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MEMORANDUM FOR	ACS Research and Evaluation Workgroup
From:	Victoria Velkoff Chief, American Community Survey Office
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Subject:	Evaluation of Changes Implemented in the 2016 American Community Survey Internet Instrument

Attached is the final American Community Survey Research and Evaluation report "Evaluation of the 2016 American Community Survey Internet Instrument Improvements." The U.S. Census Bureau completed this evaluation to ensure that the improvements introduced to the internet data collection instrument in 2016 are working as expected. The implemented changes included a Personal Identification Number reset functionality, highlighted response fields for unfolding questions, revisions to transition screens, and an increased height and width for the Ancestry response field. Based on the criteria for this evaluation, these changes have improved the American Community Survey's internet data collection instrument.

If you have any questions about this report, please contact R. Chase Sawyer at 301-763-8688 or Dave Raglin at 301-763-4226.

Attachment

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Evaluation of Changes Implemented in the 2016 American Community Survey Internet Instrument

FINAL REPORT

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Executive Summary

The American Community Survey (ACS) is continually looking for ways to reduce respondent burden and conserve resources while maintaining data quality. This report evaluates recent efforts to achieve these goals with changes to the internet data collection instrument in 2016.

With the initial testing and release of the internet instrument, the ACS discovered that there were issues that confused respondents and resulted in breakoffs. Some of these issues included:

- The inability to re-enter the instrument without the Personal Identification Number (PIN) provided at the beginning of the interview.
- High error rates on unfolding questions.
    - These questions provide a write-in field when a certain response triggers the need for more information. They appear on the same screen as the original question.
- A high number of breakoffs on transition screens due to confusing instructions.
- A lower number of reported ancestry responses than expected.

Over the course of the 2016 data year, the ACS implemented four major changes to the internet instrument based on the results of the 2014 ACS Internet Test. These changes were:

- The addition of security questions for PIN reset capability.
- Highlighted response fields for unfolding questions.
- Removal of transition screen and new language for “Pick Next Person” screen.
- Increased height of the ancestry response field.

In this report, to see if the changes had the expected results, data were analyzed before and after the implementation of the changes. From this research, the ACS determined that the changes to the 2016 internet instrument:

- Increased the number of times respondents re-entered the instrument.
- Decreased the number of errors received on unfolding questions.
- Decreased the number of breakoffs on transition screens.
- Increased the reporting of multiple ancestries.

Analysis was also performed to determine if more internet cases were completed before the mailout of the paper questionnaire after the implementation of these changes. There is evidence that the changes may have increased the number of returns received before mailout of the paper questionnaire.

1 Introduction

The American Community Survey (ACS) is continually testing ways to improve survey design and improve the respondent experience. In 2014, the Census Bureau conducted testing to determine if changes to the ACS internet data collection instrument would increase response rates and improve data collection (Zelenak, 2016). Testing showed an increase in overall response and item response rates. Based on the results of that research, the ACS implemented several changes into production in 2016. The changes were to add security questions for Personal Identification Number (PIN) reset capability, highlight response fields for unfolding questions, change the screens transitioning between responses about individual persons, and change the size of the response field for the Ancestry question.

The purpose of this evaluation is to determine if these changes have the results in ACS production as were observed in the 2014 ACS Internet Test. Most of this evaluation uses the same or very similar research questions. This report investigates if the alterations to transition screens and improved security features increased the number of respondents that successfully completed the survey. The evaluation also determines if changes to the formatting for write-in questions increased response quality.

In addition to evaluating these topics, this paper evaluates if respondents complete more surveys online before the ACS mails the paper questionnaire. Since some of the changes to the internet instrument were expected to reduce breakoffs and increase the return rates, it is hypothesized that more internet responses could be completed earlier in the data collection process. This would be an operational benefit because it would mean the ACS sends fewer mailings to respondents, which corresponds to cost savings and a reduction in perceived respondent burden.

2 Background

This evaluation builds upon work done in the 2014 ACS Internet Test. The ACS completed that experiment to determine if the proposed changes could improve internet data collection. Some areas for improvement included the PIN generation process, the capture of multiple types of ancestry, the number of breakoffs, and error rates on unfolding questions.

Since the analysis in this evaluation is heavily based upon the layout of the internet instrument, it is important to have a basic understanding of how the ACS is conducted and how questions are organized. The ACS is a multi-modal survey with four main data collection modes. These modes are internet, mail questionnaire, computer-assisted telephone interview (CATI), and computer-assisted personal interview (CAPI). This evaluation focuses on the internet data collection mode, but also looks at self-response which includes the mail mode. CATI and CAPI are both conducted as nonresponse follow-up operations. In addition to these modes, a small number of respondents complete the interview by using Telephone Questionnaire Assistance (TQA). TQA surveys are completed when a respondent contacts the Census Bureau using the

telephone number on the questionnaire and are treated as mail respondents when calculating return rates.

During the data collection process, the ACS asks questions in three different sections – basic demographic, housing, and detailed person sections. After login, address confirmation, and determining who lives in the household, the instrument presents the respondent with the questions from the basic demographic section. This series of questions asks about relationship, sex, age, Hispanic origin, and race (U.S. Census Bureau, 2014, Chapter 6).

After completing the basic demographic section, the ACS then asks the respondent the housing questions. In the housing section, the respondent answers questions that are specific to the housing unit. This includes information about subjects such as building type, tenure, and costs related to rent or homeownership (U.S. Census Bureau, 2014, Chapter 6).

After this section is complete, respondents move onto the detailed person section. The detailed person section gathers more information about the characteristics of individual household members. Some of these questions include place of birth, health insurance coverage, and labor force status (U.S. Census Bureau, 2014, Chapter 6). After the respondent finishes reporting the information for one of the household members, the respondent is then asked questions for other members of the household.

Over the course of the 2016 data year, the ACS implemented four major changes to the internet instrument based on the results of the 2014 Internet Test. These changes were:

- The addition of security questions for PIN reset capability.
- Highlighted response fields for unfolding questions.
- Removal of the transition screen and new language for “Pick Next Person” screen.
- Increasing the height of the ancestry response field.

2.1 PIN Reset

One area of concern was how respondents re-enter the instrument after they log in for the first time. In the internet instrument, once a respondent enters their User ID and confirms their address, the instrument provides the user with a PIN. This PIN allows the user to leave and re-enter the internet instrument while protecting confidentiality. The issue that sometimes arose is that respondents forgot their PIN and were not able to re-enter the instrument. In these cases, respondents had to contact the Census Bureau via phone call to have their PIN reset, but this process also reset the instrument, deleting the data the respondent had already provided.

Based on the results of the 2014 Internet Test, the ACS added security questions to the PIN generation process to allow users to reset the PIN on their own in the internet instrument for the July 2016 panel (Appendix A). The ACS believed this change would reduce respondent burden and increase the number of respondents that were able to re-enter the internet instrument to complete their questionnaire. This should lead to a higher number of completed cases via the internet instrument. In the 2014 ACS Internet Test, there were not enough

attempts to re-enter the survey using the security questions to reset the PIN to evaluate this change. The ACS decided to implement the change anyway because of the practical application (Zelenak, 2016).

2.2 Unfolding Questions

The 2014 Internet Test also examined how the ACS could reduce the number of error messages presented to the respondent by adjusting the presentation of unfolding questions. The internet instrument presents a number of questions only if the respondents answer the lead-in question in a certain way. For example, if a respondent selects the response option of "Some Other Race," an additional question appears that allows the respondent to write in a response. The problem that occurred in the initial rollout of the internet instrument was that some respondents did not seem to notice that the write-in field had appeared. The respondent would attempt to go to the next screen, but the instrument presented an error message asking them to complete the question. Some respondents provided a response and others moved on to the next question without providing a response.

Questions where the unfolding format is used include:

- Hispanic Origin
- Race
- Year Built
- Computer Use
- Internet Subscription
- Place of Birth
- Citizenship
- Current Grade Level
- Highest Grade Level
- Residence One Year Ago
- Health Insurance

The formatting change includes adding an arrow graphic that points to the write-in field, in addition to highlighting the field and bolding the border of the field (Appendix B). The research done in 2014 showed that these changes decreased the number of error messages received on the unfolding question screens (Zelenak, 2016). In July 2016, the ACS implemented the changes to these types of questions into the production internet instrument.

2.3 Transition Screen

In July 2016, the ACS also removed a screen and adjusted another screen used for transitioning between household members. Initially, after a respondent completed providing information about a person, a screen was displayed in the instrument to inform the respondent that the information was saved. Then the next screen of the instrument, called the "Pick Next Person" screen, asked the respondent to choose another person in the household for whom to report responses. Research showed that the way this transition between household members was

presented might have led respondents to break off and not complete the survey, because the respondent was instructed, “If you cannot answer now for any person on the list, click Save & Logout” (Horwitz et al., 2012).

In an attempt to fix this issue, the ACS adjusted the transition between these screens. The screen informing the respondent that the instrument was saving their data was removed. The ACS also implemented new language on the “Pick Next Person” screen to encourage respondents to answer the questions for other household members to the best of their ability. The language was changed to “Please answer as many questions as you can.” These changes resulted in a decrease in break-offs and an increase in the number of completed questionnaires in the 2014 Internet Test. Screenshots of these screens are provided in Appendix C (Zelenak, 2016).

2.4 Ancestry Field Size

Research prior to the 2014 Internet Test showed that respondents were more likely to provide multiple ancestries in the mail data collection mode than when using the internet instrument (Horwitz et al., 2012). This was most likely because of the difference in the way the internet and mail response fields were formatted (Appendix D). The mail form contains a faint line in the center of the field that encourages more than one response. This cannot be recreated in the internet instrument, so increasing the height of the field was seen as a suitable substitute because the taller and wider response field appears to allow for a more detailed response than the screen originally used (Appendix D). Research from 2011 Internet Test found that there was a significantly lower number of multiple responses in the internet mode when it was compared with mail (Horwitz et al., 2012). Testing in 2014 did not replicate the results of the 2011 Internet Test and found no statistical difference in multiple reporting (Zelenak, 2016). However, since there was no negative effect from increasing the size of the ancestry field in testing, the American Community Survey Office (ACSO) decided to increase the field size in an effort to encourage multiple responses. The ACS implemented this change in the January 2016 data collection month.

2.5 Additional Analysis

In addition to looking at the questions researched in the 2014 Internet Test, analysis was also completed to see if there is a difference in the percentage of responses that were received in the early stages of data collection. Currently, every household included in the ACS sample receives two mailings, an introductory letter and an instruction card. Then, to determine if additional mailings need to be sent, the ACS looks at the completion status of the case. Households that have not attempted to respond, or that enter the instrument but do not reach the detailed person section, are mailed a paper survey. Since the internet instrument changes are expected to reduce breakoffs and increase response rates, it is possible that more completed cases would be received early on in the data collection process.

3 Research Questions

This evaluation uses many of the same comparisons used to evaluate the results of the 2014 ACS Internet Test. This will help determine if the production implementation of the changes have the expected results based on the research conducted in 2014. There is also analysis to determine if more internet responses are received before the mail-out of the paper questionnaire. The next few sections of this report provide information on the research questions for this report and detailed information on the comparisons and statistical testing.

Research Questions (taken from the 2014 Internet Test):

1) Are respondents able to re-enter the survey using the verification questions?
2) What is the effect of the verification questions on the rate of multiple returns?
3) What is the effect of highlighting the write-in/drop-down box for unfolding questions on the percent of respondents receiving an error message?
4) What is the effect of the revised transition on self-response and internet response?
5) What is the effect of the revised transition on breakoffs?
6) What is the effect of the revised transition on item nonresponse?
7) What is the effect of increasing the height of the ancestry write-in box in the internet instrument on multiple ancestry entries?

Additional Research Question:

8) Is there a change in the number of complete internet interviews before the mail-out of the paper form?

4 Methodology

4.1 Evaluation Design

The changes to the internet instrument took place in two different time periods. The changes to the ancestry field occurred at the beginning of the 2016 data year and carried through the full year of data collection. ACS data are collected in a series of monthly panels that are open for just over three months, so the last panel that was collected solely with the old ancestry box was September 2015. Respondents that were in the October, November, or December panels could have entered the instrument before or after the change depending on when they completed the online survey. To avoid including panels that have the ability to access either instrument, the September 2015 panel was compared with data from the January 2016 panel; the first panel collected entirely using the new ancestry field.

All of the other internet changes took place in July 2016, so the March 2016 panel (the last one collected entirely with the old instrument) will be compared with the July 2016 panel (the first one collected entirely with the new instrument). These panels are used because changes to the internet instrument occur as a date-based change. This date-based change means some

respondents in the April, May, or June panels could have responded using the internet instrument before the changes were made and others could have responded after implementation of the changes. The March and July 2016 panels allow us to look at complete panels before and after the changes to the internet instrument.

Finally, for the research question of "What is the effect of the revised transition on self-response and internet response?" comparisons are made between the March and July 2016 panels. The March and July panels for 2013, 2014, and 2015 are also analyzed. This allows us to look at how those data are trending and what changes occurred after implementation of the modifications. Doing this provides a better look at if the changes to the return rate relate to the instrument adjustments and isolates effects of seasonality on returns.

4.2 Metrics

There are a number of metrics used in this evaluation. This section will provide information about specific metrics and associated standard errors, and statistical tests.

4.2.1 Research Question Metrics

The following metrics are used to answer the research questions. The metrics are labeled by research question and then by the order in which the tables are presented. Additional information is found in the results section for each research question.

1) Are respondents able to re-enter the survey using the verification questions?

$$\text{[1.1] PIN Use Rate} = \frac{\text{Number of respondents that answer security questions}}{\text{Number of respondents that reached the PIN screen}} * 100$$

$$\text{[1.2] Re-entry Rate} = \frac{\text{Number of mailable/deliverable}^{1}\text{ sample addresses that re-enter the internet instrument}}{\text{Number of sample addresses that logged or timed out of the survey}} * 100$$

[1] Addresses are considered as mailable/deliverable if the Postal Service does not return any of the mailings as "Undeliverable As Addressed" (UAA).

2) What is the effect of the verification questions on the rate of multiple returns?

$$\text{[2.1] Multiple Return Rate} = \frac{\text{Number of sample addresses providing two or more responses}}{\text{Total number of sample addresses providing at least one response}} * 100$$

3) What is the effect of highlighting the write-in/drop-down box for unfolding questions on the percent of respondents receiving an error message?

$$\text{[3.1] Error Message Rate by Total Number of Error Messages} = \frac{\text{Number of records that receive an error message on a particular screen}}{\text{Total number of error messages presented to respondents on all screens}} * 100$$

$$\text{[3.2] Error Message Rate by Screen Visit} = \frac{\text{Number of records that receive an error message on a particular screen}}{\text{Total number of records that encounter a certain screen}} * 100$$

4) What is the effect of the revised transition on self-response and internet response?

$$\text{[4.1] Internet Return Rate} = \frac{\text{Number of sample addresses that provided a complete}^{2} \text{ or sufficient partial}^{3} \text{ internet response}}{\text{Total Number of mailable/deliverable sample addresses}} * 100$$

[2] Internet responses are considered complete when respondents submits the survey or they reach the last screen.

[3] Internet responses are considered a sufficient partial when respondents reach the Detailed Person questions, but do not complete the interview.

$$\text{[4.2] Self-Response Return Rate} = \frac{\text{Number of mailable/deliverable sample addresses that provided a non-blank return by mail, Telephone Questionnaire Assistance, or a complete or sufficient partial response by internet}}{\text{Total number of mailable/deliverable sample addresses}} * 100$$

5) What is the effect of the revised transition on breakoffs?

$$\text{[5.1] Breakoff Rate} = \frac{\text{Number of records that exit on "Pick Next Person" or on the screen immediately preceding it}}{\text{Total number of records that accessed the internet Instrument}} * 100$$

$$\text{[5.2] Completion Rate} = \frac{\text{The number of addresses that complete a certain proportion of the interview}}{\text{Total number of records that accessed the internet instrument}} * 100$$

6) What is the effect of the revised transition on item nonresponse?

$$\text{[6.1] Item Nonresponse Rate} = \frac{\text{Number of records with missing data for a specified question that should have been answered}}{\text{Total number of records that should have received a valid response}} * 100$$

7) What is the effect of increasing the height of the ancestry write-in box in the internet instrument on multiple ancestry entries?

$$\text{[7.1] Multiple Ancestry Response Rate} = \frac{\text{Number of person records with more than one reported ancestries}}{\text{Total number of person records with a valid response to the Ancestry question}} * 100$$

8) Is there a change in the number of complete internet interviews before the mail-out of the paper form?

$$\text{[8.1] Early Completion Rate Before the Mailout} = \frac{\text{Number of sample addresses that complete the survey using the internet instrument before creation of the mailing list for the paper questionnaire form}}{\text{Total number of cases in a panel}} * 100$$

4.2.2 Standard Error Calculations and Statistical Testing

The variances were calculated using the Successive Differences Replication (SDR) method with replicate weights. This is that standard method for calculating variance in the ACS (U.S. Census Bureau, 2014, Chapter 12). The variance for each rate and difference were calculated using formula below. The standard error of an estimate (X) is the square root of the variance:

$$Var(X_0) = \frac{4}{80}\sum_{r=1}^{80}(X_r - X_0)^2$$

where:

X_0 = the estimate calculated using the full sample,
X_r = the estimate calculated for replicate r

All percentages are based on the actual estimates and standard errors have been calculated using the production base weights and replicate weights were used to create replicate factors. This involved taking the base weight and dividing it by the replicate factors. This doing this for the base weight adjusted it to 1. All research questions were analyzed using a two-tailed t-test at the $\alpha = 0.10$ level.

4.3 Limitations

Most of the research done in this evaluation relies on paradata collected from the internet data collection instrument. While the Census Bureau attempts to capture paradata for each response, it is not always collected for a variety of reasons. These reasons can include a respondent not enabling Java, server issues, and a wide range of other design issues. In addition to the normal paradata limitations, there is an additional limitation related to the specific dataset being used for this evaluation.

During the data analysis, it was discovered that paradata for the Pick Next Person transition screen was not being captured in the production paradata. To measure breakoff on this screen, breakoffs on screens that immediately precede the Pick Next Person Screen are looked at. The Census Bureau is looking into implementing the collection of paradata for the Pick Next Person screen in 2018.

In addition, this analysis compares data collected during different time periods. Ideally, the comparison would be for data collected at the same time using a split treatment design, as was done in the 2014 Internet Test. This was not possible for the production implementation, which all took place at one time.

5 Results

5.1 Are respondents able to re-enter the survey using the verification questions?

To analyze the use of the new security question and PIN reset features, The July 2016 panel was used to calculate how many respondents used the feature. There were 80,539 respondents or 95.0 percent that reached the PIN Screen provided us with a response to the security question field.

After reviewing the verification question use, comparisons of the percentage of people that were able to re-enter the instrument after logging or timing out were made between the March and July 2016 panels.

This analysis in Table 1 showed that respondents were more likely to log into the instrument multiple times after the implementation of the PIN reset functionality. There was a 2.6 percentage point increase between the pre-change and post-change panels.

Table 1. Comparison of Re-Entry Rates of those who Logged Out or Timed Out

Metric	Pre-Change March 2016 % (s.e.) (n=28,975)	Post-Change July 2016 % (s.e.) (n=25,993)	Difference (s.e.)	P-Value
Re-Entry Rate	63.4 (0.3)	66.0 (0.3)	2.6 (0.5)	<0.01

Source: U.S. Census Bureau, American Community Survey, March and July 2016 panels.

The last step in this analysis was to check how many respondents utilized the PIN reset function. Results show that 21.0 percent of all internet respondents that re-entered the internet instrument on a different day then when it was first accessed utilized this new functionality. This may have helped to decrease respondent burden, because this group was able to re-enter the instrument without recalling their PIN or contacting the ACS TQA.

5.2 What is the effect of the verification questions on the rate of multiple returns?

There was a hypothesis during the 2014 ACS Internet Test that some respondents might partially complete an internet response and then leave the internet instrument. If they were unable to re-enter the internet instrument, they may complete the mail form. If this occurs, it is considered a multiple response (Zelenak, 2016). Since the processing of multiple returns adds additional costs to the production of the ACS and adds respondent burden since respondents provide us similar information multiple times, it was important to determine if this would occur less often when it is easier to re-enter the instrument.

As Table 2 shows, there was a significant decrease in the rate of multiple responses of 0.5 percentage points. While this is a small percentage point change, it will have a slight cost benefit on continued ACS operations, since the ACS would not have to process these responses. More importantly, this decrease in the rate of multiple returns represents a reduction in respondent burden.

Table 2. Comparison of Multiple Return Rates (Internet and Mail Only)

Metric	Pre-Change March 2016 % (s.e.) (n=133,754)	Post-Change July 2016 % (s.e.) (n=131,765)	Difference (s.e.)	P-Value
Multiple Return Rate	2.4 (<0.1)	2.0 (<0.1)	-0.5 (0.1)	<0.01

Source: U.S. Census Bureau, American Community Survey, March and July 2016 panels.
Note: Minor additive discrepancies are due to rounding.

5.3 What is the effect of highlighting the write-in/drop-down box for unfolding questions on the percent of respondents receiving an error message?

The changes were made to draw more attention to the unfolding questions and to lower the number of error messages that respondents encounter because they miss questions that are asked on the same screen based on their previous answers. To measure this, the error message rate for the March and July 2016 panels was analyzed in two different ways.

First, the number of error messages that occurred on a certain screen divided by the total number of error messages on all screens were analyzed. This was done to see what screens issued the most error messages. Next, the number of error messages that occurred on a certain screen divided by the number of person records that encountered that screen were analyzed. This helped determine if certain screens that are not as common in the instrument path have issues.

Overall, there was a significant decrease in the number of errors that occurred for each of the unfolding questions (See Tables 3a, 3b). This makes us confident that the improvements to the unfolding questions have made it easier for respondents to navigate the instrument and reduced confusion about what was a completed response. Tables for both types of analysis are also provided below.

Table 3. Differences in the Error Message Render Rate per Screen Among all Errors Rendered

Screens with Unfolding Questions	Pre-Change March 2016 % (s.e.) (n=85,327)	Post-Change July 2016 % (s.e.) (n=81,591)	Difference (s.e.)	P-Value
Hispanic Origin	1.1 (<0.1)	0.4 (<0.1)	-0.8 (<0.1)	<0.01
Race	1.4 (0.1)	0.6 (<0.1)	-0.8 (<0.1)	<0.01
Year Built	2.6 (0.1)	1.9 (0.1)	-0.7 (0.1)	<0.01
Place of Birth	14.0 (0.1)	8.0 (0.1)	-6.0 (0.1)	<0.01
Citizenship	0.2 (<0.1)	0.1 (<0.1)	-0.1 (<0.1)	<0.01
Current Grade Level	0.9 (<0.1)	0.8 (<0.1)	-0.1 (0.1)	<0.01
Educational Attainment	1.2 (<0.1)	0.6 (<0.1)	-0.6 (<0.1)	<0.01
Health Insurance	0.3 (<0.1)	0.2 (<0.1)	-0.1 (<0.1)	<0.01

Source: U.S. Census Bureau, American Community Survey, March and July 2016 panels.
Note: Minor additive discrepancies are due to rounding.

Table 4. Differences in the Error Message Render Rate per Screen Among all Screen Visits

Screens with Unfolding Questions	Pre-Change March 2016 % (s.e.) *n*	Post-Change July 2016 % (s.e.) *n*	Difference (s.e.)	P-Value
Hispanic Origin	16.0 (0.6) *5,937*	4.9 (0.3) *6,114*	-11.2 (0.6)	<0.01
Race	9.9 (0.4) *11,818*	4.1 (0.2) *11,824*	-5.8 (0.4)	<0.01
Year Built	12.7 (0.3) *17,586*	9.0 (0.2) *17,387*	-3.6 (0.4)	<0.01
Place of Birth	6.2 (0.1) *192,953*	3.4 (<0.1) *191,168*	-2.8 (0.1)	<0.01
Citizenship	1.3 (0.1) *11,921*	0.8 (0.1) *12,042*	-0.5 (0.2)	<0.01
Current Grade Level	2.7 (0.1) *29,929*	2.3 (0.1) *28,176*	-0.4 (0.1)	<0.01
Educational Attainment	3.1 (0.1) *32,847*	1.5 (0.1) *30,780*	-1.6 (0.1)	<0.01
Health Insurance	3.6 (0.2) *7,951*	2.4 (0.1) *7,614*	-1.2 (0.3)	<0.01

Source: U.S. Census Bureau, American Community Survey, March and July 2016 panels.
Note: Minor additive discrepancies are due to rounding.

5.4 What is the effect of the revised transition on self-response and internet response?

The 2014 ACS Internet Test focused on self-response and calculated return rates for internet and total self-response. Similar analysis was conducted by comparing the March and July 2016 panels to see if the return rate was higher after the ACS implemented the changes to the internet instrument. I then looked at return rates for the March and July panels for each year since the internet instrument was introduced in 2013. Taking the difference of the difference mitigates the fact that rates change in a cyclical manner throughout the year, and therefore determine if the results were part of an overall trend or if it was due to changes in the internet instrument.

Based on data from 2013 to 2015 (Tables 4a and 4b), the July return rate is lower than the March return rate. However, what was observed is that after implementing the changes the difference in return rates is smaller in 2016 compared to 2015 (Table 4c). The result appears to be isolated to the internet mode though. When performing this analysis for overall self-response a statistical difference was not found (Tables 4b and 4c).

Table 5. Difference in Internet Return Rates by Year

Year	March Internet Return Rate % (s.e.)	July Internet Return Rate % (s.e.)	Internet Return Rate Difference (s.e.)	P-Value
2013	30.8 (0.1)	29.7 (0.1)	-1.1 (0.1)	<0.01
2014	30.9 (0.1)	29.8 (0.1)	-1.2 (0.1)	<0.01
2015	31.5 (0.1)	30.5 (0.1)	-1.0 (0.1)	<0.01
2016	33.7 (0.1)	33.3 (0.1)	-0.5 (0.1)	<0.01

Source: U.S. Census Bureau, American Community Survey, March and July 2016 panels.
Note: Minor additive discrepancies are due to rounding.

Table 6. Difference in Overall Self-Response Return Rates by Year

Year	March Self-Response Return Rate % (s.e.)	July Self-Response Return Rate % (s.e.)	Self-Response Return Rate Difference (s.e.)	P-Value
2013	56.8 (0.1)	56.3 (0.1)	-0.6 (0.2)	<0.01
2014	56.4 (0.1)	55.5 (0.1)	-0.9 (0.2)	<0.01
2015	56.2 (0.1)	54.9 (0.1)	-1.3 (0.2)	<0.01
2016	56.8 (0.1)	55.8 (0.1)	-1.0 (0.1)	<0.01

Source: U.S. Census Bureau, American Community Survey, March and July 2013 - 2016 panels.
Note: Minor additive discrepancies are due to rounding.

Table 7. Difference in 2015 Return Rates and 2016 Return Rates

Metric	Percentage Point Difference 2016-2015 % (s.e.)	P-Value
Internet Return Rate	-0.5 (0.2)	<0.01
Self-Response Return Rate	-0.3 (0.2)	0.18

Source: U.S. Census Bureau, American Community Survey, March and July 2015 - 2016 panels.
Note: Minor additive discrepancies are due to rounding.

5.5 What is the effect of the revised transition on breakoffs?

Research on the effect of the revised transition is slightly different in this evaluation than what was done in the 2014 ACS Internet Test. The reason is the difference in the programming of the current production instrument and the 2014 Internet Test instrument. In the test instrument, the paradata showed when the respondent viewed the transition screen. Due to a difference in the method of programing, the production instrument did not capture these paradata. The ACS has already decided to update the programing to collect this information in the future.

To compare how the revised transition influences breakoffs in this test, analysis focused on the last question a respondent completed. For the July 2016 panel, as a substitute for the “Pick

Next Person" screen, the last screen that came immediately before the respondent would have been presented the transition screen was used in the analysis. A case was seen as a breakoff on the transition screen if it occurred on the proceeding screen. For the March 2016 panel, a case was considered a breakoff if it occurred on the transition screen or the "Pick Next Person" screen.

From performing this analysis, there was a significant reduction in the number of households that breakoff on the screen directly preceding the "Pick Next Person" screen (see Table 5a). There was also a decrease in the proportion of breakoffs that occurred on a screen immediately preceding "Pick Next Person" screen.

Table 8. Difference in Screen Breakoff Rates in Proximity of the Transition Screen

Metrics	Pre-Change March 2016 % (s.e.) *n*	Post-Change July. 2016 % (s.e.) *n*	Difference (s.e.)	P-Value
Screen Breakoff Rate (among all households that visited the screen)	3.0 (0.1) *87,181*	1.5 (<0.1) *85,328*	-1.5 (0.1)	<0.01
Screen Breakoff Rate (among all breakoffs)	21.0 (0.4) *12,411*	12.4 (0.3) *10,455*	-8.7 (0.5)	<0.01

Source: U.S. Census Bureau, American Community Survey, March and July 2016 panels.
Note: Minor additive discrepancies are due to rounding.

In addition to the screen breakoff rate for each household, comparisons also looked at the overall break-off rates for the internet instrument. This is an important test for the production environment because response rate changes may be due to factors other than the usability of the internet instrument. This comparison looked at what percentage of cases ended in a breakoff. It was then broken out to look at how many cases that breakoff complete the housing section of the interview, but do not finish (sufficient partial), and how many enter the instrument, but do not complete the housing section of the interview (insufficient partial). The denominator for this analysis is the total number of cases that accessed the internet instrument.

Table 5b shows that after implementation of the internet instrument changes, there was a decrease in the proportion of response attempts that ended in a breakoff. Most of the change is attributable to the Sufficient Partial type, which makes sense since an interview would have to be a sufficient partial to reach the transition screen.

Table 9. Difference in Final Breakoff Rates

Metrics	Pre-Change March 2016 % (s.e.) (n=87,046)	Post-Change July. 2016 % (s.e.) (n=85,222)	Difference (s.e.)	P-Value
Overall Breakoff Rate	14.3 (0.1)	12.4 (0.1)	-2.0 (0.2)	<0.01
Breakoffs that are Sufficient Partials	9.7 (0.1)	7.8 (0.1)	-1.8 (0.1)	<0.01
Breakoffs that are Insufficient Partials	4.7 (0.1)	4.5 (0.1)	-0.2 (0.1)	0.13

Source: U.S. Census Bureau, American Community Survey, March and July 2016 panels.
Note: Minor additive discrepancies are due to rounding.

5.6 What is the effect of the revised transition on item nonresponse?

The item nonresponse rates for the March and July 2016 are compared for a subset of questions from the detailed person. The 2014 Internet Test calculated item nonresponse for some of the questions in the basic person and housing sections of the internet for thoroughness, but differences are not expected because these questions are before the screen revisions and no differences were found in the 2014 Internet test (Zelenak, 2016). All the questions that were analyzed in this evaluation are included in Table 6.

The analysis showed that the item nonresponse rate decreased by approximately one percentage point for each of the questions that were analyzed. This is likely due to the fact that fewer respondents are leaving the instrument without completing the survey.

Table 10. Item Nonresponse Rates for Selected Detailed Person Questions

Screens with Unfolding Questions	Pre-Change March 2016 % (s.e.) *n*	Post-Change July 2016 % (s.e.) *n*	Difference (s.e.)	P-Value
Place of Birth	11.2 (0.1) *216,876*	9.9 (0.1) *211,990*	-1.3 (0.2)	<0.01
Educational Attainment	9.3 (0.1) *206,495*	8.7 (0.1) *201,927*	-1.2 (0.2)	<0.01
Speak Another Language	10.3 (0.1) *201,588*	9.2 (0.1) *197,020*	-1.1 (0.2)	<0.01
Health Insurance	13.1 (0.1) *216,876*	12.4 (0.1) *211,990*	-0.8 (0.2)	<0.01
Difficulty Hearing	12.2 (0.1) *216,876*	11.1 (0.1) *211,990*	-1.0 (0.2)	<0.01
Work Last Week	9.6 (0.1) *173,272*	8.4 (0.1) *170,506*	-1.1 (0.2)	<0.01

Source: U.S. Census Bureau, American Community Survey, March and July 2016 panels.
Note: Minor additive discrepancies are due to rounding.

5.7 What is the effect of increasing the height of the ancestry write-in box in the internet instrument on multiple ancestry entries?

Research into the number of person records for which a respondent provides multiple ancestry entries has had mixed results. Looking at data from the production environment indicates whether the larger response field leads to more multiple responses. The rate of multiple ancestries between the September 2015 and January 2016 panels are compared for the mail and internet modes.

Analysis shows there was an increase of 5.8 percentage points in the number of person records that have multiple ancestries provided. Since there was no change to the Ancestry question in the paper questionnaire, mode effects can be mitigated by looking at the difference between the internet and mail instruments.

The analysis showed that there was an increase in the number of mail respondents that provided multiple ancestries between the September and January panels of 1.1 percentage points. This increase was not as large as the internet instrument, which has an increase of 5.8 percentage points in the same time period. This amounted to a 4.7 percentage point difference between internet and mail modes for the increase of reporting multiple ancestries. It would appear that in the production environment, the enlarged text field encourages multiple ancestry responses.

Table 11. Difference in the Percent of Multiple Ancestry Item Responses by Mode

Metrics	Pre-Change Sept. 2015 % (s.e.) *n*	Post-Change Jan. 2016 % (s.e.) *n*	Difference (s.e.)	P-Value
Percent of Internet Respondents Providing Two or More Ancestries	35.1 (0.2) *100,074*	40.9 (0.2) *169,367*	5.8 (0.3)	<0.01
Percent of Mail Respondents Providing Two or More Ancestries	30.1 (0.3) *55,763*	31.2 (0.2) *91,465*	1.1 (0.4)	<0.01
Percentage Point Difference	5.0 (0.4)	9.7 (0.3)	4.7 (0.5)	<0.01

Source: U.S. Census Bureau, American Community Survey, March and July 2016 panels.

5.8 Is there a change in the number of complete internet interviews before the mail-out of the paper form?

The changes to the internet instrument have potential impacts on the other data collection modes. Currently, a paper questionnaire is mailed to all deliverable addresses that have not completed the survey online approximately three weeks after the first mailing. The paper questionnaire form is not mailed out if a complete response is received via the internet. If a respondent only partially completes the survey, the mailings continue in an effort to encourage them to complete the survey. Since the changes to the internet instrument are expected to increase the number of cases that are fully complete, it is possible that fewer cases will need to have the paper form mailed. This would result in potential cost savings for the ACS.

The early completion rate is calculated for the March and July 2016 panels to make this comparison. This shows if there is a benefit to the mail process from the changes in the internet instrument. After calculating the rates, there was not a significant difference between 2016 panels. Both of the 2016 panels had a 14.1 percent internet return rate prior to the creation of the mail file before and after the implementation of the internet changes.

To attempt to isolate seasonality in response rates, the difference in 2016 was compared with the difference of the March and July panels from 2015. When comparing the two differences the fact that there is not a difference in 2016 when there was a decrease in 2015 suggests here was an improvement in completion rate before the mailout of the paper questionnaire.

Table 12. Comparison of Early Internet Completion Rates before Creation of the Mailout File

Early Completion Rate Before the Mailout	March % (s.e.) *n*	July % (s.e.) *n*	Difference (s.e.)	P-Value
2015	13.6 (0.1) *245,113*	12.6 (0.1) *296,271*	-0.9 (0.1)	<0.01
2016	14.1 (0.1) *297,973*	14.1 (0.1) *297,428*	<0.1 (0.1)	0.99
Percentage Point Difference	0.5 (0.1)	1.5 (0.1)	0.9 (0.1)	<0.01

Source: U.S. Census Bureau, American Community Survey, March and July 2016 panels.
Note: Minor additive discrepancies are due to rounding.

6 Conclusions

This evaluation has helped to confirm the results of the 2014 ACS Internet Test and ensured that the production implementation of these changes has had the expected results. From these analyses, this evaluation shows that:

- The PIN reset function allows more respondents to re-enter the instrument and likely improved the respondent experience.
- Highlighting and placing an icon to bring attention to unfolding questions has lowered the number of respondent errors on these screens.
- Revising the transition screens has lowered the number of breakoffs during the transition process.
- Increasing the height and width of the Ancestry response field has encouraged the reporting of multiple ancestries.

There is also some evidence that the changes encourage more completed internet responses before the mailout of the paper questionnaire. This is a promising result since it could decrease the amount spent on sending paper questionnaires.

The Census Bureau will continue research to improve the data collection instruments to ensure high data quality, low respondent burden, and best utilization of resources. Continuing to use

paradata to monitor the use of the internet instrument should allow us to keep innovating and improving ACS data collection methods.

7 References

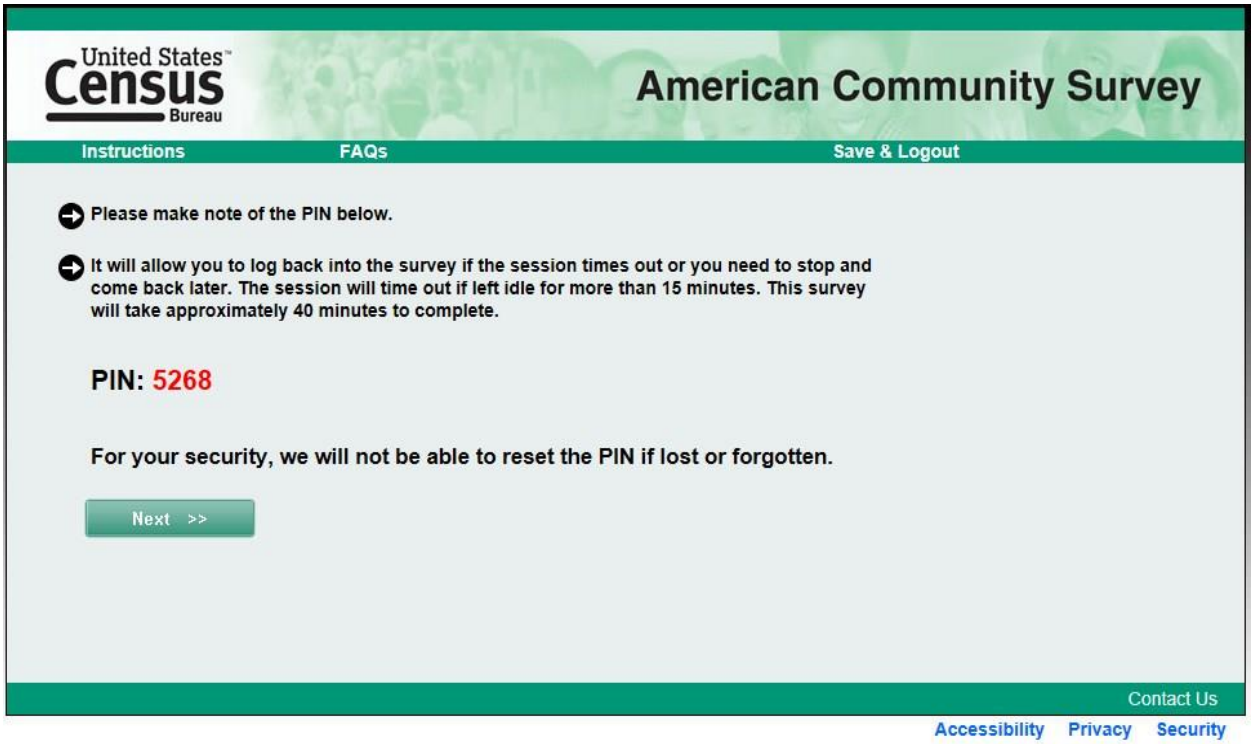
Horwitz, R., Tancreto, J.G., Zelenak, M.F., Davis, M.C (2012). Data Quality Assessment of the American Community Survey Internet Response Data. Available at: https://www.census.gov/library/working-papers/2012/acs/2012_Horwitz_02.html

U.S. Census Bureau. (2014). *American Community Survey Design and Methodology (January 2014).* Available at: http://www2.census.gov/programs-surveys/acs/methodology/design_and_methodology/acs_design_methodology_report_2014.pdf

Zelenak, M.F. (2016). 2014 American Community Survey (ACS) Internet Test. Available at: https://www.census.gov/library/working-papers/2016/acs/2016_Zelenak_01.html

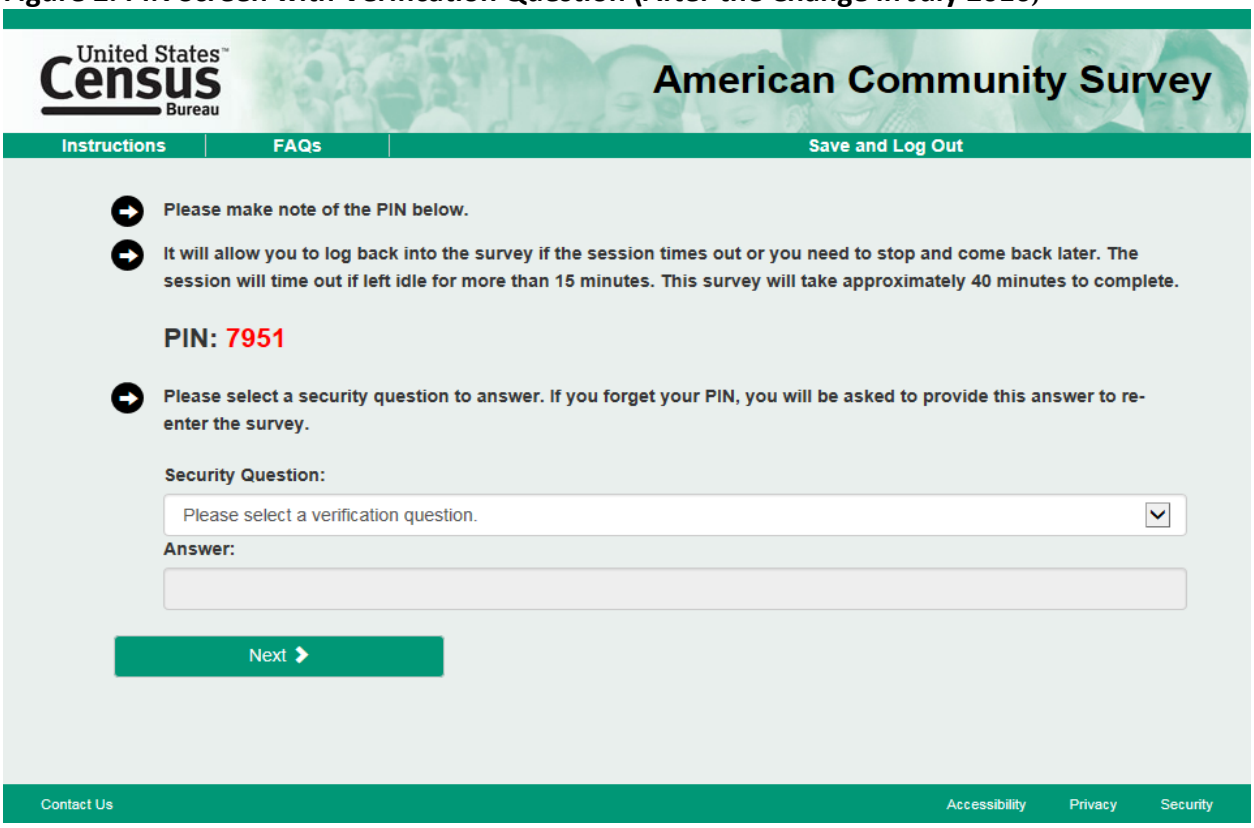
Appendix A. Version of the Additional Verification Question Screens

Figure 1. PIN Screen without Verification Question (Before the Change in July 2016)



Appendix A. Version of the Additional Verification Question Screens (continued)

Figure 2. PIN Screen with Verification Question (After the Change in July 2016)



Appendix A. Version of the Additional Verification Question Screens (continued)

Figure 3. Login Screen with Forgotten PIN Link (After the Change in July 2016)

Appendix A. Version of the Additional Verification Question Screens (continued)

Figure 4. Verification Screen Rendered Due to a Forgotten PIN (After the Change in July 2016)

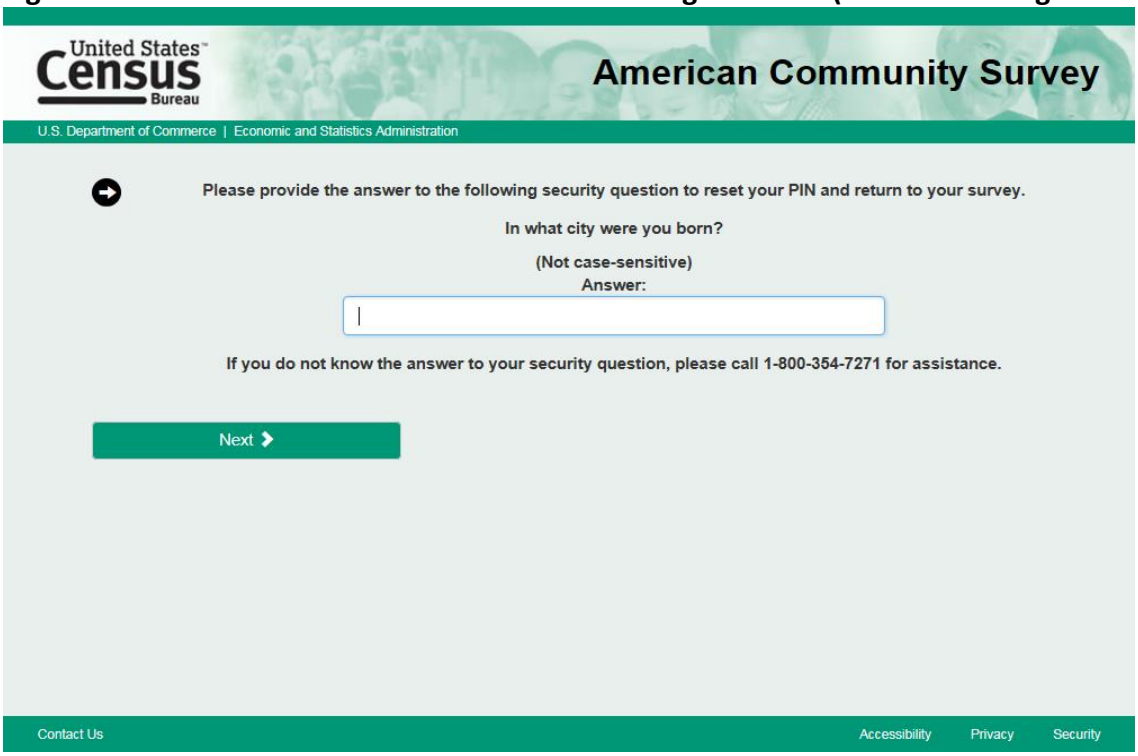
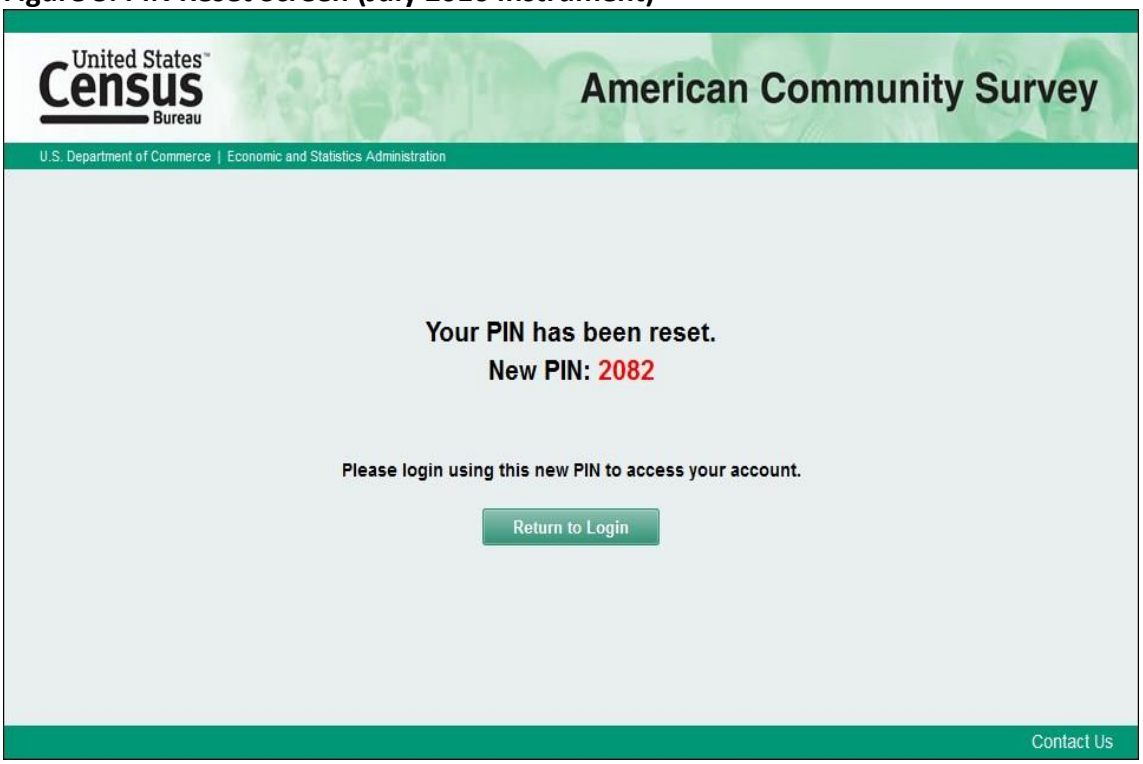


Figure 5. PIN Reset Screen (July 2016 Instrument)



Appendix B. 2016 ACS Internet Instrument: Pre and Post Change for Unfolding Design Screen (*Place of Birth)*

Figure 6. Place of Birth Screen (Before the Change in July 2016)

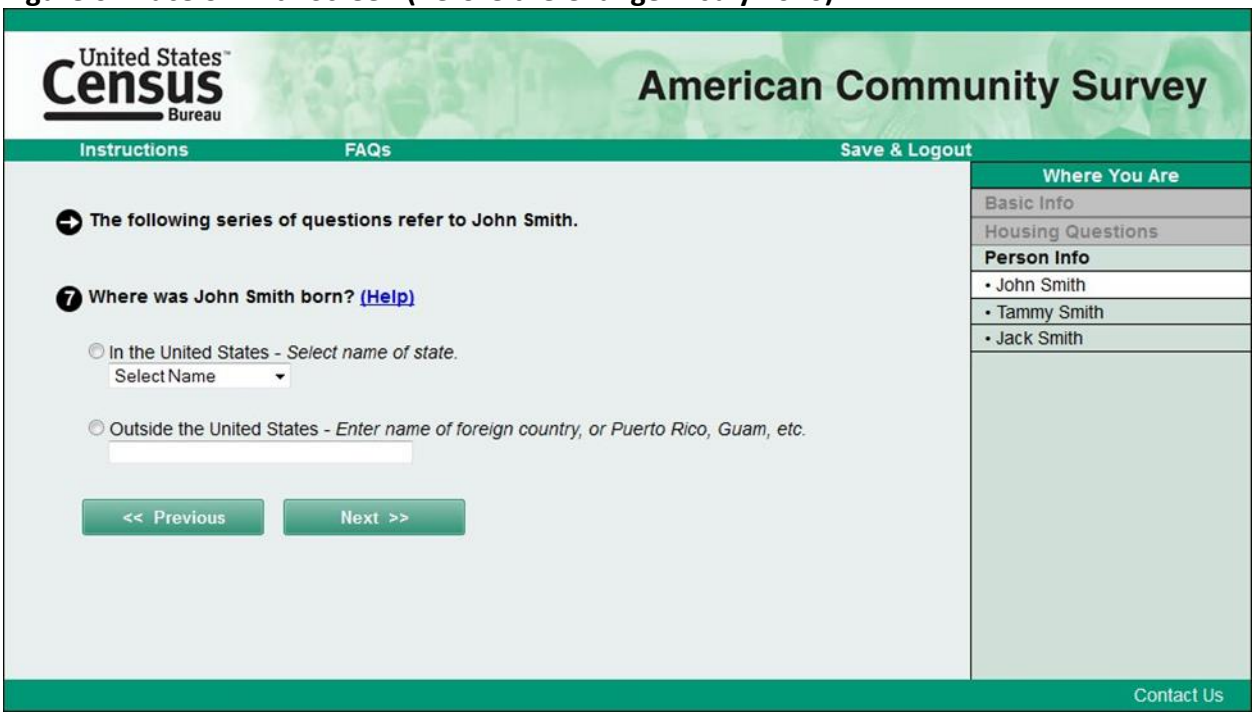
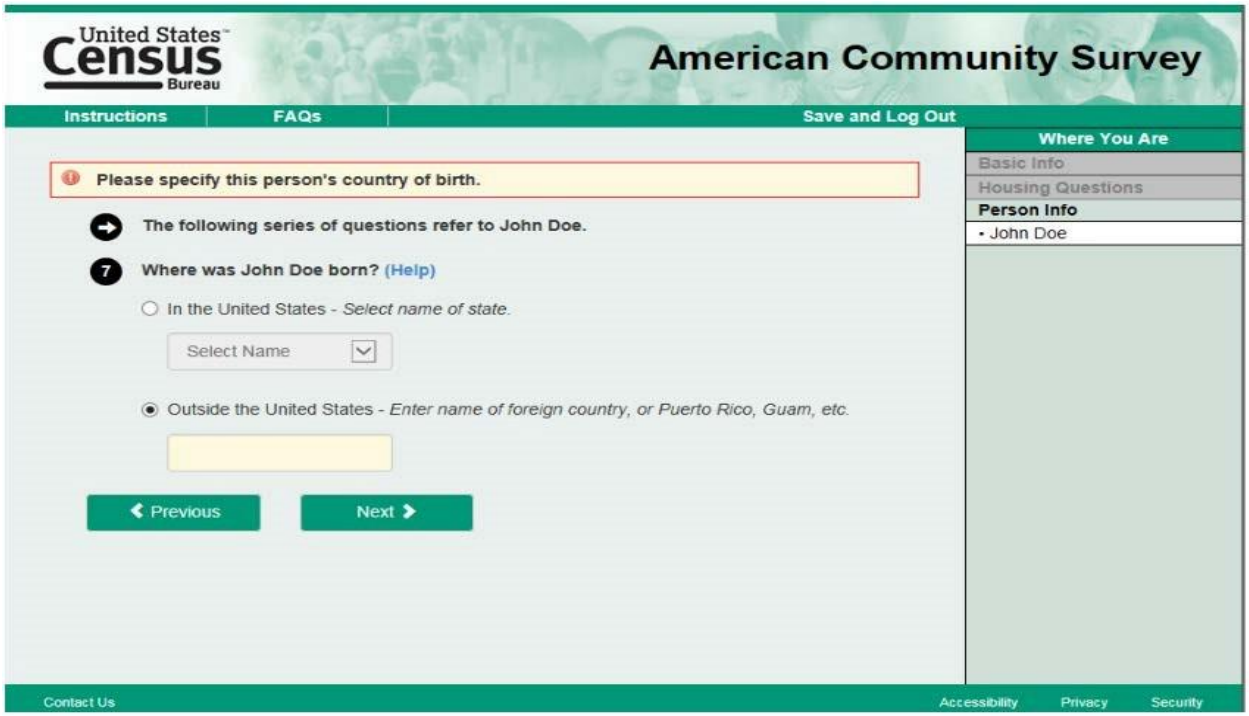
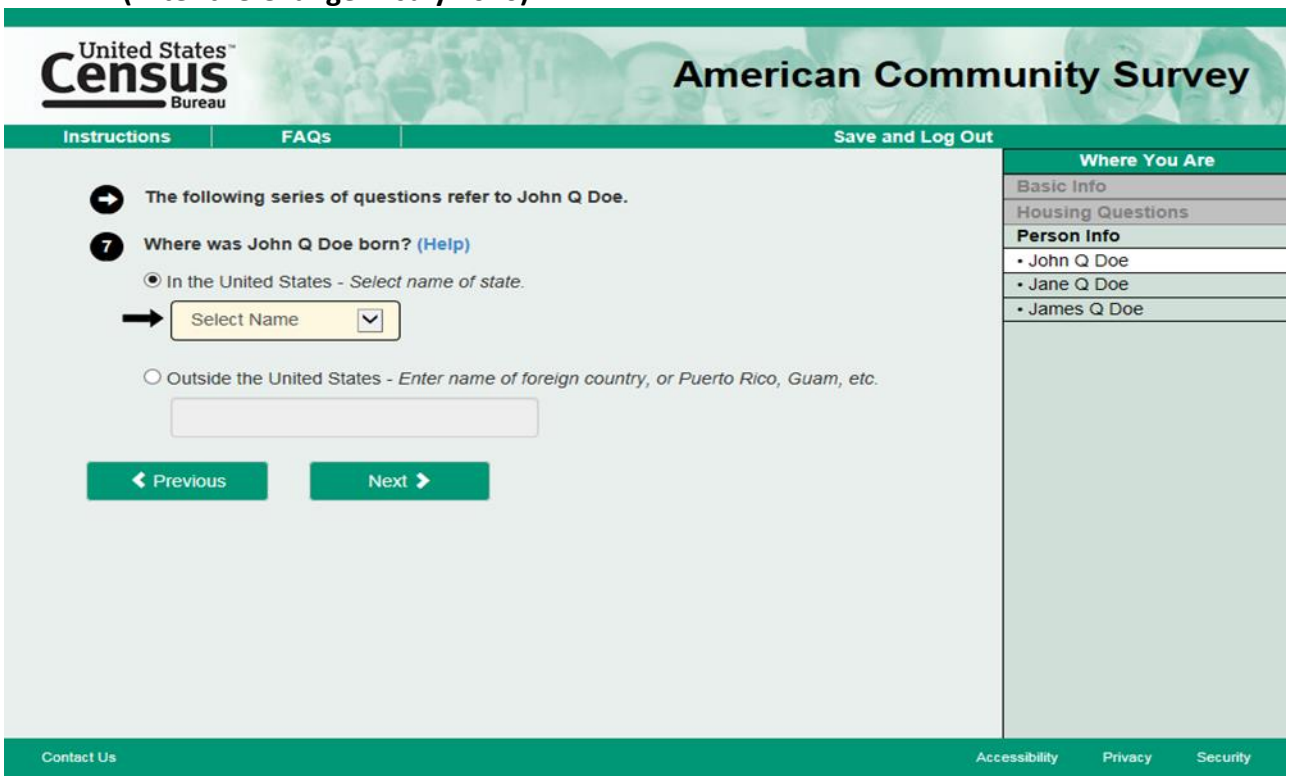


Figure 7. Place of Birth Screen with Error Message Rendered (Before the Change in July 2016)



Appendix B. 2016 ACS Internet Instrument: Pre and Post Change for Unfolding Design Screen (*Place of Birth)* (continued)

Figure 8. Place of Birth Screen with Boldly Outlined Write-in Box, Pale Yellow Fill, and Arrow (After the Change in July 2016)



Appendix C. Pre-Change Version of the Saved Person and Pick Next Person Screens and Post-Change Version of the Revised Transition Screen

Figure 9. Saved Person (Before the Change in July 2016)

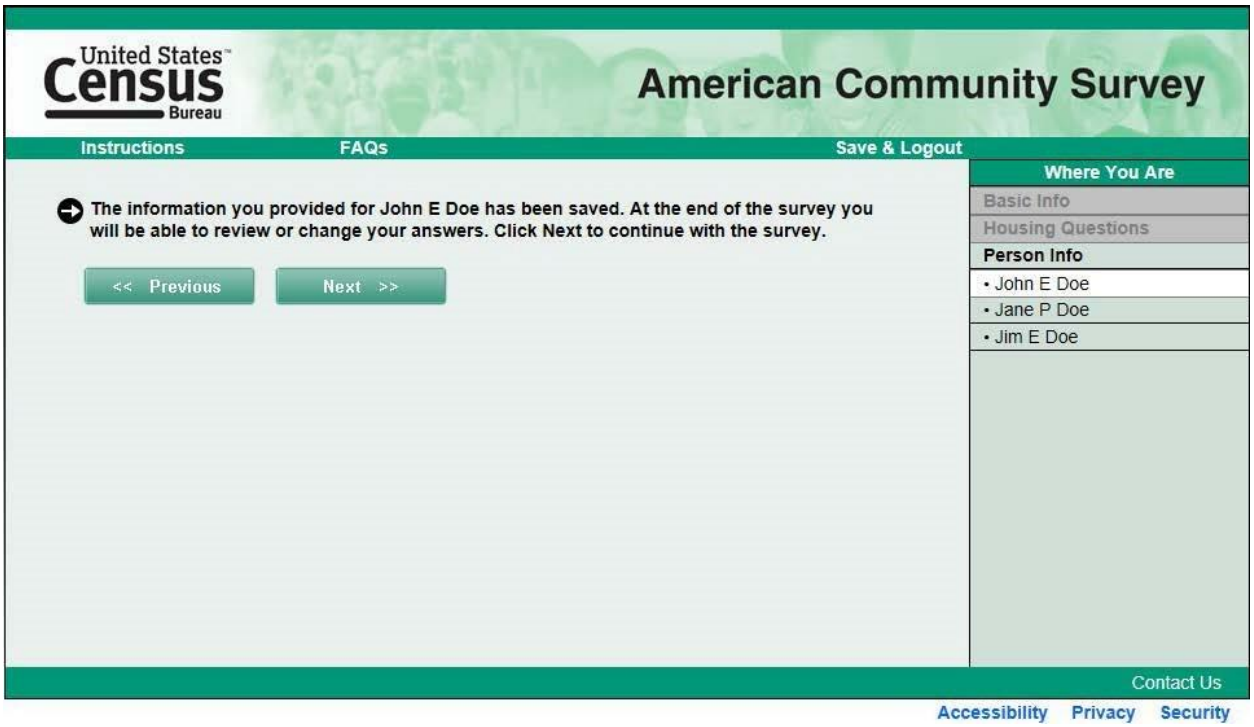
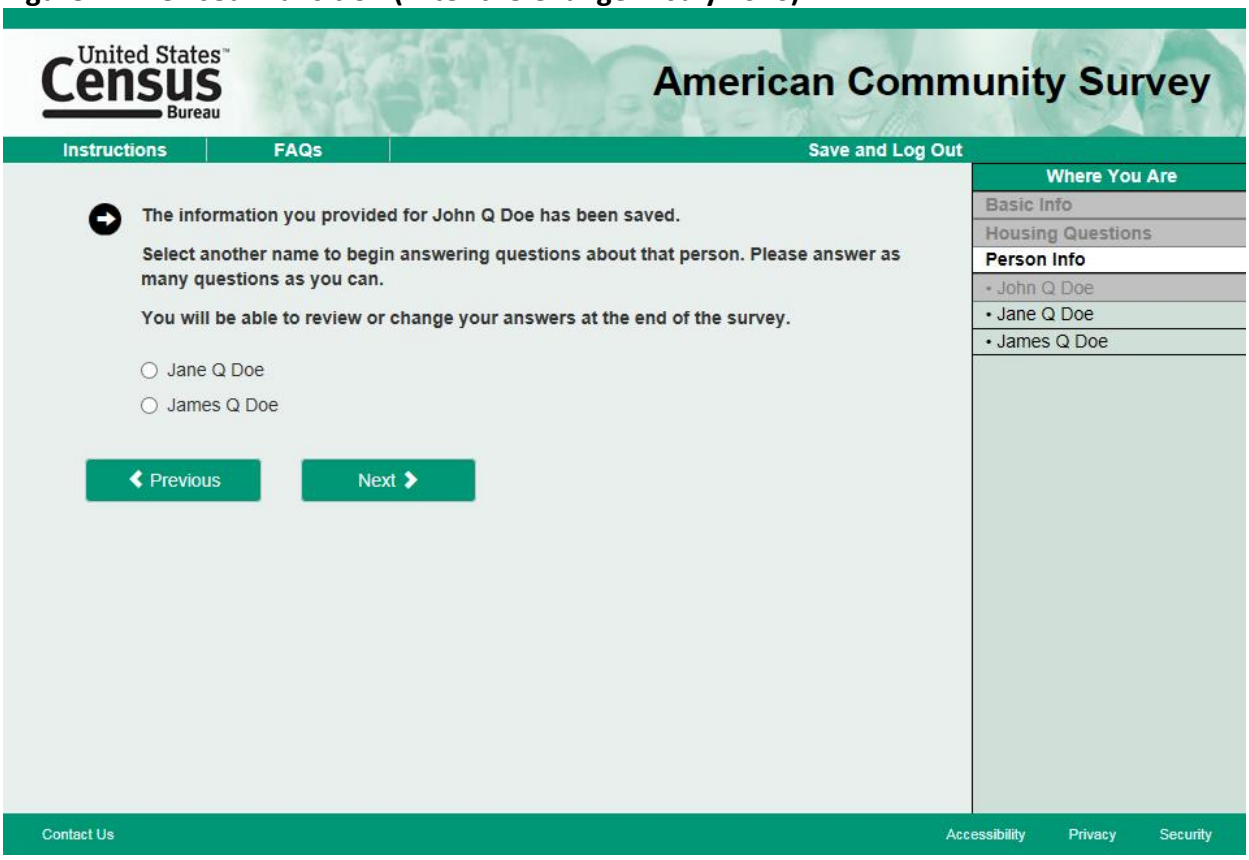


Figure 10. Pick Next Person (Before the Change in July 2016)

Appendix C. Pre-Change Version of the Saved Person and Pick Next Person Screens and Post-Change Version of the Revised Transition Screen (continued)

Figure 11. Revised Transition (After the Change in July 2016)



Appendix D. ACS Production Versions of the Ancestry Field

Figure 12. Paper Version of Ancestry Question (ACS Mail Form)

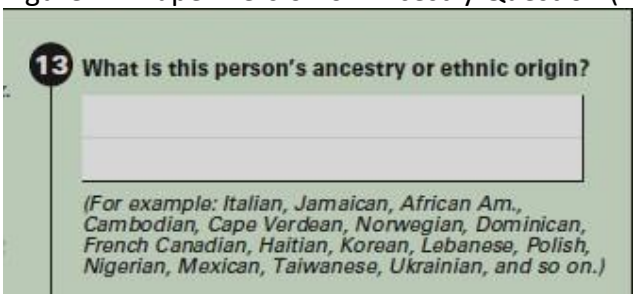


Figure 13. Internet Version of Ancestry Question (Before the Change in January 2016)

Figure 14. Internet Version of Ancestry Question (After the Change in January 2016)