

Reduction of Nonresponse Bias in Surveys through Case Prioritization

Andy Peytchev
RTI International

Sarah Riley
University of North Carolina

Jeffrey Rosen
RTI International

Joe Murphy
RTI International

Mark Lindblad
University of North Carolina

How response rates are increased can determine the remaining nonresponse bias in estimates. Studies often target sample members that are most likely to be interviewed to maximize response rates. Instead, we suggest targeting *likely nonrespondents* from the *onset* of a study with a different protocol to minimize nonresponse bias. To inform the targeting of sample members, various sources of information can be utilized: paradata collected by interviewers, demographic and substantive survey data from prior waves, and administrative data. Using these data, the likelihood of any sample member becoming a nonrespondent is estimated and on those sample cases least likely to respond, a more effective, often more costly, survey protocol can be employed to gain respondent cooperation. This paper describes the two components of this approach to reducing nonresponse bias. We demonstrate assignment of case priority based on response propensity models, and present empirical results from the use of a different protocol for prioritized cases. In a field data collection, a random half of cases with low response propensity received higher priority and increased resources. Resources for high-priority cases were allocated as interviewer incentives. We find that we were relatively successful in predicting response outcome prior to the survey and stress the need to test interventions in order to benefit from case prioritization.

Keywords: Nonresponse bias, Response propensity, Paradata, Case prioritization

Introduction

Inference from probability surveys relies on the ability to obtain responses from all sample members. Invariably, this is hindered by unit nonresponse – the failure to interview all sample members. Traditionally, response rates have been used as an indicator of the degree to which survey estimates may be biased by nonresponse. Response rates in household surveys have been declining (de Leeuw and de Heer, 2002; Groves and Couper, 1998; Rand, 2006), while effort and cost has been increasing (Curtin, Presser, and Singer, 2000) as more sample members refuse to participate (Stussman, Dahlhamer, and Simile, 2005) and require greater effort. Survey organizations are under increasing pressure to increase response rates under cost constraints. During non-response follow up, this can lead survey organizations to singularly pursue cases *that are most likely to become respondents*. But, since nonresponse bias is a function of the association between the likelihood to respond (response propensity) and the survey variable, an uninformed approach to increasing response rates may not be successful in reducing

nonresponse bias even if higher response rates are achieved (e.g., Curtin, et al., 2000; Keeter, Miller, Kohut, Groves, and Presser, 2000) – in fact, contrary to common expectation, nonresponse bias may be *increased* when the protocol is more appealing to likely respondents (Merkle and Edelman, 2009) or when additional effort brings in sample members who resemble those most likely to respond (Schouten, Cobben, and Bethlehem, 2009). Rather, nonresponse bias can be decreased depending on *how* the response rate is increased (Peytchev, Baxter, and Carley-Baxter, 2009).

The threat of increased bias occurring in a blind pursuit of higher response rates is not impossible and more informed methods to target nonresponse bias should be constructed. Nonresponse bias in an estimate of the mean of a variable, \bar{y} , based on survey respondents, r , can be expressed as the ratio of the covariance between the survey variable and the response propensity, $\sigma_{y,\rho}$, to the mean propensity, $\bar{\rho}$ (see Bethlehem, 2002):

$$Bias(\bar{y}_r) \approx \frac{\sigma_{y,\rho}}{\bar{\rho}} \quad (1)$$

Typically, survey effort is directed at increasing $\bar{\rho}$, under the assumption that $\sigma_{y,\rho}$ remains at least the same. This may often be inferred from parameterizing nonresponse bias in a mean as the expected value of the product of two separate and possibly independent terms, the nonresponse rate and the

Contact information: Andy Peytchev, RTI International, 3040 Cornwallis Rd., Research Triangle Park, NC 27709, e-mail: andrey@umich.edu

difference between the means for the respondents and nonrespondents. This assumption is unrealistic as nonresponse bias is a function of the reasons for nonparticipation. The difference between the means for the respondents and nonrespondents may actually increase to such a degree as to lead to greater bias in the estimate of \bar{y}_r under the higher response rate.

A more general fear in face to face surveys is that much of the control over which sample members are interviewed remains with the interviewer, whether through the ability to contact a sample member or to gain cooperation upon contact. Interviewers are often evaluated on their response rates and not on nonresponse bias in their sample. Thus, interviewers can be expected to direct greater effort to sample members they deem more likely to participate regardless of potential nonresponse bias in order to increase $\bar{\rho}$. This leaves those with very low propensities to remain nonrespondents and, therefore, leaving $\sigma_{y,\rho}$ relatively unchanged or even greater in magnitude. Thus, increasing response rates through this strategy can fail to reduce nonresponse bias.

Instead of simply increasing $\bar{\rho}$, consider the consequence of reducing the variability in ρ . In an extreme case, $\sigma_\rho^2 = 0$, or that in a particular survey, $s_\rho^2 = 0$. Since $\sigma_{y,\rho} = E(\sqrt{s_{y,\rho}} \sqrt{s_y^2 s_\rho^2})$, that the covariance between y and ρ is equal to the expected value of the product of their correlation and the square root of the product of their variances, the covariance $\sigma_{y,\rho}$ will also be equal to zero if the variance of ρ is reduced to zero – and nonresponse bias in an estimate of a mean, as presented in Equation 1, is eliminated regardless of the achieved response rate. Certainly, effort will not be made to reduce the likelihood of participation for sample members with above average response propensities in order to reduce σ_ρ^2 , unless it is motivated by reduction of other sources of error. However, effort, or a more effective but costly protocol, can be directed at sample members with the *lowest response propensities*. If successful, the variability in the response propensities will be reduced as will the association between propensities and survey variables, reducing nonresponse bias.

There is an added benefit from this approach: nonresponse weighting adjustments in surveys are the inverse of the likelihood of participation, whether at the sample member or subclass level. Reducing the variability of the likelihood of participation will also reduce the variability in nonresponse adjustments and will likely reduce the loss in precision due to weighting. This will increase the effective sample size and improve the precision of survey estimates. Furthermore, if one is to use a measure of survey representativeness that is derived from the variability in the response propensities (Schouten, et al., 2009), decreasing their variability through data collection will be reflected as improved survey representativeness. Indeed, the logic behind such measures, named R-indicators, is not very different from what we describe – greater variability in response propensities leaves greater potential for nonresponse bias. However, where R-indicators measure this potential after data collection, we propose to estimate it before data collection and reduce it

through survey design. Effectiveness of the proposed approach should yield higher estimates of R-indicators.

The operationalization and implementation of such an approach is challenging and includes two essential components: estimation of the response propensity and the design of an intervention for sample members with low response propensity (ρ). Complicating matters, surveys vary in the amount and type of information available on respondents and nonrespondents that can be used to estimate ρ . Sources include data from the census, administrative data, data from a previous survey administration, and paradata – auxiliary information collected during the field period, such as interviewer observations and respondent behavior. The utility of different data in directing survey effort or expense to reduce nonresponse bias is almost certainly not equal. Variables predictive of ρ , but also associated with the survey variables, are of greatest interest. If only predictive of ρ , such variables will not help the differentiation of sample cases with low response propensities that if not interviewed, would induce nonresponse bias. In this respect, using survey variables measured at an earlier point in time are of great value in the estimation of response propensities.

The second component in this approach is the construction of a survey protocol that will increase participation among sample members with low estimated response propensities. A common design feature that is known to increase response propensities is the use of respondent incentives. Studies routinely use incentives and new methods need to be identified that could increase survey participation. While much focus has been given to understanding why respondents participate in surveys and how participation can be influenced, more attention could be given to the other actor in the social interaction that occurs in the survey request in face to face surveys, and who is also responsible for initially establishing contact with the respondent. Face to face interviewers are trained in techniques to locate sample members, make the initial survey request, avert refusals, and convert prior refusals. Certainly, developing better training protocols can help increase response rates (Groves and McGonagle, 2001). But there may be value in tapping into interviewer motivation in a somewhat similar way that survey organizations attempt to tap into respondent motivation to participate in interviews. Such an approach could involve providing an incentive for each completed interview in addition to an interviewer's hourly compensation. Indeed, such performance-based incentives are common in other professions such as in the retail industry, and have demonstrated a positive effect on performance, such as increased sales volume (e.g., Banker, Lee, Gordon, and Srinivasan, 1996; Banker, Lee, and Potter, 1996). There are at least three ways through which such incentives could help survey outcomes: interviewers may improve their strategies in contacting respondents, they may make more call attempts, and they may be more persuasive at the doorstep once a household member is reached. Although per interview incentives have been intermittently implemented in studies such as the General Social Survey (Carr, Sokolowski, and Haggerty, 2006), there has been no experimental evaluation of their effectiveness.

We test both components of the proposed approach to reducing nonresponse bias – identifying cases with lower likelihood to participate and using interviewer incentives to increase cooperation rates. Four research hypotheses are considered:

1. Using paradata, administrative, demographic, and survey data, groups can be defined *prior to data collection* that will differ in subsequently realized response rates.
2. Increasing *interviewer incentives* for completing interviews with sample members with low predicted likelihood of participation will increase participation among this group.
3. Increasing interviewer incentives for completing interviews with sample members with low predicted likelihood of participation will *decrease the variability* in response propensity.
4. Increasing interviewer incentives for completing interviews with sample members with low predicted likelihood of participation will *decrease the correlations* between response propensity and key survey variables.

Data and Methods

The data for the current study come from the Community Advantage Panel Survey (CAPS)¹. CAPS evaluates the Community Advantage Program (CAP), a secondary mortgage market program. To qualify for the CAP, borrowers must meet one of three criteria: (1) have income of no more than 80% of the area median income (AMI); (2) be a minority with income not in excess of 115% of AMI; (3) or purchase a home in a high-minority (> 30%) or low-income (< 80% of AMI) census tract and have income not in excess of 115% of AMI. Two separate samples of households across the United States were selected, one of renters and another of home owners, matched on geographic location and demographic characteristics (for more detail on the CAPS design, see Riley, Ru, and Quercia, 2009). As of the end of the 2007 data collection year, the CAPS owner and renter panels had completed five and four survey administrations, respectively. The 2008 data collection period, which focuses on wealth and assets, saving behavior, mortgages, and housing experiences, began in July 2008 and included 2,795 owners and 1,088 renters. Cases were assigned to either an in-person computer-assisted interviewing mode or a computer-assisted telephone interviewing mode based on baseline subject characteristics and interviewing modes from prior rounds. For the 2008 survey, 2,191 sample cases were assigned to in-person interviewing to be conducted by 55 interviewers (with a median workload of 42 cases). For these cases, data collection began in July 2008 and ended in February 2009. Two-thousand and five interviews were conducted, achieving an overall response rate for the 2008 field data collection of 92.3% (RR1, AAPOR, 2008)² with 59% female, 54% home owners, 54% non-Hispanic White, 51% married, with partner, or with companion, 66% with some education beyond high school, and 62% from North Carolina (a substantially oversampled state).

To test the proposed approach to boosting retention and

to minimizing bias resulting from the loss of participants, we implemented a case prioritization scheme during the 2008 data collection period. Participants who were least likely to complete the 2008 survey were assigned to a low propensity subsample, and these cases were randomly assigned to receive special treatment.

To assign a priority score to each survey participant, we estimated response propensities by predicting the 2007 outcome for respondents who were eligible to be surveyed in 2008. We fit separate logistic regression models for owners and for renters. As possible predictors of 2007 survey response, we considered demographic characteristics, substantive survey variables, and survey paradata, such as interviewer observations during previous interactions. Item missing data were imputed using sequential regression imputation in IVEware (Raghunathan, Lepkowski, Van Hoewyk, and Solenberger, 2001). Significant predictors were age, race, education, gender, mortgage delinquency, the amount of time that had elapsed since loan origination, the amount of time since purchasing the home, whether the respondent had voted in the 2000 election, whether the respondent had said they were not interested in the prior wave, and whether the respondent had ever hung up during the introduction in the prior wave.

Predicted probabilities for completed interview in the prior wave were used to divide each sample into two equal groups: a low and a high response propensity. However, due to concerns about unequal opportunities for compensation of field interviewers (high propensity cases will generally have lower compensation per interview and response propensities vary geographically), this division was done within each geographic sample area. The low propensity groups were then randomly assigned to high priority or control condition. Within each sample, 50% of sample households were classified as low propensity, of which half (25% overall) were randomly assigned to be subjected to the experimental manipulation.

The experimental manipulation involved the doubling of the interviewer bonus payments for each completed interview, given in addition to interviewers' normal hourly wages for low propensity cases. We believed that the potential for greater reward for completion of high priority cases would motivate interviewers to be more persuasive in gaining cooperation from these sample members. For the 2008 CAPS, field interviewers received a \$10 bonus payment for each completed control interview and a \$20 bonus payment for each experimental interview during the first phase of data collection, which lasted 6 weeks. For the second phase of data collection interviewers received no bonus payment for control interviews and \$10 for experimental interviews. Finally, for the third phase, conducted during the last 8 weeks of data collection, interviewers received the original \$10 and

¹ CAPS is funded by the Ford Foundation.

² This response rate is conditional on sufficient participation in the previous waves and is based only on the sample in this wave; due to the complex criteria for inclusion in each wave of data collection, an overall response rate could not be calculated.

\$20 bonus payments for each completed interview. In order to avoid delayed action on the part of the interviewers, they were not notified in advance that bonuses in the third phase of data collection would be offered. In interviewer training, interviewers were instructed not to devote inordinate efforts to complete the experimental cases, but to note that these cases were very important for the successful completion of the project. Interviewers were told to work all cases diligently.

In our analysis of nonresponse bias, we consider key CAPS measures such as financial literacy, financial control, financial well-being, and self-rated thriftiness, as well as financial habits, such as whether the respondent uses credit cards only for emergencies or sends money to friends and family. We also consider self-rated general health, whether the respondent had recently experienced a physical or mental disability, and whether the respondent participated in an employer-sponsored medical insurance plan.

While this approach relies on both the ability to estimate response propensities and the degree to which they can be altered, the two components can be evaluated somewhat independently. We first look at the response rates for groups defined by estimated response propensity, i.e., how well $\hat{\rho}$ translates into the actual outcome, r . We then turn to differences in success rate in contacting and gaining cooperation among those with response propensity estimated to be low prior to the onset of data collection, i.e., whether the interviewer incentive manipulation can alter $\hat{\rho}$, as well as any differences in the amount of effort interviewers seem to be exerting. Finally, we turn to our ultimate objectives – whether the variance of the response propensity, $Var(\hat{\rho})$, can be lowered and whether the association between the response propensity and survey variables, $Cov(y, \rho)$, can be reduced, thus minimizing nonresponse bias in survey estimates of means and proportions. To achieve this, we created sample weights for two scenarios: increasing the weights for respondents in the control group by a factor of two and omitting the experimental group, and similarly, increasing the weights for respondents in the experimental group and omitting the control group.

Results

We first evaluated how predictive the estimated response propensities were of the actual outcomes in the survey. This comparison is limited by a “ceiling effect” as the overall response rate was 92.3%, yet the half of the sample with low estimated response propensities (assigned within interviewer workload)³ had a significantly lower response rate (90.3%)⁴ compared to the other half of the sample (94.3%), $\chi^2(1)=11.909$, $p < 0.001$. In light of the high response rate, as many sample members who are less likely to participate have already attrited on earlier waves of data collection, these results can be seen as encouraging for the prediction of response outcome in a longitudinal survey, when data from multiple sources are used. The nonresponse rate was almost double among those with lower response propensities.

The second component of the approach is increasing participation among those with low estimated response propen-

sities. Among sample members with low propensities, we found no significant difference in response rates between the control and experimental conditions, with 89.8% and 90.8% response rates, respectively ($\chi^2(1)=0.335$, $p=0.563$). Given the relatively long field period that was extended to over six months, which allowed ample time for all cases to be attempted multiple times and refusal conversion attempts to be made, we also looked at interview completion over the course of the data collection period.

The cumulative number of interviews completed by day in the field for the high propensity, low propensity control, and low propensity experimental conditions are presented in Figure 1. While the high propensity cases were completed much faster early into data collection, as expected, the rates of completion in the control and experimental condition are ostensibly identical.

We had identified different ways in which interviewer incentives could influence data collection and while increasing survey participation is a primary objective, it may at least increase contact with sample members. Since together in the control and experimental conditions only three cases were not contacted, we could once again examine the cumulative contact rates over the course of data collection. These curves, however, had the same pattern as for the interview rates in Figure 1, with virtually identical rates for the control and experimental conditions.

Even if the survey outcomes were not altered for this sample, it is possible that interviewers exerted more effort and gave higher priority to cases that would yield them greater compensation. Yet we find that the average number of call attempts in the two conditions are not different; 4.9 in the experimental condition and 5.0 in the control condition, $t\text{-test}(1066)=.21$, $p=.837$.⁵

Finally, we examined the key outcomes that would follow from the theoretical basis of our approach. Despite the lack of effect on response rates, we expected to find that the variance of the response propensities and the associations between the response propensities and survey variables had been reduced.

We found the hypothesized effect on the variance of the resulting response propensities in each group, with a variance of $\hat{\sigma}_\rho = 0.070$ in the control group scenario⁶ and a significantly lower variance of $\hat{\sigma}_\rho = 0.054$ ($F(1650,1650)=1.66$, $p < .001$) in the experimental group scenario. This differ-

³ Although somewhat surprisingly, the response rates were identical to these when low and high estimated response propensity group was assigned without balancing assignment across interviewers.

⁴ Control and experimental conditions were pooled due to their similar rates, as reported in more detail in the following paragraph.

⁵ Four cases in the priority condition and four cases in the control condition were excluded for having extremely high number of call attempts (over 25). Findings do not change when these cases are left in the analysis.

⁶ Recall that the control group cases are assigned twice the weight of the high propensity cases to compensate for the exclusion of the cases assigned to the experimental treatment, creating a control “scenario” with weights that sum to the full sample.

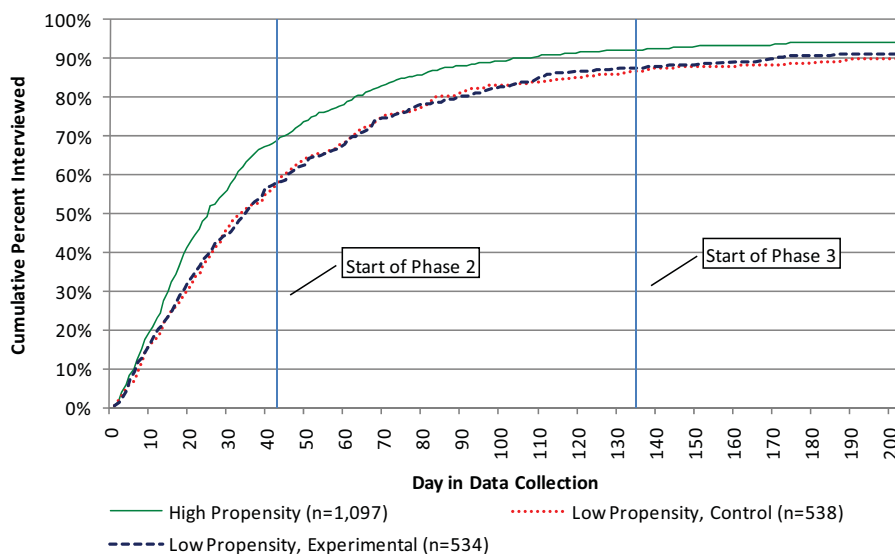


Figure 1. Cumulative Number of Interviews Completed by Day in the Field for the High Propensity, Low Propensity Control, and Low Propensity Experimental Conditions.

ence was not driven by differences in the mean propensity in each group, which was 0.915 in the control group and 0.917 in the experimental group ($t(3300)=0.97$, $p=.33$). These response propensities were estimated using the same predictors employed in the estimation of the response propensities prior to data collection, only using the outcome in the current wave. It is possible that, by chance, the two groups differed in their variability in propensity even prior to data collection. We found no such difference, with $\hat{\sigma}_\rho = 0.149$ in the control and $\hat{\sigma}_\rho = 0.146$ in the experimental condition ($F(1650,1650)=1.05$, $p=.32$). The results were almost identical for the samples of owners and of renters.

Unless the correlations between the response propensities and the survey variables were impacted so that they became greater in magnitude in the experimental group, we should expect less nonresponse bias in survey estimates through the experimental treatment. Unfortunately, a greater number of the correlations were significant in the experimental scenario (columns 4 and 5 in Table 1), and most of the correlations were significantly larger in the experimental scenario (column 6).⁷

With lower variation in the response propensities but larger correlations between the propensities and the survey variables under the experimental treatment, nonresponse bias can be affected in either direction.⁸ Unfortunately, in this instance, the lower variability in the propensities was not sufficiently lower, and the estimated nonresponse bias was somewhat higher for eight of the twelve estimates, shown in columns 7 and 8 of Table 1. This result, combined with the equally high response rates achieved in the control and experimental conditions, lead us to believe that the lower variability in response propensities found in the experimental group is a spurious effect. It would be beneficial to test whether nonresponse bias could be reduced through the proposed approach in studies with lower response rates.

Discussion and Conclusions

We were fairly successful in estimating response propensities prior to data collection that were predictive of the survey outcome that was later observed, achieving the first of the two steps in the proposed approach. Once cases were prioritized based on low response propensity, however, our manipulation of offering higher interviewer incentives for completed interviews was not successful. This null effect could have multiple explanations. It could be that the field period was sufficiently long that maximal effort was exerted on all sample cases. This explanation is unlikely, however, as the cumulative number of interviews during the early part of data collection was almost identical for the control and experimental conditions. It is much more likely that interviewers were well-trained and did their best regardless of which cases yielded higher compensation to them because they knew that they would get to attempt all cases in their workloads. It is also possible that higher interviewer incentives for some sample cases motivated interviewers to try those cases earlier and with greater effort, but that this effect was countered by a possible perception that those cases were more difficult and, therefore, were to receive special treatment – and thus did not receive more call attempts early on. Another explanation is the random assignment to conditions within interviewer workload. While it created fair compensation across interviewers and avoided confounding between case prioritization and interviewers, it also meant that all inter-

⁷ This test assumes two independent groups – since the two scenarios overlap in the high propensity cases, this is a conservative test and does not affect the conclusions.

⁸ A third term in the equation for nonresponse bias [1] is the variance of the survey variable – this was not different by experimental treatment for all but one of the survey variables, which is within the error rate allowed at $\alpha=.05$.

Table 1: Weighted Correlations between Response Propensities and Survey Variables, and Estimated Nonresponse Bias in the Control and Experimental Scenarios.

Survey Variable	n		$\sqrt{\hat{\sigma}_{y,p}}$			$\hat{Bias}(\bar{y}_r)100 \approx \frac{\hat{\sigma}_{y,p}}{\bar{p}} 100$	
	Control ^a Scenario	Exper. ^b Scenario	Control Scenario	Exper. Scenario	Abs(Diff)	Control Scenario	Exper. Scenario
<i>Health</i>							
Self-rated health	1,520	1,522	0.056*	-0.093***	0.149***	0.446	-0.579
Limited physical activity	1,519	1,521	-0.030	0.050*	0.080*	-0.083	0.109
Recent emotional problem	1,518	1,519	-0.035	-0.028	0.007	-0.089	-0.058
Employer-provided health ins.	1,518	1,522	0.008	-0.156***	0.164***	0.031	-0.429
<i>Finances and Wealth</i>							
Financial status vs. parents	1,502	1,504	0.027	-0.060*	0.087*	0.253	-0.431
Feels informed about finances	1,519	1,520	0.038	-0.046	0.084*	0.214	-0.206
Feels thrifty	1,518	1,520	0.029	0.081**	0.052	0.213	0.477
Feels on top of finances	1,517	1,519	-0.026	-0.109***	0.083*	-0.209	-0.678
Credit cards only for emergency	1,507	1,512	0.052*	0.131***	0.079*	0.465	0.924
Sent money to others	1,517	1,518	-0.063**	0.076**	0.139***	-0.211	0.197
# of relatives who own a home	1,517	1,518	0.037	-0.151***	0.188***	0.239	-0.764
Household # of vehicles	1,519	1,521	-0.121***	-0.020	0.101**	-1.114	-0.137

^aAll high propensity cases and low propensity cases assigned to the control group (weighted to compensate for the exclusion of cases assigned to the experimental group).

^bAll high propensity cases and low propensity cases assigned to the experimental group (weighted to compensate for the exclusion of cases assigned to the control group).

* Significant at $\alpha=.05$; ** Significant at $\alpha=.01$; *** Significant at $\alpha=.001$

Note: The entire questions are provided in the appendix.

viewers had both control and experimental cases; when they made trips to cases in the experimental condition, interviewers could use the same trip to attempt cases in the control condition, reducing the ability to detect any additional effort.

Regardless of the role of each of these explanations for not finding significant differences in nonresponse bias, this study presented a conservative test of the proposed approach. All sample members had participated in a prior wave of data collection thus purging nonresponse to the baseline survey. Individuals who had been repeatedly nonrespondents in prior waves were excluded thus excluding those least likely to participate. Also, achieving an overall response rate of 92.3% had left little room for reduction of nonresponse bias. With almost identical response rates in the control and experimental conditions, differences in the variance of the response propensities were likely by chance, and a reduction in nonresponse bias could not be observed. Starting with a cross-sectional sample of the general population might help to alleviate some of these limitations. Certainly, obtaining data on all nonrespondents would relax the implicit assumption that the association between response propensities and the survey variables is the same for respondents and nonrespondents. Although the general approach can be tested in an infinite number of ways, such as in web panels using respondent incentives, it would be beneficial to replicate the specific interviewer incentive approach in a probability-based cross-sectional face to face survey.

There are four lines of work that we think merit further pursuit. First, while we were quite successful in predicting response outcome prior to the study, surveys vary in the amount of information that is available on sample cases.

Exploring external sources of information is needed, particularly for cross-sectional survey designs that do not benefit from prior wave data and may also lack rich frame data. Similarly, more research will be needed on how to apply these data prior to any contact with sample cases. Two alternatives are to apply model coefficients from similar surveys, or to estimate predictive models during data collection as proposed under responsive survey design (Groves and Heeringa, 2006).

Second, interviewer incentives are ill-understood and have received little attention in the research literature, relative to respondent incentives. The mechanisms through which they may act on interviewer response rates and nonresponse bias are possibly different from those that act on respondents, as interviewers and respondents have very different roles in the social interaction at the doorstep. Further research is needed to explore how and under what circumstances, interviewer incentives could help achieve survey goals.

Third, new and effective interventions for cases with low response propensities are needed in order to succeed in the second step of our proposed approach to reducing nonresponse bias. Such interventions are certainly not limited to incentives as their effectiveness varies across target populations, modes of data collection, and other major study design features.

Last, a possible modification to the theoretical approach employed in the current study should be considered. We believe that focusing on cases with low response propensities, while theoretically justified to reduce nonresponse bias, may not be efficient in some studies. Particularly in surveys with

substantially low response rates, it may be more efficient to identify cases with the greatest potential to induce nonresponse bias in selected survey variables. These cases are not only likely nonrespondents, but are also expected to provide responses different from those of the likely respondents.

In sum, we believe that survey practitioners will benefit from thinking in terms of nonresponse bias as opposed to response rates, in managing data collection. The logical extension of this is to implement study designs that attempt to reduce nonresponse bias, and do not singularly focus on maximizing response rates. In this regard, it seems critical to recognize that all sample cases are not equal, and targeting of nonrandom, although stochastically selected, subsets of cases may help achieve the goal of minimizing nonresponse bias in survey estimates.

References

- AAPOR. (2008). *Standard Definitions: Final Dispositions of Case Codes and Outcome Rates for Surveys*. Lenexa, Kansas: AAPOR.
- Banker, R. D., Lee, S.-Y., Gordon, P., & Srinivasan, D. (1996). Contextual Analysis of Performance Impacts of Outcome-Based Incentive Compensation. *The Academy of Management Journal*, 39(4), 920-948.
- Banker, R. D., Lee, S.-Y., & Potter, G. (1996). A field study of the impact of a performancebased incentive plan. *Journal of Accounting and Economics*, 21(2), 195-226.
- Bethlehem, J. (2002). Weighting Nonresponse Adjustments Based on Auxiliary Information. In R. M. Groves, D. A. Dillman, J. L. Eltinge, & R. J. A. Little (Eds.), *Survey Nonresponse* (p. 275-288). New York: Wiley.
- Carr, C., Sokolowski, J., & Haggerty, C. (2006). *Interviewer Incentives: Are we getting enough bang for our buck?* Paper presented at the Presented at International Field Directors and Reduction of Nonresponse Bias in Surveys through Case Prioritization Technologies Conference. from https://www2.norc.org/about/Using_Interviewer_Incentives.pdf.
- Curtin, R., Presser, S., & Singer, E. (2000). The effects of response rate changes on the index of consumer sentiment. *Public Opinion Quarterly*, 64(4), 413-428.
- de Leeuw, E., & de Heer, W. (2002). Trends in Household Survey Nonresponse: A Longitudinal and International Comparison. In R. Groves, D. Dillman, J. Eltinge, & R. J. A. Little (Eds.), *Survey nonresponse* (p. 41-54). New York: Wiley.
- Groves, R. M., & Couper, M. P. (1998). *Nonresponse in Household Interview Surveys*. New York: Wiley.
- Groves, R. M., & Heeringa, S. (2006). Responsive design for household surveys: tools for actively controlling survey errors and costs. *Journal of the Royal Statistical Society Series A: Statistics in Society*, 169(Part 3), 439-457.
- Groves, R. M., & McGonagle, K. A. (2001). A Theory-Guided Interviewer Training Protocol Regarding Survey Participation. *Journal of Official Statistics*, 17(2), 249-265.
- Keeter, S., Miller, C., Kohut, A., Groves, R. M., & Presser, S. (2000). Consequences of Reducing Nonresponse in a National Telephone Survey. *Public Opinion Quarterly*, 64, 125-148.
- Merkle, D. M., & Edelman, M. (2009, March). An Experiment on Improving Response Rates and Its Unintended Impact on Survey Error. *Survey Practice*.
- Peytchev, A., Baxter, R. K., & Carley-Baxter, L. R. (2009). Not All Survey Effort is Equal: Reduction of Nonresponse Bias and Nonresponse Error. *Public Opinion Quarterly*, 73(4), 785-806.
- Raghunathan, T. E., Lepkowski, J. M., & Solenberger, J. V. P. (2001). A Multivariate Technique for Multiply Imputing Missing Values Using a Sequence of Regression Models. *Survey Methodology*, 27, 85-95.
- Rand, M. (2006). *Telescoping Effects and Survey Nonresponse in the National Crime Victimization Survey*. Paper presented at the Joint UNECE-UNODC Meeting on Crime Statistics. <http://www.unece.org/stats/documents/ece/ces/ge.14/2006/wp.4.e.pdf>.
- Riley, S. F., & Quercia, H. R. R. G. (2009). The Community Advantage Program Database: Overview and Comparison With the Current Population Survey. *Cityscape: A Journal of Policy Development and Research*, 11(3), 247-256.
- Schouten, B., Cobben, F., & Bethlehem, J. (2009). Indicators for the representativeness of survey response. *Survey Methodology*, 35(1), 101-114.
- Stussman, B., Dahlhamer, J., & Simile, C. (2005). *The Effect of Interviewer Strategies on Contact and Cooperation Rates in the National Health Interview Survey*. Paper presented at the Federal Committee on Statistical Methodology from <http://www.fcs.gov/events/papers05.html>.

Appendix

In general, would you say your health is excellent, very good, good, fair, or poor?

- 1 EXCELLENT
- 2 VERY GOOD
- 3 GOOD
- 4 FAIR
- 5 POOR

During the past four weeks, were you limited in the kind of work or other regular activities you do as a result of your physical health?

- 1 YES
- 2 NO

During the past four weeks, have you accomplished less than you would like to as a result of any emotional problems, such as feeling depressed or anxious?

- 1 YES
- 2 NO

The next few questions are about your household's medical insurance coverage.

Are *you* covered by medical insurance provided by an employer or union, either yours or another family member's?

- 1 YES
- 2 NO
- 3 DON'T HAVE ANY MEDICAL INSURANCE (VOLUNTEERED ONLY)

Compare your financial situation now with your parents' when they were the age you are now. Would you say that you are currently much worse off than they were, somewhat worse off, about the same, somewhat better off, or that you are currently much better off than your parents were at your age?

- 1 MUCH WORSE OFF
- 2 SOMEWHAT WORSE OFF
- 3 ABOUT THE SAME
- 4 SOMEWHAT BETTER OFF
- 5 MUCH BETTER OFF

Now I would like to ask you a couple questions about household spending and finances. Think about how you ["and your spouse/partner"] manage household finances, such as saving for an emergency, using debt wisely, and investing for the future. Please rate how informed you ["and your spouse/partner"] feel on the following scale.

Would you say...

- 1 YOU ["AND YOUR SPOUSE/PARTNER"] FEEL VERY WELL INFORMED
- 2 YOU ["AND YOUR SPOUSE/PARTNER"] FEEL FAIRLY WELL INFORMED
- 3 YOU ["AND YOUR SPOUSE/PARTNER"] FEEL JUST SOMEWHAT INFORMED
- 4 NOT INFORMED AT ALL

Some people tend to be very thrifty, saving money whenever they have the chance, while others are very spending-oriented, buying whenever they can and even borrowing to consume more.

How would you classify yourself? Would you say...

- 1 VERY THRIFTY, SAVING MONEY WHENEVER I CAN
- 2 SOMEWHAT THRIFTY, OFTEN SAVING MONEY
- 3 NEITHER THRIFTY NOR SPENDING-ORIENTED
- 4 SOMEWHAT SPENDING-ORIENTED, SELDOM SAVING MONEY
- 5 VERY SPENDING-ORIENTED, HARDLY EVER SAVING MONEY

In the past 12 months, how often have you felt that you were “on top” of the financial matters in your life? (Would you say very often, fairly often, sometimes, almost never, or never?)

- 1 VERY OFTEN
- 2 FAIRLY OFTEN
- 3 SOMETIMES
- 4 ALMOST NEVER
- 5 NEVER

The next statement is: “The only thing I use my credit cards for is emergencies.”

Would you say that you strongly agree with this statement, agree, neither agree nor disagree, disagree, or strongly disagree?

- 1 STRONGLY AGREE
- 2 AGREE
- 3 NEITHER AGREE NOR DISAGREE
- 4 DISAGREE
- 5 STRONGLY DISAGREE

Many people send money to family or friends by check, money order, wire, Money Gram or Western Union. Since we last talked to you, have you [“and your spouse/partner”] ever sent money to any family or friends living somewhere else?

- 1 YES
- 2 NO

How many of your family members own homes? Would you say all, most, some, or none?

- 1 ALL
- 2 MOST
- 3 SOME
- 4 NONE

How many cars, trucks, motorcycles, or other motor vehicles, boats, ATVs, do you [“and your spouse/partner”] own or lease?
----- [ALLOW 0-9]