CAN WE IMPROVE OUR METHODS TO REDUCE NONRESPONSE BIAS IN RDD SURVEYS?

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KEY WORDS: Nonresponse Bias, Response Rates, Cooperation, Advance Letters, Introductions, Answering Machines, Refusal Conversion, Incentives, Contact Attempts, Call Attempts, Respondent Attitudes.

Nonresponse Bias in RDD Surveys

Telephone surveys have taken the place of many field surveys over the past 25 years. As this transition occurred, the greatest concern has been coverage bias that might occur with the shift to telephone interviews. Coverage has become less of a concern for most telephone surveys and new concerns about nonresponse have arisen to take center stage. There is general consensus that response rates are declining in RDD (list assisted, random digit dialed surveys) telephone surveys. The decline has been controlled in many surveys by increasing effort and thus the cost of data collection. The typical types of compensation include increasing the number of call attempts, lengthening the interview period, and making refusal conversion attempts. These methods tend to be costly, time consuming, and increase respondent burden and frustration. Other strategies to improve response include research on the best time and days to call, and adding advance letters and monetary incentives into the survey process. This paper argues that it is time to revise our calling strategy for RDD surveys to better address how to reduce nonresponse bias. It proposes that we development a model that optimizes calling strategies with the express intent to reduce nonresponse bias rather than continue to focus on nonresponse rates.

Technology and lifestyle changes are clearly impacting how we conduct telephone survey research. Several excellent papers are available to explain how these lifestyle changes have impacted survey methods (e.g., Brick, Martin, Warren, and Wivagg, 2003; Tucker, Lepkowski, and Pierkarski, 2002; Curtin et al., 2000; Cooper, Groves, Cialdini, 1992). And there is a wealth of information regarding how technology impacts society. Neither of these concerns will be the central focus of this paper. Instead, it focuses on the pragmatics of conducting telephone research in the new millennium; specifically RDD samples. It will cover three general topics, *day-to-day sample management, enticements to response, and respondents' attitudes toward surveys.*

Day-to-Day Sample Management

Call Scheduling and Call Protocols

Call scheduling is critical to completing a survey on time, within budget, and with an acceptable response rate. Obviously the primary goal is to complete interviews; the secondary goal is to make contact to establish eligibility. In 1988, Weeks found that the majority of call scheduling systems used protocols that were based on either a "contact probability approach" or a "priority score approach.[1]" Most of the research on call scheduling protocols focuses on the cold call contacts, where no contact with a person has occurred. We have a good understanding about the best time and days to call for these cases.

The best time to make initial contact and complete interviews is evenings and weekends (Weeks 1987; Kulka and Weeks 1988; Greenberg and Stokes 1990). Massey et al. (1996: 486) provides a detailed analysis of calling protocol options for the first, third and fifth call attempt. They conclude that the best protocols for contacting a household have a mix of weeknight and weekend calls. Ideally, the protocol should include only one daytime call during the first five call attempts, preferably made during the first 3 calls. Weekday calls are useful to reach businesses and result in slightly fewer refusals and breakoffs. They also note that there is a "tradeoff" between the best time to make contact and best time for gaining cooperation (e.g., chance of a refusal increases too). Brick et al. (1996) found this as well for the first and second call attempt for cases subsequently determined to be eligible households.

Less information is available for determining the optimal length of time between call attempts, partially because the length of the interview periods varies across studies. For example, one study found that the number of days between attempts was significant

[1] The contact probability approach uses algorithms for noncontact cases which are either a fixed probability for each time slot or use a conditional probability that adjusts the probabilities based on earlier noncontact calls (Weeks 1988:410). The priority score approach weights each noncontact every time the call scheduler is run. The weights are based on a variety of characteristics that produce a probability score used to schedule the next cold callback (See Stokes and Greenberg (1990) and Greenberg and Stokes (1990) for a discussion).

(Stokes and Greenberg 1990), while a similar comparison was not (Brick et al. 1996). Brick and his colleagues (1996:148) conclude this was partly due to the difference in the lag between attempts; their lag was almost always greater than two days, while greater than two days was the largest lag time in the other study (with a much shorter survey period).

Researchers have suggested that the outcome for the second attempt may be dependent on the timing of the first call attempt (Groves, 1989; Kulka and Weeks, 1989). However, Brick et al., (1996) found this not to be the case, but again noted it might be study specific due to differences in call protocols. We need a better understanding about timing between call attempts. This is an area where further research is badly needed.

Brick et al., (2003, pp. 2-3) recently showed that the mean number of call attempts to complete a refusal conversion has increased from 7.4 attempts to 10.0 attempts, with a relative difference of a 35 percent increase in effort over five years. Currently, the "cooling off period" prior to starting the calls range between a week and ten days, largely depending on the size of the sample and the length of the calling period. When the cooling off period is over, refusals are placed back into the call queue for the call scheduler. However, recent research indicates that the timing for making the call is important. A study in California found that "contact rates are generally higher and cooperation rates lower for conversion calls made in the same time slot as the refusal" (Edwards, DiSoga, and Yen, 2003:5). When they exclude the same time slot pairs, the best time to make contact and complete a refusal conversion is weekday mornings. It would be helpful if this study could be replicated in a national RDD sample.

Another interesting study worthy of replication examined refusal conversion using the combined data for RDD surveys conducted by a telephone survey center between 1995 and 2000 (Triplett, Scheib, and Blair, 2001). This yielded about 10,000 completed interviews and around 6,000 cases of initial refusals where refusal conversion was used. They found that the optimal cooling off period before initiating a refusal conversion varied across geographic region and whether the refusal occurred at the household or respondent level. Overall, the worst time to attempt a refusal conversion call was within the first six days. It was better to wait longer if the refusal occurred at the respondent level then at the household level.

Since almost all of the studies examine only cold call cases, it is unclear how well the current calling protocols are working with cases that continue as noncontacts, such as ring-no-answers, busy signals, and answering machines. It is not clear how making one, two, and three attempts at refusal conversion impacts calls to other noncontact cases. We really do not know much about the interplay between the difference types of noncontact and the timing and the number of call attempts being made. Weeks (1988) provides a table of 12 types of calling rules that can be applied (e.g., busy signals, temporarily absent, answering machines, refusals). Unfortunately, most of these other noncontact outcomes are predicated by survey mangers decisions and the maximum number of attempts rather then the probability of completing an interview. A successful call scheduler in today's world of technology should have a similar contact probability or a priority score for busy signals, refusals, appointment callbacks, and answering machines and other call screening devices (e.g., caller ID, call blocking, and privacy managers).

Number of Call Attempts

Concerns about efficiency, survey costs, and the number of call attempts arose as changes in technology occurred and response rates declined (e.g., Curtin et al., 2000; Brick et al., 2003). Changes in the telephone system and a huge increase in demand for nonresidential telephone numbers have reduced the residency hits for RDD surveys (Tucker, Lepkowski, and Pierkarski, 2002). These factors drove researchers into making more call attempts to noncontacts and to complete refusal conversion calls in the hopes of gaining more completed interviews. Thus the need for more calls increase the cost of the survey and the time needed to complete the survey. Though rarely discussed, it also increases the burden on the respondent, sometimes it seems to the point of harassment (e.g., two and three refusal conversions attempts, or making over 100 call attempts).

Conversely, many surveys limit noncontact calls to a specified number of call attempts to control costs. However, thus far results are mixed on what types of biases can occur due to the number of call attempts made for the sample. For example, in 1996 pre-election polling Frankovic (2003) reported that increasing the number of call attempts, using refusal conversion, making appointments, and calling throughout the day inflated the number of Democrats beyond sampling error, but using the same measures had little impact in 2000 pre-election polling. Conversely, Traugott (1987) found differences in the political affiliation represented in a Michigan state study during the 1984 presidential campaign. Increased effort (first to fifth call attempt) produced more Republicans and reduced the over representation of Democrats and females. Keeter et al., (2003) examined two national RDD studies that used

identical surveys but varied in the amount of effort used to conduct the studies. One study resulted in a response rate of 36 percent and the other study 60.6 percent. "Across 91 comparisons, no difference exceeded 9 percentage points, and the average difference was about 2 percentage points" (Keeter et al., 2000:235). Most of the statistical differences were due to differences in the demographics, but they found no evidence of bias for the demographics when compared to the Current Population Survey. Biemer and Link, (2003) examined demographics as a function of nonresponse using latent class analysis. They estimate response bias remains constant within a 30-60 percent response rate, but bias increases within the 10-40 percent range. If the response rates were a little lower, the Keeter et. al. (2000) findings could have been different. As Biemer (2001) suggests, other factors can play a more important role in creating bias such as the data collection process used and the survey instrument design (measurement error), even if an excellent response rate results.

Methods Used to Encourage Cooperation

Survey Introductions

There is little doubt that survey introductions play an important part in a successful telephone interview. However, what is included in the introduction varies according to how they are regulated. Federal or state funded research must follow federal and state guidelines and regulations. Slightly less regulated, the "Not-for-Profit" research centers typically fall under Institutional Review Boards or are guided by professional guidelines. Finally, the least regulated "For Profit" research institutions follow professional guidelines.

Informed consent for most federal surveys must include the purpose of the study, the duration of the survey, whether it is voluntary or mandatory, and a confidentiality statement. Setting aside the federally regulated surveys, Shepard (2002:3)[2] found that whether For Profit (FP) or Not-for-Profit (NFP), the general purpose of the study and the name of the company or agency that is conducting the study are mentioned (by 90 percent or more). There is less consistency regarding confidentiality statements (72 percent FP and 86 percent NFP) and the approximate length of the survey (64 percent FP and 48 percent NFP). Otherwise, as Sobal (1978) discovered, introductions vary greatly across surveys.

What do we know about the impact of introductions for RDD surveys? In general, an assurance of privacy and confidentiality appears to impact response rates, cooperation rates, and data quality in a small way, and only for sensitive topics (Singer, Von Thorn, and Miller (1995:74). However, stopping to reaffirm confidentiality before asking sensitive questions does not appear to work (Frey 1986). Adding a statement about "not selling anything," could help with surveys that might be confused with fund raising or marketing calls (e.g., Gonzenbach and Jablonski 1993; van Leewen and de Leeuw 1999). Otherwise, studies to examine the amount of information and type of information included in the introduction are difficult to test (Singer and Frankel 1982) and thus far show little impact on cooperation (e.g., Meegama and Blair 1999, Tuckel and Shukers 1997, O'Neil and Groves, 1979). Thus far, we have not found the "silver bullet" for what works best for introductions.

The Council on Marketing and Opinion Research (CMOR) has a task force examining introductions with multifaceted goals (CMOR 2003). It is some of the more promising research being conducted at this time. Their ideas include allowing interviewers more freedom in the introduction and providing multiple scripts and key words to use to aid interviewers in gaining cooperation. Another task force is examining training. An early recommendation suggests using training modules that include voice training, assertiveness training, refusal rebuttal, and providing a general background about the importance of survey research and what it contributes to society. Grove's work with training interviewers using techniques to avoid or convert refusals reinforces the hypothesis that training interviewers is very important in gaining cooperation (Groves and McGonagle 2001). This research focuses on the first few moments of interaction between the respondent and the interviewer; teaching interviewers to respond based upon what the respondent says (i.e., offer the appropriate type of rebuttal).

Messages for Answering Machines

It seems surprising that many survey organizations do not leave a message when an answering machine is reached. Shepard (2002:2) reports that among for profit researchers only 17 percent leave a message, while 22 percent were currently considering leaving a message. O'Rourke et al. (1998:2) reports that 25 percent Not-For-Profit researchers leave messages when calling an RDD number, of those 29 percent left a message on the first call and 93 percent left a message on a subsequent

[2] The Marketing Research Association provided a sample of its members (FP) and the not-for-profits organizations were surveyed by O'Rourke et al. (1998) via the publication membership for *the Survey Research Newsletter* (List of Academics and Not-for Profit Survey Research Organizations).

call. The frequency of leaving a message varied (e.g., once, twice, three times, once a week) and some organizations left the same message, while others varied the message depending on whether it was a scheduled callback (O'Rourke, 1998:2). However, thus far leaving a message does not appear to impact the overall response rate or refusal rates, no matter what message is left (Link et al., 2003; Baumgartner, 1990; Xu, Bates and Switzer, 1993; Tuckel and Shukers, 1997) --- not even if a message mentions a monetary incentive or the option to callback at the respondent's convenience (Tuckel and Schulman, 2002). So maybe it is not so surprising that many researchers have chosen not to leave a message.

However, future research should better account for call screening devices such as answering machines and caller ID. While leaving a message does not seem to matter, ownership of such things changes the probability the household will be contacted (Roth, Montiquila, and Brick, 2001; Piazza, 1993 Kochanek et al. 1995).

Sending Advance Letters

Advance Letters

The goal of an advance letter is to forewarn the respondent to expect a call and to provide a way to help legitimize the call in advance (e.g., Dillman, Gallegos, and Frey, 1976; Traugott, Groves, and Lepkowski, 1987). This should reduce the chances of the respondent hanging up on a "cold call." One caveat to remember is that an advance letter can only be sent to the listed portion of the RDD sample. Unfortunately this group is more likely to respond and the unlisted less likely to respond. The other caveat is that sending a letter is no guarantee it will be read, remembered, disseminated to other adults in the household, nor that the person who answers the call will be the one who read the letter. Finally, the results of studies using advance letters in RDD surveys are mixed and any benefit of improving response appears to be declining over time (Cantor et al., 2002).[3] Several experiments suggest that advance letters improve response for the entire sample by 0 to 3 percent (Brick et al., 1997; Singer, Van Hoewvk, and Maher, 2000). Some studies did report a reduction in the number of calls needed to complete an interview. All of the reports did have a control group that came from the listed portion and acceptable response rates that included at least one refusal conversion.

[3] However, Link et al. (2003) reported an increase of as much as 10 percent across states for the Behavioral Risk Factor Surveillance System survey.

Future research should include more comparisons of the demographics and dependent measures to confirm that the added cost is helpful in reducing nonresponse bias. Thus far the results have been mixed. Camburn et al. (1995:972) noted that frequent and obvious mentions of the study's purpose (child immunization) resulted in more respondents consulting their records to respond to questions. Traugott, Groves, and Lepkowski, (1987) found a stronger relationship between presidential approval and partisanship for those who received the letter than for those who did not receive the letter (did not change the substantive conclusion). Parsons, Owens, and Skogan (2002:2) found that the listed samples in their two studies were more likely to be white, older, and college educated, but less likely to be married than the unlisted sample. Goldstein and Jennings (2002:612-614) using a listed sample of registered voters found that, in general, the demographics were improved with an advance letter. However, people between 30-45 years old were more likely to participate, (18 percent) when a letter was received while those between 18-29 years old were *less* likely to participate (17 percent) when they received a letter.

Nonetheless, the use of the advance letter is likely to increase for three reasons. First, researchers are willing to settle for any improvement in response rate regardless of whether the increase is statistically significant. Second, the improvement that does occur tends to result in greater cooperation and thus provides a chance to reduce cost via fewer calls (Brick and Collins, 1997). Increased cooperation provides a greater chance to reduce nonresponse bias. Third, advance letters become somewhat more effective with the inclusion of a prepaid monetary incentive.

Incentives in Advance Letters

Dillman (1978; 2000) believes the likelihood of cooperation increases when the respondent perceives a benefit from the survey and the cost of completing the survey is not too high (burdensome). Sending an incentive in advance adds to the perceived benefits of completing the survey and adds to the legitimacy of the request. A "token" monetary incentive works best because larger amounts are likely to be confused with a payment.

It is difficult to determine the impact of monetary incentives for RDD surveys. The studies are less comparable than for the advance letters research (without incentives). Some of the studies use FedEx, but most use first class mail, and sample populations vary greatly. The length of the interview period and number of attempts also varies. In general, adding an incentive impacts response rates somewhat

(improvement ranges between three or four percent up to eight to ten percent). Prepayment seems to work best, but in a few cases for some sub-populations promised payments appears to work (e.g., Cantor, 2003).

Incentives in Refusal Conversion Letters

Pre-paid incentives are also useful for refusal conversion letters. The most recent study by Cantor Wang, and Abi-Habib (2003) finds the impact of a refusal conversion letter with an incentive is about equal to an advance letter and costs less to send. However, the impact of the refusal conversion letter at the screening level has a dampening effect on cooperation in the subsequent extended interview. Similarly, Strouse and Hall (1997) found a negative reaction when a $10 promised incentive was offered in a refusal conversion letter, when the household had already been offered $5 at the initial telephone contact. Cantor Wang, and Abi-Habib (2003) caution that what occurs in the early stages of the survey might have an impact on the subsequent interview.

Incentives and Data Quality

Adding a monetary incentive, prepaid or promised, can have a small impact on the response distribution for key indicators (Singer, Van Hoewvk, and Maher, 2002). Most of this difference was accounted for by changes in demographics, nonwhite and older people were less likely to have item nonresponse. Other studies (Chandhok 2001; Strouse and Hall, 1997) have found no impact or a positive impact on data quality (e.g., fewer don't knows/missing data), while Cantor Wang, and Abi-Habib (2003) found less missing data for the no incentive group. Several studies examined the differences within the sample for a reduction of bias and found little or no difference in the respondents that received an incentive and those that did not (See Singer, Van Hoewvk and Maher, 2002).

Future Research

Conducting RDD surveys is requiring more effort to maintain acceptable response rates. However, simply increasing the number of completed interviews does not appear to necessarily reduce nonresponse bias. In fact, several studies indicate that improving response rates can increase bias or have no effect. The problem is that a handful of studies can not generalize to the vast number of topics and differences in heterogeneity within survey populations for the RDD surveys conducted each year. We also know that we can have a 10 percent response rate and have a very accurate estimate and a 90 percent response rate and have a very poor estimate. Rather then worry about the decline in response rates it is more prudent to attempt to avoid nonresponse bias via better sample management. Future research should establish call patterns that work best for different sub-populations to assure they are represented in the sample. Calling protocols should account for other types of noncontacts to optimize the chance of a completed interview. Once this is achieved, we could apply different protocols based on population characteristics that are important to assure representation in order to provide accurate, unbiased estimates. This should shorten the survey period and reduce the number of call attempts needed to complete an interview.

Respondent's Attitudes toward Surveys

Much of our day-to-day sample management to increase cooperation directly impacts respondent's attitudes towards the survey. Continuing to add more effort to improve response rates is essentially pushing us to use "telemarketing strategies." The Federal Trade Commission estimates that over 60 million people will register their telephone numbers on the National Do Not Call List by October 1st of 2003.[4] While this list does not apply to survey research, it is a strong indication of people's attitudes toward unwanted telephone calls. People have already resorted to screening calls via unlisted numbers, answering machines, caller ID, call blocking, and privacy managers. It is getting more and more difficult to contact households by telephone and when they are contacted, people are less willing to respond. In the long run, our current strategies to improve response are probably doomed to fail.

So, what can we do to improve respondent cooperation? One way to do this is to educate the population about the importance of survey research and how it is used in every day life. The most common reason to participate is enjoyment of the survey process and the value placed on the survey research topic (Rogelberg et al., 2001). However, the frequency of survey requests (Goyder 1986) and past experience with burdensome surveys can decrease the chance of future cooperation (Sharp and Frankel, 1983). The second way is to respect the respondent and remember that the research community "shares" respondents. What occurs in one survey can affect subsequent participation in other surveys.

As a statistical society, it is important we help to educate the public about survey research. The American Statistical Association's (ASA) *Adopt a School Program* and the *Quantitative Literacy Projects for grades K-12* are excellent examples for

[4] As of today, October 1st 2003 over 50 million telephone numbers are registered according to WUSATV9.com

how to teach the general public about statistics and its uses. But to do this, we also need more members to volunteer their skills such as "Joe Ward, from San Antonio, who visited high school classrooms making use of a JASA article on the failure of the O-rings in the Challenger space shuttle disaster or Mike Capobianco, from New York, who challenged a group of high school students to name a field of endeavor in which he could not name a statistical application" (information taken directly from the ASA website). It is important that ASA members share their talents with others.

We need to build a positive industry image, especially in the current negative political environment. It is very troubling when members of Congress encourage people to not respond to the US Census. And we are taking steps to change public attitudes. The American Statistical Association and Springer-Verlag produce Chance magazine. Chance's goal is to reach out to non-statisticians by showing them how statistics are used in society. The American Association for Public Opinion Research has taken a public stance against several questionable "survey" practices (e.g. push polling, fund raising under the guise of research, using survey data to create lists of potential clients). CMOR deserves a thank you for helping to assure that telephone research did not get included in the "do not call" list legislation. They continue to educate the public about this legislation. Finally, the federal statistical agencies have created a wonderful website that helps to educate the America public about the federal statistical agencies (Fedstat.gov). All of these things should have an impact on future cooperation.,

A Final PostScript About the Future

This past Census people of Hispanic descent became the largest minority in America. Immigration has risen steadily since 1960. America accepted over 9.8 million immigrants in the past decade. They arrived from a variety of countries (51 percent from Latin America, 30 percent from Asia, 13 percent from Europe and 6 percent from Canada and other areas). Most of our surveys are not translated into non-English languages; however, 47 million people over the age of five spoke a language other then English in their homes (approximately 60 percent spoke Spanish, 4 percent Chinese, 3.5 percent, French, 3 percent German, 2.6 percent, Tagalog, 2 percent Vietnamese, 2 percent Italian, and 2 percent Korean (See Martin and Midgley, 2003:39). While the percentages are small, it is very likely that social and political attitudes and social demographic characteristics vary greatly for the people we tend to exclude from our surveys. It is also not clear how many refusals can be attributed to poor command of the English language. It would seem reasonable if a person does not clearly understand a request, they might be more likely to think the survey does not apply to them and decline to respond, thus inflating the refusal rates.

The 2000 US Census Disability Status Report (Waldrop and Stern 2003) states that 3.6 percent of Americans have a sensory disability (sight or hearing), among those 65 or older 14.2 percent had a sensory disability (4.7 million people). Our current survey practices of typically excluding these "other noncontact" groups reminds me of the research in the 1940-1950s that excluded minorities and women in medical trial studies. When minorities and women were included in the medical studies it "threw the findings off." Are we possibly repeating the mistakes of our past?

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