

CALLING LOCAL TELEPHONE COMPANY BUSINESS OFFICES TO DETERMINE THE RESIDENTIAL STATUS OF A WIDE CLASS OF UNRESOLVED TELEPHONE NUMBERS IN A RANDOM-DIGIT-DIALING SAMPLE

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INTRODUCTION

Even after large numbers of dialing of sample numbers in a random-digit-dialing (RDD) sample, 5 to 15 percent of the sample numbers can end up with an unresolved residential status. These unresolved numbers make it difficult to accurately compute response rates for RDD samples.

The National Immunization Survey (NIS) offers an opportunity to examine the issue of unresolved telephone numbers on a continuing, large-scale basis. The NIS uses stratified quarterly list-assisted RDD telephone samples. The 78 strata cover the entire U.S. The total sample size for each quarter consists of roughly 475,000 sample telephone numbers.

As part of the NIS statistical estimation processes, stratified samples of telephone numbers in the various categories of unresolved numbers were drawn in both the second and third quarters of 1994. Local telephone company business offices were called to determine the residential status of the subsample numbers. Starting with the fourth quarter of 1994, the effort of calling local telephone company business offices was expanded to cover all sample numbers in certain classes of unresolved telephone numbers. In order to judge the accuracy of the information provided by telephone company business offices, we also carried out a verification test in the third quarter. In order to verify interviewer work, the third quarter sample of telephone numbers was a general sample that was not restricted to just unresolved numbers.

This is a condensed version of the paper that was presented at the AAPOR meetings, which is available on request.

The procedure for determining which local telephone company business office to contact made use of two AT&T files, which contain operating company information.

QUARTER 4 1994 PRODUCTION CALLS TO TELEPHONE COMPANY BUSINESS OFFICES

In order to reduce the proportion of unresolved telephone numbers at the end of the data collection period and to reduce the amount of inefficient calling, a major effort was made during the fourth quarter of 1994 to contact telephone company business offices. All cases with 11 or more telephone call attempts with no human contact, as well as all cases with multiple answering machine contacts and no response, were submitted to telephone company business offices to determine if the sample number corresponded to a working residential number. All cases identified as residential by a business office received additional call attempts.

Dispositions

In order to obtain data that tracked the "incoming" case status against the "outgoing" status, after contacting the telephone company offices, the following case dispositions were used:

- Possible business office dispositions for original case dispositions of non-answering machine/service.
 - Nonworking number, including "temporarily not in service," "other nonworking number," "number changed," "disconnected."
 - Business use only and business extension.
 - Residential/private residence.
- Possible business office dispositions for original case dispositions of answering machine/service.
 - Residential/private residence as reported by the business office.
 - Business use only and business extension as reported by the telephone business office.

Outcomes

The results of the calls made to telephone company business offices during the fourth quarter of 1994 are shown in Tables 1 and 2. Table 1 shows that of the 14,624 telephone numbers on which at least one attempt was made to reach a telephone company business office

when the case status was noncontact, 18% of the numbers were identified as being residential.

Table 2 shows results for cases where the final case disposition was an answering machine or answering service. Within two general categories (household status known and household status unknown), the original case status shown in Table 2 is divided into pending or final.

Of cases originally coded with a pending disposition of answering machine/service and known household, 21% were classified by telephone company offices as business and 12% as nonworking. Of cases coded with a final disposition of answering **machine**/service and known household, 9% were classified by business offices as business and 38% as nonworking. Although this indicates a high proportion of classification error in these categories, the absolute number of cases is small. There is also a high percentage of business office classifications as nonworking for the original disposition of answering machine/service unknown household status.

The high levels of nonworking classifications for answering machine/service dispositions are surprising. Some preliminary figures for Quarter 1 of 1995 are similarly high. Furthermore, a limited verification of business **office** determinations for Quarter 1 showed that the business **office** determinations were usually correct (10 of 16 cases).

CALLS TO TELEPHONE COMPANY BUSINESS OFFICES TO ESTIMATE NONRESPONSE AND VERIFY DISPOSITIONS

For Quarter 2 of 1994, calls to telephone company business offices were primarily made to a sample of numbers that were unresolved as to whether they were residential. The long version of this paper gives results for Quarter 2 calling.

Quarter 3 1994 Calling

The intent of Quarter 3 calls was to provide verification of interviewer assigned disposition codes for the full range of disposition categories, as a check on validity of survey-determined dispositions. Business **office** calls were made two months after survey interviews were conducted.

Tables 3, 4, and 5 contain results of the business office calls by categories of disposition codes. Table 3 shows dispositions classified as business or nonworking in the survey; Table 4 contains dispositions that are residential; and Table 5 is for those that are unresolved. Sample sizes as well as percentages are shown. Results are shown separately by whether or not an advance letter was sent. A letter was sent when a number was **directory**-listed as a residential number. Thus, such numbers are in general more likely to be residential than numbers that are not directory-listed.

In Table 3, findings that business offices have classified nearly all numbers as business or nonworking would be expected. This was not the case for any disposition category in the first four rows of the table. Although much of the disagreement is due to business **office** errors (as discussed later), the results still indicate moderate-to-high error rates resulting from interviewer calling. Because of the substantial time lag between the interviews and the business office calls, some of the discrepancies are undoubtedly due to real changes. The last two rows of the table pertain to numbers that were screened out in the **GENESYS-ID preidentification** process. This process is designed to remove a portion of the nonworking and business numbers. These results indicate that this process is operating correctly.

In Table 4, one would hope to find near concurrence between the business offices and the survey in the classification of numbers as residential. This generally occurred. For the situation where a letter was not sent, however, the proportion of numbers classified as nonworking by the business offices was fairly high for some disposition codes.

Table 5 presents results for the unresolved dispositions. Explanations of some of these dispositions is needed. "Answering machine, eligibility unknown" contains those numbers for which there was only answering machine contact, unless the message clearly stated that the number was residential, or unless the message stated that the number was for a company that was known to be large and not operated out of a personal residence.

"Call back, appointment or broken appointment at introduction" contains numbers where attempts at completing interviews are unsuccessful. In many surveys, such numbers are considered residential. In this survey, however, this disposition was treated as uncertain status, because not even the introduction was completed. When an advance letter was not sent, the business **office** results indicate that most of the numbers are not residential. Because advance letters were infrequently sent among numbers with this disposition, overall results are close to those for those when a letter was not sent.

"**HUDI**, language or impairment" contains numbers for which there is a hang-up during introduction, language barrier, or physical or mental impairment.

Accuracy of Telephone Company Business Office Information

Verification calls were made directly to all telephone numbers for which the Quarter 3 interview and the business office disagreed as to whether a number was or was not residential. Verification calls were made within a few days of the business office calls.

Table 6 gives a summary, across all disposition codes, of the agreement between the verification calls and

the telephone business office calls. If all direct call verifications resulted in definite determinations that agreed with business office determinations, all entries would be zero except for the residential column for the first row, the business column for the second row, and the nonworking column for the third row. The actual results are far from this.

The undetermined cases in the "Residential" row were mostly ring no answer and answering machine with unknown status. Thus, most of the undetermined cases may be residential. Nonetheless, in at least 38% of the cases in which the business classified a number as residential when the survey classified it otherwise, the business office was wrong, or the interviewer recorded the answer incorrectly.

For numbers classified as business by the telephone business offices, there were very few disagreements between the interview and the business offices. Thus, both the survey and the business offices are apparently very accurate for these numbers. When the business offices classified the number as nonworking, at least 36% of their determinations were incorrect.

Table 7 breaks out the data of Table 6 into the original interview disposition categories. In the first four rows of the table (numbers that the business offices classified as residential), business office determinations appear to be most error-prone for "answering machine not household". Perhaps this is because most of these numbers are at residences and were obtained from the telephone company as residential service (rather than businesses) in order to reduce phone bills. Most of the other rows of Table 7 contain too few cases to draw any conclusions.

SUMMARY AND CONCLUSIONS

In the Quarter 4 production telephone company business **office** calling, we were able to classify a large percentage of the noncontact cases as out-of-scope. This avoided interviewers having to make unproductive additional call attempts on these telephone numbers.

In the Quarter 3 business office calls, a high percentage of numbers classified by interviewers as business or nonworking were reported as residential by business offices, especially for directory-listed numbers. Agreement between interviewers and business **offices** was much better for numbers classified by interviewers as residential.

The direct call verifications showed substantial error rates among business **office** reports for those numbers where business offices and interviewers disagreed. For example, at least 44% of the numbers classified by interviewers as "answering machine, not household" and by business offices as residential were not residential according to verification calls. Verification calls show that there are errors both in codes resulting from local

telephone company business offices and from interviewer calls.

Table 1

FINAL OUTCOME AFTER TELEPHONE COMPANY BUSINESS OFFICE CALLS FOR NONCONTACT CASES

Business Office Determination	NonContact Cases	
	N	%
Residential	2,687	18.4%
Business	7,616	52.1%
Nonworking	2,572	17.6%
No information given	1,749	12.0%
All determinations	14,624	100%

Table 2

FINAL OUTCOME AFTER TELEPHONE COMPANY BUSINESS OFFICE CALLS FOR ANSWERING MACHINE/SERVICE CASES

Original Case Disposition	Business Office Determination				
	Residential	Business	NonWorking	No Information Given	n
Answering machine known household (pending)	54%	21%	12%	13%	77
Answering machine known household (final)	41%	9%	38%	12%	58
Answering machine household status unknown (pending)	47%	24%	16%	13%	542
Answering machine household status unknown (final)	36%	15%	37%	12%	820

Table 6

SUMMARIZED RESULTS OF VERIFICATION OF BUSINESS OFFICE CALLS FOR SLICHS/BUSINESS OFFICE DETERMINATIONS

Business Office Determination	Verification Determination										
	Residential		Business		Nonworking		Undetermined		Other		Total
Residential	58	42%	33	24%	19	14%	25	18%	4	3%	139
Business	1	17%	1	17%	1	17%	3	50%	0	0%	6
Nonworking	8	32%	1	4%	9	36%	3	12%	4	16%	25

Table 3

BUSINESS OFFICE DETERMINATIONS FOR NIS DISPOSITIONS THAT ARE BUSINESS AND NONWORKING

NIS Disposition	Advance Letter Sent					Advance Letter Not Sent				
	Residential	Business	Non-Working	Refusal	Total	Residential	Business	Non-Working	Refusal	Total
Other NW	27%	11%	50%	11%	62	15%	15%	52%	19%	62
Changed	32%	5%	52%	11%	62	29%	13%	48%	10%	62
Answer machine, not household	53%	18%	8%	21%	62	16%	56%	16%	11%	62
Not residential (business)	42%	35%	6%	16%	62	10%	60%	19%	11%	62
GENESYS-ID deletions: business						0%	79%	14%	7%	14
GENESYS-ID deletions: nonworking						0%	11%	86%	3%	36

Table 4

BUSINESS OFFICE DETERMINATIONS FOR NIS DISPOSITIONS THAT ARE RESIDENTIAL

NIS Disposition	Advance Letter Sent					Advance Letter Not Sent				
	Residential	Business	Non-Working	Refusal	Total	Residential	Business	Non-Working	Refusal	Total
Call back, S1 answered	74%	0%	4%	28%	23	78%	4%	9%	9%	23
Refusals, S1 answered	62%	3%	7%	28%	29	66%	7%	7%	21%	29
Household, no eligible or nonresp.	83%	0%	9%	9%	23	48%	0%	13%	39%	23
Complete	74%	4%	9%	13%	23	57%	0%	17%	26%	23
Complete, converted refusal	74%	0%	9%	17%	23	57%	4%	22%	17%	23

Table 5
BUSINESS OFFICE DETERMINATIONS FOR NIS DISPOSITIONS THAT ARE UNRESOLVED

NIS Disposition	Advance Letter Sent					Advance Letter Not Sent				
	Residential	Business	Non-Working	Refusal	Total	Residential	Business	Non-Working	Refusal	Total
Ring no ans., busy, other no contact	56%	23%	5%	16%	62	18%	50%	18%	15%	62
Fax/modem	45%	37%	5%	13%	62	10%	65%	10%	16%	62
Ans. match elg. unk.	76%	9%	0%	15%	34	35%	19%	21%	24%	62
Call back, app't or broken app't at intro	83%	0%	0%	17%	23	38%	29%	15%	18%	34
HUDI, lang. or impairment	87%	0%	0%	13%	23	70%	4%	17%	9%	23
Ref. at intro	74%	4%	0%	22%	23	52%	9%	13%	26%	23

Table 7
RESULTS OF VERIFICATION OF BUSINESS OFFICE CALLS BY NIS DISPOSITION CODE

NIS Determination	Business Office Determination ^a	Verification Determination										
		Residential		Business		Nonworking		Undetermined		Other		Total
Other nonworking	Res	15	58%	1	4%	7	27%	3	12%	0	0%	26
Number changed	Res	17	45%	3	8%	11	29%	7	18%	0	0%	38
Answering machine, not household	Res	12	28%	19	44%	0	0%	9	21%	3	7%	43
Not residence (business)	Res	14	44%	10	31%	1	3%	6	19%	1	3%	32
Call back or appointment, S1 answered	Bus	0	0%	1	25%	0	0%	3	75%	0	0%	4
Call back or appointment, S1 answered	NW	1	14%	0	0%	1	14%	2	29%	3	43%	7
No age eligible or section, not refusal	NW	1	20%	0	0%	3	60%	1	20%	0	0%	5
Complete interview	Bus	1	50%	0	0%	1	50%	0	0%	0	0%	2
Complete interview	NW	6	46%	1	8%	5	38%	0	0%	1	8%	13

^a Res = residential; Bus = business; NW = not working