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MEMORANDUM FOR ACS Research and Evaluation Advisory Group

From: James B. Treat (**signed on 04/10/2013**)  
Chief, American Community Survey Office

Prepared by: Deborah H. Griffin and Todd R. Hughes  
American Community Survey Office

Subject: Analysis of Alternative Call Parameters in the American  
Community Survey's Computer Assisted Telephone Interviewing

Attached is the final American Community Survey Research and Evaluation report on a recent analysis of alternative call parameters for the Computer Assisted Telephone Interviewing (CATI) data collection mode. The goal of this research was to reduce respondent burden, in the form of contact attempts during the ACS CATI mode, by changing specific call parameters related to call back rules.

If you have any questions about this report, please contact Deborah Griffin at (301) 763-2855 or Todd Hughes at (301) 763-6686.

Attachment

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# Analysis of Alternative Call Parameters in the American Community Survey's Computer Assisted Telephone Interviewing

FINAL REPORT

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## **BACKGROUND**

In Congressional testimony about the mandatory nature of the American Community Survey (ACS), it became clear that Congressional staff were advocating on behalf of constituents who felt “harassed” due to multiple efforts by the Census Bureau to obtain interviews. These repeated contacts with sample households is a consequence of multiple mailings, repeated telephone call attempts using Computer Assisted Telephone Interviewing (CATI) methods, and potential personal visits using Computer Assisted Personal Interviewing (CAPI) methods. The ACS, like other household surveys, strives to maximize response to achieve the highest levels of quality by reducing the potential for nonresponse bias. In some instances, households could certainly perceive these multiple contacts and multiple modes of contact as harassment.

In recognition of these concerns, we wanted to assess the potential cost and quality implications of reducing these contacts. We analyzed existing CATI data applying a series of alternative CATI termination rules. For this analysis we applied a set of plausible assumptions about how CATI households that would no longer be interviewed under our stricter CATI termination rules would behave in CAPI. We looked for options that would reduce the number of times that we try to contact sample households to complete the survey. We chose to focus on the CATI and CAPI operations, because testimony identified these modes as examples of when individuals felt especially aggravated. This paper draws on detailed analysis conducted by staff in the Decennial Statistical Studies Division and the Center for Statistical Research Methods. From those results, we estimated the likely impacts of proposed changes on contact attempts, costs, and quality.

## **METHODOLOGY**

### **Study Universe**

We used paradata from ACS CATI and CAPI operations for the June 2011 to February 2012 production panels for this research. The WebCATI system and the Contact History Instrument (CHI) for CAPI are the primary sources of these paradata. We chose to start with the June 2011 production panel because the CHI began collecting ACS CAPI operation data in a limited capacity in July of 2011, expanding to all CAPI operations in August of 2011 (which corresponds to the CAPI collection of the June 2011 panel). Zelenak and Davis (2013) created this data set to study the impact of multiple contacts in CATI and CAPI on final interview outcome. Table 1 cites the CATI and CAPI outcomes associated with this data set from their research. We chose to use this data set for our analysis and Table 1 includes our selected universe counts. In most cases, they are nearly identical to the universe in the Zelenak and Davis research. While we are exploring the differences, we do not believe that they are a noteworthy limitation.

The goal of our research is to manipulate call treatment strategies to assess the effect on workloads and outcomes. About 790,000 cases were included in the 9-month aggregation of CATI workloads. The CATI workload includes some addresses that are later determined to be ineligible for CATI, primarily cases that CATI interviewers found to have inoperable or incorrect telephone numbers. We found a large proportion (over 58 percent) of the CATI universe to be either ineligible for CATI or to have another outcome that we also excluded.<sup>1</sup> We chose to exclude all of these cases with an outcome of CATI “other”

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<sup>1</sup> Appendix A lists the additional final CATI outcome codes that were included in this “other” category and excluded from our analysis.

from our study universe, assuming that any changes in treatment would not affect these cases.<sup>2</sup> We assume that all of the cases with a final CATI outcome of “other” move into CAPI under all of our tested alternatives. Our focus was to see the effect that changes in call strategies would have on the CATI universe that had outcomes of interviews, refusals, and (non-refusal) noninterviews. This reduced our study universe to 326,705 cases. This universe is the focus of all of our measures of CATI call attempts and contacts. It is important to acknowledge that by choosing this restricted universe, however, we are not describing the full CATI workloads or the total phone calls made to all sampled households, just those made to this universe of households. For this reason, we limit our metrics to comparisons of the current and alternative approaches.

Table 1. CATI Analysis Universe

	<b>Zelenak and Davis (2013)</b>	<b>Study Universe</b>
Total 9-month CATI universe and outcomes	783,276	790,931
CATI Interviews	189,466	
CATI Refusals	71,656	
CATI Noninterviews (not Refusals)	63,054	
CATI Other	459,100	
9-month CATI universe excluding CATI Other	324,176	326,705

In addition to analyzing CATI paradata and projecting CATI workloads, costs, and outcomes, we used CAPI paradata to estimate the implied workloads for CAPI under these alternatives. Zelenak and Davis (2013, forthcoming) found that the CAPI universe for this 9-month sample included over 497,000 addresses. Table 2 includes breakdowns of the sources of the CAPI workload and the CAPI outcomes. Note that during CAPI, interviewers determined that about 40,000 sample cases were ineligible for the survey. Cases that are ineligible for the ACS include addresses that are nonexistent or not a housing unit (an address associated with a commercial property or a group quarters facility). Like the “other CATI” outcomes, we chose to exclude these ineligible CAPI cases from our CAPI analysis universe.

The CAPI workload includes a subsample of refusals, other nonresponse cases, and “other” cases exiting CATI unresolved and a subsample of cases that were not originally in the CATI workload (cases with incomplete addresses and addresses without phone numbers). Table 2 summarizes the sources of the CAPI subsamples, dropping the ineligible cases. Our analysis focused only on the CAPI cases that were originally in CATI that would have been eligible for CAPI. We assumed that the outcomes and the workloads associated with cases that never passed through CATI were unaffected by our manipulations.

Given that we can only identify these ineligible cases after CAPI and since only a subsample of CATI cases goes to CAPI, we estimated the total universe of such cases by applying a factor to account for CAPI subsampling. As highlighted in Table 2, we estimate that 767,819 CATI cases were eligible for CAPI subsampling as survey-eligible housing units. This universe is subject to change if CATI contact rules send a greater number of cases into CAPI. Most of our measures isolate changes in the workload, cost, and outcome measures for this universe of cases under the current versus alternative treatments.

<sup>2</sup> Upon closer review, some of these outcomes might have been reasonable to include but we do not think eliminating them has a major impact on the findings. See limitations.

Table 2. CAPI Analysis Universe

	Zelenak and Davis (2013)	Study Universe
Total 9-month CAPI subsample and outcomes	497,617	497,782
CAPI Interviews	437,210	
CAPI Refusals	10,368	
CAPI Noninterviews (not Refusals)	10,433	
Ineligible <sup>3</sup>	39,606	
Sources of 9-month CAPI subsample( excluding ineligibles)	458,011	
Never sent to CATI	274,612	
In CATI	183,399	
CATI Refusal	21,404	
CATI Noninterview (not Refusal)	19,656	
CATI Other	142,339	
Estimate of 9-month CAPI-eligible universe by CATI outcome <sup>4</sup>	767,815	767,819
CATI Interviews	189,466	
Eligible for CAPI subsampling	578,349	
CATI Refusal	67,498	
CATI Noninterview (not Refusal)	61,985	
CATI Other	448,866	

### Alternatives

The telephone centers implement the contact rules for each survey they conduct through a set of parameters determined by survey sponsors. In the ACS, the following four parameters drive most of the contact strategy and we chose to limit our analysis to changes to these four parameters.

- Maximum number of total calls
- Maximum number of non-productive calls (calls without a contact) before the first contact
- Maximum number of refusals (explicit)
- Maximum number of immediate hang ups

Table 3 summarizes the current set of parameter values and the 14 alternative sets of parameters that we studied. Note that the maximum number of total calls ranges from 15 to 25 while the maximum number of nonproductive calls (noncontacts) before the first contact ranges from 12 to 20.

We currently allow a maximum of two refusals and the only alternative tested was to reduce this to 1. The immediate hang-up parameter is the number of hang-ups required to equal an initial refusal. Therefore, the current immediate hang-up max value of 3 means that at the third hang-up, the refusal counter will increase by one. After the refusal counter has been incremented to a non-zero value (due to either an explicit refusal or three hang-ups), each hang-up thereafter also increases the refusal counter by one. We tested an alternative immediate hang-up max value of 2 rather than 3, meaning that at the second hang-up, the refusal counter would increment by 1.

<sup>3</sup> The “ineligible” category in CAPI includes “Type C” outcomes indicating that a case was determined to be ineligible for the survey. This would include demolished housing units and addresses corresponding to commercial units or group quarters.

<sup>4</sup> Estimated based on an approximate 3.15 subsampling weight

Table 3. Tested CATI Parameters

Treatment	Refusal max	Hang-up max	Unproductive calls max	Total calls max
Current	2	3	20	25
1	1	3	20	25
2	2	2	20	25
3	2	3	15	15
4	2	3	12	15
5	1	2	20	25
6	1	3	15	15
7	1	3	12	15
8	1	2	15	15
9	1	2	12	15
10	1	2	20	20
11	1	2	15	20
12	1	2	12	20
13	2	2	15	15
14	2	2	12	15

### Calculations of Outcomes under Alternative Treatments

Given that all of the tested alternatives represent a reduction in effort in CATI, we could use CATI outcome codes and paradata to classify cases that would have continued in CATI as initial noncontacts, refusals, etc. We tallied the associated call attempts and contacts and estimated the resulting outcomes. These outcomes included estimates of cases converted to CATI interviews, cases with additional refusal or hang-up outcomes, and cases that ultimately reached a call max. We estimated the additional cases that would be eligible for CAPI and applied a CAPI subsampling rate of 1/3.15 to identify the added work entering CAPI. We annualized many of the workload estimates by weighting our 9-month sample by a factor of 12/9.

### Limitations

Several important limitations might lead to different results in production than those found in this simulation. It is possible that the CATI universe associated with our June 2011 through February 2012 sample panel dataset differs in some ways from the CATI universe under the new 2013 ACS that includes an Internet response option. The pattern of outcomes observed for cases with specified call histories will not persist into 2013 and beyond.

We chose to limit our research to a restricted set of outcome codes – cases that we thought we would influence with call parameter changes. Later review identified that we might have erroneously excluded some outcome categories. We do not anticipate that this is a major limitation but it may understate some potential effects. We made numerous assumptions that the outcomes observed for cases with certain call histories would continue to occur in 2013. In addition, we assumed that the CAPI response rate for new CATI noninterviews (cases that we would have resolved with continued contacts) is equal to the response rate for all other CATI noninterviews. This may be a conservative estimate.

Unlike the hang up, unproductive call, and total call outcomes, that the WebCATI system codes, interviewers code refusals. We know that the coding of CATI cases as refusals is subjective. Some interviewers are hesitant to classify a case as a refusal, as it reflects poorly on their performance. To the extent that interviewers underreport or differentially report true refusals, these results may not fully address respondent reluctance to participate.

The cost estimates included in this research involve multiple assumptions of per case costs that we may not fully realize in production. Differences could be due to associated staffing and scheduling implications and limitations in the methodology used to estimate costs per case, per interview, and per call attempt. We acknowledge that implementing any call strategy changes in production may yield different results than those modeled in this analysis.

### **Measurements of Changes in Annual CATI and CAPI Workloads**

As noted earlier, we chose to focus on a subset of the total CATI and CAPI workloads – those that we would affect by changing the CATI call parameters. Comparisons of expected workloads for each treatment relative to the current treatment within this restricted universe identifies the incremental difference that we used to project reductions or increases in the total CATI and CAPI workloads.

### **Measurements of Contact Attempts**

We chose three metrics to measure contact attempts. The first is an estimate of the reduction in the mean number of CATI calls (productive or nonproductive) per sample case. We calculated the difference in the estimated total number of CATI calls under the current and alternative call parameters relative to the CATI-eligible universe. A more precise measure of contact attempts that both respondents may be the reduction in the mean number of CATI calls (again, productive or nonproductive) that the call center made after any initial resistance (a refusal or a hang up). This is the difference in the estimated total number of CATI calls after an outcome of “refusal” or “hang up” under the current and alternative treatment relative to the CATI-eligible universe.

We based the third measure on a score that results from assigning different weights to different call attempt outcomes. These scores cumulate the numbers of previous refusals, hang-ups, and productive and nonproductive calls to the same household. We produced several variations of this measure. We show absolute scores and comparative scores in terms of the percent reduction in contact attempts, a simple ratio of the drop in this score relative to the score associated with the current parameters. In this report, we include the results from a model that includes the following weights:

- A call attempt with no call history of refusals or hang-ups has a value of 0. If the only previous contact resulted in a call back request, the value is 0.5.
- A call attempt with a call history that included a single immediate hang up has a weight of 1. If the call history also included a requested call back, that weight is 0.5.
- A call attempt with a call history of a single refusal has a value of 2. If the household had requested a callback, the value is 1.
- A call attempt with a call history that included 2 hang-ups has a weight of 2. If the call history also included a requested call back, that weight is 1.
- A call attempt with a call history of a refusal and a hang-up has a value of 5. If the household had requested a callback, the value is 3.

### **Measurements of Quality**

To assess the effect of changes in call parameters on quality we considered two measures of quality – nonresponse and sample size. To measure the potential increase in nonresponse bias we estimated a combined CATI and CAPI response rate for our analysis universe under the current call parameters and again for each alternative. Specifically, we combined estimates of the expected number of CATI and

CAPI interviews for a given treatment and calculated a weighted response rate relative to the universe of survey-eligible CATI cases. We then produced measures of the reduction in this response rate associated with each alternative.

Given the design of the ACS, there are reliability implications associated with accepting a CATI noninterview when you have a chance of converting it. If we complete fewer cases in CATI, only about 1-in-3 of these noninterviews is eligible for CAPI due to CAPI subsampling. In addition, cases interviewed in CAPI have higher sampling weights than those interviewed in CATI. This means that even with a similar interview rate, we would lose sample interviews and increase sampling variability. We calculated annual estimates of the reduction in total completed interviews by applying a weight of 12/9 to the estimated reduction in total interviews in our study universe. We plan to work with DSSD to try to approximate the effect on sampling error.

### **Measurements of Cost**

We chose a very simple model to predict the costs associated with the proposed changes. Cutting back on CATI call attempts and reducing the number of CATI interviews represent cost savings from the CATI operation. Based on the average length of a CATI interview, we estimated the salaries and all associated management and facility overheads to be \$31 for each completed interview<sup>5</sup>. Methods to estimate the cost of an individual call attempt were less clear, given that we do not have accurate data on the time spent on each unproductive call. However, using historical data on the number of total call attempts, total interviews, and costs for a given month, we estimated that every eliminated CATI call attempt saved about \$1.60. Given the estimation methods we employed, we have included two cost assessments in this study: a complete cost impact that reflects the known cost savings from a reduced number of interviews and the estimated cost savings from reduced call attempts, and a more conservative cost savings estimate that assumes no savings per call reduction. Including both sets of estimates provides a sense of the range of possible costs.

Important cost implications result from increasing the CAPI workload. Under alternative policies, we would no longer have CATI interviews for the sample addresses that we currently resolve in CATI by repeated call attempts. We estimated that about 31.5 percent of these sample addresses would require CAPI data collection. For each additional CAPI case, we estimated a cost of \$137.50, which reflects the average Fiscal Year 2012 total Regional Office cost per case in the CAPI workload.

### **Cost/Benefit Measurements**

We chose to calculate ratios of selected cost, quality, and contact attempt metrics as a way to assess cost/benefit tradeoffs. Specifically we calculated the ratio of cost savings relative to lost interviews, the ratio of total calls eliminated per lost interview, and the ratio of costs associated with each eliminated call.

## **RESULTS**

### **Changes in Annual CATI and CAPI Workloads**

Table 4 includes projected annual CATI workload changes in terms of changes in CATI interviews and in total CATI calls (broken out by total nonproductive calls and total productive calls or contacts). It also

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<sup>5</sup> Note that this is higher than the estimated cost per case in CATI as this is restricted to the costs for the subset of cases that are interviewed.

includes projected changes in CAPI workloads and CAPI interviews. We currently make about 4.7 million calls (3.8 million nonproductive and 0.9 million contacts) each year to complete about 253,000 CATI interviews in this study universe. Note that this estimate only accounts for the calls made to the subset of cases that we analyzed in this research. The total number of CATI calls is much greater than this 4.7 million as it includes the calls made to resolve the cases that we considered out-of-scope in our study.

Table 4. Annual Changes in CATI and CAPI Workloads

Treatment	Change in Total CATI Interviews	Change in Total CATI Calls	Change in Nonproductive Calls	Change in Productive Calls (Contacts)	Change in CAPI Workload	Change in CAPI Interviews
1	-18,992	-425,800	-302,021	-123,779	6,023	5,705
2	-2,071	-81,893	-56,996	-24,897	657	622
<b>3</b>	<b>-17,589</b>	<b>-909,377</b>	<b>-823,603</b>	<b>-85,775</b>	<b>5,577</b>	<b>5,283</b>
<b>4</b>	<b>-20,915</b>	<b>-1,192,184</b>	<b>-1,098,024</b>	<b>-94,160</b>	<b>6,632</b>	<b>6,282</b>
5	-23,555	-586,284	-420,225	-166,059	7,469	7,075
6	-33,747	-1,201,033	-1,013,697	-187,336	10,701	10,137
7	-37,052	-1,483,087	-1,287,467	-195,620	11,749	11,130
8	-37,076	-1,297,031	-1,077,931	-219,100	11,757	11,137
9	-40,380	-1,579,039	-1,351,663	-227,376	12,805	12,129
10	-27,128	-687,832	-506,511	-181,321	8,603	8,149
11	-30,395	-1,118,539	-928,553	-189,985	9,639	9,130
12	-34,271	-1,414,311	-1,214,072	-200,239	10,868	10,294
<b>13</b>	<b>-18,967</b>	<b>-953,537</b>	<b>-850,805</b>	<b>-102,732</b>	<b>6,015</b>	<b>5,697</b>
<b>14</b>	<b>-22,292</b>	<b>-1,236,344</b>	<b>-1,125,227</b>	<b>-111,117</b>	<b>7,069</b>	<b>6,696</b>

As expected, the alternatives that reduced the refusal max from 2 to 1 and dropped the total call max from 25 to 15 and the nonproductive call max to 15 or less (shaded - 6 through 9) have the most dramatic effects on the CATI and CAPI workloads. Alternatives 3 and 4 (bolded) retain the refusal max of 2 and the hang-up max of 3 but reduce the total max to 15 and the nonproductive call max to 15 or less. These alternatives also show large reductions in total CATI calls, with less of an effect on the CATI interviews and CAPI workloads. Treatments 13 and 14 (bolded) are similar to treatments 3 and 4 (with an additional reduction in the hang-up max from 3 to 2) and show similar workload changes.

### Contact Attempts

Table 5 summarizes three contact attempt measures by treatment. We estimate that in our study universe of eligible CATI sample addresses, a sample address receives an average of nearly 11 total calls. Given that some households respond in the first few calls means, many households are receiving far more than these 11 calls. Table 5 displays the reduction and the percent reductions in these total calls. It appears that we can reduce the mean number of calls per case by about 3 (a reduction of about 27 percent or more) under treatments 7, 8, 9, and 12 (shaded).

We estimate that in our study universe we currently make an average of 2.7 additional calls after a respondent gives us some indication of reluctance to participate (refusal or hang-up). We estimate that annually we make over 1.2 million total calls after a respondent indicated resistance to participate. Most of these alternatives have a noteworthy reduction and percent reduction in these post-resistance calls. Treatments 5 through 12 (bolded) reduce these calls by about 50 percent or more.

As described earlier, we calculated contact attempt scores as a cumulative measure of contact attempts based on number of calls and the call outcomes. Data collection using our current call parameters received a total annual score of about 1.8 million. Table 5 displays the percent reduction in the total scores for the alternatives. With the exception of treatment 2, all of these alternatives show at least a 30 percent reduction in contact attempts. Alternatives 5 through 12 show the greatest reductions.

Table 5. Contact Attempts

Treatment	Mean TOTAL CATI calls per eligible case		Mean TOTALCATI calls per eligible case AFTER INITIAL RESISTANCE		Contact Attempt Score
	Change	PERCENT	Change	PERCENT	Change
1	-0.98	-9.0%	-0.98	-36.2%	-44.3%
2	-0.19	-1.7%	-0.19	-7.0%	-7.8%
3	-2.09	-19.2%	-0.89	-33.0%	-29.9%
4	-2.74	-25.1%	-0.90	-33.3%	-30.1%
<b>5</b>	<b>-1.35</b>	<b>-12.4%</b>	<b>-1.35</b>	<b>-49.8%</b>	<b>-63.4%</b>
<b>6</b>	<b>-2.76</b>	<b>-25.3%</b>	<b>-1.56</b>	<b>-57.8%</b>	<b>-60.5%</b>
7	-3.40	-31.3%	-1.57	-58.0%	-60.7%
8	-2.98	-27.3%	-1.78	-66.0%	-72.4%
9	-3.62	-33.3%	-1.79	-66.2%	-72.5%
10	-1.58	-14.5%	-1.53	-56.6%	-66.9%
11	-2.57	-23.6%	-1.54	-57.0%	-67.2%
12	-3.25	-29.8%	-1.56	-57.9%	-67.9%
13	-2.19	-20.1%	-0.99	-36.8%	-34.2%
14	-2.84	-26.1%	-1.00	-37.0%	-34.5%

## Quality

To assess the increase in survey nonresponse, and potentially nonresponse bias, we calculated response rates for our study universe. Specifically, we calculated the ratio of the weighted estimate of CATI and CAPI interviews relative to the universe of survey-eligible cases that were initially eligible for CATI. See the methodology section for detail. The response rate for our study universe was very high, 96.0 percent. Zelenak and Davis (2013) found that CAPI response rates for CATI nonrespondents, even CATI refusals, were very high. For this reason, moving cases out of CATI and into CAPI has a negligible impact on the combined response rates as shown in Table 6. We do not expect that nonresponse error is likely to increase because of any of these alternatives. These estimated response rates may also understate the likely response rate since a case actually converted in CATI, which would be missed under a more restrictive CATI termination rule, may well have a higher chance of being interviewed in CAPI than the typical CAPI case.

Table 6 also displays the estimated annual loss in completed interviews under each treatment. Treatments 6 through 9 and 12 (shaded) have the greatest impact with an expected loss of about 24,000 or more completed interviews each year. This loss in completed interviews is most likely to affect the quality (reliability) of survey estimates. Additional losses in reliability would result from increasing the number of completed CAPI interviews, which are interviews with higher sampling weights due to subsampling. We also include estimates of those additional CAPI interviews in Table 6. Treatments 1, 3, 4, 13, and 14 (bolded) approximately cut the losses seen for options 6 through 9 and 12 in half.

Table 6. Quality Measures

Treatment	Estimated Response Rate for study universe	Percentage Point Change in Response Rate	Annual Change in Total Completed Interviews	Annual Change in CAPI Interviews
1	95.9%	-0.1	-13,287	5,705
2	96.0%	-0.0	-1,449	622
3	95.9%	-0.1	-12,306	5,283
4	95.9%	-0.1	-14,632	6,282
5	95.9%	-0.1	-16,479	7,075
6	95.9%	-0.1	-23,610	10,137
7	95.8%	-0.2	-25,922	11,130
8	95.8%	-0.2	-25,939	11,137
9	95.8%	-0.2	-28,251	12,129
10	95.9%	-0.1	-18,979	8,149
11	95.9%	-0.1	-21,265	9,130
12	95.8%	-0.2	-23,977	10,294
13	95.9%	-0.1	-13,269	5,697
14	95.9%	-0.1	-15,596	6,696

### Data Collection Costs

Table 7 summarizes two estimates of the reduction in annual CATI costs – one based on assumptions of reductions due solely to the reduction in CATI interviews, the other reflecting additional cost savings due to reductions in call attempts. Table 7 also includes the estimated increase in the annual CAPI costs, and two resulting net cost estimates, as described earlier.

Table 7. Data Collection Costs

Treatment	Upper Bound on the Change in Annual CATI Costs (\$000)	Lower Bound on the Change in Annual CATI Costs (\$000)	Estimated Change in Annual CAPI Costs (\$000)	(Upper Bound) Net Effect on Annual Data Collection Costs (\$000)	(Lower Bound) Net Effect on Annual Data Collection Costs (\$000)
1	-\$1,270	-\$589	\$828	-\$442	\$239
2	-\$195	-\$64	\$90	-\$105	\$26
3	-\$2,000	-\$545	\$767	-\$1,233	\$222
4	-\$2,556	-\$648	\$912	-\$1,644	\$264
5	-\$1,668	-\$730	\$1,027	-\$641	\$297
6	-\$2,968	-\$1,046	\$1,471	-\$1,496	\$425
7	-\$3,522	-\$1,149	\$1,616	-\$1,906	\$467
8	-\$3,225	-\$1,149	\$1,617	-\$1,608	\$467
9	-\$3,778	-\$1,252	\$1,761	-\$2,018	\$509
10	-\$1,941	-\$841	\$1,183	-\$759	\$342
11	-\$2,732	-\$942	\$1,325	-\$1,407	\$383
12	-\$3,325	-\$1,062	\$1,494	-\$1,831	\$432
13	-\$2,114	-\$588	\$827	-\$1,287	\$239
14	-\$2,669	-\$691	\$972	-\$1,697	\$281

Significant cost savings appear possible if we see costs savings from call reductions. Using a more conservative methodology for estimating CATI savings, the data collection cost increases range from \$26,000 (treatment 2) to \$509,000 (treatments 9). The potential reductions in costs across alternative treatments range from \$105,000 (treatment 2) to about \$2 million (treatment 9) under less conservative assumptions. Keep in mind that the cost estimates included in this research involve multiple assumptions of per case costs that we may not fully realize in production due to associated staffing and scheduling implications and limitations in the methodology used to estimate costs per case, per interview, and per

call attempt. We recognize that implementing any call strategy changes in production may yield different results than those modeled in this analysis.

### Cost/Benefit Analysis

Table 8 summarizes several cost/benefit ratios. In this table, we used the upper bound cost savings estimates from Table 7. When we look at the cost savings associated with a given alternative relative to the total number of lost interviews for that treatment we see that treatments 3, 4, 13, and 14 (shaded) provide the greatest cost savings for each sacrificed interview. Comparing reduced contacts with quality, we find that the total calls eliminated per lost interview ranges from a low of about 32 (treatment 1) to a high of about 82 (treatment 4). We can optimize reductions in total post-resistance calls per lost interview with alternative 2. Treatments 3, 4, 13, and 14 show the more favorable costs relative to eliminated calls.

Table 8. Cost/Benefit Metrics

Treatment	Cost vs. Quality	Contact Attempts vs. Quality		Cost vs. Contact Attempts
	Data collection cost savings per lost interview	Total calls eliminated per lost interview	Total post-resistance calls eliminated per lost interview	Data collection cost savings associated with each eliminated CATI call
1	\$33.26	32.0	32.0	\$1.04
2	\$72.37	56.5	56.5	\$1.28
3	\$100.23	73.9	31.6	\$1.36
4	\$112.35	81.5	26.8	\$1.38
5	\$38.91	35.6	35.6	\$1.09
6	\$63.38	50.9	28.8	\$1.25
7	\$73.53	57.2	26.3	\$1.29
8	\$61.99	50.0	29.9	\$1.24
9	\$71.41	55.9	27.6	\$1.28
10	\$39.97	36.2	35.1	\$1.10
11	\$66.15	52.6	31.5	\$1.26
12	\$76.36	59.0	28.4	\$1.29
13	\$96.96	71.9	32.6	\$1.35
14	\$108.82	79.3	27.9	\$1.37

### CONCLUSION

This paper summarizes some of the major findings of paradata analysis conducted by staff in DSSD (Mary Frances Zelenak and Mary Davis). It also uses some of the detailed simulation estimates based on CATI and CAPI paradata that staff in CSR (Eric Slud and Darcy Steeg Morris) produced. The results illustrate the cost/benefit trade-offs associated with changes in call center parameters. A significant reduction in the number of contact attempts is possible. It also appears that general gains in efficiencies are possible with some of these changes. The most significant quality cost associated with those changes is a loss in completed interviews, a consequence of CAPI subsampling. If we can realize per call cost reductions in CATI, the drop in call attempts for many of these treatments could actually reduce total data collection costs.

Options 3, 4, 13, and 14 perform well in most of the cost/benefit measures. Under alternative 4 we would retain the existing refusal max of 2 and the hang-up max of 3 but reduce the total and nonproductive call max values, essentially eliminating many nonproductive calls – a clear gain in operational efficiency. Treatment 14 is a minor refinement of treatment 4 (only difference is the reduction in the hang-up max

from 3 to 2). This alternative gains additional drops in contacts without a major loss in completed interviews. Under treatments 4 and 14 we would eliminate about 1.2 million total CATI calls each year. In addition, under each of these four treatments we would eliminate a large number of calls each year to households that indicated they did not want to participate.

## **NEXT STEPS**

Research by Slud, Erdman, Morris, Petkunas, Tokle, and Wieczorek found that an indication of a requested callback was an important predictor of success in obtaining an interview, even after encountering a refusal or a series of immediate hang-ups. If we could use paradata on requested callbacks to refine the call parameters, we may be able to increase the rate of conversions while still reducing contacts. Discussions with TMO indicate that they may be able to build this capability. Given that potential, we should repeat some of these analyses with additional treatments that consider this call back flag.

Our decision to test changes to existing call parameters allows us to make changes easily. We recommend that TMO implement one of these sets of parameter changes effective as soon as possible and that we monitor the results of these changes to validate, and possibly refine, our projections.

## **ACKNOWLEDGMENTS**

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## **REFERENCES**

Zelenak, M. and Davis, M. 2013. Impact of Multiple Contacts by Computer-Assisted Telephone Interview and Computer-Assisted Personal Interview on Final Interview Outcome in the American Community Survey. 2013 American Community Survey Research and Evaluation Report Memorandum Series #ACS13-RER-08.

**Final CATI Outcome Codes Included in “Other”**

- 11 – Provided respondent with information/assistance only
- 12 – Respondent claims has filed
- 13 – Respondent claims will file
- 14 – Provided respondent with information/assistance – new case ID
- 15 – Complete/sufficient partial, special resolutions
- 20 – Sample unit ineligible – out of scope
- 21 – Sample unit eligible but unavailable through closeout
- 22 – Sample unit not found/reached/eligibility uncertain
- 23 – Coded out based on survey parameters
- 24 – Unconverted language problem
- 25 – Unconverted hearing barrier
- 172 – Sample reduction
- 175 – Fax received by TC
- 176 – Congressional, delete case
- 177 – CAPI recycle
- 188 – Insufficient partial, callback
- 191 – Language barrier
- 192 – Hearing barrier
- 193 – Privacy detector
- 194 – Never contacted, confirmed number
- 195 – Never contacted, unconfirmed number
- 198 – Other assessor pre-final type 3