The Value of the Increasing Effort To Maintain High Response Rates in Telephone Surveys

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Abstract

Declining response rates and coverage in random-digit-dial (RDD) telephone surveys have been observed by many researchers. Several studies have also shown that efforts to increase response rates often do not significantly affect estimates for key outcome variables, but few such studies have been conducted on large scale surveys including a broad range of health services measures. Using the Community Tracking Study Household Survey, a health services survey of roughly 30,000 families per round based on a national RDD sample, we examine the impact on key survey estimates of different simulated levels of effort. Using call history data, we simulate fewer call attempts, fewer refusal conversion attempts, and shorter time periods in the field than were actually pursued, and then re-weight the data according to the simulated outcomes. We then examine the impact of these reduced efforts on weighted estimates, comparing them to the estimates resulting from the complete survey data. These comparisons shed light on whether reducing the level of effort during data collection is likely to affect survey estimates for commonly used health services measures.

Keywords: RDD survey, response rate, refusal conversion, call attempts, nonresponse bias, Community Tracking Study

1. Introduction and Background

Many studies have shown that response rates in RDD telephone surveys are declining (DiSogra et al. 2003, de Leeuw and de Heer 2002, Brick et al. 2003). Response rates[1] on the University of Michigan's Survey of Consumer Attitudes have declined steadily over the past quarter century, averaging about one percentage point per year. The growth in nonresponse from 1979 to 1996 was driven primarily by increasing non-contacts and, since 1996, due to a rise in refusals (Curtin et al. 2005). Mean response rates across states in the Behavioral Risk Factor Surveillance Survey System (BRFSS) surveys dropped 12 percentage points from 1996 (63 percent) to 2001 (51 percent) (Link 2004). Although the initial response rate for the Center for Disease Control's National Immunization Survey was higher than for most RDD surveys, response rates for that survey also have declined in recent years, from 86 percent in 1994 to 74 percent in 2002 (Smith et al., 2005). [2]

The experience of large scale non-government RDD surveys has been similar. Over the three rounds of the Urban Institute's National Survey of American Families, the screening response rate declined 12 percentage points between 1997 (round 1) and 2002 (round 3), despite increases in call limits and use of incentives (Brick et al., 2003). However, there was little change in response rates for extended interviews, indicating that the key problem was the decline in initial cooperation. Across the four rounds of the Center for Studying Health System Change's Community Tracking Study Household Survey, family level response rates declined from 65 percent (1996) to 56 percent (2003).

A key question is whether the decline in response rates has increased nonresponse bias. In general, nonresponse causes bias only if nonresponders are different than responders. And higher response rates can help mitigate bias if harder-to-get respondents are more like the nonrespondents than the initial respondents. However, several studies have indicated that falling response rates may not increase bias for well designed surveys, with dispersed calling patterns and appropriate weighting methods (Curtin et al. 2005; Groves et al. 2004; Keeter 2000, 2004; Merkle and Edelman 2002). Few such studies have been conducted on large scale surveys that include a broad range of health services measures.

Using the fourth round of the Community Tracking Study Household Survey (CTS), a health services survey of 25,000 to 30,000 families per round based on a national RDD sample, we examine the impact of

[1] Calculated according to AAPOR guidelines (AAPOR, 2004).

[2] Response rates for the NIS surveys are based upon the CASRO response rate (Frankel, 1983), which is calculated as the product of the resolution rate, screening completion rate, and interview completion rate among eligible households or persons.

simulating different levels of effort on key survey estimates. We vary call attempts, refusal conversion attempts, and the length of the field period, and then re-weight the data according to the simulated outcomes. We then examine the impact of these reduced efforts on key weighted estimates, comparing them to the estimates resulting from the complete survey data. These comparisons shed light on whether reducing the level of effort during data collection is likely to affect survey estimates for commonly used health services measures.

2. Data

The CTS includes periodic surveys of households (including linked insurers), physicians, and employers and site visits with leaders of local health systems. The survey samples are concentrated in 60 nationally representative communities, supplemented by a random sample to improve national estimates. Twelve communities were selected for in-depth interviews with community health leaders and larger survey samples. The purpose of the surveys and site visits are to provide data on how the U.S. health care system is changing over time, and how those changes affect people.[3] There have been four rounds of CTS, roughly every two years since 1996. The CTS household survey has a clustered design where the primary sampling units were a national probability sample of 60 sites. It has a list-assisted RDD sample, supplemented by face-to-face interviews in 12 nationally representative markets to increase representation of households without landline telephones. All interviews are conducted by computer-assisted telephone interviewing (CATI), with in-person interviews completed by cellular telephone. Starting in round 2, the sample has included a mix of "re-interview," other "overlap," and new sample. The "re-interview" cases are those where the telephone number resulted in a complete interview in the prior round. The other "overlap" cases were telephone numbers released for interviewing the prior round, but that did not result in completed interviews. The new sample contained telephone numbers not part of the prior round sample (both those that could have been sampled in the prior round and those that did not exist at that time). The round 4 survey was conducted from February 2003 through February 2004.

[3]The CTS is funded by the Robert Wood Johnson Foundation, and sponsored and designed by the Center for Studying Health System Change (see www.hschange.org). The technical report on the fourth round of the CTS household survey is available at www.hschange.org/ CONTENT/757/.

A total of 20,998 households, including 25,419 family units and 39,260 adults and 7,327 children, were surveyed. A household was defined as a "complete" if at least one family unit in the household completed an interview. Households were divided into family reporting units, with one informant per family unit responding about other family members for demographic and health services use questions. Questions on health status, health conditions, and attitudinal items were self-reported by each adult.

3. Methods

The CATI program[4] produces a call history file that contains one record per call attempt. Each record has the date and time of call, and a call disposition code. We used this history file to do our simulation based on three different parameters: (1) the number of call attempts, (2) the number of refusal conversion attempts, and (3) the elapsed time the case was pursued. For each parameter, we simulated two lower levels of effort for the RDD cases only. For each of the six simulations, we re-weighted the data, and then compared weighted (national person-level) estimates for key estimates for these simulations to the actual estimates, both overall and for policy-relevant subgroups.

The weighting steps for the original CTS weights and each of the six simulations were as follows:

- adjust for the probability of selection of telephone numbers and addresses, and for multiple ways of getting into the sample
- adjust for response and eligibility determination (weighting cells defined by sample component, site, substratum)
- integrate the RDD sample with the small field sample component
- post-stratify the person-level weights using Current Population Survey counts

[4] The CATI program used the CASES software, a UNIX-based system developed by the Computer-Assisted Survey Methods (CMS) Program at the University of California, Berkeley. (Neither the CSM staff nor the University of California bear any responsibility for the results or conclusions presented here or elsewhere.)

based on sex, age, Hispanic, race, and education

- trim outlier weights and re-post-stratify.

We selected four widely used measures of access to health care, health status, and health services use -- whether the person: (1) had a usual source of care, (2) postponed needed medical care in the last year, (3) had fair or poor health status (self-reported), and (4) the number of doctor visits in the past year. Except for health status, the other measures were provided by a family informant.

Five policy-relevant subgroups were included in the analysis: (1) children, (2) the uninsured, (3) those in low-income families, (4) Hispanics, and (5) non-Whites. Children comprised about 16 percent of the unweighted sample and about 26 percent of the weighted sample size. The uninsured comprised about 10 percent of the unweighted sample and 13 percent of the weighted sample size. Those in low-income families (below 200 percent of the federal poverty line) comprised about 26 percent of the unweighted sample and about one-third of the weighted sample size. Hispanics comprised about 10 percent and 14 percent, respectively, and non-Whites comprised about 19 percent and 21 percent, respectively.

4. Actual Level of Effort

Table 1 shows the actual number of attempts made to complete the household interviews, Table 2 the actual number of refusal conversion attempts, and Table 3 shows the actual elapsed time (in weeks) for the household completes. We defined a refusal conversion attempt as any call attempt where the *preceding* attempt had a *current disposition* of "refused." The unweighted household level response rate for the RDD cases was 63 percent.

For each of these three parameters (call attempts, refusal conversion attempts, and elapsed time), we simulated two lower levels of effort. Any case with a level of effort above a particular simulation cutpoint was re-classified according to its status at the new cutpoint. For the call attempts, we simulated estimates assuming we had ended efforts after 40 attempts and 20 attempts. Terminating calls at 40 attempts reduces the number of household completes by about 2,200 and the unweighted response rate to 56 percent. Ending at 20 attempts reduces the number of completes by about 5,800 and the unweighted response rate to 45 percent (see Table 1).

For the refusal conversion attempts, we simulated impacts as if we had ended attempts after four and one, respectively. Table 2 shows that ending efforts at four refusal conversion attempts reduces the number of household completes by about 5,400 and reduces the response rate to 46 percent; ending efforts after one refusal conversion attempt reduces the number of completes by about 6,700 and the response rate to 42 percent.

In terms of the elapsed time simulations, our two cutpoints were at 20 weeks and at 12 weeks from the first attempt. Table 3 shows that ending data collection after 20 weeks reduces the number of household completes by about 2,500 and the response rate to 55 percent; ending at 12 weeks reduces the completes by about 4,500 and the response rate to 49 percent.

5. Results

Weighted estimates for the full sample shown in this paper may not match CTS estimates published elsewhere because of differences in how subgroups were defined. All estimates were run using SUDAAN software (developed by Research Triangle Institute), using the Taylor Series approach to variance estimation and the unequal-without-replacement design assumption.

Tables 4 through 6 show the results of the simulations for the entire CTS sample. In each table, the rows represent the four variables for which we are comparing estimates across the simulations. (The row for "doctor visits" shows the weighted mean number of visits, and the other three rows show the weighted percent responding "yes.") The first column shows the weighted estimate based on the actual level of effort. The second and third columns show the weighted estimate under the simulated scenarios with lower levels of effort.

Table 4 shows that the simulated estimates differ very little from the actual estimates when the number of calls is reduced. For example, our actual estimate of people having a usual source of care is 87.53 percent. When we simulate maximizing our attempts to 40, the estimate is 87.69 percent; and when we simulate a cutoff of 20 attempts, the estimate is 87.78 percent. All four sets of estimates in this table differ by no more than one percentage point (or $1/10^{th}$ of a visit). As one would expect, however, the standard errors increase slightly because we have fewer respondents included in the simulated estimates and because the weighting adjustments for nonresponse are higher, thereby increasing the design effect.

The results are similar for reducing the level of refusal conversion efforts (see Table 5). The largest impact was for the percentage of people reporting that they postponed needed medical care in the last year, but that impact was very small. The actual estimate was 16.84 percent, and the simulated estimates with limited refusal conversion attempts were 17.17 percent (4 attempts) and 17.20 percent (1 attempt). As with Table 4, the differences across rows are less than one percentage point (or less than $1/10^{th}$ of a visit).

The impact of varying elapsed time (Table 6) is similar for the four variables. For example, the mean number of doctor visits for the actual completes was 3.80. Had we stopped attempting cases after 20 weeks, the mean would have been 3.83 visits, and had we stopped after 12 weeks, the mean would have been 3.89 visits.

The remaining 12 tables show the results of the simulations for each of the five subgroups: children, the uninsured, people in low-income families, Hispanics, and non-Whites. Each table shows the results for all five subgroups, and for one key variable and effort parameter (attempts, refusal conversion attempts, and elapsed time).

For example, Table 7 shows the estimates of the percentage of people having a usual source of care, and how reducing the number of attempts affects that estimate for the five subgroups. Here we see slightly larger effects of the simulated lower level of effort for a few of the subgroups. For children and people in low income families, the differences in estimates are less than one percentage point. For the uninsured, there is not much of a difference between the estimates based on the actual sample and the simulated sample cut at 40 attempts (63.90 vs. 63.44 percent); however, the estimate for the last column, cutting attempts at 20, is a bit higher at 65.36 percent. For Hispanics, there is a difference of 3 percentage points between the first and third columns; and for non-Whites, there is a difference of about 1.4 percentage points. Note that, for all subgroups, the standard errors increase as the level of effort decreases.

While the remaining tables differ slightly from one another, the same basic story emerges. Many weighted subgroup estimates do not change much when using a simulated lower level of effort—most are still within one percentage point, with the occasional difference slightly larger (two or three percentage points) and probably not significant from a policy perspective.

6. Conclusions

This simulation sheds light on whether lengthy field periods, with extensive refusal conversion efforts and many follow-up calls, result in changes in commonly used health and health services use measures for an RDD survey with thorough sample weighting. We found that reducing the level of refusal conversion efforts, total calls, and length of the field period resulted in very small changes in estimates, with most differences within one percentage point of the actual estimate, whether looking at the overall sample or at subgroups. The response rates for the simulated estimates are quite low, declining up to 20 percentage points for minimal refusal conversion efforts. However, with the proper weighting steps, including both nonresponse adjustments and poststratification to external demographic counts, it appears that the lower response rate did not affect the estimates in a significant way As one would expect, there is a slight increase in variance due to the larger weighting adjustments that are necessary. The potential savings in time and money for the reduced level of effort can now be weighed against a scenario that shows remarkably similar estimates and only slightly higher variances.

TABLE 1. ACTUAL LEVEL OF EFFORT AMONG RDD HOUSEHOLD COMPLETES

Attempts	Households	Percent
1	1,579	7.7
2	1,552	7.6
3	1,282	6.3
4	1,168	5.7
5	1,064	5.2
6-10	3,817	18.6
11-20	4,205	20.5
21-40	3,593	17.5
> 40	2,220	10.8
Total	**20,480**	**100.0**

TABLE 2. ACTUAL REFUSAL CONVERSION ATTEMPTS AMONG RDD HOUSEHOLD COMPLETES

Refusal Conversion Attempts	Households	Percent
0	13,212	64.5
1	539	2.6
2	469	2.6
3	447	2.2
4	429	2.1
5+	5,384	26.3
Total	**20,480**	**100.0**

TABLE 3. ACTUAL ELAPSED WEEKS AMONG RDD HOUSEHOLD COMPLETES

Elapsed Weeks (Rounded)	Households	Percent
0	4,475	21.9
1	3,003	14.7
2	1,541	7.5
3-6	4,065	19.9
7-12	2,853	13.9
13-20	2,077	10.1
>20	2,462	12.0
Total	**20,476***	**100.0**

*Four households had missing dates

TABLE 4. VARYING CALL ATTEMPTS

	Actual Attempts	Cut at 40 Attempts	Cut at 20 Attempts
Has usual source of care (s.e.)	87.53 (0.54)	87.69 (0.57)	87.78 (0.63)
Postponed care (s.e.)	16.84 (0.33)	17.16 (0.40)	17.18 (0.43)
Doctor visits (s.e.)	3.80 (0.06)	3.83 (0.06)	3.89 (0.06)
Fair/poor health (s.e.)	13.71 (0.49)	13.76 (0.49)	14.00 (0.51)

TABLE 5. VARYING REFUSAL CONVERSION ATTEMPTS

	Actual Ref. Conver-sion Attempts	Cut at 4 Ref. Conver-sion Attempts	Cut at 1 Ref. Conver-sion Attempt
Has usual source of care (s.e.)	87.53 (0.54)	87.06 (0.65)	87.30 (0.64)
Postponed care (s.e.)	16.84 (0.33)	17.17 (0.38)	17.20 (0.40)
Doctor visits (s.e.)	3.80 (0.06)	3.88 (0.07)	3.88 (0.07)
Fair/poor health (se)	13.71 (0.49)	13.89 (0.50)	14.04 (0.49)

TABLE 6. VARYING ELAPSED TIME

	Actual Time	Cut at 20 Wks	Cut at 12 Wks
Has usual source of care (s.e.)	87.53 (0.54)	87.11 (0.58)	87.29 (0.66)
Postponed care (s.e.)	16.84 (0.33)	17.10 (0.36)	17.28 (0.41)
Doctor visits (s.e.)	3.80 (0.06)	3.83 (0.06)	3.89 (0.06)
Fair/poor health (s.e.)	13.71 (0.49)	13.80 (0.49)	13.86 (0.56)

SUBGROUP RESULTS

TABLE 7. VARYING CALL ATTEMPTS -HAS USUAL SOURCE OF CARE-

	Actual Attempts	Cut at 40 Attempts	Cut at 20 Attempts
Children	93.24	93.71	93.50
	(0.61)	(0.65)	(0.81)
Uninsured	63.09	63.44	65.36
	(1.83)	(1.88)	(2.50)
Low Income	81.71	81.91	82.60
	(1.05)	(1.13)	(1.23)
Hispanic	73.22	74.38	76.23
	(1.81)	(2.11)	(2.13)
Non-White	80.89	81.10	82.25
	(1.29)	(1.47)	(1.49)

TABLE 8. VARYING CALL ATTEMPTS -POSTPONED NEEDED CARE-

	Actual Attempts	Cut at 40 Attempts	Cut at 20 Attempts
Children	3.74	4.07	4.03
	(0.38)	(0.41)	(0.44)
Uninsured	29.94	30.18	30.70
	(1.39)	(1.64)	(1.65)
Low Income	18.22	18.62	18.70
	(0.70)	(0.76)	(0.76)
Hispanic	14.38	14.94	14.60
	(0.89)	(1.09)	(0.98)
Non-White	15.14	15.49	15.64
	(0.67)	(0.73)	(0.77)

TABLE 9. VARYING CALL ATTEMPTS -NUMBER OF DOCTOR VISITS-

	Actual Attempts	Cut at 40 Attempts	Cut at 20 Attempts
Children	3.05	3.14	3.15
	(0.07)	(0.08)	(0.10)
Uninsured	1.86	1.83	1.96
	(0.12)	(0.13)	(0.18)
Low Income	3.83	3.92	3.97
	(0.13)	(0.14)	(0.15)
Hispanic	3.06	3.03	3.31
	(0.15)	(0.15)	(0.17)
Non-White	3.33	3.39	3.46
	(0.10)	(0.11)	(0.13)

TABLE 10. VARYING CALL ATTEMPTS -FAIR OR POOR HEALTH-

	Actual Attempts	Cut at 40 Attempts	Cut at 20 Attempts
Children	4.10	4.28	4.62
	(0.37)	(0.41)	(0.49)
Uninsured	19.94	19.58	19.28
	(1.03)	(1.15)	(1.31)
Low Income	21.35	21.74	21.82
	(0.89)	(0.90)	(0.97)
Hispanic	21.93	21.32	21.51
	(0.99)	(1.27)	(1.37)
Non-White	19.41	19.50	18.84
	(0.71)	(0.76)	(0.80)

TABLE 11. VARYING REFUSAL CONVERSION ATTEMPTS -HAS USUAL SOURCE OF CARE-

	Actual Ref. Conversion Attempts	Cut at 4 Ref. Conversion Attempts	Cut at 1 Ref. Conversion Attempt
Children	93.24	92.76	92.69
	(0.61)	(0.82)	(0.87)
Uninsured	63.09	63.52	63.91
	(1.83)	(2.12)	(2.22)
Low	81.71	80.86	81.12
Income	(1.05)	(1.44)	(1.39)
Hispanic	73.22	70.57	70.59
	(1.81)	(2.62)	(2.47)
Non-	80.89	80.05	80.08
White	(1.29)	(1.69)	(1.66)

TABLE 12. VARYING REFUSAL CONVERSION ATTEMPTS -POSTPONED NEEDED CARE-

	Actual Ref. Conversion Attempts	Cut at 4 Ref. Conversion Attempts	Cut at 1 Ref. Conversion Attempt
Children	3.74	3.92	4.05
	(0.38)	(0.50)	(0.55)
Uninsured	29.94	30.09	29.58
	(1.39)	(1.54)	(1.52)
Low	18.22	18.25	18.42
Income	(0.70)	(0.70)	(0.69)
	14.38	13.81	13.58
Hispanic	(0.89)	(1.11)	(1.12)
Non-	15.14	14.19	14.11
White	(0.67)	(0.67)	(0.67)

TABLE 13. VARYING REFUSAL CONVERSION ATTEMPTS -NUMBER OF DOCTOR VISITS-

	Actual Ref. Conversion Attempts	Cut at 4 Ref. Conversion Attempts	Cut at 1 Ref. Conversion Attempt
Children	3.05	3.11	3.11
	(0.07)	(0.09)	(0.10)
Uninsured	1.86	1.85	1.81
	(0.12)	(0.13)	(0.12)
Low Income	3.83	3.94	3.92
	(0.13)	(0.15)	(0.16)
Hispanic	3.06	2.96	2.98
	(0.15)	(0.18)	(0.18)
Non-White	3.33	3.41	3.42
	(0.10)	(0.13)	(0.14)

TABLE 14. VARYING REFUSAL CONVERSION ATTEMPTS -FAIR OR POOR HEALTH-

	Actual Ref. Conversion Attempts	Cut at 4 Ref. Conversion Attempts	Cut at 1 Ref. Conversion Attempt
Children	4.10	4.01	4.20
	(0.37)	(0.39)	(0.43)
Uninsured	19.94	20.66	20.45
	(1.03)	(1.20)	(1.15)
Low Income	21.35	21.68	22.10
	(0.89)	(0.93)	(0.95)
Hispanic	21.93	22.04	22.38
	(0.99)	(1.28)	(1.33)
Non-White	19.41	19.51	19.57
	(0.71)	(0.82)	(0.95)

TABLE 15. VARYING ELAPSED TIME -HAS USUAL SOURCE OF CARE-

	Actual Time	Cut at 20 Weeks	Cut at 12 Weeks
Children	93.24	92.56	92.94
	(0.61)	(0.77)	(0.82)
Uninsured	63.09	62.10	62.76
	(1.83)	(1.95)	(2.38)
Low Income	81.71	80.63	80.86
	(1.05)	(1.21)	(1.34)
Hispanic	73.22	72.27	73.46
	(1.81)	(2.27)	(2.50)
Non-White	80.89	80.66	80.69
	(1.29)	(1.43)	(1.73)

TABLE 16. VARYING ELAPSED TIME -POSTPONED NEEDED CARE-

	Actual Time	Cut at 20 Weeks	Cut at 12 Weeks
Children	3.74	3.70	3.87
	(0.38)	(0.44)	(0.50)
Uninsured	29.94	29.82	29.64
	(1.39)	(1.45)	(1.49)
Low Income	18.22	18.66	18.77
	(0.70)	(0.74)	(0.70)
Hispanic	14.38	14.25	14.37
	(0.89)	(0.86)	(0.99)
Non-White	15.14	15.24	15.30
	(0.67)	(0.66)	(0.76)

TABLE 17. VARYING ELAPSED TIME -NUMBER OF DOCTOR VISITS-

	Actual Time	Cut at 20 Weeks	Cut at 12 Weeks
Children	3.05	3.07	3.14
	(0.07)	(0.08)	(0.10)
Uninsured	1.86	1.83	1.94
	(0.12)	(0.14)	(0.18)
Low Income	3.83	3.87	3.93
	(0.13)	(0.13)	(0.15)
Hispanic	3.06	3.00	3.19
	(0.15)	(0.15)	(0.17)
Non-White	3.33	3.33	3.41
	(0.10)	(0.12)	(0.12)

TABLE 18. VARYING ELAPSED TIME -FAIR OR POOR HEALTH-

	Actual Time	Cut at 20 Weeks	Cut at 12 Weeks
Children	4.10	4.59	4.30
	(0.37)	(0.46)	(0.56)
Uninsured	19.94	20.25	20.21
	(1.03)	(1.08)	(1.26)
Low Income	21.35	22.03	21.92
	(0.89)	(0.94)	(0.99)
Hispanic	21.93	21.76	22.00
	(0.99)	(1.15)	(1.45)
Non-White	19.41	19.53	19.31
	(0.71)	(0.79)	(0.86)

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