suggests that in the context of long-running longitudinal surveys with high-levels of commitment from participants, much longer questionnaire can be successfully administered over the web, and this need not be a major barrier to adopting a mixed-mode approach.

Cognitive assessments are a key feature of many longitudinal studies. Most of these assessments are designed to be conducted in controlled conditions with an interviewer present, and are challenging to administer remotely via the web. HRS have administered a series of cognitive assessments by web, telephone and face-to-face but have found systematic differences in test performance by mode, with web respondents scoring better than telephone respondents who in turn score better than face-to-face respondents. (Ofstedal, McClain and Couper, 2019).

In relation to bio-measures, there are some types of measure e.g. whole blood draws which cannot be self-administered by participants, though a number of other measures e.g. saliva, dried blood spots, can potentially be carried out in this way, and there is increasing interest in the use of new technologies to collect bio-medical data.

Collection of consents to data linkage is another integral aspect of the cohort studies but collecting consent via the web is challenging. In Next Steps, data linkage consent rates collected from web participants were 20% to 30% lower than those obtained from face-to-face participants. Although this difference may be in part due to selection into mode, it is likely that there is a significant mode effect. Understanding Society also find that data linkage consent rates are substantially lower on the web than face-to-face (Jackle et al, 2019).

Overall, although it may be true that there are some types of questionnaire content that may not be optimally collected on the web or by mixed-mode, there are relatively few examples of types of measures or questionnaire elements that it is not *possible* to collect in this way. Similarly, long questionnaires need not necessarily be a major barrier to adopting a face-to-face approach.

Cost

Reducing cost is a key motivator for adopting a mixed mode approach. The total cost of a mixed mode survey includes both fixed costs (such as questionnaire development, programming, setting up of systems, interviewer training etc) and variable costs (the data collection costs). The additional complexity of a mixed mode survey may mean that fixed costs can be higher than for a single mode survey. If mixed mode surveys were used repeatedly then the fixed costs associated with set-up would likely reduce. It is not straightforward to estimate cost-savings, in part as the costs associated with converting existing surveys to mixed-mode can be harder to estimate and are often not considered, and also because there are additional costs associated with new fieldwork protocols introduced to boost web response rates e.g. higher incentives, additional letters, increased administration time. There is also a potential for mixed-mode to change the unit cost in other modes e.g. face-to-face fieldwork unit costs may increase due to fewer, more difficult cases being approached in this mode which may mean fieldwork is less cost efficient and these cases require more effort.

Having said this, unit level data collection costs for mixed-mode surveys can be substantially cheaper, provided that sufficiently high numbers can be persuaded to participate via the

cheaper mode (web). Understanding Society estimates that the costs of mixed mode data collection per wave is between 8%-15%, once the additional costs of mixed-mode are incorporated (Bianchi, Biffingnandi, and Lynn, 2017).

Mixed mode surveys are more difficult to cost accurately due to uncertainties regarding uptake of different modes, and large unit cost differences by mode. For example, the NCDS Age 55 survey was costed at a fixed-price on the assumption that 45% would participate via web, but the web take-up rate was actually in excess of 60%. If a mixed mode approach were to be repeated then evidence of previous high web take-up rates may lead to a greater reduction in cost and price.

Conclusions

There are important scientific and methodological implications of the choice of data collection mode, which must be considered carefully in any survey design decisions, and relatively little robust empirical evidence, in particular in some key areas, on which to base these decisions. There are also many different trade-offs in relation to different sources of survey errors and survey costs, and these trade-offs are different for each survey. Although Understanding Society has successfully transitioned to a mixed-mode approach, it is a household panel study and as such has a fundamentally different design to the cohort studies e.g. shorter questionnaires, shorter intervals between-sweeps etc, fewer direct assessments. Moreover, the decision to go mixed-mode on Understanding Society was informed by extensive methodological testing in the innovation panel. The considerations for the cohort studies are somewhat different – particularly in the light of much less frequent follow-up as well as different balance of content. Although our experience of using mixed-mode on NCDS and Next Steps has been positive, extensive methodological testing would be needed prior to adopting a mixed-mode approach in future sweeps of our studies, and a face-to-face approach for certain core components of some of the studies is likely to remain optimal - primarily to avoid longitudinal as well as cross-sectional mode effects on measurement.

References

Bianchi, A., Biffignandi, S., and Lynn, P. (2017), “Web-Face-to-Face Mixed-Mode Design in a Longitudinal Survey: Effects on Participation Rates, Sample Composition, and Costs.” *Journal of Official Statistics*, 33 (2): 385–408.

Burton, J. (2019). “Moving a household panel survey to mixed-mode: the experience of *Understanding Society*”. Presentation at NRCM conference on ‘The future of online data collection in social surveys: shared learning on the challenges, opportunities and best practice”.

De Leeuw, E. D. (2018). “Mixed-Mode: Past, Present, and Future”. *Survey Research Methods*, 12(2), 75-89.

Gaia, A. (2017). “The Effect of Respondent Incentives on Panel Attrition in a Sequential Mixed-mode Design”. Colchester: University of Essex, ISER: Understanding Society Working Paper Series No. 2017-03.

Jäckle, A., Beninger, K., Burton, J., and Couper, M.P. (2019), “Understanding Data Linkage

Consent in Longitudinal Surveys." To appear in P. Lynn (ed.), *Advances in Longitudinal Survey Methodology*. New York: Wiley.

Jäckle, A., Gaia., A and Benzeval, A.(2017) "Mixing modes and measurement methods in longitudinal studies". Report published by the Cohort & Longitudinal Studies Enhancement Resources (CLOSER). UCL Institute of Education, London.

Jäckle, A. (2016). *Identifying and Predicting the Effects of Data Collection Mode on Measurement*. Paper presented at the CLOSER Mixing Modes and Measurement Methods in Longitudinal Studies Workshop, London.

Jäckle, A., Lynn, P., and Burton, J. (2015). Going Online with a Face-to-Face Household Panel: Effects of a Mixed Mode Design on Item and Unit Non-Response. *Survey Research Methods*, 9(1), 57-70.

Ofstedal, M.B., McClain, C.A., and Couper, M.P. (2019), "Measuring Cognition in a Multi-mode Context." To appear in P. Lynn (ed.), *Advances in Longitudinal Survey Methodology*. New York:Wiley.