GenPopWeb2: The utility of probability-based online surveys – a non-technical summary

Oriol J. Bosch[1], Olga Maslovskaya[2]

[1]Department of Methodology, The London School of Economics and Political Science

[2]Department of Social Statistics and Demography, School of Economic Social and Political Science, University of Southampton

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Probability-based online surveys can be defined as surveys which use an online mode to administer the questionnaire to all or most of the sampled participants selected using a probability-based sampling approach (i.e., every unit from a sampling frame of target population has a known and non-zero probability of inclusion). Nevertheless, probability-based online surveys are not homogeneous. They can vary in different dimensions: they can be one-time surveys or can have a panel nature, they can implement different recruitment strategies, the individuals who do not have access to the internet (*offliners*) can be treated differently and different mobile devices could be allowed for survey completion. In this report, we provide an up-to-date and comprehensive compilation of existing evidence exploring the utility of probability-based online surveys. We also compare different approaches to probability-based online surveys across a number of dimensions from a data quality perspective (e.g., the effect on nonresponse errors of providing internet to offliners or allowing them to answer using offline modes). Based on the information retrieved from 92 papers reviewed, the results could be summarised as follows:

Coverage errors. Some specific design decision of probability-based online surveys can introduce coverage errors. If offliners are excluded from the sample, research has unanimously found that specific populations will be excluded, biasing the sample (e.g., older, less educated, less urban). However, some evidence seems to suggest that excluding offliners does not affect univariate and multivariate statistics. In addition, excluding either mobile-only or PC-only participants might induce bias, although little empirical research is available to date.

Sampling errors. In countries such as the UK, probability-based surveys rely on address-based frames, which do not include names of individuals. In some instances, researchers might need to invite sampled units through mail letters to take part in an online survey. In these cases, the selection of individuals within households can only be done by the address residents, which must follow quasi-random protocols (e.g., one adult per household with most recent birthday or up to two adults). These quasi-random protocols present a higher likelihood of introducing selection biases. To avoid quasi-random protocols, all sample members from an address might be asked to participate, but this could induce fraud and fake interviews if incentives are offered to participants.

Nonresponse errors. The nonresponse bias has been generally found to be higher for online surveys. This is driven by lower response rates and differential response propensities. The extent to which online surveys introduce nonresponse errors is highly moderated by the design choices made. First, one-time surveys and panels present different nonresponse processes, which can affect the size of their errors. Specifically, individuals joining online panels (e.g., younger, more educated, higher incomes) have been found to be significantly different than those who do not. In addition, those who drop out from panels have also been found to be significantly different than those who stay, although results are mixed in terms of their characteristics.

Second, different recruitment strategies also have the potential of affecting nonresponse errors. When conducting a survey on the back of an offline cross-sectional survey or panel, most nonresponse errors come from the initial survey or panel recruitment.

Third, providing offliners with internet or allowing them to answer through an offline mode has been found to improve the representativeness of online surveys. While those provided with internet connection or connected devices present a similar or even higher loyalty, those offered an offline option are more likely to not respond and/or attrite. Regardless of this, the positive effect on representativeness persists across waves for both approaches.

Fourth, optimisation of questionnaires for mobile devices or “mobile-first” approach to a questionnaire design is considered being the best practice. The past research has found a

significantly higher unit and item nonresponse rate for mobile participants, which was reduced by optimising the design of the survey for mobile devices.

Adjustment errors. The lack of an interviewer for the recruiting and/or interviewing stages can reduce the amount of auxiliary data available to make adjustments compared to face-to-face mode of data collection. Of special interest is the difference between using fresh samples or recruiting on the back of another cross-sectional offline survey or an offline panel. Weights produced using the information from previous surveys or waves have been found to be highly efficient in reducing the overall bias, substantially more than those computed for fresh samples (e.g., calibration weights).

Specification errors. There is no reason to expect differences in terms of specification errors, although no empirical research is available.

Measurement errors. Although there are good reasons to expect online surveys to present different measurement errors than offline surveys (e.g., no interviewer present, visual presentation of quesitons), especially face-to-face surveys, most research has shown either no significant differences or mixed results. Indeed, the few studies exploring the measurement quality of online surveys compared to face-to-face surveys through Multitrait-Multimethod (MTMM) analyses have found no significant differences. When it comes to comparing measurement errors across dimensions, some differences have been found, although most appear to be low or mixed results were reported. First, panels can introduce panel conditioning. However, mixed results have been found for both positive and negative effects of panel conditioning effects. Second, allowing offliners to use offline modes can introduce unwanted mode effects within the survey sample, which might affect estimates for different groups. The only studies available have found that differential unwanted mode effects exist between interviewer-administered surveys and online ones, but not between mail and online surveys. Third, the presence of mobile devices has also been considered as a potential danger to measurement quality for a long time. However, it has been reported that both optimised or non-optimised online surveys and offline surveys have similar measurement errors in the contexts where response quality indicators were compared or direct exploration of measurement quality took place. In addition, evidence suggests that optimisation further reduce the likelihood of some unwanted behaviours to happen.

Processing errors. Processing errors are expected to be lower for online surveys than offline alternative, especially when compared to paper questionnaires. Nevertheless, no empirical research is available to sustain this claim, to the authors' knowledge.

3.1. Practical recommendations

Based on our results, we provide some practical recommendations. We only consider the impact on data quality, regardless of the costs:

1. Although the internet penetration has been growing during last years, providing alternatives to offliners instead of excluding them leads to less biased samples. To avoid mode effects, it is recommended to provide internet connection rather than allowing offliners to answer with offline modes. However, this might not always be economically feasible (especially for one-time surveys). In those cases, offering a paper questionnaire as an alternative to offliners seems to be less likely to introduce mode effects than introducing interviewer-based modes.
2. Although allowing to participate with mobile devices might introduce nonresponse errors (mostly associated with break-offs and item nonresponse), these seem to be offset by the potential coverage errors of excluding the participants willing to use mobile devices.

Hence, we recommend allowing mobile devices in all survey which has been the usual practice in survey data collection for a long time now. Since optimising the survey design for mobile devices seems to reduce nonresponse and measurement errors, we also recommend doing so or using "mobile-first" approach to questionnaire design which is considered being the best practice for a number of years now.

3. Recruiting on the back of another cross-sectional offline survey or an offline panel might be a feasible alternative comparable or even better than recruiting a fresh sample of respondents. Existing research has shown that little extra bias is introduced when recruiting the panellist. Besides, using the rich set of information from the base survey or panel used to obtain the sample can help designing better adjustment strategies than those available for fresh samples.
4. Some variables have been linked to nonresponse in most of the literature reviewed, regardless of the one-time or panel nature of surveys, or different recruiting strategies used. Better educated respondents have been found to be more likely to join online surveys/panels and/or to participate in all types of surveys. Literature also demonstrates that people with higher income are more likely to participate in surveys, whereas men and non-white/non-native English speakers are less likely to take part. Therefore, specific strategies should be explored to tackle these differences in the likelihood of joining online surveys and probability-based online panels.