



UNITED STATES DEPARTMENT OF COMMERCE
Economics and Statistics Administration
U.S. Census Bureau
Washington, DC 20233-0001

November 6, 2012

2012 AMERICAN COMMUNITY SURVEY RESEARCH AND EVALUATION REPORT
MEMORANDUM SERIES #ACS12-RER-30

MEMORANDUM FOR ACS Research and Evaluation Steering Committee

From: James B. Treat (**signed on 11/1/12**)
Chief, American Community Survey Office

Prepared by: Sandra Lockett Clark
Special Studies Staff
American Community Survey Office

Subject: Evaluation of an Alternative Option for Improving the Mail Return Edit

Attached is the final American Community Survey (ACS) Research and Evaluation report on Evaluating an Alternative Option for Improving the Mail Return Edit. This evaluation explores one possible alternative option of revising the current method for determining the FEFU workload that offers more flexibility. If you have any questions about this report, please contact Sandra Clark at 301-763-5884.

Attachment

cc:
ACS Research and Evaluation Team
D. Raglin (ACSO)
Todd Hughes (ACSO)
Ken Dawson (ACSO)
Agnes Kee (ACSO)
Scott Boggess (SESHD)
Tom Gryn (SESHD)

Evaluation of an Alternative Option for Improving the Mail Return Edit Used in Failed Edit Follow up

FINAL REPORT

Sandra Lockett Clark

American Community Survey Office



Table of Contents

Introduction..... 1

Background..... 2

Research Questions..... 3

Evaluation Methodology..... 3

 Workloads..... 3

 Item Nonresponse 4

Limitations..... 5

Results..... 6

 Would the proportion of mail returns sent to FEFU change if we used this new system? 6

 How successful is FEFU in reducing item nonresponse? Which items are most likely to be resolved and which show limited gains in FEFU? 10

 How would the item nonresponse rates for mail returns be impacted if we used the alternative approach? 13

Conclusion 14

Appendices..... 14

 Appendix 1..... 1

 Appendix 2..... 1

 Appendix 3..... 1

Introduction

Since the start of the American Community Survey (ACS) we have included a Failed Edit Follow-Up Operation (FEFU) to recontact households that returned a mail form with missing data. We send mail forms to FEFU for coverage and content reasons. Coverage follow-up includes mail responses for households consisting of more than five people (there is room on the questionnaire to collect data for only five people), mail responses where the count of people (household size) on the cover page does not equal the number of persons with data on the form, and mail responses that are vacant or temporarily occupied housing units. The workload for content follow-up includes mail responses with varying degrees of missing data, as determined by the criteria in the “mail return edit.” This evaluation will only explore modifications to the content portion of the mail return edit.

Our goal for content follow-up is to minimize the levels of item nonresponse on mail returned forms. We currently use a method that gives follow up priority to items on the questionnaires that Census Bureau subject matter experts believe to be most important. We assign a priority of “critical”, “moderate”, or “low” to each question (item) and calculate a summary of the priorities associated with patterns of missing data associated with each mail return. A return becomes eligible for content FEFU when data are missing for:

- (A) 2 or more critical priority housing questions
- (B) 3 or more moderate priority housing questions
- (C) 11 or more low priority housing questions
- (D) 2 or more critical priority population questions
- (E) 3 or more moderate priority population questions (1-person households only)
- (F) 4 or more moderate priority population questions (2+ person households)
- (G) 1 critical priority housing question and 1 critical priority population question

Due to budget cuts in 2008, the ACS was required to reduce the number of cases sent to FEFU. Unfortunately, the method we used to determine the FEFU workload was not designed to implement a quick and efficient way to optimize such a decrease, therefore the overall content portion of the sample was simply cut by 30 percent without using any sort of prioritizing strategy. We acknowledged that this was not the most effective way to do this, however due to lack of time and staff resources we were unable to implement another option.

This evaluation explores one possible alternative option of revising the current method for determining the content FEFU workload that offers more flexibility. It is based on assigning a point value to each missing item on the questionnaire, with the most important items receiving more points (ranging from 0 to 4). To create a total point value for each mail return we sum the

points and the return becomes eligible for FEFU if the value meets a pre-determined threshold. The threshold can be modified based on increases or decreases in program allocations. While this proposal has intuitive value, we deemed it important to assess the implications of such a revision.

In this evaluation, returns failing the coverage portion of the edit are included in the analysis and treated equally among all methods. Mail returns require coverage follow-up when:

- (A) The number of reported persons is greater than 5 and the number of person records is less than or equal to 5
- (B) The number of reported persons is greater than the number of person records and (A) is not true
- (C) There are no person records (unit is assumed to be vacant or temporarily occupied)

Background

To define the alternative method, staff in the Social, Economic, and Housing Statistics Division (SEHSD) and the Population Division (POP) assigned a value of 0, 1, 2, 3, or 4 to every item, or group of items, on the questionnaire (see Appendix 1). These values were based on a subjective assessment of the value of the answer to each question. Initially the assessment converted the criticality levels used in the current methodology (which are also displayed in Appendix 1 and were constructed based on the analyst's perceived importance of their item's value) to corresponding points. An item with a "critical" level of criticality was given a value of 3 or 4, a "moderate" a 2 or 3, and a "low" a 0 or 1. Next, the points were adjusted based on the item's importance to the edits used to clean up and allocate responses. They gave priority to items used frequently in the edits, and to items found in edits located in the beginning of the edit hierarchy. After the adjustment, several items' point values no longer had a direct correlation to the criticality level of the current method. For example, the electricity item had a criticality level of "critical" and was assigned a point value of 2 and the year moved in item had a criticality level of "moderate" and was assigned a point value of 1. Most adjustments followed this pattern - going from a higher level of criticality to a lower point score - however, a few items had higher point values than the implied criticality levels (such as property value and sex, which went from "low" to 2 points).

Most items were considered individually and assigned a point value if a response was missing for the item. For example, the units in structure item (BLD) generates a value of 4 if it is left blank on the questionnaire. However, some items are grouped together and assigned a value based on the responses to all the items within the group. For example, the rooms (RMS) and bedrooms (BDS) items are group together and a value of 2 is assigned if responses are missing for both of the items; otherwise a value of 0 is assigned. The logic is that if a response is

provided for one of these items then that response can be used to allocate a response for the other, and therefore it is not as high a priority as it would be if responses for both items were missing.

Under this new methodology, the points are added together to create a total score for each mail return. The general concept behind the alternative methodology is that every mail return ends up with a score that is the sum of all values for missing housing data and all values for missing person data from all persons on the form. Questionnaires with values of 0 would therefore be totally complete (or only missing data for items with values of 0), while a score of over 100 means that most, if not all, items are missing. Note that under this method larger households would be more likely to have higher scores.

Research Questions

- (1) Would the proportion of mail returns sent to FEFU (FEFU workload) change if we used this new system?
- (2) How successful is FEFU in reducing item nonresponse? Which items are most likely to be resolved and which show limited gains in FEFU?
- (3) How would the item nonresponse rates for mail returns be impacted if we used the alternative approach?

Evaluation Methodology

Workloads

To answer research question 1 we calculated FEFU workloads based on the current and the alternative criteria. To determine the total number of cases eligible for FEFU based on the current methodology, we concatenated the mail returns from all 2010 panels found in the housing level daily keyed data files into a single dataset. This dataset was processed through the mail return edit program (known as the Automated Clerical Edit, or ACE), which we obtained from staff in the Survey Control and Data Processing Branch of the American Community Service Office (ACSO). The workload was defined as the sum of all cases eligible for coverage or content follow up.

To determine the total number of cases eligible for FEFU based on the proposed alternative methodology we ran the same dataset through a modified version of the ACE program. As

described in the background section, this modified version replaced the “critical”, “moderate”, and “low” levels of criticality with point values of 0 through 4. To ensure that all coverage follow-up cases were included in the workload for the alternative method, we assigned records failing the coverage follow-up criteria a point value of 1000. We totaled the points for each mail return.

The alternative method requires the definition of a specific point threshold to identify the FEFU workload. To determine a reasonable threshold for this analysis, we ran a frequency distribution of the point scores for all 2010 panel mail returns. Appendix 2 displays the distribution of the point scores. If a phone number was not available on the return or there was a multiple return or interview for the household that provided sufficient data the return was not eligible for FEFU and therefore a point score was not calculated. This accounted for about 7.5 percent of mail returns. The 49,586 forms with values of 1000 are coverage failures. This table shows that about 11.5 percent of all mail returns had scores in excess of 20 (but less than 1000) and that many forms had scores of 2 or less. We decided to analyze FEFU workloads based on several different point thresholds, starting with a threshold that approximates the current FEFU workload. Currently we send roughly 30 percent of all mail returns to FEFU for content reasons. Therefore, if we wanted to keep the workload roughly the same, the point threshold would be 7.¹ This means that all mail returns with 7 or more points would be sent to FEFU. We experimented with different point thresholds and compared the workloads produced by each version with the current workload.

Item Nonresponse

To answer research questions 2 and 3, we had to determine how successful FEFU is at reducing item nonresponse. Item nonresponse is missing data due to a respondent failing to provide an answer to a required item. This research uses unedited data, therefore if an answer is provided it is counted as a response even if it is invalid. Determining if a response is required is sometimes difficult to do using unedited data when the criteria needed to find out if they are in universe for the item is missing. Therefore, cases with undetermined universes are excluded from our calculations (see limitations for more information).

We calculated FEFU item resolve rates for each item on the mail questionnaire by dividing the number of mail returns with missing data for that item that were resolved in FEFU by the total number of mail returns with missing data for that item that were sent to FEFU.

¹ From Table 8 in Appendix 2 we find that the percent of mail returns with total points of 7 or greater is about 28.9 while the proportion with points of 6 or greater is about 32.6.

To calculate the numerator for the rate, we tallied the number of mail returns with missing data for each item prior to FEFU (pre-FEFU count) and the number of mail returns with missing data after FEFU (post-FEFU count). The difference, the pre-FEFU count minus the post-FEFU count is the number of resolved mail returns. The post-FEFU count was calculated based on the FEFU output data from 2010 production, which used the current criteria. Dividing this numerator by the pre-FEFU count and multiplying by 100 produced the FEFU item resolve rates. We calculated these rates for all items on the questionnaire.

FEFU Item Resolve Rate = (Mail returns with Missing Data Resolved in FEFU for item x) / Mail returns with Missing Data Sent to FEFU for item x) * 100

We answer research question 2 based solely on these resolve rates. To answer research question 3 we had to calculate and compare the item nonresponse rates for all mail returns after FEFU using the current method and the alternative methods.

To simulate Post-FEFU Rates for the alternative methods, we used the FEFU item resolve rates. We applied the resolve rates to the proportion of mail returns that have missing values for each item that would be sent to FEFU using the alternative methods (we used multiple variations based on differing workload thresholds). We did this to estimate the expected reduction in nonresponse for each item, which we subtracted from the pre-FEFU mail return item nonresponse rates to calculate the Post-FEFU item nonresponse rates for each method. This simulation assumes that the same rate of resolution observed in the current FEFU would be achieved for any case failing that item. We summarized the expected post-FEFU item NR rates by method to identify which of the options results in the lowest expected levels of item NR.

The research is for operational purposes and is not intended to make inferences about the population. We calculated all estimates using unweighted 2010 data and did not perform statistical testing.

Limitations

During production, the ACE program is run daily. Before a case is sent to FEFU the edit checks the control file (a file that includes the status of responses for all sampled households) to make sure we did not receive another mail return or a CATI or CAPI interview for that household. For a small number of cases this information makes them ineligible for FEFU, since we have enough data from another source.

The variables used from the control file are not static; they change as updates become available. This research processed all the 2010 panel mail returns through the clerical edit at one time,

during the 2011 calendar year. An edit was included to account for multiple returns or interviews; however, without the benefit of daily processing it was impossible to re-create the exact 2010 FEFU sample. The data used for this research also differ from the 2010 FEFU sample in that it includes all 2010 panel mail returns and some mail returns could have come in after December 31, 2010 and been included in the 2011 production workload.

We realize that the alternative method's scoring system is likely to send more large households to FEFU². However, after discussions with subject matter analysts and others in ACSO we decided to pursue this method because it may provide the best return on our investment. The largest cost in the FEFU operation is to get in contact with a household, therefore the more data we obtain once we make contact, the better. It should be pointed out that the current methodology includes only one criterion geared toward one-person households, and in general this methodology also favors larger households.

We define the item nonresponse rate as the ratio of the number of missing responses to the number of questions requiring a response. Unique skip patterns were taken into account in order to determine if a response was required. Because we used unedited data, critical information needed to define a universe was sometimes missing. We decided to only include instances that required a response, which may have depressed the true missing data rate.

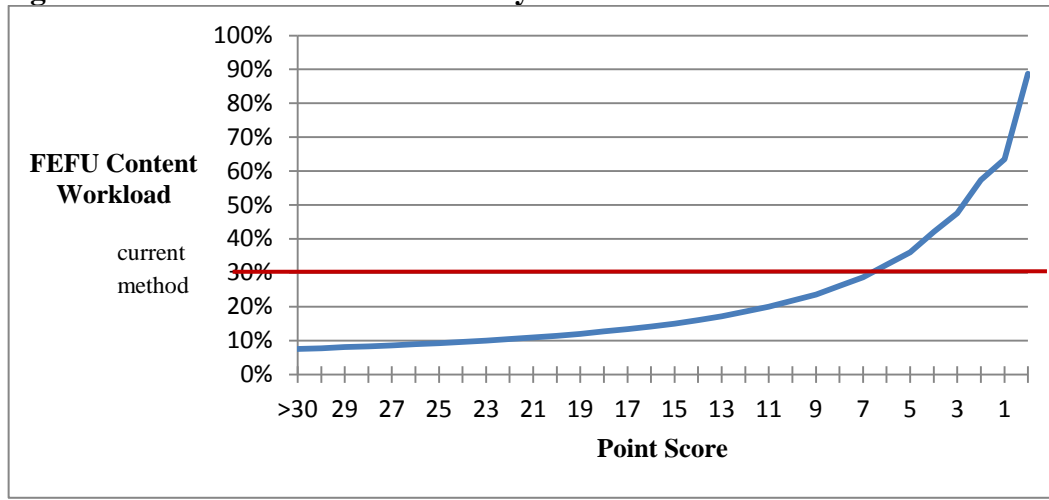
Results

Would the proportion of mail returns sent to FEFU change if we used this new system?

To estimate how the change in methods would affect the FEFU workload, we compared total content follow up workloads given the current methodology with a series of potential content follow up workloads given varying point thresholds under the new option. We also created cross tabulations of the FEFU workloads under both methodologies. Figure 1 shows the percentage of all mail returns that would be sent to FEFU based on several point thresholds. It also displays the workload under the current methodology. Clearly the proportion of mail returns sent to FEFU could change under this new system but this new system affords the flexibility to define a smaller workload (based on the percent of mail returns failing) if necessary. For example, a point score of 7 results in a FEFU workload of about 29 percent but raising the threshold to a score of 19 reduces the FEFU workload to about 12 percent. Reducing the threshold to a score of 5 would increase the FEFU workload by over 7 percentage points.

² This does not include households with 6 or more people since both the current and alternative methodologies send these households to FEFU for coverage follow-up.

Figure 1. FEFU Content Workload by Alternative Method Point Score



Source: ACS 2010 panel mail return data

We also wanted to identify how the current and alternative workloads differed. Tables 1 through 4 summarize these findings. The discrepancies (off-diagonals) are highlighted yellow. We refer to the alternative method using a 7 point threshold as “Alternative 7”. Table 1 compares the FEFU status of all 2010 mail returns using the current rule versus the 7 point threshold under the new rule.

Table 1. FEFU Status for All Mail Returns – Current vs. Alternative 7

CURRENT	ALTERNATIVE 7			Total
	Not included in FEFU	Included in FEFU -content	Included in FEFU -coverage	
Not included in FEFU	824,181	35,477	NA	859,658 (66.3)
Included in FEFU -content	49,821	336,712	NA	386,533 (29.8)
Included in FEFU -coverage	NA	NA	49,586	49,586 (3.8)
Total	874,002 (67.5)	372,189 (28.7)	49,586 (3.8)	1,295,777 (100.0)

NA - Not Applicable

Source: ACS 2010 panel mail return data

While the current mail return edit sends about 30 percent of all mail returns to FEFU for content reasons, alternative 7 would send about 29 percent. Roughly, 50,000 households that are included in the current FEFU content workload would not be included in the alternative 7 workload and about 36,000 cases currently not in the FEFU content workload would be included.

A review of the 50,000 cases included in the current workload but excluded from the alternative 7 workload found two common scenarios. The larger of the two scenarios was two person households where the only item missing was the state of birth write-in, which was missing for both people in the household. The other scenario included cases with a combination of housing value, real estate taxes, and home insurance items missing. Both scenarios met the criteria of the current method because they had two critical item failures. Under the alternative methodology, these cases did not qualify for FEFU because their point scores fell under the 7 point threshold.

A review of the 36,000 cases included in the alternative 7 workload but excluded from the current workload found many households with missing basic demographic data for younger household members. Under the current methodology, the criticality levels for the race and Hispanic origin items are “critical” for those over 15 years old and “low” for those under 15. These households were determined ineligible for FEFU under the current methodology because they did not have two “critical” failures or enough “low” failures to meet the criteria, but they scored enough points under the alternative methodology to meet the 7 point threshold.

In addition to using a 7-point threshold, we ran cross tabulations using thresholds of 8, 9, and 10. These versions will be referred to as, “Alternative 8”, “Alternative 9” and “Alternative 10”. Tables 2, 3, and 4 compare the FEFU status using the current rule versus these three alternatives. For every threshold point increase, the content portion of the FEFU workload decreases by roughly 2.5 percentage points (resulting in up to about a 24 percent decrease).

The universe of cases included under the current method but not included under the alternative method increases as the threshold rises from roughly 50,000 cases in alternative 7 to about 110,000 cases in alternative 10. The universe of cases not included under the current method but included using the alternative method decreases as the point threshold rises (from about 35,000 cases to about 6,000 cases). The alternative 10 workload basically becomes a subset of the current workload as it only includes 5,552 cases not in the current workload.

Table 2. FEFU Status for All Mail Returns – Current vs. Alternative 8

CURRENT	ALTERNATIVE 8			Total
	Not included in FEFU	Included in FEFU - content	Included in FEFU - coverage	
Not included in FEFU	839,024	20,634	NA	859,658 (66.3)
Included in FEFU - content	68,516	318,017	NA	386,533 (29.8)
Included in FEFU - coverage	NA	NA	49,586	49,586 (3.8)
Total	907,540 (70.0)	338,651 (26.1)	49,586 (3.8)	1,295,777 (100.0)

NA -Not Applicable

Source: ACS 2010 panel mail return data

Table 3. FEFU Status for All Mail Returns – Current vs. Alternative 9

CURRENT	ALTERNATIVE 9			Total
	Not included in FEFU	Included in FEFU - content	Included in FEFU - coverage	
Not included in FEFU	848,766	10,892	NA	859,658 (66.3)
Included in FEFU - content	91,037	295,496	NA	386,533 (29.8)
Included in FEFU - coverage	NA	NA	49,586	49,586 (3.8)
Total	939,803 (72.5)	306,388 (23.6)	49,586 (3.8)	1,295,777 (100.0)

NA - Not Applicable

Source: ACS 2010 panel mail return data

Table 4. FEFU Status for All Mail Returns – Current vs. Alternative 10

CURRENT	ALTERNATIVE 10			Total
	Not included in FEFU	Included in FEFU - content	Included in FEFU - coverage	
Not included in FEFU	854,106	5,552	NA	859,658 (66.3)
Included in FEFU - content	109,714	276,819	NA	386,533 (29.8)
Included in FEFU - coverage	NA	NA	49,586	49,586 (3.8)
Total	963,820 (74.4)	282,371 (21.8)	49,586 (3.8)	1,295,777 (100.0)

NA - Not Applicable

Source: ACS 2010 panel mail return data

One concern of the research is the fact that under the alternative methodology larger households have the potential to acquire a higher point score than smaller households, because they have a larger number of items to complete on the mail questionnaire. The hypothesis is that the alternative methodology could bias smaller households because as the threshold for the point score is raised, the FEFU workload would consist of more two to five person households and fewer single person households. Table 5 shows the percentage of mail returns included in the FEFU content workload³ by household size for the current and alternative 7, 8, 9 and 10 methodologies.

³ The FEFU coverage workload, which consists of households with more than five people, is not included because cases within this workload are sent to FEFU under all methodologies. For this reason, the table only includes one through five person households.

These data show that a greater proportion of larger households than smaller households are sent to FEFU for content follow-up using both the current and alternative methodologies. The proportions calculated using the current methodology are very similar to those calculated using the alternative 7 methodology. Roughly 27 percent of one-person households and 40 percent of five person households are included in both the current and alternative 7 workloads. The proportion of two, three, and four person households are also similar between the current and alternative 7 methodologies. In addition, it appears that the proportions of mail returns decrease as the point threshold rises for household of all sizes and the decreases are fairly consistent among methods.

Table 5. Proportion of Mail Returns in FEFU Content Workload for Each Methodology by Household Size

Number of people in household	Mail Returns	Methodology				
		Current	ALT7	ALT8	ALT9	ALT10
1	360,822	26.5	26.2	23.9	21.8	20.1
2	485,313	30.6	28.6	26.0	23.4	21.5
3	186,942	34.4	33.1	30.0	27.2	24.9
4	150,049	35.4	34.5	31.4	28.3	26.0
5	62,214	40.4	40.4	37.1	34.2	31.7

How successful is FEFU in reducing item nonresponse? Which items are most likely to be resolved and which show limited gains in FEFU?

Tables 6 and 7 summarize the FEFU resolve rates for each item. Recall that the resolve rates are the proportion of FEFU missing values that were successfully collected in FEFU. The tables are sorted by the resolve rates, which range from about 16 percent to a little over 70 percent.

Table 6 displays rates for the 29 housing items, which shows very few resolve rates under 50 percent. Most of the lower rates are for items that require a dollar amount, which respondents may not know from memory and are unwilling to estimate or look up in their records.

Surprisingly the property value item, which also happens to require a dollar amount, has one of the highest resolve rates (71.2 percent) among the housing and population items. Unlike the other items requiring dollar amounts, the answer for this item cannot be found on a bill and is generally discussed as an estimate; therefore, respondents may feel more comfortable estimating this item.

Table 6. FEFU Resolve Rates - Housing Items

Housing Items	FEFU Resolve Rate	Housing Items	FEFU Resolve Rate
Home Insurance	40.3	Tenure	57.3
Second Mortgage Payment	46.0	Type of Heating Fuel	57.9
Food Stamps	46.2	Home Gas Costs	58.0
Real Estate Tax Payment	46.5	Building Type	58.2
Mobile Home Costs	46.6	Agriculture	59.4
Mortgage Payment	47.9	Rent Include Meals	60.6
Rent Payment	50.7	Insurance in Mortgage	64.1
Rooms	50.9	Home Fuel Costs	64.2
Electricity	51.9	Real Estate Tax in Mortgage	64.5
Vehicles	52.1	Acres	66.9
Water Costs	53.1	Second Mortgage	69.0
Sink	53.3	Mortgage	70.4
Condo	53.9	Business	71.0
Bedrooms	54.4	Property Value	71.2
Telephone	55.4		

Source: ACS 2010 panel mail return data

Table 7 displays rates for the 57 population items. The two items with the lowest resolve rates are the wages and self-employment income items. This is not surprising, as these items also tend to have high missing data rates. Items related to marital status and other marital events, as well as, journey to work also have lower rates. The items with lower rates tend to be more personal or sensitive items, which respondents are reluctant to provide even in FEFU. The four population items with the highest rates (absent from work, looking for work, layoff from work, and when last worked), along with the recalled to work item, are asked only of respondents 15 years and over who responded that they did not work during the week prior to the interview. It is possible that these respondents are eagerly looking for work (particularly because of the difficult economic conditions) and are happy to provide these answers to interviewers conducting a government survey. It is also possible that it is easier to reach these respondents because they are not at work and are home during the day.

These data conclude that on average, FEFU is successful in obtaining responses for more than half (about 56 percent) of all missing data.

Table 7. FEFU Resolve Rates - Population Items

Population Items	FEFU Resolve Rate	Population Items	FEFU Resolve Rate
Wages	16.1	Supplemental Security Income	58.2
Self-Employment Income	26.4	Married in Past 12 Months	58.3
Number of Times Married	28.8	Grade Attending	58.4
Journey to Work - # of people	33.6	Public Assistance	58.4
Divorced in the Past 12 Months	38.8	Difficulty Going Out	59.6
Widowed in the Past 12 Months	39.2	Language Other Than English	59.8
Total Income	39.4	Occupation	59.8
Language Spoken	39.7	Citizenship	60.0
Usual Hours Worked	41.0	Military Service	60.1
Weeks Worked	43.7	Kind of Work	60.3
Age	43.9	Employer	60.4
Marital Status	45.7	Cognitive Disability	60.6
Year Married	47.7	Journey to Work - method	60.7
Social Security Income	50.2	Difficulty Dressing	60.8
Fertility	50.2	Migration	60.9
Year of Entry	51.5	Physical Disability	61.0
Health Insurance	52.8	Relationship	61.0
English Speaking Ability	54.1	Ancestry	62.8
Interest Earned	54.5	Race	63.1
Industry	54.6	Period of Military Service	64.5
Retirement Income	54.9	Recalled to Work	64.6
Difficulty Seeing	55.0	Place of Birth	65.3
Class of Worker	55.5	Sex	66.2
Hearing Disability	56.5	Hispanic Origin	66.9
Worked Last Week	56.6	When Last Worked	69.8
Other Income	57.0	Layoff From Work	70.7
School Enrollment	57.4	Looking for work	71.1
Educational Attainment	58.0	Absent from work	73.1
Work Activities	58.1		

Source: ACS 2010 panel mail return data

How would the item nonresponse rates for mail returns be impacted if we used the alternative approach?

The primary goal of the FEFU operation is to reduce item nonresponse for mail returns. To optimize the return on our investment we developed a methodology to send forms missing the most critical items. Therefore, we wanted to see how the item nonresponse rates, using the alternative methods to send cases to FEFU, compare to those after using the current method. Various item nonresponse rates are shown in Appendix 3. The first column, “Mail Return Item NR Rate”, displays item nonresponse rates calculated prior to the FEFU operation and indicate the amount of missing data on all self-response mail returns. The columns under the “POST-FEFU Item NR Rate by Method” section show the proportion of all mail returns that would still be missing data for each item by the method used. These estimates were based on the resolve rate of the current method and the proportions of mail returns with missing values that would be sent to FEFU under each option. The lower the item nonresponse rate, the better. The columns in the “Differences” section show how each version of the alternative method compares to the current method. When reviewing the difference columns a positive estimate indicates that the alternative version produces a lower item nonresponse, while a negative estimate indicates the alternative version produces a higher item nonresponse rate. The estimated POST-FEFU item nonresponse rates for the alternative 7 method are very similar to the current method’s POST-FEFU item nonresponse rates with slightly lower rates for almost all of the items. The only items that have higher rates in alternative 7 relative to the current method are the home insurance, real estate taxes, and place of birth items. These findings are expected because these items had a criticality level of “critical” under the current rules and a point value of 2 under the alternative methods. The low point value keeps the score for the return under the 7 point threshold resulting in fewer returns with missing data for these items going to FEFU. The fact that more items have equal or lower nonresponse rates under the alternative 7 version suggests that this method of determining the FEFU workload may be slightly more effective in reducing item NR.

Appendix 3 also includes the results of using the alternative 8, 9, and 10 methods. It is interesting to note that the POST-FEFU item nonresponse rates for many items in alternative 8 are about the same or lower than the current method. Further increasing the threshold to 9, or even 10, also appears to have very little impact on the item nonresponse rates. This suggests that the alternative version may be a very attractive method for supporting the current FEFU workload, as well as, provide an effective method for modifying the workload if desired or necessary to save costs.

Conclusion

The results of this evaluation suggest that the alternative method is a good option for determining the FEFU workload. It is a flexible option that can be used to maintain, increase, or decrease the FEFU workload. The alternative 7 method offers a workload equivalent to the current workload and results in comparable or slightly reduced nonresponse rates for most items. The research also shows that increasing the point threshold up to 10 points could substantially decrease the workload while having minimal impact on item nonresponse rates. While more research is necessary to study the differences in the workload of the alternative methods concerning household size, this evaluation finds little differences between the alternative methods when a score of seven and up to ten points is used as the threshold. The item resolve rates calculated to support this evaluation indicate that we obtain over half of missing data sent to FEFU, which is quite impressive and improves the quality of the ACS mail return data.

Based on these findings we should conduct cost/benefit analyses to determine if the benefits of conducting FEFU on the larger workload of the current method compared to the alternative method using 10 points (or more) is worth the additional cost given the minimal reduction in item nonresponse rates. The data presented here show the increase in item nonresponse due to raising the threshold to 10, for example, is, on average, only about 0.25 percentage points. In 2010, the average cost for conducting a FEFU interview was \$9.75. Switching from the current methodology to the 10-point alternative methodology could reduce the workload by over one hundred thousand cases and save close to one million dollars.

Appendices

Appendix 1. FEFU Criticalities

Appendix 2. Distribution of Points for the Alternative Method

Appendix 3. Item Nonresponse Rates and FEFU Resolve Ratios

Appendix 1

Table 8. FEFU CRITICALITIES

Item	Description	CURRENT	POINT VALUE
BLD	Units in structure	C	4
YBL	Year built	M	1
YBLW	Year built write-in		
MVY	Year moved in	M	1
ACR	Lot size	M	2
AGS	Agricultural sales	M	2
BUS	Business on property	L	1
RMS	Rooms	M	RMS and BDS missing-2 otherwise-0
BDS	Bedrooms	L	
RWAT, TOIL, BATH	Plumbing	L	1
SINK, STOV, REFR	Kitchen	L	1
TEL	Telephone	L	1
VEH	Vehicles	L	1
HFL	Type of fuel	L	1
ELEX	Electricity checkbox	C	2
ELE	Electricity cost		
GASX	Gas checkbox	ELE missing-C ELE ^missing-L	ELE missing-2 ELE ^missing-1
GAS	Gas cost		
WATX	Water checkbox	C	2
WAT	Water cost		

Item	Description	CURRENT	POINT VALUE
FULX	Other fuel checkbox	HFL=4,5,6-C HFL=1,2,3,7,8,9-L HFL= missing -L	HFL=4,5,6-2 HFL=1,2,3,7,8,9-1 HFL= missing-1
FUL	Other fuels cost		
FS	Food stamps	L	1
CONX	Condominium checkbox	L	1
CON	Condominium fee		
CONN	NO Condominium fee		
TEN	Tenure	C	4
RNT	Rent	C	2
RNTM	Meals in rent	L	1
VAL	Property value	L	2
TAX	Real estate taxes	C	2
TAXN	No real estate taxes		
INS	Property insurance	C	2
INSN	No property taxes		
MRGX	Mortgage	C	2
MRG	Mortgage payment	C	3
MRGT	Mortgage payment includes taxes	C	2
MRGI	Mortgage payment includes insurance	C	2
SMX	Second mortgage/ home equity loan	C	2

Item	Description	CURRENT	POINT VALUE
SM	Other mortgage payments	C	2
SMN	No other mortgage payments		
MH	Mobile home costs	L	1
SEX	Sex	L	2
DBY	Year born	C	4
AGE	Age		
REL	Relationship	C	4
HIS	Hispanic checkbox	AGE>=15-C AGE<15-L AGE= missing-1	AGE>=15-4 AGE<15-1 AGE= missing-1
HISW	Hispanic write-in		
RAC	Race checkbox	AGE>=15-C AGE<15-L AGE= missing-L	AGE>=15-4 AGE<15-1 AGE= missing-1
RCW1	Race write-in		
RCW2	Race write-in		
RCW3	Race write-in		
PBW2	Place of birth--foreign country	AGE>=15-C AGE<15-L AGE= missing-L	PBX1=missing and AGE>=15-3 PBX1 ^missing and AGE<15- 2 AGE<1-1 AGE= missing-1
PBW3	Place of birth --U.S. state		
CIT	Citizenship	C	2
CITW	Citizenship write-in		
YOE	Year of entry	C	2
SCH	School enrollment	C	2
SCHG	Grade attending		
SCHGW	Grade attending write-in		

Item	Description	CURRENT	POINT VALUE
SCHL	Educational attainment	C	3
SCHLW	Educational attainment write-in		
FODW	Field of Degree		
ANCW	Ancestry	L	0
MIG	Mobility status	M	1
MGW1	Migration foreign country		
MGW5	Migration U.S. state		
LANX	Speaks another language	M	1
LANW	Other language		
ENG	English ability		
HINS1-HINS8, HINSW	Health Insurance	M	2
DEAR	Hearing difficulty	C	2
DEYE	Vision difficulty		
DREM	Difficulty learning	C	2
DPHY	Difficulty walking	C	2
DDRS	Difficulty dressing	C	2
DOUT	Difficulty going out	C	2
MAR	Marital Status	L	2
MARHM, MARHW, MARHD	Marital History	L	1

Item	Description	CURRENT	POINT VALUE
MARHT and MARHY	Times married and year last Married	L	1
FER	Fertility	L	1
GCL	Presence of grandchildren	L	1
GCR	Responsible for grandchildren	L	1
GCM	Length of time responsible for grandchildren	L	1
MIL	Military service	M	2
MILP	Period of service		
DRATX	Have VA disability rating	M	1
DRAT	Disability rating		
WRK	Worked last week	C	3
WRKJ	Do any work last week		
	Place of work address	M	1
PWW1			
PWW2	Place of work city		
PWX3	Inside city limits		
PWW4	Place of work county		
PWW5	Place of work state		
PWW6	Place of work ZIP		
JWTR	Transportation to work	M	1
JWRI	Riders		
JWLH	Hour left home		
JWLM	Minute left home		
JWAM	AM/PM left home		
JWMN	Minutes to work		

Item	Description	CURRENT	POINT VALUE		
NWLA	On layoff	M	1		
NWAB	Temporarily absent				
NWRE	Informed of recall				
NWLK	Looking for work				
NWAV	Available for work				
WKL	When last worked	C	3		
WKWX	50 to 52 weeks worked	M	2		
WKW	Weeks worked				
WKH	Hours worked				
COW	Class of worker				
INW2	Industry	M	2		
INW3	Kind of business/industry				
INX4	Type of business/industry				
OCW1	Occupation				
OCW2	Most important activities				
WAG	Wages/salary income			C	3
SEM	Self-employment income				
INT	Interest income				
SS	Social security income				
SSI	Supp. security income				
PA	Public assistance income				
RET	Retirement income				
OI	Other income				
TI	Total income				

Appendix 2

**Table 9. Distribution of Points for all 2010 Mail Returns
Percent of all 2010
Mail Return**

Total Points	2010 Mail Returns	Percent of all 2010 Mail Return
NA ¹	96,702	7.5
0	326,724	25.2
1	79,469	6.1
2	127,211	9.8
3	70,917	5.5
4	78,019	6.0
5	47,532	3.7
6	47,428	3.7
7	33,538	2.6
8	32,263	2.5
9	24,017	1.9
10	23,660	1.8
11	18,320	1.4
12	17,603	1.4
13	14,776	1.1
14	13,079	1.0
15	11,307	0.9
16	10,341	0.8
17	8,636	0.7
18	8,736	0.7
19	7,366	0.6
20	6,927	0.5
21	6,024	0.5
22	5,776	0.4
23	5,061	0.4
24	4,667	0.4
25	4,284	0.3
26	3,981	0.3
27	3,668	0.3
28	3,494	0.3
29	3,798	0.3
30	3,373	0.3
31 and over	97,494	7.5
1000 ²	49,586	3.8

¹This includes cases ineligible for FEFU because a phone number was not available or there was a multiple return or interview for the household that provided sufficient data.

²Coverage failures

Source: ACS 2010 panel mail return data

Appendix 3

ITEM	Mail Return Item NR Rate	POST-FEFU Item NR Rate by Method					Differences			
		CURR	ALT 7	ALT 8	ALT 9	ALT 10	CURR - ALT7	CURR - ALT8	CURR - ALT9	CURR - ALT10
<i>Housing Items</i>										
Acres	7.6	5.0	4.5	4.7	4.9	5.1	0.5	0.2	0.1	-0.1
Agriculture	2.4	1.5	1.4	1.5	1.5	1.6	0.1	0.0	0.0	0.0
Bedrooms	3.7	2.2	2.2	2.2	2.2	2.3	0.1	0.0	0.0	0.0
Building Type	2.7	1.5	1.5	1.5	1.5	1.5	0.0	0.0	0.0	0.0
Business	6.3	4.3	3.9	4.1	4.3	4.4	0.4	0.2	0.0	-0.1
Condo	5.5	3.4	3.3	3.3	3.4	3.4	0.1	0.0	0.0	0.0
Electricity	5.9	3.4	3.5	3.6	3.6	3.7	-0.1	-0.2	-0.2	-0.3
Food Stamps	3.3	2.1	2.0	2.1	2.1	2.1	0.0	0.0	0.0	0.0
Home Fuel Costs	15.1	9.0	8.7	9.0	9.3	9.5	0.3	0.0	-0.3	-0.5
Home Gas Costs	11.3	7.0	6.9	7.1	7.2	7.4	0.1	-0.1	-0.3	-0.4
Type of Heating Fuel	7.0	4.6	4.4	4.5	4.6	4.7	0.1	0.0	-0.1	-0.1
Home Insurance	12.8	8.7	9.2	9.4	9.6	9.8	-0.5	-0.7	-0.9	-1.1
Sink	2.6	1.5	1.5	1.5	1.5	1.5	0.0	0.0	0.0	0.0
Mobile Home Costs	28.9	21.2	20.7	21.2	21.6	22.0	0.5	0.0	-0.4	-0.8
Mortgage Payment	3.6	2.2	2.3	2.3	2.4	2.5	0.0	-0.1	-0.1	-0.2
Insurance in Mortgage	2.1	1.0	1.1	1.2	1.2	1.3	-0.1	-0.2	-0.2	-0.3
Real Estate Tax in Mortgage	1.8	0.8	0.9	1.0	1.0	1.0	-0.1	-0.1	-0.2	-0.2
Mortgage	4.3	1.8	1.9	1.9	2.0	2.1	-0.1	-0.1	-0.2	-0.3
Rooms	3.8	2.4	2.3	2.4	2.4	2.4	0.1	0.0	0.0	0.0
Rent Payment	3.4	2.3	2.4	2.4	2.5	2.5	0.0	-0.1	-0.2	-0.2
Rent Include Meals	2.3	1.5	1.5	1.5	1.6	1.6	0.0	0.0	-0.1	-0.1
Second Mortgage Payment	3.3	2.1	2.2	2.3	2.3	2.4	-0.1	-0.1	-0.2	-0.2
Second Mortgage	4.1	1.7	1.8	1.8	1.9	1.9	-0.1	-0.1	-0.2	-0.2
Real Estate Tax Payment	10.6	6.5	7.0	7.1	7.3	7.5	-0.5	-0.7	-0.9	-1.0
Telephone	3.6	2.2	2.1	2.1	2.1	2.2	0.1	0.0	0.0	0.0
Tenure	5.1	2.9	2.8	2.8	2.9	2.9	0.1	0.0	0.0	-0.1
Property Value	11.0	5.3	5.2	5.4	5.7	5.9	0.1	-0.1	-0.4	-0.6
Vehicles	3.0	1.8	1.8	1.8	1.8	1.8	0.0	0.0	0.0	0.0
Water Costs	8.5	5.0	5.1	5.2	5.3	5.4	-0.1	-0.2	-0.3	-0.4
<i>Population Items</i>										
Age	1.0	0.7	0.7	0.7	0.7	0.7	0.0	0.0	0.0	0.0
Hispanic Origin	5.6	2.6	2.5	2.6	2.7	2.8	0.1	0.1	-0.1	-0.2
Race	2.7	1.4	1.3	1.3	1.4	1.5	0.1	0.1	0.0	-0.1
Sex	2.5	1.6	1.4	1.5	1.5	1.6	0.2	0.1	0.0	0.0
Relationship	0.8	0.4	0.4	0.4	0.4	0.4	0.0	0.0	0.0	0.0
Citizenship	5.7	2.8	2.8	2.8	2.8	2.8	0.0	0.0	0.0	-0.1
Migration	8.8	4.5	4.5	4.6	4.6	4.7	0.0	0.0	-0.1	-0.2
Absent from work	5.7	3.6	3.5	3.6	3.8	4.0	0.1	-0.1	-0.3	-0.4
Looking for work	2.3	1.5	1.4	1.5	1.6	1.6	0.0	0.0	-0.1	-0.2
School Enrollment	7.4	4.0	4.0	4.0	4.1	4.1	0.0	0.0	-0.1	-0.1

Grade Attending	3.4	2.1	2.1	2.2	2.2	2.3	0.0	-0.1	-0.1	-0.2
Educational Attainment	7.5	3.8	3.8	3.8	3.9	3.9	0.0	-0.1	-0.1	-0.1
Weeks Worked	4.0	2.9	2.8	2.9	2.9	3.0	0.1	0.0	-0.1	-0.1
Worked Last Week	6.9	3.5	3.5	3.5	3.6	3.6	0.0	0.0	0.0	0.0
Difficulty Dressing	8.2	3.8	3.9	3.9	4.0	4.0	-0.1	-0.1	-0.1	-0.2
Difficulty Seeing	6.7	3.7	3.7	3.7	3.7	3.7	0.0	0.0	0.0	-0.1
Difficulty Going Out	7.9	3.8	3.8	3.9	3.9	3.9	0.0	0.0	0.0	-0.1
Physical Disability	8.3	3.8	3.9	3.9	4.0	4.0	-0.1	-0.1	-0.2	-0.2
Cognitive Disability	8.1	3.8	3.8	3.8	3.9	3.9	-0.1	-0.1	-0.1	-0.2
Hearing Disability	6.2	3.2	3.2	3.2	3.2	3.2	0.0	0.0	0.0	0.0
Marital Status	7.4	4.5	4.5	4.5	4.5	4.5	0.0	0.0	0.0	0.0
Ancestry	17.1	10.2	10.1	10.4	10.6	10.8	0.1	-0.2	-0.4	-0.6
Class of Worker	8.0	5.7	5.4	5.6	5.8	6.0	0.3	0.1	-0.1	-0.2
English Speaking Ability	3.6	2.6	2.6	2.7	2.8	2.8	0.0	-0.1	-0.1	-0.2
Fertility	6.0	3.5	3.5	3.5	3.5	3.6	0.0	0.0	0.0	0.0
Interest Earned	20.6	13.0	12.9	13.2	13.5	13.7	0.1	-0.2	-0.5	-0.7
Employer	12.3	8.3	7.9	8.2	8.5	8.8	0.5	0.2	-0.2	-0.4
Kind of Work	8.7	5.7	5.4	5.6	5.8	6.0	0.3	0.1	-0.1	-0.3
Industry	11.1	7.8	7.3	7.6	7.9	8.1	0.4	0.1	-0.1	-0.3
Journey to Work - # of people	1.3	1.0	1.0	1.0	1.1	1.1	0.0	0.0	0.0	0.0
Journey to Work - method	2.6	1.7	1.7	1.8	1.8	1.9	0.0	0.0	-0.1	-0.2
Language Spoken	12.7	10.1	10.1	10.3	10.4	10.6	0.0	-0.2	-0.3	-0.5
Language Other Than English	6.6	3.3	3.3	3.3	3.3	3.4	0.0	0.0	0.0	-0.1
Military Service	9.0	4.5	4.4	4.5	4.5	4.5	0.1	0.1	0.0	0.0
Period of Military Service	1.3	0.8	0.7	0.8	0.8	0.8	0.1	0.0	0.0	0.0
Layoff From Work	8.9	4.3	4.2	4.4	4.6	4.9	0.1	-0.1	-0.3	-0.5
Recalled to Work	8.7	6.2	6.0	6.3	6.5	6.6	0.1	-0.1	-0.3	-0.5
Occupation	7.3	4.8	4.5	4.7	4.9	5.0	0.3	0.1	-0.1	-0.2
Work Activities	10.8	7.3	6.9	7.2	7.4	7.6	0.4	0.1	-0.1	-0.3
Other Income	17.2	10.3	10.2	10.4	10.6	10.8	0.0	-0.2	-0.4	-0.5
Public Assistance	17.1	10.1	10.0	10.2	10.4	10.6	0.0	-0.2	-0.4	-0.6
Place of Birth	14.3	7.4	8.1	8.4	8.7	8.9	-0.7	-1.0	-1.3	-1.5
Retirement Income	17.0	10.4	10.3	10.5	10.7	10.9	0.0	-0.1	-0.3	-0.5
Self-Employment Income	20.9	17.2	17.1	17.3	17.4	17.5	0.0	-0.1	-0.2	-0.3
Social Security Income	17.1	11.0	11.0	11.1	11.3	11.5	0.0	-0.1	-0.3	-0.5
Supplemental Security Income	17.8	10.6	10.5	10.8	11.0	11.2	0.0	-0.2	-0.4	-0.6
Total Income	18.7	13.4	13.3	13.5	13.7	13.8	0.0	-0.1	-0.3	-0.4
Wages	18.6	16.4	16.4	16.5	16.6	16.6	0.0	-0.1	-0.1	-0.2
Usual Hours Worked	3.9	2.9	2.8	2.9	2.9	3.0	0.1	0.0	0.0	-0.1
When Last Worked	11.0	5.1	5.0	5.3	5.6	5.9	0.1	-0.2	-0.5	-0.8
Year of Entry	4.3	2.6	2.7	2.8	2.9	2.9	-0.1	-0.2	-0.3	-0.3
Married in Past 12 Months	5.6	3.8	3.7	3.8	3.9	4.0	0.2	0.0	-0.1	-0.2
Widowed in the Past 12 Months	11.3	9.1	9.0	9.1	9.3	9.4	0.1	0.0	-0.2	-0.3
Divorced in the Past 12 Months	11.5	9.2	9.1	9.3	9.5	9.6	0.1	-0.1	-0.2	-0.3
Year Married	2.6	1.9	1.9	1.9	2.0	2.0	0.0	0.0	-0.1	-0.1
Number of Times Married	3.5	2.8	2.8	2.8	2.9	2.9	0.0	0.0	0.0	-0.1

Health Insurance	2.5	1.5	1.5	1.5	1.6	1.6	0.1	0.0	0.0	0.0
------------------	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Source: ACS 2010 panel mail return data