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MEMORANDUM FOR ACS Research and Evaluation Steering Committee

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Subject: Evaluation of Multiple Responses

Attached is the final American Community Survey (ACS) Research and Evaluation report, "Evaluation of Multiple Responses." This paper assesses the frequency and content of respondents' multiple responses to questions requiring a single response and if ACS should continue to blank multiple responses in the mail mode.

If you have any questions about this report, please contact David Raglin (301-763-4226) or Samantha Fish (301-763-7542).

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Evaluation of Multiple Responses

FINAL REPORT

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Introduction

Prior to summer 2007, the Key from Paper (KFP) data capture methodology being used to record data from mailed back questionnaires did not accommodate the capture of multiple checkbox responses for items requesting a single response. For most items on the questionnaire, the keying procedures instructed the keyers to key only the first response in the event of a multiple response. This potentially biased the data by allowing the order of the response categories to dictate which response was chosen.

Then, in summer 2007, the American Community Survey (ACS) moved to the Integrated Computer Assisted Data Entry (iCADE) data capture system which uses optical mark recognition to capture all checkbox responses and clerically verifies all instances of multiple responses for each item. Since the new system permits the identification of multiple responses, changes were made to the rules dealing with them to eliminate bias. For most questionnaire items where multiple responses are not acceptable, the response is recorded as missing and later imputed without regard to the multiple responses. However, the instances of multiple responses are available for research purposes.

Since the implementation of the iCADE system, the treatment of multiple responses as missing data for questions that require a single response has not been reconsidered. The current methodology was never meant to be the final solution in dealing with multiple responses; it was a less biased approach than the old one and the best that ACS could manage in a time of many new changes. After the 2005 ACS Key from Image (KFI) Test, when multiple response combinations were last studied, it was suggested that for items with high rates of multiple responses we should analyze the multiple response combinations for a possible redesign of the edits.

Now that we conveniently have records of multiple responses, we can assess the degree to which blanking occurs in the mail mode and to evaluate what, if any, changes should be made to the capture and processing methods dealing with these responses. This research paper measures the rate at which multiple responses are received in the mail mode for questions that require a single response. For those with a high rate of multiple responses, the response combinations are identified and conjectures are made as to why these mail mode respondents are marking their answers this way.

Research Questions

1. How frequently do mail mode respondents mark more than one answer to a question requiring a single response? Which survey questions have high mail mode multiple response rates?
2. For each question with a high mail mode multiple response rate,
 - (a) What are the instructions and examples provided on the questionnaire?¹
 - (b) What are the combinations of boxes being marked?
 - (c) Why might the mail respondents be marking multiple checkboxes?
 - (d) Can other information on the form indicate what the correct response should be?

¹ Instructions on the ACS-30 guide were not considered, although it is mailed to respondents in the ACS packet.

3. Should ACS continue to blank multiple responses in the mail mode or treat them differently either in data capture or during editing?

Methodology

This evaluation considers the universe of returned mail forms from the 2008 ACS sample that were collected between January 2008 and March 2009. The ACS typically accepts late mail returns up to three months after the initial mail out for each sample panel, which is why the collection period extends into 2009. Multiple response data are summarized using the daily processing files from the American Community Survey Office.

Mail multiple response rates are only calculated for items on the questionnaire that require a single response. The rate is defined as the number of multiple response instances as a percent of total number of response instances. Responses are counted regardless of whether or not the respondent was eligible to be asked the question. Based on responses to previous items, some items are only asked of certain individuals; for example, an item that asks if the respondent has given birth to any children in the past 12 months is only asked of females age 15 to 50. We defined the multiple response rates this way because our goal is to assess how often respondents, when they answer, provide a multiple response to a question that requires a single response.

Although this report may offer insight that can be helpful in determining if any questionnaire items may need rewording, reformatting, or clarified instructions; this report first serves to assess the rate at which multiple responses from mail mode respondents occur in order to constructively decide if data capture methods should be modified. The data in this evaluation are unweighted to reflect the actual occurrence of multiple responses collected from the 2008 ACS panel in mail mode operation. Conclusions drawn from these data are characteristic only of the 2008 ACS panel mail mode respondents. They should not be generalized to describe the behavior of the U.S. population.

Additionally, multiple responses for questions requiring a single response are not possible in the ACS telephone and personal visit interviewing modes because the automated instrument does not accommodate multiple entries.²

Results

1. **How frequently do mail mode respondents mark more than one answer to a question requiring a single response? Which survey questions have high mail mode multiple response rates?**

Table A in the Appendix summarizes for each item requiring a single response the number of multiple response instances, the number of total response instances, and the multiple response rate in the 2008 ACS sample.³ The data are sorted by multiple response rates in descending order.

² If a respondent gives a multiple response to a single response requiring question in either of these modes, the interviewer or field representative inquires further to try to obtain the a correct single response.

³ We have omitted the “refrigerator” and “telephone” items (questions H8f and H8g on the form) from Table A because, due to a 2008 data capture error that has since been corrected, the multiple response rates for these items were drastically inflated. However, both items’ corrected multiple response rates are less than a few tenths of a percent.

Items with multiple response rates greater than 0.50 percent are displayed in Table 1. Only seven items are in that table, meaning that multiple responses are uncommon for the majority of variables in the ACS.

Table 1. Item Multiple Response Rates

Source: 2008 American Community Survey Sample

www.census.gov/acs/www/Downloads/survey_methodology/acs_design_methodology.pdf

Item	Item Number	Variable Name	Number of Multiple Responses	Number of Total Responses	Multiple Response Rate
Educational attainment	P11	SCHL	272,272	2,707,636	10.06
Heating fuel	H10	HFL	50,646	1,251,500	4.05
Journey to work	P30	JWTR	16,621	1,370,126	1.21
Months responsible for grandchildren	P24c	GCM	217	31,236	0.69
Year built	H2	YBL	7,693	1,143,855	0.67
Class of worker	P40	COW	10,860	1,648,452	0.66
Grade level attending	P10b	SCHG	4,484	720,169	0.62

As noted in previous research, items with the greatest number of checkbox answer choices seem to have the highest rates of multiple responses. It is reasonable to expect that the fewer the number of checkbox choices, the less opportunity there is for multiple responses to occur (Love, 2006). All of the items listed in Table 1 have five response categories or more.

The educational attainment item, which asks for an individual’s highest level of educational achievement, had by far the highest rate of multiple responses, approximately 10.1 percent. When this item was tested in the 2006 ACS Content Test for use on the 2008 ACS questionnaire, high multiple response rates were observed (see Appendix B), but since the question asks for the highest level of educational attainment it was decided that in the event of a multiple response ACS would select the highest level of educational attainment. The heating fuel and journey to work items had the next highest multiple response rates of 4.1 and 1.2 percent, respectively. The heating fuel item asks for the primary heating fuel for the housing unit and the journey to work item asks for the individual’s usual mode of transportation to work.

2. For each question with a high mail mode multiple response rate,
 - (a) What are the instructions and examples provided on the questionnaire?
 - (b) What are the combinations of boxes being marked?
 - (c) Why might the mail mode respondent be marking multiple checkboxes?
 - (d) Can other information on the form indicate what the correct response should be?

The above research questions are answered for each item listed in Table 1 except for the months responsible for grandchildren item. We chose not to study the multiple responses for this item since the number of instances is so few.

The analysis for each item begins on a new page for ease of reference.

Educational Attainment

(a) What are the instructions and examples provided on the questionnaire?

The educational attainment items asks for the highest degree or level of schooling completed and then provides two additional instructions in italics: the first instructs the respondent to mark only one box, and the other explains to mark the previous grade or highest degree received if the person is currently enrolled. Figure 1 shows the educational attainment question as it appeared on the 2008 ACS form.

Figure 1. Educational Attainment Item

Source: 2008 American Community Survey Questionnaire

www.census.gov/acs/www/Downloads/survey_methodology/acs_design_methodology.pdf

11 What is the highest degree or level of school this person has COMPLETED? Mark (X) ONE box. If currently enrolled, mark the previous grade or highest degree received.

NO SCHOOLING COMPLETED

No schooling completed

NURSERY OR PRESCHOOL THROUGH GRADE 12

Nursery school

Kindergarten

Grade 1 through 11 – Specify grade 1 – 11

12th grade – NO DIPLOMA

HIGH SCHOOL GRADUATE

Regular high school diploma

GED or alternative credential

COLLEGE OR SOME COLLEGE

Some college credit, but less than 1 year of college credit

1 or more years of college credit, no degree

Associate’s degree (for example: AA, AS)

Bachelor’s degree (for example: BA, BS)

AFTER BACHELOR’S DEGREE

Master’s degree (for example: MA, MS, MEng, MEd, MSW, MBA)

Professional degree beyond a bachelor’s degree (for example: MD, DDS, DVM, LLB, JD)

Doctorate degree (for example: PhD, EdD)

(b) What are the combinations of checkboxes being marked?

Due to the overwhelming number of ways respondents filled out this question, Table 2 shows only the combinations that occurred 1,000 times or more during the 2008 ACS sample. We counted a multiple response as any instance where the respondent marked two or more checkboxes. We did not give consideration to the write-in field.

A majority of the response combinations in Table 2 involved a type of high school completion with a higher level of educational attainment with no write-in value for grade level. These types of responses from Table 2 account for approximately 68.4 percent of the educational attainment multiple responses. More specifically, the responses of “regular high school diploma” with “some college credit” or “1 or more years of college credit” and no write-in value account for 25.0 and 22.9 percent of the educational attainment multiple responses, respectively. These

responses might represent adults that completed the equivalent of a high school education and took a few college courses or currently enrolled undergraduate students.

Other frequent response combinations involved the “Grade level 1 through 11”, accounting for roughly 11.3 percent of the multiple responses. Most of these responses have a written response present in the grade level write-in field, as we would hope. In some further investigation, we noted that the combinations of “Grade level 1 through 11” with “Regular high school diploma” or “GED or alternative credential”, which made up 3.3 and 2.2 percent of the educational attainment multiple responses respectively, have written responses indicating grade levels 8 through 11 a wide majority of the time. These responses probably represent adults that either dropped out of high school and later earned their GED or didn’t finish up to grade 12 but earned their diploma.

Table 2. Frequent Multiple Response Combinations to the Educational Attainment Item

Source: 2008 American Community Survey Sample

www.census.gov/acs/www/Downloads/survey_methodology/acs_design_methodology.pdf

Response A	Response B	Response C	Write-in Field Filled?	Number of Instances	Percent of Item's Multiple Responses	Percent of Item's Total Responses
Regular high school diploma	Some college credit		No	67,781	25.0	2.5
Regular high school diploma	1+ years college credit		No	62,246	22.9	2.3
Regular high school diploma	Associate's degree		No	15,111	5.6	0.6
Regular high school diploma	Bachelor's degree		No	9,486	3.5	0.4
GED or alternative credential	Some college credit		No	9,405	3.5	0.3
Grade 1 through 11	Regular high school diploma		Yes	8,843	3.3	0.3
GED or alternative credential	1+ years college credit		No	7,487	2.8	0.3
Grade 1 through 11	GED or alternative credential		Yes	6,042	2.2	0.2
No schooling completed	Grade 1 through 11		Yes	5,601	2.1	0.2
12th grade -- no diploma	Regular high school diploma		No	5,421	2.0	0.2
Bachelor's degree	Master's degree		No	4,574	1.7	0.2
12th grade -- no diploma	GED or alternative credential		No	3,969	1.5	0.1
Regular high school diploma	Bachelor's degree	Master's degree	No	2,816	1.0	0.1
Grade 1 through 11	Regular high school diploma		No	2,773	1.0	0.1
Bachelor's degree	Professional degree		No	2,349	0.9	0.1
GED or alternative credential	Associate's degree		No	2,145	0.8	0.1
Associate's degree	Bachelor's degree		No	2,011	0.7	0.1
Regular high school diploma	Some college credit		Yes	1,822	0.7	0.1
Master's degree	Professional degree		No	1,793	0.7	0.1
Nursery school	Kindergarden	Grade 1 through 11	Yes	1,662	0.6	0.1
Grade 1 through 11	12th grade -- no diploma		Yes	1,602	0.6	0.1
No schooling completed	Nursery school		No	1,468	0.5	0.1
12th grade -- no diploma	Some college credit		No	1,423	0.5	0.1
Grade 1 through 11	Regular high school diploma	Some college credit	Yes	1,388	0.5	0.1
Regular high school diploma	1+ years college credit		Yes	1,382	0.5	0.1
No schooling completed	12th grade -- no diploma		No	1,364	0.5	0.1
Kindergarden	Grade 1 through 11		Yes	1,198	0.4	0.0
Grade 1 through 11	GED or alternative credential	Some college credit	Yes	1,140	0.4	0.0
Grade 1 through 11	GED or alternative credential		No	1,099	0.4	0.0
Grade 1 through 11	Regular high school diploma	1+ years college credit	Yes	1,026	0.4	0.0
12th grade -- no diploma	1+ years college credit		No	1,001	0.4	0.0
			Other Instances	34,844	12.8	1.3
			Total Instances	272,272	100.0	N/A

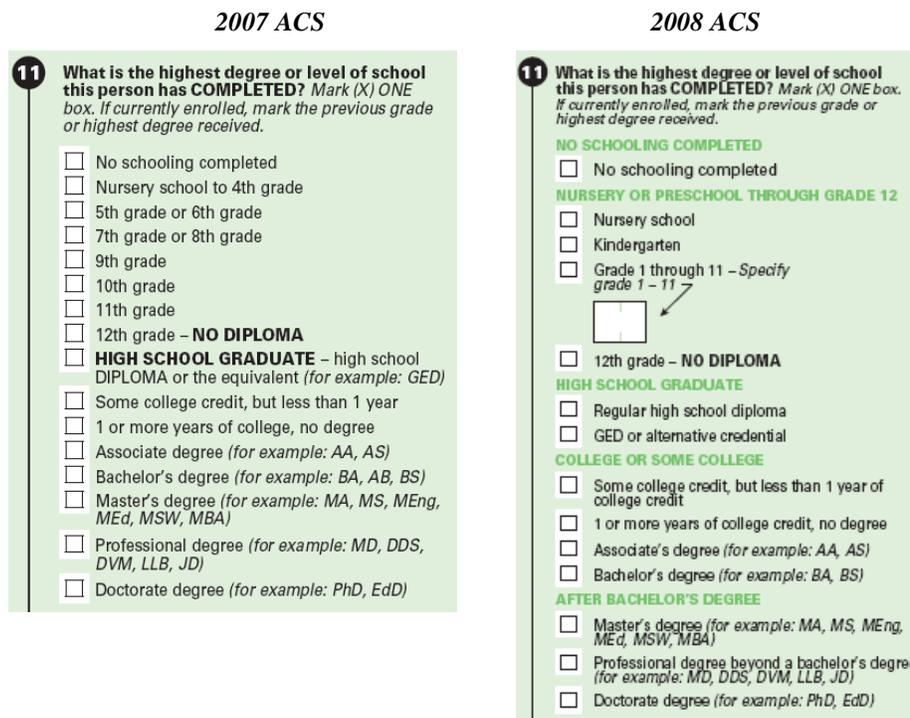
(c) Why might the respondent be marking multiple check boxes?

There are several conjectures as to why respondents might be marking multiple responses to this question, but there is no evidence to support a solid conclusion. There was a major change to the question in the 2008 ACS: the list of response categories were divided and listed under five headings, the nursery school and kindergarten checkbox was separated, and a write-in field for grades 1 through 11 was added. Figure 2 shows the difference between the 2007 and 2008 versions of this question. It is reasonable but too general to say that this is the reason for the increased occurrence of multiple responses. We'd ideally like to know what about the change in format influenced new respondent behavior.

Figure 2. Versions of the Educational Attainment Item

Source: 2007 & 2008 American Community Survey Questionnaires

www.census.gov/acs/www/Downloads/survey_methodology/acs_design_methodology.pdf



Results from the 2006 ACS Content Test showed that the test version of the educational attainment question had a higher rate of multiple responses than occurred with the old version (see Appendix B). Since the biggest changes from the old to the new layouts were the addition of headers in the response options and lengthening (visually) the list of checkboxes, these factors may be most responsible for the change in respondent behavior.

Due to the transition from KFP to the new data capture system in summer 2007, electronic multiple response data were readily accessible for the second half of 2007. To analyze the change in respondent behavior due to the change in the questionnaire, we compared the 2007 data for the August through December sample panels to 2008 August through December panel

data. The 2007 sample panel data were collected using the old version of the question and the 2008 sample panel data were collecting using the new version. We found that although the number of total responses was similar for each period, the 2008 time frame had more than double the number of multiple responses instances than were recorded for the same sample panel months in 2007. There were 1,439,518 and 1,110,731 total responses to the educational attainment item for the 2007 and 2008 periods, respectively. In the 2007 period there were 34,486 multiple response instances, but in the 2008 period there were 110,158 multiple response instances. This means that the multiple response rates for these time periods were 2.4 percent in 2007 and, in contrast, 9.9 percent in 2008. This is similar to the finding in the 2006 Content Test, 2.8 percent for the control version and 9.0 percent for the test version.

We decided to see how the most frequent combinations of multiple responses differed between the two treatments. First, we had to recode all of the checkbox responses so that responses from the two years were comparable.⁴ After recoding, we were then able to compare the response combinations between question versions. Table 3 shows combinations that had at least 1,000 instances during both treatments. We found that the top four response combinations were the same. At first this seemed sort of surprising because in a study that looked at the effect of the grouping of response options in an educational attainment question, researchers found that the respondents answered differently to response options that were divided by distinctive headers and space in an online survey (Redline, et. al., 2009).

Table 3. Multiple Response Combinations for Two Versions of the Educational Attainment Item
Source: American Community Survey Mail Responses for August – December Sample Panels in 2007 and 2008
www.census.gov/acs/www/Downloads/survey_methodology/acs_design_methodology.pdf

Response A	Response B	2007 Aug-Dec Panels			2008 Aug-Dec Panels		
		Number of Instances	Percent of Item's Multiple Responses	Percent of Item's Total Responses	Number of Instances	Percent of Item's Multiple Responses	Percent of Item's Total Responses
High School Graduate	Some College Credit	13,335	38.7	0.9	32,926	29.9	3.0
High School Graduate	1+ Years College Credit	8,716	25.3	0.6	29,384	26.7	2.6
High School Graduate	Associate's Degree	1,552	4.5	0.1	7,370	6.7	0.7
5th to 11th Grade	High School Graduate	1,124	3.3	0.1	5,998	5.4	0.5
	Other Instances	9,759	28.3	0.7	34,480	31.3	3.1
	Total Instances	34,486	100.0	2.4	110,158	100.0	9.9

Still after this investigation, it is not clear why the design change between the 2007 and the 2008 educational attainment question makes respondents more apt to mark multiple responses.

⁴ For example, the newer version of the question has a checkbox for grade levels 1 through 11, but the older version has checkboxes that distinguish between several different grades. For a quick assessment, we chose to use the write-in field for grade level in the 2008 data and create recodes for nursery school through fourth grade and fifth grade through eleventh grade. Multiple response combinations from the 2008 data that marked “grade level 1 through 11” and did not have a write-in value were not recoded into either category. This is a minor limitation since there were few of these cases in relation to the number of multiple responses who marked “grade level 1 through 11” and provided a write-in response.

However, there are other possible explanations yet to be explored. One might be an effect due to the bolded green headers, and a second might be what we are calling “the milestone effect”. First, the dark green headers added to this question in 2008 may catch people’s eye like a bold title in text book. These divisions among the list of response checkboxes may divide the reader’s attention, making them more inclined to mark multiple boxes. Second, due to sociological factors respondents may desire declaring their major academic milestones like high school graduation or college graduation. For young children, we now often celebrate kindergarten graduation and graduation from elementary school because they are seen as noteworthy accomplishments. Thus, our respondents may have a tendency to mark checkboxes associated with milestones that they are proud to report they have achieved.

(d) Can other information on the form indicate what the correct response should be?

There are several variables already used in the edits that can make an educated guess at a person’s highest level of educational attainment (ie. age). However, since the ACS currently records the highest level of attainment in the event of a multiple response, we are confident that the correct answer is selected.

Heating Fuel

(a) What are the instructions and example provided on the questionnaire?

This question asks which fuel was used most for heating the housing unit. There is no instruction to mark only one checkbox or special instruction for the case where two fuels are used equally often. Figure 3 shows the question as it appeared on the 2008 ACS form.

Figure 3. Heating Fuel Item

Source: 2008 American Community Survey Questionnaire

www.census.gov/acs/www/Downloads/survey_methodology/acs_design_methodology.pdf

Which FUEL is used MOST for heating this house, apartment, or mobile home?

- Gas: from underground pipes serving the neighborhood
- Gas: bottled, tank, or LP
- Electricity
- Fuel oil, kerosene, etc.
- Coal or coke
- Wood
- Solar energy
- Other fuel
- No fuel used

(b) What are the combinations of checkboxes being marked?

Due to the large number of multiple response combinations for this item, Table 4 shows only combinations that make up one percent or more of the multiple responses. The table shows that 49.3 percent of the multiple responses to this item were “gas from underground pipes serving the neighborhood” with “electricity”. For comparison, the 2005 ACS KFI Test also found this combinatory response to occur in nearly half of the heating fuel multiple responses. “Wood” with another fuel was another common multiple response that accounted for about 23.4 percent of the multiple responses. In these instances, wood may be the secondary heating fuel for the housing unit.

Table 4. Most Frequent Multiple Responses to the Heating Fuel Item

Source: 2008 American Community Survey Sample

www.census.gov/acs/www/Downloads/survey_methodology/acs_design_methodology.pdf

Response A	Response B	Response C	Number of Instances	Percent of Item's Multiple Responses	Percent of Item's Total Responses
Gas: underground pipes	Electricity		24,970	49.3	2.00
Gas: bottled, tank, or LP	Electricity		5,456	10.8	0.44
Electricity	Wood		3,911	7.7	0.31
Gas: bottled, tank, or LP	Wood		2,934	5.8	0.23
Fuel oil, kerosene, etc.	Wood		2,381	4.7	0.19
Gas: underground pipes	Wood		2,124	4.2	0.17
Electricity	Fuel oil, kerosene, etc.		1,506	3.0	0.12
Electricity	No fuel used		841	1.7	0.07
Gas: bottled, tank, or LP	Fuel oil, kerosene, etc.		618	1.2	0.05
Gas: bottled, tank, or LP	Electricity	Wood	520	1.0	0.04
		Other Instances	5,385	10.6	0.43
		Total Instances	50,646	100.0	4.05

(c) Why might the respondent be marking multiple checkboxes?

Although this question does not specify to mark only one box, in the 2006 Content Test it was found that adding such an instruction statistically increased the proportion of multiple responses from low response areas (Woodward, et. al., 2007). It seems counterintuitive that respondents would be more inclined to mark multiples when they are instructed to mark only one box, so maybe we are not asking them their main heating fuel source in a way that is best for their understanding. Moreover, it may be the case that respondents use two heating fuels equally often. To help respondents with this issue a special instruction in italics, following the convention used in the questionnaire, could be tested. Second, respondents may be marking multiple checkboxes because they are not realizing that the question is asking about heating fuel. In the question's wording, "fuel" is capitalized, which may take the emphasis off of "HEATING fuel" as the subject of inquiry. Some respondents may respond with "electricity" and "gas" because their homes use both fuels, even though only one of them is used for heating.

(d) Can other information on the form indicate what the correct response should be?

Two questionnaire items regarding the household monthly consumption of gas and electricity are asked in the housing section of the ACS form. Although answers to these questions indicate if the household uses gas or electricity, they do not help us to determine which fuels are used for heating purposes. Moreover, we looked at cases that marked multiple responses to the heating fuel item on their mail form and were followed up with to obtain a single response in the ACS's failed edit follow up (FEFU) operation.

In instances where a respondent marks a multiple response and only one is allowed, ACS typically blanks the response and imputes a value during the editing process (the only exception is the educational attainment item). However, if sample cases are followed up with in FEFU, the interviewer asks the respondent for answers to items that are blank. So, for cases that had a multiple response to the heating fuel item and resulted in a completed interview coming out of the FEFU operation, we will have (ideally) the single response that each respondent should have provided on the mail form.

From our analysis, we learned that often times the correct answer was one of the responses from the multiple response combination, but the correct responses were not always evenly distributed among the fuel types in the original multiple response combination. For example, instances of the most common multiple response combination, "gas from underground pipes" and "electricity", resolved to "gas from underground pipes" 74 percent of the time after a FEFU interview while only 23 percent of the time it resolved to "electricity".

Journey to Work

(a) What are the instructions and example provided on the questionnaire?

This question asks how the respondent usually got to work last week. Following that, there is a long special instruction that says if more than one mode is used then mark the method of transportation used for the greatest distance. Figure 4 displays this question as it appeared on the 2008 ACS form.

Figure 4. Journey to Work Question Item

Source: 2008 American Community Survey Questionnaire

www.census.gov/acs/www/Downloads/survey_methodology/acs_design_methodology.pdf

30 How did this person usually get to work **LAST WEEK**? If this person usually used more than one method of transportation during the trip, mark (X) the box of the one used for most of the distance.

<input type="checkbox"/> Car, truck, or van	<input type="checkbox"/> Motorcycle
<input type="checkbox"/> Bus or trolley bus	<input type="checkbox"/> Bicycle
<input type="checkbox"/> Streetcar or trolley car	<input type="checkbox"/> Walked
<input type="checkbox"/> Subway or elevated	<input type="checkbox"/> Worked at home → SKIP to question 38a
<input type="checkbox"/> Railroad	<input type="checkbox"/> Other method
<input type="checkbox"/> Ferryboat	
<input type="checkbox"/> Taxicab	

(b) What are the combinations of checkboxes being marked?

Due to the large number of observed combinations, Table 5 shows only combinations that represented one percent or more of the multiple responses. There are many multiple response combinations that occur often, but most of the combinations involve the checkbox for “car, truck, or van”. The most frequent combination was “car, truck, or van” and “motorcycle”, which accounted for 12.3 percent of all journey to work multiple responses. Respondents who reply this way may do so because they drove to work and rode their motorcycle that week. Similarly, the 8.4 percent of multiple responses of “car, truck, or van” with “worked at home” probably results from a respondent that commuted to work and worked at home that week.

Table 5. Most Frequent Multiple Responses to the Journey To Work Item

Source: 2008 American Community Survey Sample

www.census.gov/acs/www/Downloads/survey_methodology/acs_design_methodology.pdf

Response A	Response B	Response C	Number of Instances	Percent of Item's Multiple Responses	Percent of Item's Total Responses
Car, truck, or van	Motorcycle		2,038	12.3	0.15
Car, truck, or van	Walked		1,769	10.6	0.13
Car, truck, or van	Bus or trolley bus		1,603	9.6	0.12
Car, truck, or van	Worked at home		1,395	8.4	0.10
Bus or trolley bus	Subway or elevated		1,315	7.9	0.10
Car, truck, or van	Other method		927	5.6	0.07
Car, truck, or van	Bicycle		861	5.2	0.06
Car, truck, or van	Subway or elevated		735	4.4	0.05
Walked	Worked at home		701	4.2	0.05
Car, truck, or van	Railroad		469	2.8	0.03
Bus or trolley bus	Walked		453	2.7	0.03
Bicycle	Walked		302	1.8	0.02
Subway or elevated	Railroad		275	1.7	0.02
Car, truck, or van	Bicycle	Walked	215	1.3	0.02
Car, truck, or van	Bus or trolley bus	Subway or elevated	188	1.1	0.01
Subway or elevated	Walked		181	1.1	0.01
Bus or trolley bus	Railroad		178	1.1	0.01
		Other Instances	3,016	18.1	0.22
		Total Instances	16,621	100.0	1.21

(c) Why might the respondent be marking multiple checkboxes?

Respondents may be marking multiples because they do not commute to work the same way everyday. This may be the case for the following combinations: “car, truck, or van” with “motorcycle”, which accounted for 12.3 percent of multiples; “car, truck, or van” with “worked at home”, which accounted for 8.4 percent of multiples; and “walked” with “worked at home”, which accounted for 4.2 percent of multiples. Another reason respondents may mark multiple checkboxes is that they use two or more modes of transportation during their commute. Although there is a special instruction that says if the person used more than one method of transportation during their trip then he/she should mark the box for the mode used for most of the distance, the special instruction is three lines long so it may be overlooked. Also, if a respondent feels he/she has understood this question they may not look at the special instructions.

(d) Can other information on the form indicate what the correct response should be?

There is no other information on the ACS form that could reveal the correct response. However, we looked at the journey to work multiple response cases shown in Table 4 that were followed up with in the ACS’s failed edit follow up (FEFU) operation to obtain a single response. These cases often resolved to a single response that was one of the answers from the respondent’s multiple response. Also, each multiple response combination was resolved differently in that the corrected responses did not resolve to a certain response for a vast majority of the time. For example, the multiple responses for “car, truck, or van” and “worked at home” that were sent to FEFU (n=197) resolved to “car, truck, or van” 48.7 percent of the time and to “worked at home” 48.7 percent of the time. In comparison, the multiple responses of “car, truck, or van” and “walked” sent to FEFU (n=267) were corrected to “car, truck, or van” 54.3 percent of the time, “walked” 28.5 percent of the time, and “worked at home” 12.7 percent of the time.

Year Built

(a) What are the instructions and example provided on the questionnaire?

This question asks when, approximately, the housing unit was first built. Figure 5 shows the question as it appeared on the 2008 ACS form.

Figure 5. Year Built Item

Source: 2008 American Community Survey Questionnaire

www.census.gov/acs/www/Downloads/survey_methodology/acs_design_methodology.pdf

2 About when was this building first built?

2000 or later – Specify year →

1990 to 1999

1980 to 1989

1970 to 1979

1960 to 1969

1950 to 1959

1940 to 1949

1939 or earlier

(b) What are the combinations of checkboxes being marked?

Table 6 shows response combinations that accounted for one percent or more of the multiple responses to this question. Most often respondents marked the “2000 or later” checkbox with another answer choice. These instances account for 67.7 percent of all the multiple response cases. Another common multiple response was for the respondent to select adjacent time period like “1970 to 1979” with “1980 to 1989”. This occurred in at least 22.9 percent of the multiple responses. Both of these multiple marking conventions represent almost all of the multiple response combinations.

Table 6. Most Frequent Multiple Responses to Year Built

Source: 2008 American Community Survey Sample

www.census.gov/acs/www/Downloads/survey_methodology/acs_design_methodology.pdf

Response A	Response B	Number of Instances	Percent of Item's Multiple Responses	Percent of Item's Total Responses
2000 or later	1990 to 1999	1,213	15.8	0.11
2000 or later	1970 to 1979	1,069	13.9	0.09
2000 or later	1980 to 1989	859	11.2	0.08
2000 or later	1960 to 1969	675	8.8	0.06
2000 or later	1950 to 1959	629	8.2	0.05
2000 or later	1939 or earlier	490	6.4	0.04
1970 to 1979	1960 to 1969	350	4.5	0.03
1980 to 1989	1970 to 1979	341	4.4	0.03
1960 to 1969	1950 to 1959	325	4.2	0.03
1940 to 1949	1939 or earlier	270	3.5	0.02
1950 to 1959	1940 to 1949	266	3.5	0.02
2000 or later	1940 to 1949	259	3.4	0.02
1990 to 1999	1980 to 1989	217	2.8	0.02
	Other Instances	730	9.5	0.06
	Total Instances	7,693	100.0	0.67

(c) Why might the respondent be marking multiple checkboxes?

First, let us discuss the multiple response combination where the “2000 or later” checkbox is marked with another checkbox. Of the cases that marked multiples in this manner, 68 percent provided a write-in value. We hypothesized that looking at the write-in values for these cases may provide a hint as to why respondents would mark multiples in this way.

Of the cases that marked “2000 or later” with another checkbox and provided a write-in value, 94 percent wrote in a year that fell within the time period of the second checkbox marked. We conclude that respondents who mark “2000 or later” with another checkbox typically write in the year that falls within the time frame of the second checkbox. This provides reasonable evidence that respondents who mark “2000 or later” with another checkbox know that their houses were built prior to 2000 and are trying to communicate that. This behavior may result from interpreting “2000 or later” to mean “2000 or earlier”. These respondents may also read and check the box for “2000 or later” before they read the rest of the answer options. In a list of response options, respondents usually select items near the top of the list (Kroshnick & Alwin, 1987).

Other multiple response combinations were selections of adjacent time periods. A respondent may select both time periods if he/she is not certain which time frame is the correct response. Thus, by selecting both time periods, the respondent may be indicating a range for the year his/her housing unit was first built. Further investigation showed that this behavior was seen among both renters and owners.

(d) Can other information on the form indicate what the correct response should be?

No, there is no other information on the ACS form that could reveal what the correct response should be in the event of a multiple response. However, the combinations of multiple responses are convincing evidence that respondents are answering the year built question in one of two ways: prematurely marking “2000 or later” when they really mean a year earlier than 2000 or providing the ACS with a longer, estimated time frame. This theory could be checked by reviewing the multiple response cases sent to ACS’s FEFU operation for the mail mode. If the case was reopened in FEFU and correct data were obtained for the year built item, we would know what the correct response should have been. We refrained from analyzing the FEFU data for this item because we believe we have sufficient evidence as to what is going on and that it would not change our conclusions.

Class of Worker

(a) What are the instructions and example provided on the questionnaire?

This question asks what this person is and provides a special instruction that specifies to mark only one box. The question follows from an introduction that describes questions 40-45 and instructions respondents on which job they should report. Figure 6 shows the question as it appeared on the 2008 ACS form.

Figure 6. Class of Worker Item

Source: 2008 American Community Survey Questionnaire

www.census.gov/acs/www/Downloads/survey_methodology/acs_design_methodology.pdf

K Answer questions 40 – 45 if this person worked in the past 5 years. Otherwise, SKIP to question 46.

40 – 45 CURRENT OR MOST RECENT JOB ACTIVITY. Describe clearly this person's chief job activity or business last week. If this person had more than one job, describe the one at which this person worked the most hours. If this person had no job or business last week, give information for his/her last job or business.

40 Was this person –
Mark (X) ONE box.

- an employee of a PRIVATE FOR PROFIT company or business, or of an individual, for wages, salary, or commissions?
- an employee of a PRIVATE NOT FOR PROFIT, tax-exempt, or charitable organization?
- a local GOVERNMENT employee (city, county, etc.)?
- a state GOVERNMENT employee?
- a Federal GOVERNMENT employee?
- SELF-EMPLOYED in own NOT INCORPORATED business, professional practice, or farm?
- SELF-EMPLOYED in own INCORPORATED business, professional practice, or farm?
- working WITHOUT PAY in family business or farm?

(b) What are the combinations of checkboxes being marked?

Table 7 shows only combinations that represented one percent or more of the multiple responses. Many of the multiple response combinations include checkboxes relating to self-employment with another checkbox response or government employment with another checkbox response. Table 7 shows that the most common multiple responses involved “private for profit” with self-employment, which account for 30.2 percent of the multiple responses for this item. Also, some combinations such as “private for profit” and “private not for profit”, which is the third most frequent multiple response, sounds as if respondents are reporting on two different jobs.

Table 7. Most Frequent Multiple Responses to the Class of Worker Item

Source: 2008 American Community Survey Sample

www.census.gov/acs/www/Downloads/survey_methodology/acs_design_methodology.pdf

First Selection	Second Selection	Number of Instances	Percent of COW Multiple Responses	Percent of Total COW Responses
Private for Profit	Self-Employed, Not Incorporated	2,061	19.0	0.13
Private for Profit	Self-Employed, Incorporated	1,219	11.2	0.07
Private for Profit	Private Not for Profit	926	8.5	0.06
Local Government	State Government	854	7.9	0.05
Self-Employed, Not Incorporated	Without Pay	626	5.8	0.04
Private for Profit	Local Government	587	5.4	0.04
Private for Profit	Without Pay	495	4.6	0.03
Self-Employed, Not Incorporated	Self-Employed, Incorporated	419	3.9	0.03
Private Not for Profit	Self-Employed, Not Incorporated	339	3.1	0.02
Private for Profit	State Government	331	3.0	0.02
Self-Employed, Incorporated	Without Pay	288	2.7	0.02
Private for Profit	Federal Government	273	2.5	0.02
Private Not for Profit	Local Government	245	2.3	0.01
Local Government	Self-Employed, Not Incorporated	238	2.2	0.01
State Government	Federal Government	226	2.1	0.01
Local Government	Federal Government	211	1.9	0.01
Private Not for Profit	State Government	142	1.3	0.01
State Government	Self-Employed, Not Incorporated	124	1.1	0.01
Other Response Combinations		1,256	11.6	0.08
Total COW Multiple Responses		10,860	100.0	0.66

(c) Why might the respondent be marking multiple checkboxes?

The two most frequent multiple responses for this question, “private for profit” with “self-employed, not incorporated” or “self-employed, incorporated”, may be responses from respondents who are solely business owners or who work for a “private for profit” but are also self-employed on the side. These individuals fall in both categories according to the answer choice descriptions, so although the special instructions for this question say to mark only one checkbox it is difficult for them to mark a single response.

Other reasons respondents may be marking multiple checkboxes is because they hold two or more jobs. Seeing responses such as government employment with “private for profit” leads us to believe this. Although there is an instruction to mark only one box, there is no specification on how to answer if you are employed in multiple organizations. In order to capture the number of workers who hold two or more jobs, this question may need to be revised.

(d) Can other information on the form indicate what the correct response should be?

Although there is no other checkbox question that will provide a precise hint to the correct response in the case of a multiple response to the class of worker question, there are a few questions that ask for write-in responses that could be helpful. These are items P41, P42, P44, and P45 on the questionnaire and they ask for the name of the person’s employer, the kind of business or industry it is, the kind of work the person does, and the most important activities or duties the person performs. Since these are write-in entries and not checkbox responses, it would be harder to appropriately assess the correct response for each multiple selection for the class of worker question. This is a task best left for the edits.

Grade Level Attending

(a) What are the instructions and example provided on the questionnaire?

This question asks what grade or level this person was attending in the last 3 months. There is a special instruction that says to mark only one box. Figure 7 shows the question as it appears on the form, along with the question asked directly before it.

Figure 7. Grade Level Attending Item

Source: 2008 American Community Survey Questionnaire

www.census.gov/acs/www/Downloads/survey_methodology/acs_design_methodology.pdf

a. At any time IN THE LAST 3 MONTHS, has this person attended school or college? *Include only nursery or preschool, kindergarten, elementary school, home school, and schooling which leads to a high school diploma or a college degree.*

No, has not attended in the last 3 months → *SKIP to question 11*

Yes, public school, public college

Yes, private school, private college, home school

b. What grade or level was this person attending?
Mark (X) ONE box.

Nursery school, preschool

Kindergarten

Grade 1 through 12 – *Specify grade 1 – 12*

College undergraduate years (freshman to senior)

Graduate or professional school beyond a bachelor's degree (*for example: MA or PhD program, or medical or law school*)

(b) What are the combinations of checkboxes being marked?

Table 8 shows only combinations that represented one percent or more of the multiple responses. Responses and multiple responses for this question were counted regardless of their eligibility to respond (if the respondent answered “no” in part (a) of the question then they are told to skip to question 11). However, the negative effect of including additional responses in our analysis is estimated to be minimal and is suitable for this general analysis. The multiple response “grade 1 through 12” with “college undergraduate years” was the most frequent multiple responses, occurring 49.0 percent of the time. The next most common multiple responses were “kindergarten” with “grade 1 through 12” and “undergraduate” with “graduate”, accounting for 12.1 and 10.4 percent, respectively, of the multiple responses.

Table 8. Most Frequent Multiple Responses to the Grade Level Attending Item

Source: 2008 American Community Survey Sample

www.census.gov/acs/www/Downloads/survey_methodology/acs_design_methodology.pdf

Response A	Response B	Response C	Response D	Number of Instances	Percent of Item's Multiple Responses	Percent of Item's Total Responses
Grade 1 - 12	Undergraduate			2,195	49.0	0.30
Kindergarden	Grade 1 - 12			544	12.1	0.08
Undergraduate	Graduate			467	10.4	0.06
Grade 1 - 12	Graduate			339	7.6	0.05
Nursery/Preschool	Kindergarden			308	6.9	0.04
Nursery/Preschool	Kindergarden	Grade 1 - 12		267	6.0	0.04
Grade 1 - 12	Undergraduate	Graduate		82	1.8	0.01
Nursery/Preschool	Grade 1 - 12			64	1.4	0.01
Kindergarden	Grade 1 - 12	Undergraduate		49	1.1	0.01
Nursery/Preschool	Kindergarden	Grade 1 - 12	Undergraduate	48	1.1	0.01
				Other Instances	121	2.7
				Total Instances	4,484	100.0
						0.62

(c) Why might the respondent be marking multiple checkboxes?

Respondents who have just graduated or completed one educational milestone and are progressing towards or are in another may mark multiple responses to this question. It is possible to be in both categories during a three month reference period. For example, high school graduates that are about to attend or currently attend college may mark the “grade 1 through 12” and “undergraduate” checkboxes. Further investigation shows that multiple responses of “grade 1 through 12” with “undergraduate” generally specified attendance in grade “12” (59.9 percent) or left the write in field blank (30.9 percent).

Other examples of respondents who marked multiples to this question are children who have completed kindergarden and are about to attend first grade, and students who have recently completed their undergraduate degree and are beginning their graduate programs. In the second and third most frequent multiple responses, cases like these seemed to account for a majority of the multiple responses.

Revising this question to have a time reference of less than 3 months might eliminate multiple responses from respondents in “in between” situations, but this could have some other negative effects like losing count of people who recently graduated or losing people during breaks when they aren’t in school. Also, as with other items being analyzed in this evaluation, we note that the instruction to mark only one checkbox is separated from the question by italics. Dillman recommends using the same font as the question because instructions separated from a question by font are usually assumed to be optional or occasionally needed (Dillman, 2007).

(d) Can other information on the form indicate what the correct response should be?

The educational attainment question may provide a hint as to what the correct response may be, but no other information on the ACS form could reveal what the correct response should be in the event of a multiple response. If time permits, it might be interesting to look at how multiple response cases are resolved in the ACS’s FEFU operation where the respondent is contacted to clarify or provide missing data items.

3. Should ACS continue to blank multiple responses in the mail mode or treat them differently either in data capture or during editing?

After extensively looking at the multiple response combinations items with the highest rates of multiple responses, we see that across the board that there are a few prominent multiple response combinations for each item. For a few of the items we were able to see what the correct response should have been for each multiple response combination using FEFU, and that response is not the same 100 percent of the time for each combination. There are surely methods yet to be developed that could more accurately impute what the correct answer might be, and analysts are encouraged to consider this when it's time to revise their edits. However, at the same time, we want to caution over-editing the data. This report will be distributed among subject matter analysts whose corresponding ACS questions had high multiple response rates in the mail for them to make their own decisions.

Conclusions

This assessment tells us that multiple responses are not very common in the ACS with the exception of responses to the educational attainment and heating fuel items, which had multiple response rates around 10 percent and 4 percent, respectively, in the 2008 ACS sample. Revisions for items should be considered for future content testing to determine if it is possible to reduce the rate of multiple responses without jeopardizing data quality.

It is advised that the Statistical Process Control (SPC) team continue to monitor the rates of multiple response in the ACS because, due to the discovery of the processing error for telephone and refrigerator item responses, it has been shown that these rates can be indicative of an error in the labeling of checkboxes on the ACS questionnaire, which is a tedious job done by hand by one person for lots of different ACS forms. As ACS expands the languages it offers for its questionnaires and continues to make changes to questions, monitoring these rates will become more essential.

We also encourage analysts to consider using multiple response data in future edit revisions as we know the multiple responses from the mail mode are blanked and imputed without regard to the response combinations that the respondent provided. Some have already, as a result of this research, compared how particular multiple response combinations are resolved in FEFU versus the imputation process. Comparisons, at least for the heating fuel question, showed that the differences between the actual and imputed data are moderate.

Moreover, an Internet response option for the ACS is being tested. If successfully added to ACS production, the Internet questions will help alleviate multiple response issues because we use radio buttons that prevent multiple responses for single response items.

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Appendix A

Table A. Multiple Responses for Checkbox Items Requiring a Single Response

Source: 2008 American Community Survey Sample

www.census.gov/acs/www/Downloads/survey_methodology/acs_design_methodology.pdf

Item	Item Number	Variable Name	Number of Multiple Responses	Number of Total Responses	Multiple Response Rate
Educational attainment	P11	SCHL	272,272	2,707,636	10.06
Heating fuel	H10	HFL	50,646	1,251,500	4.05
Journey to work	P30	JWTR	16,621	1,370,126	1.21
Months responsible for grandchildren	P24c	GCM	217	31,236	0.69
Year built	H2	YBL	7,693	1,143,855	0.67
Class of worker	P40	COW	10,860	1,648,452	0.66
Grade level attending	P10b	SCHG	4,484	720,169	0.62
Electricity	H11a	ELEX	223	50,232	0.44
Type of industry	P43	INX4	6,929	1,583,415	0.44
Available for work	P36	NWAV	2,064	484,139	0.43
Gas	H11b	GASX	1,052	379,635	0.28
Water	H11c	WATX	970	356,905	0.27
Service in Armed Forces	P25	MIL	6,216	2,401,108	0.26
Tenure	H14	TEN	2,914	1,228,714	0.24
Mobility status	P14a	MIG	5,954	2,762,282	0.22
Place of work	P29c	PWX3	2,634	1,332,225	0.20
AM/PM Journey to work	P32	JWAM	2,455	1,271,152	0.19
Weeks worked past 12 months	P38a	WKW	1,433	809,212	0.18
Type of building	H1	BLD	2,040	1,253,429	0.16
Marital status	P19	MAR	3,742	2,419,118	0.15
English ability	P13c	ENG	1,277	886,265	0.14
When last worked	P37	WKL	1,576	1,172,745	0.13
Mortgage	H19a	MRGX	1,371	1,037,032	0.13
Disability rating	P27a	DRAT	171	133,163	0.13
Citizenship	P8	CIT	3,396	2,821,064	0.12
Second mortgage	H20a	SMX	1,230	1,034,375	0.12
Number of vehicles	H9	VEH	1,217	1,252,371	0.10
Relationship	P2	REL	2,616	2,926,769	0.09
Health insurance through Medicaid	P15d	HINS4	1,341	1,553,532	0.09
Health insurance purchased directly	P15b	HINS2	1,326	1,633,028	0.08
Wages/salary	P46a	WAGX	1,398	1,860,055	0.08
School enrollment	P10a	SCH	1,947	2,765,440	0.07
Health insurance - employer/union	P15a	HINS1	1,671	2,416,385	0.07
Speaks another language at home	P13a	LANX	1,752	2,801,396	0.06
Worked 50 weeks or more in past 12 months	P38b	WKWX	1,060	1,712,991	0.06
Condominium	H13	CONX	647	1,146,263	0.06
Mortgage payment includes insurance	H19d	MRGI	330	590,637	0.06
Other fuel	H11d	FULX	398	771,807	0.05
Social Security or railroad retirement	P46d	SSX	1,070	2,095,660	0.05
Health insurance through Medicare	P15c	HINS3	850	1,744,130	0.05
Interest, rental income, etc.	P46c	INTX	922	1,965,888	0.05
Worked last week	P28a	WRK	1,029	2,433,346	0.04
Informed of recall	P34c	NWRE	159	380,486	0.04
Retirement reciprocity	P46g	RETX	827	2,110,609	0.04
Agriculture sales	H5	AGS	205	575,920	0.04
Health insurance through other source	P15h	HINS8	510	1,448,186	0.04

Item	Item Number	Variable Name	Number of Multiple Responses	Number of Total Responses	Multiple Response Rate
Any work last week	P28b	WRKJ	436	1,276,058	0.03
Physical disability	P17a	DPHY	842	2,648,416	0.03
Looking for work	P35	NWLK	379	1,228,395	0.03
Difficulty going out	P18	DOUT	727	2,412,034	0.03
Mortgage payment includes real estate tax	H19c	MRGT	173	591,733	0.03
Difficulty remembering	P17b	DREM	776	2,661,052	0.03
Disability rating	P27b	DRATX	116	407,330	0.03
Acreage	H4	ACR	291	1,024,464	0.03
Times married	P21	MARHT	478	1,780,588	0.03
Married in the past 12 months	P20a	MARHM	491	1,829,931	0.03
Temporarily absent from work	P34b	NWAB	324	1,208,416	0.03
Responsible for grandchildren	P24b	GCR	122	465,649	0.03
Married in the past 12 months	P20a	MARHM	491	1,829,931	0.03
Times married	P21	MARHT	478	1,780,588	0.03
Mortgage payment includes real estate tax	H19c	MRGT	173	591,733	0.03
Temporarily absent from work	P34b	NWAB	324	1,208,416	0.03
Looking for work	P35	NWLK	379	1,228,395	0.03
Meals included in rent	H15b	RNTM	84	332,864	0.03
Any work last week	P28b	WRKJ	436	1,276,058	0.03
Business on property	H6	BUS	191	1,060,398	0.02
Difficulty dressing	P17c	DDRS	606	2,654,280	0.02
Hearing difficulty	P16a	DEAR	475	2,825,293	0.02
Fertility	P23	FER	255	1,328,719	0.02
Grandchildren living in house	P24a	GCL	420	2,394,318	0.02
On layoff	P34a	NWLA	287	1,327,140	0.02
Other income reciprocity	P46h	OIX	393	2,134,952	0.02
Place of birth	P7	PBX1	445	2,595,763	0.02
Running water	H8a	RWAT	198	1,256,388	0.02
Self-employment reciprocity	P46b	SEMX	418	2,007,366	0.02
Sex	P3	SEX	627	2,929,565	0.02
Bathtub or shower	H8c	BATH	151	1,254,193	0.01
Vision difficulty	P16b	DEYE	388	2,807,780	0.01
Yearly food stamp reciprocity	H12	FS	87	1,248,098	0.01
Health insurance through Tricare	P15e	HINS5	224	1,494,123	0.01
Health insurance through VA	P15f	HINS6	171	1,481,447	0.01
Health insurance through Indian Health Service	P15g	HINS7	93	1,452,211	0.01
Divorced in the past 12 months	P20c	MARHD	96	1,698,961	0.01
Widowed in the past 12 months	P20b	MARHW	134	1,703,462	0.01
Public assistance reciprocity	P46f	PAX	210	2,150,826	0.01
Sink with faucet	H8d	SINK	90	1,253,676	0.01
Supplemental Security Income reciprocity	P46e	SSIX	271	2,121,799	0.01
Stove or range	H8e	STOV	123	1,253,580	0.01
Flush Toilet	H8b	TOIL	121	1,254,397	0.01

Appendix B

These are some unpublished results from the 2006 Content Test for multiple response analysis of the educational attainment items. The “test” version is the version we now use in production.

Table 19. Multiple Responses for Educational Attainment, Mail Responses, Age ≥ 3

Source: 2006 American Community Survey Content Test

www.census.gov/acs/www/methodology/2006_content_test/

	Control (TREATMENT=1)	Test (TREATMENT=2)	Diff	ME	Significant
One response ¹ (ATTAIN_MULT=1)	91.8%	82.0%	-9.8%	± 0.8%	Yes
Multiple responses ² (ATTAIN_MULT=2)	2.8%	9.0%	6.2%	± 0.5%	Yes
No response (ATTAIN_MULT=3)	5.4%	9.0%	3.6%	± 0.6%	Yes

¹If only one response was given to the educational attainment question. In the test version, if the “Grade 1 through 11” box was checked but a grade was not specified it is counted as non-response. If the box was not checked, but a grade was specified that counts as one response.

²If more than one response was given to the educational attainment question.