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MEMORANDUM FOR ACS Research and Evaluation Workgroup

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Subject: 2017 Adaptive Strategy Test Final Report for the American
Community Survey

Attached is the final American Community Survey (ACS) Research and Evaluation report for the
2017 Adaptive Strategy Test.

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2017 Adaptive Strategy Test

FINAL REPORT

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TABLE OF CONTENTS

EXECUTIVE SUMMARY	v
1. Introduction	1
2. Background	1
3. Literature Review	2
4. Methodology	4
4.1 Experimental Design	4
4.2 Sample Design.....	6
4.3 Classification Algorithm	7
4.4 Analysis Rates.....	8
4.4.1 Self-Response Return Rates	8
4.4.2 Final Response Rates	9
4.4.3 Item Nonresponse Rates	10
4.5 Standard Errors	10
4.6 Characteristics of Respondents of the Choice Method versus the Push Method.....	11
5. Assumptions and Limitations	13
5.1 Assumptions.....	13
5.2 Limitations.....	13
6. Results	13
6.1 Self-Response Return Rates	13
6.2 Final Response Rates	14
6.3 Item Nonresponse Rates.....	16
6.4 Demographics	17
7. Conclusions	27
8. References	27
Appendix A. Push Method Materials	29
A.1 Push Method – Initial Mailing Package Letter	29
A.2 Push Method – Reminder Letter	30
A.3 Push Method – Paper Questionnaire Package Letter.....	31
A.4 Push Method – Additional Reminder Postcard	32
A.5 Push Method – Final Reminder Postcard	33
Appendix B. Choice Method Materials	34
B.1 Choice Method – Pre-Notice Letter	34
B.2 Choice Method – Initial Mailing Package Letter	35
B.3 Choice Method – Reminder Postcard	36

B.4	Choice Method – Replacement Questionnaire Package Letter	37
B.5	Choice Method – Final Reminder Postcard	38

List of Tables

Table 1.	Mailing Schedules for Choice versus Push methods.....	5
Table 2.	Distribution of Mailing Strategies within Tract Categories.....	6
Table 3.	2017 Census Test Decennial Classification Algorithm	7
Table 4.	Classifying Tracts into Preference Categories.....	8
Table 5.	Demographic Characteristics for Comparing Mailing Strategies.....	12
Table 6.	Self-Response Return Rates for Mail Preference Tracts.....	13
Table 7.	Self-Response Return Rates for Mixed Preference Tracts.....	14
Table 8.	Self-Response Return Rates by Algorithm Rule	14
Table 9.	Final Response Rates for Mail Preference Tracts.....	15
Table 10.	Final Response Rates for Mixed Preference Tracts.....	15
Table 11.	Household-level Item Nonresponse for Mail Preference Tracts	16
Table 12.	Household-level Item Nonresponse for Mixed Preference Tracts	16
Table 13.	Person-level Item Nonresponse for Mail Preference Tracts.....	17
Table 14.	Person-level Item Nonresponse for Mixed Preference Tracts.....	17
Table 15.	Age Distribution for Mail Preference Tracts	18
Table 16.	Age Distribution for Mixed Preference Tracts	18
Table 17.	Age T-tests for Mail Preference Tracts	19
Table 18.	Race Distribution for Mail Preference Tracts.....	19
Table 19.	Race Distribution for Mixed Preference Tracts.....	20
Table 20.	Hispanic Origin Distribution for Mail Preference Tracts.....	20
Table 21.	Hispanic Origin Distribution for Mixed Preference Tracts.....	20
Table 22.	Educational Attainment Distribution for Mail Preference Tracts.....	21
Table 23.	Educational Attainment Distribution for Mixed Preference Tracts.....	21
Table 24.	Income Distribution for Mail Preference Tracts	21
Table 25.	Income Distribution for Mixed Preference Tracts	22
Table 26.	Marital Status Distribution for Mail Preference Tracts.....	22
Table 27.	Marital Status Distribution for Mixed Preference Tracts.....	22
Table 28.	Nativity Distribution for Mail Preference Tracts.....	23
Table 29.	Nativity Distribution for Mixed Preference Tracts.....	23
Table 30.	English Ability Distribution for Mail Preference Tracts.....	23

Table 31. English Ability Distribution for Mixed Preference Tracts.....	24
Table 32. Internet Access Distribution for Mail Preference Tracts	24
Table 33. Internet Access Distribution for Mixed Preference Tracts	24
Table 34. Region Distribution for Mail Preference Tracts	25
Table 35. Region Distribution for Mixed Preference Tracts	25
Table 36. Urban Rural Distribution for Mail Preference Tracts	25
Table 37. Urban Rural Distribution for Mixed Preference Tracts.....	26
Table 38. Type of Computer Distribution for Mail Preference Tracts	26
Table 39. Type of Computer Distribution for Mixed Preference Tracts.....	26

List of Figures

Figure 1. Overview of the 2017 ACS Mail Contact Strategy and Mailing Universes.....	2
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EXECUTIVE SUMMARY

In 2013, the U.S. Census Bureau introduced an internet mode for data collection for the American Community Survey (ACS). The addition of this mode helped lower the data collection costs for the ACS and provided a convenient way for respondents to complete the survey. Overall, the response rates for the ACS increased; however, in certain areas of the country, response rates actually decreased (Baumgardner, Griffin, and Raglin 2014).

The purpose of the 2017 Adaptive Strategy Test was to see if offering a paper questionnaire earlier in the mailing process would increase self-response in areas where response decreased. The Census Bureau targeted geographic areas (census tracts) believed to be associated with a preference for the mail response mode and sent a sample of the housing units within those tracts a paper questionnaire in the initial mailing package. This mailing strategy was called the Choice method. With the Choice method, households were able to choose between responding online or by paper from the start. The remaining housing units in the targeted tracts received the current ACS mailing strategy, called the Push method. In the Push method, the paper questionnaire is included in the third mailing.

Each tract was classified as either Mail Preference (likely to respond by mail or no internet access), Mixed Preference (potential preference to respond by mail), or Internet Preference (likely to respond online). The following metrics were used to assign the tracts to a Preference category:

- The ratio of mail to internet return rates from 2013 to 2016
- The self-response check-in rate for 2013-2016
- The number of high speed internet connections per 1,000 households
- The percent of the population that is 65 and older
- The difference in self-response check-in rates before and after internet implementation

Housing units in Mail Preference or Mixed Preference tracts were randomly assigned to either receive Choice method materials or Push method materials. Evaluations were made by comparing the Choice and Push methods within each Preference category. Including a paper questionnaire in both the first and third mailing increases costs for the ACS program. In order to justify adopting the Choice method treatment, we would need to see a sizable increase in self-response. Housing units in the Internet Preference tracts received the Push method materials and were not included in our analysis.

Key findings:

Overall, the Push method had higher self-response return rates in both the Mail Preference and Mixed Preference tracts. The Choice method had higher self-response return rates than the Push method in the mail mode, and the Push method had higher self-response return rates than the Choice method in the internet mode.

There was no significant difference in the final response rates between the two methods.

We looked at the total item nonresponse rates for each method to see if respondents for one method were more likely to leave fields blank. The Choice method resulted in a higher household-level item nonresponse rate for the Mail Preference tracts. There was no difference in the household-level item nonresponse rates between the Choice and Push methods for Mixed Preference tracts. There was no significant difference in the person-level item nonresponse rates between the two treatments for either the Mail Preference or Mixed Preference tracts.

We also looked at demographic distributions to see whether the respondents for the two treatments differed demographically. We found that the age distribution was significantly different for the Mail Preference category, with the Choice method resulting in a higher percentage of adults 65 and older, and the Push method resulting in a higher percentage of adults 30 to 49. There was a higher proportion of 'other computer' owners (a computer other than desktop, laptop, smartphone, or tablet) in the Push method than the Choice method (for the Mail Preference category). For all other demographic items, there were no significant differences in distributions between the Choice and Push methods.

Including a paper questionnaire in both the first and third mailing increases costs for the ACS program. In order to justify adopting the Choice method treatment, we would need to see a sizable increase in self-response. Based on the above findings, and the cost of implementing the Choice method treatment, we do not recommend implementing the Choice method in the ACS using the tested classification algorithm. Future research could be conducted to refine the metrics and the algorithm to better identify tracts or housing units where a Choice method mailing strategy would be beneficial.

1. INTRODUCTION

In 2013, the U.S. Census Bureau introduced an internet mode for data collection, which helped lower the data collection costs for the American Community Survey (ACS) and provided a convenient way for respondents to complete the survey. Although the response rates for the ACS increased after this change, in certain parts of the county, response actually went down (Baumgardner, Griffin, and Raglin 2014).

The current mailing strategy (called the Push method) for the ACS sends a paper questionnaire in the third mailing. It is called the Push method because the first two mailings push the recipient to respond to the survey online (often called a web-push strategy). This strategy potentially frustrates those who want to respond, but not online. There are a variety of reasons why someone might not respond online. Some individuals do not have internet access. Others may have privacy concerns or simply prefer a paper questionnaire. Research has shown that those less likely to respond by internet include people 65 and older, adults with less than a high school education, and those living in households with a total income of less than \$20,000 (Pew Research Center 2015). These groups could possibly benefit from receiving a paper questionnaire earlier. The method of including the paper questionnaire in the first mailing is called the Choice method, as recipients are given the choice of responding online or by paper.

For the 2017 Adaptive Strategy Test, the Census Bureau tested whether sending a paper questionnaire in the first mailing could result in higher self-response rates than by using the current Push method in certain areas.

2. BACKGROUND

The ACS is an ongoing, nationwide survey conducted by the Census Bureau to collect detailed social, economic, housing, and demographic information from the population living in housing units and group quarters. The ACS uses a mail contact strategy to encourage residents in sampled addresses to self-respond.

The ACS sends up to five mailings to a mailable, sampled address. The list of mailable, sampled addresses is updated (i.e., cut) twice during this process to remove households that have already responded, minimizing the number of mail contacts received by those who have already responded.

The first mailing (initial mailing package) is sent to all mailable addresses in the sample. The initial mailing package includes an invitation to participate in the ACS online, information about the survey, and mentions that a paper questionnaire will be sent in a few weeks to those unable to respond online. About seven days later, these addresses are sent a reminder letter

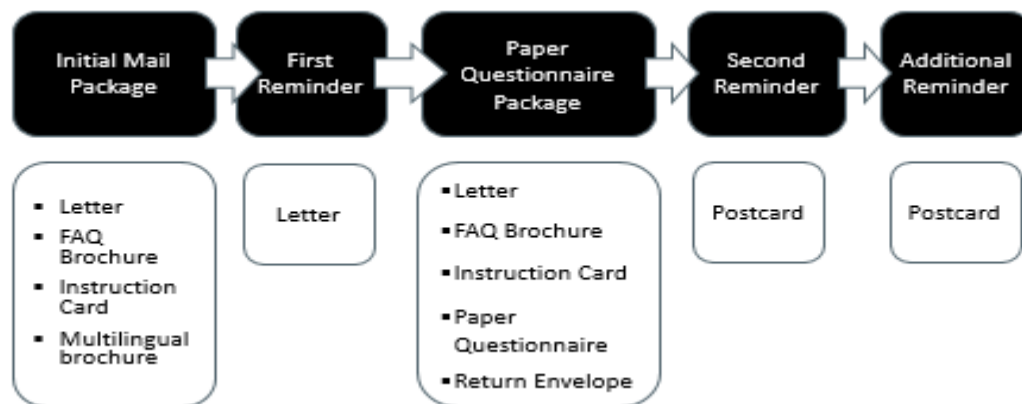
(second mailing), which repeats the instructions to respond online or wait for a paper questionnaire.¹

About three weeks after the initial mailing, the nonrespondents are sent a third mailing package that includes a paper questionnaire (a new response mode option) and instructions for responding online. These addresses are sent a reminder postcard about four days later (fourth mailing). Finally, about two weeks after the reminder postcard is sent, nonrespondents are sent a fifth and final mailing, which is an additional reminder postcard.²

About a month after the fifth mailing is sent, a subsample of the nonrespondents are selected for the Computer-Assisted Personal Interviewing (CAPI) nonresponse follow-up operation.

Figure 1 shows an overview of the mailing contact strategy used for the ACS.

Figure 1. Overview of the 2017 ACS Mail Contact Strategy



See the ACS Design and Methodology Report (U.S. Census Bureau 2014) for additional information about the ACS.

3. LITERATURE REVIEW

Adaptive design refers to the adaption of surveys to improve the efficiency of data collection (e.g., increasing response or lowering costs). One of the assumptions made is that different subgroups of the population think and behave differently and could benefit from tailoring the survey to each subgroup, for example offering different response modes (Calinescu, Bhulai, and Schouten 2013). There are currently three response modes for the ACS, which are offered sequentially (internet first). The Adaptive Strategy Test aimed to see whether we could find the

¹ This is the current production, or Push, strategy. The Choice method will have already sent a paper questionnaire.

² In October 2017, the Computer-Assisted Telephone Interview (CATI) operation was dropped for the ACS due to cost and performance reasons.

subgroups who cannot or prefer not to use the internet and offer a selection of modes at the beginning.

In 2013, the Census Bureau evaluated the effects of adding an internet response option to the ACS (Baumgardner, Griffin, and Raglin 2014). The evaluation found that adding internet increased the overall self-response rate from 2012 to 2013.³ However, using an internet push mail strategy may have discouraged some households without internet access (or who prefer to respond by paper) to not respond at all. In fact, there was a decrease in certain states and within certain demographic groups (e.g., older households and low-income households).

In 2015, research was conducted in support of the 2020 Census (2015 National Content Test (NCT)) in which a variety of mailing strategies were tested in an effort to increase self-response.⁴ One of these mailing strategies (called Internet Choice) involved sending a paper questionnaire in the first mailing. The sample for the NCT was divided into three strata - Low, Medium, or High response. These strata were defined based on the low response score from the Census Bureau's Planning Database and the number of internet connections per 1,000 households (based on information from the Federal Communications Commission (FCC)). Housing units within each stratum were randomly assigned to a mailing strategy (there were nine possible strategies for the Low response stratum and seven for the Medium and High strata). The Internet Choice strategy was only available to housing units in the Low stratum.

The Internet Choice strategy had higher self-response rates than seven of the other eight treatments for the Low response stratum (Phelan 2016). Continuing research is under way to further develop the methodology for the 2020 Census.

Additional research conducted outside the Census Bureau has identified demographic characteristics associated with low internet response (Pew Research Center 2015). These characteristics include age, education, race, income, and geographic location (region and rurality). The research found that the vast majority of Americans now use the internet (89 percent of the U.S. adult population in 2015 compared to 14 percent in 1996) but that there may be bias among certain subgroups in the population.

The Pew Research Center's American Trends Panel, which included both a mail sample and a web sample, found that more than half of the mail sample (56 percent) were adults ages 65 and older and just 1 percent were adults younger than 30. By comparison, 24 percent of web respondents were 65 and older and 14 percent were younger than 30.

³ The national self-response rate was calculated using data from January 2013 to June 2013. This was done in part because the government shutdown in October 2013 disrupted the ACS collection process.

⁴ The mailing strategies in the 2015 NCT Test are different than those used by ACS.

For education, 49 percent of the mail sample had a high school diploma or less education and only 21 percent completed college. By comparison, 14 percent of the web sample had a high school diploma or less and 57 percent graduated from college.

The mail sample had a much larger proportion of black respondents (16 percent vs. 6 percent) and a smaller proportion of white respondents (70 percent vs. 80 percent) than the web sample.

The mail respondents also had lower incomes than the web respondents, with 42 percent of mail respondents having family incomes less than \$20,000, compared with 10 percent of web respondents. At the other end of the income range, 25 percent of web respondents had incomes of \$100,000 annually or higher, compared with just 2 percent of mail respondents.

For geographic location, the mail sample had a higher proportion of adults living in rural areas (25 percent vs. 14 percent) and a lower proportion living in urban areas (30 percent vs. 36 percent) than the web sample. The regional distribution was similar across the Northeast, Midwest and West, but the South was represented more heavily among mail respondents than among web respondents (41 percent vs. 32 percent).

4. METHODOLOGY

This report answers the following research questions:

1. What is the impact of offering a choice in mode on the self-response return rates (both overall and by mode), final response rates, response reliability, and cost?
2. What are the characteristics of the households who respond using the Choice method versus the Push method?
3. What is the impact of offering the Choice method on item nonresponse versus the Push method? Also answer this by mode.

4.1 Experimental Design

Two mailing strategies were used for this project. The strategy used for the Choice method mailing strategy was similar to that which is used for the Puerto Rico Community Survey, in which a paper questionnaire is sent in the initial mailing. The Push method followed the current production mailing strategy, in which we push for response online first. Table 2 outlines the mailing schedules for each method.

Table 1. Mailing Schedules for Choice versus Push methods

<i>Date mailed</i>	<i>Choice Method (Treatment Group)</i>	<i>Push Method (Control Group)</i>
09/21/17	Pre-Notice Letter	Initial Mailing <ul style="list-style-type: none"> • Letter* • Instruction Card for using internet • Frequently Asked Questions (FAQ) Brochure • Multilingual Brochure
09/25/17	Initial Mailing <ul style="list-style-type: none"> • Letter* • Instruction Card for using mail or internet • Questionnaire • Return Envelope • FAQ Brochure • Multilingual Brochure 	--
09/28/17	Reminder Postcard	Reminder Letter
10/13/17	--	Paper Questionnaire Package <ul style="list-style-type: none"> • Letter • Questionnaire • Return Envelope • FAQ Brochure • Instruction Card
10/17/17	--	Reminder Postcard
10/19/17	Replacement Questionnaire Package <ul style="list-style-type: none"> • Letter • Questionnaire • Return Envelope • FAQ Brochure • Instruction Card 	--
11/02/17	Final Reminder Postcard	Final Reminder Postcard

* The letters for the two mailing strategies had slightly different wording to address the fact that one method provides two response mode options and the other has only one.

To decide which households received the Choice method treatment, we used a classification algorithm to categorize census tracts into one of three groups: Mail Preference, Mixed Preference, and Internet Preference. See Section 4.3 for information on the classification algorithm.

Mail Preference

These are tracts where we believe there is a preference to respond by mail or an inability to respond online and low self-response overall.

Mixed Preference

These are tracts that we believe may prefer mail and may benefit from being offered a mode choice in the initial mailing.

Internet Preference

These are tracts we believe are likely to respond online.

Once tracts were classified into one of these three groups, we randomly selected half of the methods panel (MP) groups and assigned mailing strategies based on whether the sample address was in a selected MP group as shown in Table 2. MP groups are discussed in more detail in Section 4.2.

Table 2. Distribution of Mailing Strategies within Tract Categories

<i>Tracts</i>	<i>If address in selected MP group...</i>	<i>If address not in selected MP group...</i>
Mail Preference	Choice method	Push method
Mixed Preference	Choice method	Push method
Internet Preference	Push method	Push method

Assigning addresses this way resulted in roughly half the sample addresses in the Mail Preference and Mixed Preference categories getting the Choice method treatment and the other half getting the Push method treatment. All addresses in the Internet Preference category received the Push method materials.

4.2 Sample Design

The monthly ACS production sample has approximately 295,000 addresses and is divided into 24 nationally representative groups, referred to as MP groups. Each MP group consists of approximately 12,000 addresses. This test was carried out in the October 2017 ACS production sample and 12 of the 24 groups were selected for testing. There were approximately 94,000 addresses in the Mail Preference and Mixed Preference tracts, with approximately 47,000

addresses receiving Choice materials and the other 47,000 receiving Push materials. The remaining addresses were in the Internet Preference tracts and were not included in the analysis.

4.3 Classification Algorithm

The Census Bureau conducted similar research in preparation for the 2020 Census and is working on an updated algorithm (Bentley and Mathews 2016) to determine which tracts to offer a choice in response mode in the first mailing (the 2020 Census version of the Choice method is slightly different from the one being used for this test). Table 3 outlines the metrics used by the decennial classification algorithm for the 2017 Census Test.

Table 3. 2017 Census Test Decennial Classification Algorithm

IF the ratio of mail to internet return rates from 2013-2016 is...	AND the self-response check-in rate for 2013-2016 is...	AND the rate of high speed internet connections per 1,000 households is...	AND the percent of people 65 and older is...	THEN the tract is...
>=1	<41.283%	Any rate	Any percent	Choice
>=1	>=41.283%	<=400	Any percent	Choice
>=1	>=41.283%	Any rate	>22%	Choice
Anything else	Anything else	Anything else	Anything Else	Push

The return rate and check-in rate information was calculated from ACS 1-year files, the number of high speed internet connections came from the FCC, and the percent of the population that is 65 and older metric came from the Planning Database (PDB).

The cut-offs for the check-in rates and age (41.283 percent and 22 percent, respectively) were determined based on a desire to have about 20 percent of the tracts placed into the choice group, which was optimal for a balance of sample size and cost concerns. The internet connection cut-off was determined based on the FCC data being categorical and the number of tracts in each category.

For the 2017 Adaptive Strategy Test, the 2017 Census Test algorithm, alongside other classification techniques (e.g., cluster analysis, discriminant analysis) were evaluated for their effectiveness. Ultimately, we chose to adopt a similar algorithm to the 2017 Census Test because it worked as well or better than the other classification techniques and was more flexible for future use. The adapted algorithm used mostly the same metrics with some minor changes for the cut-off values to classify tracts as Mail Preference. To classify tracts as Mixed Preference, we expanded the cut-offs to select more tracts. An extra metric was also added for classifying the Mixed Preference tracts that calculated the difference in self-response check-in rates before and after the ACS internet implementation.

Table 4 outlines the algorithm used to classify tracts into preference categories.

Table 4. Classifying Tracts into Preference Categories

IF the ratio of mail to internet return rates from 2013-2015 is...	AND the self-response check-in rate for 2013-2016 is...	AND the rate of high speed internet connections per 1,000 households is...	AND the percent of people 65 and older is...	AND the difference in self-response check-in before and after implementation is...	THEN the tract is...
≥ 1.20	$< 41.283\%$	Any rate	Any percent	Any difference	Mail Preference
≥ 1.20	$\geq 41.283\%$	≤ 400	Any percent	Any difference	Mail Preference
≥ 1.20	$\geq 41.283\%$	Any rate	$> 22\%$	Any difference	Mail Preference
≥ 1.75	Any rate	Any rate	Any percent	Any difference	Mail Preference
> 1	$< 50\%$	Any rate	Any percent	Any difference	Mixed Preference
> 1	$\geq 50\%$	≤ 400	Any percent	Any difference	Mixed Preference
> 1	$\geq 50\%$	Any rate	$> 22\%$	Any difference	Mixed Preference
Any ratio	Any rate	Any rate	Any percent	< -10	Mixed Preference

The remaining tracts were classified as Internet Preference and were not used in the analysis.

4.4 Analysis Rates

We evaluated the effect of the two treatments by comparing:

- Self-Response return rates (at the start of CAPI).
- Final Response rates (at closeout).
- Item Nonresponse rates (at closeout).

We also compared the demographic distributions of the responses for each treatment.

4.4.1 Self-Response Return Rates

We compared self-response return rates between treatments within Preference categories (i.e., Choice vs Push within the Mail Preference tracts and then Choice vs Push within the Mixed Preference tracts). Self-response return rates were calculated overall (total self-response) and also separately for internet and mail response. They were calculated using the base weights (the inverse of the probability of selection for a unit). For the comparisons of return rates by mode, the small number of returns obtained from Telephone Questionnaire Assistance (TQA) were classified as mail returns.

$$\text{Self-Response Return Rate} = \frac{\text{Number of mailable and deliverable sample addresses that provided a non-blank}^5 \text{ paper questionnaire via mail or TQA OR a complete or sufficient partial internet response}^6}{\text{Total number of mailable and deliverable sample addresses}} \times 100$$

Addresses designated as “undeliverable” by the United States Postal Service and for which no response was received were excluded from all return rate calculations. If more than one response was received from a single address (i.e., the survey was completed online and a paper questionnaire was mailed back), the response received first was considered the mode of response for this test.

4.4.2 Final Response Rates

Final response rates were calculated overall and by mode. They were calculated using the base weights for self-responses; CAPI cases were weighted by multiplying a sub-sampling factor by the initial base weight.

$$\text{Final Response Rate} = \frac{\text{Number of sample addresses that provided a complete or sufficient partial response}}{\text{Total number of addresses in the initial sample universe that were eligible}^7 \text{ to respond to the survey}} \times 100$$

⁵ A return is considered “blank” if there are no persons with sufficient response data and there is no telephone number listed on the form by the respondent.

⁶ A “sufficient partial response” is one that is complete up to the first question in the detailed person question section for the first person in the household.

⁷ Out-of-scope addresses include demolished homes, homes under construction, relocated houses or trailers, or addresses that are now a permanent business or storage facility. These classifications were determined during CAPI.

4.4.3 Item Nonresponse Rates

Total household-level item nonresponse rates and total person-level item nonresponse rates were calculated for each treatment and by mode. The total item nonresponse rates are the sum of the individual variable item nonresponse (separately for housing and person variables). The individual item nonresponse rates are as follows:

$$\text{Household-level Item Nonresponse Rate} = \frac{\text{Number of eligible housing units that did not provide a required response for the item}}{\text{Total number of eligible housing units}^8 \text{ required to provide a response to the item}} \times 100$$

$$\text{Person-level Item Nonresponse Rate} = \frac{\text{Number of eligible persons that did not provide a required response for the item}}{\text{Total number of eligible persons}^8 \text{ required to provide a response to the item}} \times 100$$

The total item nonresponse rates are:

$$\text{Total Household-level Item Nonresponse Rate} = \frac{\text{Sum of Individual Household-level Item Nonresponse Rate Numerators}^9}{\text{Sum of Individual Household-level Item Nonresponse Rate Denominators}^9} \times 100$$

$$\text{Total Person-level Item Nonresponse Rate} = \frac{\text{Sum of Individual Person-level Item Nonresponse Rate Numerators}^9}{\text{Sum of Individual Person-level Item Nonresponse Rate Denominators}^9} \times 100$$

4.5 Standard Errors

All variances were estimated using the Successive Differences Replication (SDR) method with replicate weights, the standard method used for the ACS. The variance for each rate and difference was calculated using the formula below.

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

⁸ A housing unit or person is eligible if at least some questions were answered, including any questions that determine the universe for the missing question (e.g., Age is used to determine the universe for Educational Attainment, so a person is not eligible for the Educational Attainment question if Age is missing).

⁹ Items (questions) included in these sums are listed in Table 5.

Where:

X_r = the estimate calculated using the r^{th} replicate

X_0 = the estimate calculated using the full sample

4.6 Characteristics of Respondents using the Choice Method versus the Push Method

We compared the demographic characteristics of those who responded in a self-response mode before the start of CAPI within the different treatments. There were household-level characteristics and person-level characteristics. The person-level characteristics are for each person in the household, not just the respondent.

The household-level characteristics were:

- Computer type
- Internet access
- Urban/rural
- Census region

The person-level characteristics were:

- Age
- Race
- Hispanic origin
- Education attainment
- Income
- Marital status
- English ability
- Nativity

Table 5 provides the demographic characteristics and the different categories for each. The categories for type of computer, internet access, age, race, Hispanic origin, educational attainment, income, marital status, and census region were based on definitions used by the Pew Research Center in their research on internet usage (Pew Research Center 2015). The Pew Research Center definitions for English ability and urban/rural do not completely match up to the ACS data. The categories for urban/rural were created by collapsing “mostly rural” and “rural”. The categories for English ability were left unchanged.

Table 5. Demographic Characteristics for Comparing Mailing Strategies

<i>Demographic Characteristics</i>	<i>Categories</i>
Computer Ownership	Desktop or Laptop Smartphone Tablet Other computer No computer
Internet access	Yes No
Age	Less than 18 18-29 30-49 50-64 65+
Race	White only Black only Other race only Two or more races
Hispanic origin	Hispanic Non-Hispanic
Educational attainment	High School or less Some college or associates degree Bachelor's degree or higher
Income	Less than \$20,000 \$20,000 to \$99,999 \$100,000 or higher
Marital status	Married Divorced or separated Widowed Never married
English ability	Speaks English only Speaks English very well Speaks English well Does not speak English well Does not speak English
Nativity	Born in the United States Not Born in the United States
Urban/rural	Urban Rural
Census region	Northeast Midwest South West

5. ASSUMPTIONS AND LIMITATIONS

5.1 Assumptions

- A single ACS monthly sample is representative of an entire year (twelve panels) and the entire frame sample, with respect to both return rates and cost.
- A single methods panel group (1/24 of the full monthly sample) is representative of the full monthly sample.

5.2 Limitations

- Group quarters and sampled housing unit addresses from remote Alaska and Puerto Rico were not included in the sample for the test.
- The universes for the third, fourth, and fifth mailings from treatment to treatment are different, and some caution should be given in drawing conclusions about those mailings from treatment comparisons.

6. RESULTS

6.1 Self-Response Return Rates

What is the impact of offering a choice in mode on the self-response return rates?

To answer this question, we compared the self-response return rates (overall and by mode) of the Choice method and Push method treatments within the Mail Preference and Mixed Preference tracts at the start of CAPI.

Table 6. Self-Response Return Rates for Mail Preference Tracts

Mode	Choice Method	Push Method	Difference	P-value
Total Self-Response	37.3 (0.4)	39.1 (0.4)	-1.7 (0.6)	<0.01*
Internet Response	6.5 (0.2)	17.8 (0.3)	-11.3 (0.3)	<0.01*
Mail Response	30.8 (0.3)	21.2 (0.3)	9.6 (0.4)	<0.01*

Source: U.S. Census Bureau, American Community Survey, 2017 Adaptive Strategy Test. DRB Approval Number: CBDRB-FY19-RAGLIN-B0004.

*P-value is significant based on a two-tailed t-test at $\alpha=0.1$ level.

Note: Minor additive discrepancies are due to rounding. Standard errors are in parentheses.

Table 7. Self-Response Return Rates for Mixed Preference Tracts

Mode	Choice Method	Push Method	Difference	P-value
Total Self-Response	45.7 (0.5)	48.4 (0.5)	-2.8 (0.6)	<0.01*
Internet Response	10.5 (0.3)	25.6 (0.4)	-15.1 (0.5)	<0.01*
Mail Response	35.1 (0.5)	22.8 (0.4)	12.3 (0.6)	<0.01*

Source: U.S. Census Bureau, American Community Survey, 2017 Adaptive Strategy Test. DRB Approval Number: CBDRB-FY19-RAGLIN-B0004.

*P-value is significant based on a two-tailed t-test at $\alpha=0.1$ level.

Note: Minor additive discrepancies are due to rounding. Standard errors are in parentheses.

For both Mail and Mixed Preference tracts, the Choice method produced higher return rates in the mail mode, but the difference in return rates for the internet mode (Push being higher) was so great, the overall return rates were significantly higher for the Push method.

We also compared the overall self-response return rates by each rule of our classification algorithm in order to see if the Choice method had higher self-response for any of the particular metric combinations. Each rule corresponds to a row in Table 4. Table 8 shows the by-rule results.

Table 8. Self-Response Return Rates by Algorithm Rule

Rule	Choice Method	Push Method	Difference	Adjusted P-value
Algorithm Rule 1	33.0 (0.4)	34.5 (0.4)	-1.5 (0.7)	0.17
Algorithm Rule 2	56.6 (2.0)	57.5 (2.3)	-0.8 (2.9)	1.00
Algorithm Rule 3	58.0 (1.4)	60.5 (1.3)	-2.5 (1.9)	0.77
Algorithm Rule 4	47.2 (1.7)	52.7 (1.5)	-5.5 (2.3)	0.13
Algorithm Rule 5	42.9 (0.6)	45.6 (0.5)	-2.7 (0.7)	<0.01*
Algorithm Rule 6	57.9 (5.5)	63.3 (5.6)	-5.4 (8.2)	1.00
Algorithm Rule 7	60.7 (1.9)	64.1 (1.6)	-3.4 (2.8)	0.77
Algorithm Rule 8	51.5 (1.1)	54.2 (1.2)	-2.6 (1.5)	0.39

Source: U.S. Census Bureau, American Community Survey, 2017 Adaptive Strategy Test. DRB Approval Number: CBDRB-FY19-RAGLIN-B0004.

*P-value is significant based on a two-tailed t-test at $\alpha=0.1$ level.

Note: Standard errors are in parentheses. P-values are adjusted for multiple comparisons.

Rule 5 of the algorithm (if the ratio of mail to internet responses was greater than 1 and the self-response check-in rate was less than 50 percent) had higher return rates for the Push method (after adjusting the p-values for multiple comparisons). There was no difference between Choice and Push for all other rules of the algorithm.

6.2 Final Response Rates

What is the impact of offering a choice in mode on the final response rates?

To answer this question, we compared the final response rates (overall and by mode) by treatment.

Table 9. Final Response Rates for Mail Preference Tracts

Mode	Choice Method	Push Method	Difference	P-value
Total Response	91.6 (0.4)	92.2 (0.3)	-0.6 (0.5)	0.18
Internet Response	6.8 (0.2)	15.7 (0.3)	-8.9 (0.3)	<0.01*
Mail Response	25.8 (0.3)	17.5 (0.2)	8.3 (0.4)	<0.01*
CAPI Response	59.0 (0.4)	59.0 (0.4)	-0.1 (0.6)	0.92

Source: U.S. Census Bureau, American Community Survey, 2017 Adaptive Strategy Test. DRB Approval Number: CBDRB-FY19-RAGLIN-B0004.

*P-value is significant based on a two-tailed t-test at $\alpha=0.1$ level.

Note: Minor additive discrepancies are due to rounding. Standard errors are in parentheses.

Table 10. Final Response Rates for Mixed Preference Tracts

Mode	Choice Method	Push Method	Difference	P-value
Total Response	93.3 (0.3)	93.4 (0.4)	-0.1 (0.5)	0.85
Internet Response	11.4 (0.3)	24.6 (0.4)	-13.3 (0.6)	<0.01*
Mail Response	31.8 (0.4)	20.9 (0.4)	11.0 (0.6)	<0.01*
CAPI Response	50.1 (0.6)	48.0 (0.7)	2.2 (0.9)	0.02*

Source: U.S. Census Bureau, American Community Survey, 2017 Adaptive Strategy Test. DRB Approval Number: CBDRB-FY19-RAGLIN-B0004.

*P-value is significant based on a two-tailed t-test at $\alpha=0.1$ level.

Note: Minor additive discrepancies are due to rounding. Standard errors are in parentheses.

The overall final response rates between the Choice and Push methods for Mail Preference tracts are not significantly different (as seen in Table 9). The final response rates from the internet mode are higher for the Push method and the final response rates from the mail mode are higher for the Choice method. There is no significant difference between methods for the CAPI mode.

The overall final response rates between the Choice and Push methods for Mixed Preference tracts are not significantly different (as seen in Table 10). The final response rates from the internet mode are higher for the Push method and the final response rates from the mail mode are higher for Choice method. The final response rates from CAPI are higher for the Choice method.

The final response rates were not different for the Choice method versus the Push method. However, the Choice method treatment is more expensive (because it includes two paper questionnaires as opposed to one), thus we do not recommend adopting this treatment based on the final response rate analysis.

Due to the poor performance of the Choice method in this test, we decided not to perform the cost and reliability analysis.

6.3 Item Nonresponse Rates

What is the impact of offering the Choice method on item nonresponse versus the Push method?

We calculated total household-level item nonresponse rates and total person-level item nonresponse rates for all treatments (for the self-response modes only).

For the Mail Preference tracts (Table 11), the total household-level item nonresponse for returns received in the Choice method (7.9 percent missing items) was higher than for the Push method (7.4 percent missing items). The item nonresponse rate for the Push method was higher than the Choice method in the mail mode. There was no difference for the internet mode.

Table 11. Household-level Item Nonresponse for Mail Preference Tracts

Category	Choice Method	Push Method	Difference	P-value
Total Nonresponse	7.9 (0.1)	7.4 (0.1)	0.5 (0.2)	0.02*
Internet Nonresponse	4.6 (0.2)	4.7 (0.2)	-0.1 (0.3)	0.68
Mail Nonresponse	8.8 (0.2)	9.9 (0.2)	-1.1 (0.3)	<0.01*

Source: U.S. Census Bureau, American Community Survey, 2017 Adaptive Strategy Test. DRB Approval Number: CBDRB-FY19-RAGLIN-B0004.

*P-value is significant based on a two-tailed t-test at $\alpha=0.1$ level.

Note: Standard errors are in parentheses.

For Mixed Preference tracts (Table 12), there was no difference in the total household-level item nonresponse rates. The item nonresponse rate for the Push method was higher than the Choice method for both the mail and internet modes.

Table 12. Household-level Item Nonresponse for Mixed Preference Tracts

Category	Choice Method	Push Method	Difference	P-value
Total Nonresponse	6.7 (0.1)	6.7 (0.2)	<0.1 (0.2)	0.94
Internet Nonresponse	3.8 (0.2)	4.5 (0.2)	-0.7 (0.2)	<0.01*
Mail Nonresponse	7.7 (0.2)	9.3 (0.3)	-1.6 (0.3)	<0.01*

Source: U.S. Census Bureau, American Community Survey, 2017 Adaptive Strategy Test. DRB Approval Number: CBDRB-FY19-RAGLIN-B0004.

*P-value is significant based on a two-tailed t-test at $\alpha=0.1$ level.

Note: Standard errors are in parentheses.

What is unusual with the results in Tables 11 and 12 is that, by mode, the differences indicate higher item nonresponse for the Push method, but the difference in total item nonresponse is not significantly different or indicates lower item nonresponse for the Push method. This is an example of Simpson's paradox, in which trends for subgroups disappear or reverse direction when combined. We believe this has to do with the unequal distribution of responses within treatments (the Push method has a higher proportion of internet responses and the Choice method has a higher proportion of mail responses). Mail responses also typically have higher

item nonresponse rates than internet returns, so the overall completion rate is being driven by the mail returns.

Tables 13 and 14 show the person-level item nonresponse rates.

For Mail Preference tracts, there was no difference in the total person-level item nonresponse rates for the Choice method and the Push method. The person-level item nonresponse rate for the Push method was higher than for the Choice method for both the internet and mail modes.

Table 13. Person-level Item Nonresponse for Mail Preference Tracts

Category	Choice Method	Push Method	Difference	P-value
Total Nonresponse	9.7 (0.2)	10.0 (0.2)	-0.3 (0.3)	0.30
Internet Nonresponse	6.7 (0.5)	8.3 (0.3)	-1.6 (0.5)	<0.01*
Mail Nonresponse	10.7 (0.2)	12.1 (0.3)	-1.4 (0.4)	<0.01*

Source: U.S. Census Bureau, American Community Survey, 2017 Adaptive Strategy Test. DRB Approval Number: CBDRB-FY19-RAGLIN-B0004.

*P-value is significant based on a two-tailed t-test at $\alpha=0.1$ level.

Note: Standard errors are in parentheses.

For Mixed Preference tracts, there was no difference in the total person-level item nonresponse rates for the Choice method and the Push method. The person-level item nonresponse rate for the Push method was higher than the Choice method for both the internet and mail modes.

Table 14. Person-level Item Nonresponse for Mixed Preference Tracts

Category	Choice Method	Push Method	Difference	P-value
Total Nonresponse	8.4 (0.2)	8.7 (0.2)	-0.4 (0.3)	0.19
Internet Nonresponse	6.5 (0.4)	7.6 (0.3)	-1.1 (0.5)	0.01*
Mail Nonresponse	9.2 (0.2)	10.4 (0.3)	-1.2 (0.4)	<0.01*

Source: U.S. Census Bureau, American Community Survey, 2017 Adaptive Strategy Test. DRB Approval Number: CBDRB-FY19-RAGLIN-B0004.

*P-value is significant based on a two-tailed t-test at $\alpha=0.1$ level.

Note: Standard errors are in parentheses.

Again, although the comparisons are significant by mode, the overall difference in treatments is not significant (Simpson's paradox).

For more information on Simpson's paradox see Carlson (2016).

6.4 Demographics

What are the demographic characteristics of the households who respond using the Choice method versus the Push method?

We examined the demographic characteristics (both household-level and person-level characteristics from Table 5) of those that responded by a self-response mode prior to the start of CAPI. The different treatments are abbreviated as:

- MLC – Mail Preference, Choice Method
- MLP – Mail Preference, Push Method
- MXC – Mixed Preference, Choice Method
- MXP – Mixed Preference, Push Method

Tables 15 and 16 show the age distributions between the Push and Choice methods for the Mail Preference and Mixed Preference tracts.

Table 15. Age Distribution for Mail Preference Tracts

Category	MLC Count	MLC Percent	MLP Count	MLP Percent
Less than 18	3,300	17.8 (0.4)	3,700	18.7 (0.4)
18-29	2,000	10.9 (0.3)	2,200	11.7 (0.3)
30-49	3,600	19.2 (0.3)	4,000	20.5 (0.4)
50-64	4,600	24.8 (0.5)	4,700	23.7 (0.4)
65+	5,000	27.3 (0.5)	4,900	25.4 (0.5)

$\chi^2 = 19.3$, Adjusted p-value = $<0.01^*$

Source: U.S. Census Bureau, American Community Survey, 2017 Adaptive Strategy Test. DRB Approval Number: CBDRB-FY19-RAGLIN-B0004.

Note: Minor additive discrepancies are due to rounding. Standard errors are in parentheses.

Table 16. Age Distribution for Mixed Preference Tracts

Category	MXC Count	MXC Percent	MXP Count	MXP Percent
Less than 18	3,200	18.5 (0.4)	3,400	18.8 (0.4)
18-29	1,900	11.7 (0.4)	2,000	11.6 (0.3)
30-49	3,500	21.1 (0.4)	3,900	22.1 (0.4)
50-64	4,100	23.9 (0.5)	4,200	23.3 (0.4)
65+	4,200	24.8 (0.5)	4,200	24.2 (0.5)

$\chi^2 = 3.9$, Adjusted p-value = 1.00

Source: U.S. Census Bureau, American Community Survey, 2017 Adaptive Strategy Test. DRB Approval Number: CBDRB-FY19-RAGLIN-B0004.

Note: Minor additive discrepancies are due to rounding. Standard errors are in parentheses.

The age distribution for the Mail Preference tracts was significantly different between Choice and Push (using a Chi-square test). We followed up by conducting t-tests for age and then adjusted for multiple comparisons. There was still a significant difference between the Choice and Push for some of the age categories (Table 17). The Choice method had a higher percentage of adults 65 and older than the Push method, while the Push method had a higher percentage for those age 30-49. The other three categories, less than 18, age 18-29, and age 50-64 were not statistically different.

Table 17. Age T-tests for Mail Preference Tracts

Category	Choice Method	Push Method	Difference	Adjusted P-value
Less than 18	17.8 (0.4)	18.7 (0.4)	-1.0 (0.5)	0.11
18-29	10.9 (0.3)	11.7 (0.3)	-0.8 (0.5)	0.11
30-49	19.2 (0.3)	20.5 (0.4)	-1.3 (0.5)	0.10*
50-64	24.8 (0.5)	23.7 (0.4)	1.1 (0.6)	0.11
65+	27.3 (0.5)	25.4 (0.5)	2.0 (0.6)	<0.01*

Source: U.S. Census Bureau, American Community Survey, 2017 Adaptive Strategy Test. DRB Approval Number: CBDRB-FY19-RAGLIN-B0004.

*P-value is significant based on a two-tailed t-test at $\alpha=0.1$ level.

Note: P-values are adjusted for multiple comparisons. Minor additive discrepancies are due to rounding. Standard errors are in parentheses.

There was no significant difference between the Choice method and Push method for age in the Mixed Preference tracts.

Tables 18 and 19 show the race distributions between mail methods for the Mail Preference and Mixed Preference tracts.

There was no difference in the race distributions for the Choice method and the Push method. This is true for both the Mail Preference and Mixed Preference categories.

Table 18. Race Distribution for Mail Preference Tracts

Category	MLC Count	MLC Percent	MLP Count	MLP Percent
White Only	13,500	70.5 (0.5)	14,000	69.8 (0.7)
Black Only	3,200	18.5 (0.6)	3,400	19.2 (0.5)
Other Race Only	1,300	7.3 (0.3)	1,300	7.3 (0.4)
Two or More Races	650	3.7 (0.3)	700	3.7 (0.2)

$\chi^2 = 0.8$, Adjusted p-value = 1.00

Source: U.S. Census Bureau, American Community Survey, 2017 Adaptive Strategy Test. . DRB Approval Number: CBDRB-FY19-RAGLIN-B0004.

Note: Minor additive discrepancies are due to rounding. Standard errors are in parentheses

Table 19. Race Distribution for Mixed Preference Tracts

Category	MXC Count	MXC Percent	MXP Count	MXP Percent
White Only	13,500	80.3 (0.5)	14,500	79.9 (0.5)
Black Only	1,200	8.2 (0.4)	1,300	8.6 (0.4)
Other Race Only	1,300	8.1 (0.5)	1,300	8.1 (0.4)
Two or More Races	500	3.4 (0.3)	600	3.3 (0.2)

$\chi^2 = 0.5$, Adjusted p-value = 1.00

Source: U.S. Census Bureau, American Community Survey, 2017 Adaptive Strategy Test. DRB Approval Number: CBDRB-FY19-RAGLIN-B0004.

Note: Minor additive discrepancies are due to rounding. Standard errors are in parentheses.

Tables 20 and 21 show the Hispanic origin distributions for the Mail Preference and Mixed Preference categories.

There was no difference in the Hispanic origin distributions for the Choice method and the Push method. This is true for both the Mail Preference and Mixed Preference categories.

Table 20. Hispanic Origin Distribution for Mail Preference Tracts

Category	MLC Count	MLC Percent	MLP Count	MLP Percent
Hispanic	2,300	14.9 (0.6)	2,700	16.3 (0.6)
Non-Hispanic	15,500	85.1 (0.6)	16,000	83.7 (0.6)

$\chi^2 = 3.2$, Adjusted p-value = 0.70

Source: U.S. Census Bureau, American Community Survey, 2017 Adaptive Strategy Test. DRB Approval Number: CBDRB-FY19-RAGLIN-B0004.

Note: Minor additive discrepancies are due to rounding. Standard errors are in parentheses.

Table 21. Hispanic Origin Distribution for Mixed Preference Tracts

Category	MXC Count	MXC Percent	MXP Count	MXP Percent
Hispanic	2,000	13.2 (0.6)	2,000	12.8 (0.5)
Non-Hispanic	14,500	86.8 (0.6)	15,500	87.2 (0.5)

$\chi^2 = 0.3$, Adjusted p-value = 1.00

Source: U.S. Census Bureau, American Community Survey, 2017 Adaptive Strategy Test. DRB Approval Number: CBDRB-FY19-RAGLIN-B0004.

Note: Minor additive discrepancies are due to rounding. Standard errors are in parentheses.

Tables 22 and 23 show the education attainment distributions for the Mail Preference and Mixed Preference categories.

There was no difference in the educational attainment distributions between Choice and Push for either the Mail Preference or Mixed Preference categories.

Table 22. Educational Attainment Distribution for Mail Preference Tracts

Category	MLC Count	MLC Percent	MLP Count	MLP Percent
High School or less	6,700	51.4 (0.6)	6,900	50.5 (0.5)
Some college or associates degree	4,000	30.3 (0.5)	4,100	30.6 (0.4)
Bachelor's degree or higher	2,300	18.4 (0.4)	2,500	18.9 (0.4)

$\chi^2 = 1.7$, Adjusted p-value = 1.00

Source: U.S. Census Bureau, American Community Survey, 2017 Adaptive Strategy Test. DRB Approval Number: CBDRB-FY19-RAGLIN-B0004.

Note: Minor additive discrepancies are due to rounding. Standard errors are in parentheses.

Table 23. Educational Attainment Distribution for Mixed Preference Tracts

Category	MXC Count	MXC Percent	MXP Count	MXP Percent
High School or less	5,300	43.2 (0.6)	5,300	41.7 (0.6)
Some college or associates degree	3,700	30.7 (0.5)	3,900	32.0 (0.5)
Bachelor's degree or higher	3,000	26.1 (0.6)	3,000	26.3 (0.6)

$\chi^2 = 3.5$, Adjusted p-value = 1.00

Source: U.S. Census Bureau, American Community Survey, 2017 Adaptive Strategy Test. DRB Approval Number: CBDRB-FY19-RAGLIN-B0004.

Note: Minor additive discrepancies are due to rounding. Standard errors are in parentheses.

Tables 24 and 25 show the income distributions for the Mail Preference and Mixed Preference categories.

There was no difference in the income distributions between the Choice method and the Push method for either of the Mail Preference or Mixed Preference categories.

Table 24. Income Distribution for Mail Preference Tracts

Category	MLC Count	MLC Percent	MLP Count	MLP Percent
Less than \$20,000	6,300	50.9 (0.5)	6,700	51.9 (0.5)
\$20,000 to \$99,999	5,700	45.6 (0.5)	5,800	45.0 (0.5)
\$100,000 or higher	450	3.6 (0.2)	400	3.1 (0.1)

$\chi^2 = 4.3$, Adjusted p-value = 1.00

Source: U.S. Census Bureau, American Community Survey, 2017 Adaptive Strategy Test. DRB Approval Number: CBDRB-FY19-RAGLIN-B0004.

Note: Minor additive discrepancies are due to rounding. Standard errors are in parentheses.

Table 25. Income Distribution for Mixed Preference Tracts

Category	MXC Count	MXC Percent	MXP Count	MXP Percent
Less than \$20,000	5,000	43.0 (0.6)	5,400	43.6 (0.6)
\$20,000 to \$99,999	6,100	51.5 (0.6)	6,200	51.0 (0.6)
\$100,000 or higher	600	5.6 (0.3)	600	5.4 (0.3)

$\chi^2 = 0.9$, Adjusted p-value = 1.00

Source: U.S. Census Bureau, American Community Survey, 2017 Adaptive Strategy Test. DRB Approval Number: CBDRB-FY19-RAGLIN-B0004.

Note: Minor additive discrepancies are due to rounding. Standard errors are in parentheses.

Tables 26 and 27 show the marital status distributions for the Mail Preference and Mixed Preference categories.

There was no difference in the marital status distributions between the Choice method and the Push method for either of the Mail Preference or Mixed Preference categories.

Table 26. Marital Status Distribution for Mail Preference Tracts

Category	MLC Count	MLC Percent	MLP Count	MLP Percent
Married	7,500	51.1 (0.6)	7,900	51.1 (0.7)
Divorced or separated	2,200	15.4 (0.4)	2,200	14.7 (0.4)
Widowed	1,200	8.3 (0.3)	1,300	8.8 (0.3)
Never married	3,500	25.2 (0.4)	3,700	25.4 (0.5)

$\chi^2 = 2.4$, Adjusted p-value = 1.00

Source: U.S. Census Bureau, American Community Survey, 2017 Adaptive Strategy Test. DRB Approval Number: CBDRB-FY19-RAGLIN-B0004.

Note: Minor additive discrepancies are due to rounding. Standard errors are in parentheses.

Table 27. Marital Status Distribution for Mixed Preference Tracts

Category	MXC Count	MXC Percent	MXP Count	MXP Percent
Married	7,400	55.2 (0.7)	7,700	55.0 (0.6)
Divorced or separated	1,800	14.0 (0.4)	1,900	14.1 (0.4)
Widowed	1,000	7.8 (0.2)	1,100	7.6 (0.3)
Never married	3,000	23.1 (0.5)	3,200	23.3 (0.4)

$\chi^2 = 0.2$, Adjusted p-value = 1.00

Source: U.S. Census Bureau, American Community Survey, 2017 Adaptive Strategy Test. DRB Approval Number: CBDRB-FY19-RAGLIN-B0004.

Note: Minor additive discrepancies are due to rounding. Standard errors are in parentheses.

Tables 28 and 29 show the nativity distributions for the Mail Preference and Mixed Preference categories.

There was no difference in the nativity distributions between the Choice method and the Push method for either of the Mail Preference or Mixed Preference categories.

Table 28. Nativity Distribution for Mail Preference Tracts

Category	MLC Count	MLC Percent	MLP Count	MLP Percent
Born in the United States	16,000	91.0 (0.4)	16,500	90.3 (0.4)
Not Born in the United States	1,400	9.0 (0.4)	1,500	9.7 (0.4)

$\chi^2 = 2.0$, Adjusted p-value = 1.00

Source: U.S. Census Bureau, American Community Survey, 2017 Adaptive Strategy Test. DRB Approval Number: CBDRB-FY19-RAGLIN-B0004.

Note: Minor additive discrepancies are due to rounding. Standard errors are in parentheses.

Table 29. Nativity Distribution for Mixed Preference Tracts

Category	MXC Count	MXC Percent	MXP Count	MXP Percent
Born in the United States	14,500	89.8 (0.4)	15,000	90.1 (0.4)
Not Born in the United States	1,400	10.3 (0.4)	1,500	9.9 (0.4)

$\chi^2 = 0.5$, Adjusted p-value = 1.00

Source: U.S. Census Bureau, American Community Survey, 2017 Adaptive Strategy Test. DRB Approval Number: CBDRB-FY19-RAGLIN-B0004.

Note: Minor additive discrepancies are due to rounding. Standard errors are in parentheses.

Tables 30 and 31 show the English ability distributions for the Mail Preference and Mixed Preference categories.

There was no difference in the English ability distributions between the Choice method and the Push method for either of the Mail Preference or Mixed Preference categories.

Table 30. English Ability Distribution for Mail Preference Tracts

Category	MLC Count	MLC Percent	MLP Count	MLP Percent
Speaks English only	14,000	83.5 (0.6)	14,500	83.4 (0.5)
Speaks English very well	1,500	9.8 (0.4)	1,500	10.0 (0.3)
Speaks English well	500	3.6 (0.2)	550	3.5 (0.2)
Does not speak English well	300	2.3 (0.2)	350	2.3 (0.2)
Does not speak English	100	0.8 (0.1)	100	0.8 (0.1)

$\chi^2 = 0.5$, Adjusted p-value = 1.00

Source: U.S. Census Bureau, American Community Survey, 2017 Adaptive Strategy Test. DRB Approval Number: CBDRB-FY19-RAGLIN-B0004.

Note: Minor additive discrepancies are due to rounding. Standard errors are in parentheses.

Table 31. English Ability Distribution for Mixed Preference Tracts

Category	MXC Count	MXC Percent	MXP Count	MXP Percent
Speaks English only	13,000	84.2 (0.5)	13,500	85.4 (0.5)
Speaks English very well	1,300	9.5 (0.4)	1,200	8.6 (0.3)
Speaks English well	450	3.5 (0.2)	500	3.7 (0.2)
Does not speak English well	300	2.2 (0.2)	250	1.8 (0.2)
Does not speak English	80	0.6 (0.1)	70	0.5 (0.1)

$\chi^2 = 7.6$, Adjusted p-value = 1.00

Source: U.S. Census Bureau, American Community Survey, 2017 Adaptive Strategy Test. DRB Approval Number: CBDRB-FY19-RAGLIN-B0004.

Note: Minor additive discrepancies are due to rounding. Standard errors are in parentheses.

Tables 32 and 33 show the internet access distributions for the Mail Preference and Mixed Preference categories.

There was no difference in the internet access distributions between the Choice method and the Push method for either of the Mail Preference or Mixed Preference categories.

Table 32. Internet Access Distribution for Mail Preference Tracts

Category	MLC Count	MLC Percent	MLP Count	MLP Percent
Yes	6,600	80.3 (0.5)	6,700	80.3 (0.5)
No	1,700	19.7 (0.5)	1,700	19.7 (0.5)

$\chi^2 = <0.1$, Adjusted p-value = 1.00

Source: U.S. Census Bureau, American Community Survey, 2017 Adaptive Strategy Test. DRB Approval Number: CBDRB-FY19-RAGLIN-B0004.

Note: Minor additive discrepancies are due to rounding. Standard errors are in parentheses.

Table 33. Internet Access Distribution for Mixed Preference Tracts

Category	MXC Count	MXC Percent	MXP Count	MXP Percent
Yes	6,200	85.9 (0.4)	6,500	85.9 (0.5)
No	1,100	14.1 (0.4)	1,100	14.1 (0.5)

$\chi^2 = <0.1$, Adjusted p-value = 1.00

Source: U.S. Census Bureau, American Community Survey, 2017 Adaptive Strategy Test. DRB Approval Number: CBDRB-FY19-RAGLIN-B0004.

Note: Minor additive discrepancies are due to rounding. Standard errors are in parentheses.

Tables 34 and 35 show the region distributions for the Mail Preference and Mixed Preference categories.

There was no difference in the region distributions between the Choice method and the Push method for either of the Mail Preference or Mixed Preference categories.

Table 34. Region Distribution for Mail Preference Tracts

Category	MLC Count	MLC Percent	MLP Count	MLP Percent
Northeast	1,100	13.4 (0.5)	1,200	13.3 (0.4)
Midwest	2,500	22.0 (0.5)	2,500	22.3 (0.4)
South	4,200	53.7 (0.7)	4,300	53.7 (0.7)
West	900	10.9 (0.4)	850	10.7 (0.4)

$\chi^2 = 0.3$, Adjusted p-value = 1.00

Source: U.S. Census Bureau, American Community Survey, 2017 Adaptive Strategy Test. DRB Approval Number: CBDRB-FY19-RAGLIN-B0004.

Note: Minor additive discrepancies are due to rounding. Standard errors are in parentheses.

Table 35. Region Distribution for Mixed Preference Tracts

Category	MXC Count	MXC Percent	MXP Count	MXP Percent
Northeast	1,500	18.8 (0.6)	1,500	18.4 (0.5)
Midwest	2,300	23.8 (0.6)	2,300	23.0 (0.5)
South	2,700	41.4 (0.7)	2,900	42.5 (0.7)
West	1,100	16.0 (0.5)	1,200	16.1 (0.5)

$\chi^2 = 2.1$, Adjusted p-value = 1.00

Source: U.S. Census Bureau, American Community Survey, 2017 Adaptive Strategy Test. DRB Approval Number: CBDRB-FY19-RAGLIN-B0004.

Note: Minor additive discrepancies are due to rounding. Standard errors are in parentheses.

Tables 36 and 37 show the urban/rural distributions for the Mail Preference and Mixed Preference categories.

There was no difference in the urban/rural distributions between the Choice method and the Push method for either of the Mail Preference or Mixed Preference categories.

Table 36. Urban Rural Distribution for Mail Preference Tracts

Category	MLC Count	MLC Percent	MLP Count	MLP Percent
Urban	3,700	35.2 (0.6)	3,700	34.3 (0.5)
Rural	4,900	64.8 (0.6)	5,100	65.7 (0.5)

$\chi^2 = 1.3$, Adjusted p-value = 1.00

Source: U.S. Census Bureau, American Community Survey, 2017 Adaptive Strategy Test. DRB Approval Number: CBDRB-FY19-RAGLIN-B0004.

Note: Minor additive discrepancies are due to rounding. Standard errors are in parentheses.

Table 37. Urban Rural Distribution for Mixed Preference Tracts

Category	MXC Count	MXC Percent	MXP Count	MXP Percent
Urban	2,600	25.5 (0.6)	2,700	26.6 (0.6)
Rural	5,000	74.6 (0.6)	5,200	73.5 (0.6)

$\chi^2 = 1.4$, Adjusted p-value = 1.00

Source: U.S. Census Bureau, American Community Survey, 2017 Adaptive Strategy Test. DRB Approval Number: CBDRB-FY19-RAGLIN-B0004.

Note: Minor additive discrepancies are due to rounding. Standard errors are in parentheses.

Tables 38 and 39 show the distributions of the type of computer respondents own for the Mail Preference and Mixed Preference categories. Because the categories are not mutually exclusive, we performed t-tests instead of chi-square tests.

Table 38. Type of Computer Distribution for Mail Preference Tracts

Category	Choice Method	Push Method	Difference	Adjusted P-value
Desktop or Laptop	69.7 (0.6)	69.7 (0.6)	<0.1 (0.8)	1.00
Smartphone	74.3 (0.6)	74.5 (0.6)	-0.1 (0.8)	1.00
Tablet	58.8 (0.7)	59.7 (0.6)	-1.0 (0.9)	1.00
Other computer	4.5 (0.4)	5.7 (0.4)	-1.3 (0.5)	0.09*
No computer	16.6 (0.5)	16.1 (0.5)	0.5 (0.7)	1.00

Source: U.S. Census Bureau, American Community Survey, 2017 Adaptive Strategy Test. DRB Approval Number: CBDRB-FY19-RAGLIN-B0004.

*P-value is significant based on a two-tailed t-test at $\alpha=0.1$ level.

Note: P-values are adjusted for multiple comparisons. Minor additive discrepancies are due to rounding. Standard errors are in parentheses.

Table 39. Type of Computer Distribution for Mixed Preference Tracts

Category	Choice Method	Push Method	Difference	Adjusted P-value
Desktop or Laptop	78.6 (0.6)	79.2 (0.6)	-0.6 (0.8)	1.00
Smartphone	79.9 (0.6)	80.0 (0.4)	-0.1 (0.8)	1.00
Tablet	67.4 (0.7)	67.2 (0.7)	0.2 (0.9)	1.00
Other computer	6.7 (0.5)	5.9 (0.4)	0.7 (0.7)	1.00
No computer	11.7 (0.4)	10.9 (0.4)	0.8 (0.6)	0.79

Source: U.S. Census Bureau, American Community Survey, 2017 Adaptive Strategy Test. . DRB Approval Number: CBDRB-FY19-RAGLIN-B0004.

*P-value is significant based on a two-tailed t-test at $\alpha=0.1$ level.

Note: P-values are adjusted for multiple comparisons. Minor additive discrepancies are due to rounding. Standard errors are in parentheses.

In Table 38, the Push method had a higher percentage of households with “other computer” than Choice. There were no other significant differences between Choice and Push for type of computer for the Mail Preference tracts. There was no significant difference between Choice and Push for type of computer in the Mixed Preference tracts (Table 39).

7. CONCLUSIONS

Including a paper questionnaire in both the first and third mailings increases costs for the ACS program. In order to justify adopting the Choice method treatment, we would need to see a sizable increase in self-response. Although the Choice method increased response in the mail mode, we did not see an increase in overall self-response for this method, thus we do not recommend moving forward with using the implemented algorithm to give a choice in response mode in the initial mailing package. Future research could be conducted to refine the algorithm to better identify tracts or housing units where a Choice mailing strategy would be beneficial.

The Choice method household-level item nonresponse rate was higher than the Push method. The household-level item nonresponse rates were not significantly different between the Choice and Push in the Mixed Preference tracts.

The age distribution was significantly different for the Mail Preference category, with Choice having a higher percentage of 65 and older adults, and Push having a higher percentage of 30 to 49 year olds. There was a higher proportion of “other computer” owners in the Push method treatment than the Choice method treatment in the Mail Preference tracts. For all other demographic distributions, there was no significant difference between Choice and Push.

The Choice method treatment did not have a positive effect on self-response for the ACS, but did work well in tests conducted for the decennial census. We are not entirely sure why, but it could be due to the length of the ACS survey and the general lack of awareness of the ACS to the public.

8. REFERENCES

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Appendix A. Push Method Materials

A.1 Push Method – Initial Mailing Package Letter

ACS-13(L)(2017)
(6-2016)



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

A message from the Director, U.S. Census Bureau ...

Your household has been randomly selected to complete a very important national survey, the American Community Survey. The U.S. Census Bureau conducts this survey to give our country an up-to-date picture of how we live—our education, employment, housing, and more. Using the enclosed instructions, please complete the survey online as soon as possible at:

<https://respond.census.gov/acs>

The Census Bureau is using the Internet to collect this information in an effort to conserve natural resources, save taxpayers' money, and process your data more efficiently. If you are unable to complete the survey online, there is no need to contact us. We will send you a paper questionnaire in a few weeks.

This survey collects critical information used to meet the needs of communities across the United States. For example, results from this survey are used to decide where new schools, hospitals, and fire stations are needed. This information also helps communities plan for the kinds of emergency situations that might affect you and your neighbors, such as floods and other natural disasters.

The Census Bureau chose your address, not you personally, as part of a randomly selected sample. You are required by U.S. law to respond to this survey. The Census Bureau is required by U.S. law to keep your answers confidential. The enclosed brochures answer frequently asked questions about the survey.

If you need help completing the survey, please call our toll-free number (1-800-354-7271).

Thank you.

Sincerely,

John H. Thompson
Director

Enclosures



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A.2 Push Method – Reminder Letter

ACS-20(L)(2015)
(5-2015)



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

A message from the Director, U.S. Census Bureau ...

A few days ago, you should have received instructions for completing the **American Community Survey** online. Local communities depend on information from this survey to decide where schools, highways, hospitals, and other important services are needed. If you have not already responded, please do so now.

Respond now at <https://respond.census.gov/acs>
Log in using this user ID:

If we do not receive your response online, we will mail a paper questionnaire to your address.

Your response to this survey is required by law. Your response is critically important to your local community and your country. Responding promptly will prevent your receiving additional reminder mailings, phone calls, or personal visits from Census Bureau interviewers.

If you need help completing the survey or have questions, please call 1-800-354-7271.

Thank you in advance for your prompt response.

Sincerely,

John H. Thompson
Director, U.S. Census Bureau

A.3 Push Method – Paper Questionnaire Package Letter

ACS-14(L)(2017)
(6-2016)



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

A message from the Director, U.S. Census Bureau...

About two weeks ago, the U.S. Census Bureau sent instructions for completing the American Community Survey to your address. We asked you to help us with this very important survey by completing it online. But we have not received your response yet.

If you have already completed the survey, thank you very much. If you have not, please complete the survey soon using ONE of the following two options.

- Option 1:** Go to <https://respond.census.gov/acs> to complete the survey online.
- Option 2:** Fill out and mail back the enclosed questionnaire.

This survey is so important that a Census Bureau representative may attempt to contact you by telephone or personal visit if we do not receive your response.

The information collected in this survey will help decide where new schools, hospitals, and fire stations are needed. The information also is used to develop programs to reduce traffic congestion, provide job training, and plan for the health care needs of the elderly.

The Census Bureau chose your address, not you personally, as part of a randomly selected sample. You are required by U.S. law to respond to this survey. The Census Bureau is required by U.S. law to keep your answers confidential. The enclosed brochure answers frequently asked questions about the survey.

If you need help completing the survey, please call our toll-free number (1-800-354-7271).

Thank you.

Sincerely,

John H. Thompson
Director

Enclosures

A.4 Push Method – Additional Reminder Postcard

ACS-29(2015) (7-2015)



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

A message from the Director, U.S. Census Bureau . . .

Within the last few weeks, the U.S. Census Bureau sent you several requests to complete the American Community Survey. **Now is the time to complete the survey if you have not already done so.** Please complete the questionnaire and return it now OR go to <https://respond.census.gov/acs> to respond online.

Your response to this survey is required by U.S. law. If you do not respond, a Census Bureau interviewer may contact you to complete the survey. Local and national leaders use the information from this survey for planning schools, hospitals, roads, and other community needs.

If you need help completing the survey or have questions, please call our toll-free number (1-800-354-7271).

Thank you.

A handwritten signature in black ink, appearing to read "John H. Thompson".

John H. Thompson

A.5 Push Method – Final Reminder Postcard

ACS-23(2015) (7-2015)



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

A message from the Director, U.S. Census Bureau . . .

Within the last few weeks, the U.S. Census Bureau mailed an American Community Survey questionnaire package to your address. **You are required by U.S. law to respond to this survey.** The Census Bureau is required by U.S. law to keep your answers confidential. If you have already responded, thank you. If you have not, please complete the questionnaire and send it now, or complete the survey online now at <https://respond.census.gov/acs>.

Your response is critically important to your local community and to your country. If you do not respond, a Census Bureau interviewer may contact you by personal visit to complete the survey.

If you would like to complete the survey by telephone or need assistance, please call our toll-free number (1-800-354-7271).

Thank you.

A handwritten signature in black ink, appearing to read "John H. Thompson".

John H. Thompson

Appendix B. Choice Method Materials

B.1 Choice Method – Pre-Notice Letter

ACS-12(LX)AS(2017)
(6-2017)



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

A message from the Director, U.S. Census Bureau...

In a few days your household will receive instructions in the mail on how to complete a very important national survey, the American Community Survey. Please follow the instructions to complete the survey promptly. The U.S. Census Bureau is conducting this survey and chose your address, not you personally, as part of a randomly selected sample.

The American Community Survey collects information about various topics like education, housing, and jobs. Information from this survey is used by federal, state, local, and tribal governments to meet the needs of communities across America. For example, community leaders use this information to decide where schools, highways, hospitals, and other services are needed. The survey also is used to develop programs to reduce traffic congestion, provide job training, and plan for the health care needs of the elderly.

If you have access to the Internet and want to learn more about the American Community Survey, please visit the Census Bureau's Web site: www.census.gov/acs.

Thank you in advance for your help.

Enclosures

B.2 Choice Method – Initial Mailing Package Letter

ACS-13(LX)AS(2017)
(6-2017)



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

A message from the Director, U.S. Census Bureau...

Your household has been randomly selected to complete a very important national survey, the American Community Survey. The U.S. Census Bureau conducts this survey to give our country an up-to-date picture of how we live—our education, employment, housing, and more.

Please complete the survey as soon as possible using ONE of the following two options.

Option 1: Go to <https://respond.census.gov/acs> to complete the survey online. You will need information from the address label on the enclosed questionnaire to log in.

Option 2: Fill out and mail back the enclosed questionnaire.

This survey collects critical information used to meet the needs of communities across the United States. For example, results from this survey are used to decide where new schools, hospitals, and fire stations are needed. This information also helps communities plan for the kinds of emergency situations that might affect you and your neighbors, such as floods and other natural disasters.

The Census Bureau chose your address, not you personally, as part of a randomly selected sample. You are required by U.S. law to respond to this survey. The Census Bureau is required by U.S. law to keep your answers confidential. The Census Bureau is not permitted to publicly release your responses in a way that could identify you. Per the Federal Cybersecurity Enhancement Act of 2015, your data are protected from cybersecurity risks through screening of the systems that transmit your data. The enclosed brochure answers frequently asked questions about the survey.

If you need help completing the survey, please call our toll-free number (1-800-354-7271).

Thank you.

Enclosures



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B.3 Choice Method – Reminder Postcard

ACS-20(X)AS(2017) (6-2017)



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

A message from the Director, U.S. Census Bureau...

A few days ago, you should have received a request to complete the American Community Survey. If you have already responded, thank you. If you have not, please complete the survey online at <https://respond.census.gov/acs> or mail the questionnaire back soon.

Local and national leaders use the information from this survey for planning schools, hospitals, roads, and other community needs.

If you need help completing the survey or have questions, please call our toll-free number (1-800-354-7271).

Thank you.

B.4 Choice Method – Replacement Questionnaire Package Letter

ACS-14(LX)AS(2017)
(6-2017)



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

A message from the Director, U.S. Census Bureau...

About three weeks ago, the U.S. Census Bureau sent instructions for completing the American Community Survey to your address. We asked you to help us with this very important survey by completing it and mailing back the questionnaire or providing your information online. But we have not received your response yet.

If you have already completed the survey, thank you very much. If you have not, please complete the survey soon using ONE of the following two options.

Option 1: Go to <https://respond.census.gov/acs> to complete the survey online.

Option 2: Fill out and mail back the enclosed questionnaire.

This survey is so important that a Census Bureau representative may attempt to contact you by telephone or personal visit if we do not receive your response.

The information collected in this survey will help decide where new schools, hospitals, and fire stations are needed. The information also is used to develop programs to reduce traffic congestion, provide job training, and plan for the health care needs of the elderly.

The Census Bureau chose your address, not you personally, as part of a randomly selected sample. You are required by U.S. law to respond to this survey. The Census Bureau is required by U.S. law to keep your answers confidential. The Census Bureau is not permitted to publicly release your responses in a way that could identify you. Per the Federal Cybersecurity Enhancement Act of 2015, your data are protected from cybersecurity risks through screening of the systems that transmit your data. The enclosed brochure answers frequently asked questions about the survey.

If you need help completing the survey, please call our toll-free number (1-800-354-7271).

Thank you.

Enclosures



census.gov

B.5 Choice Method – Final Reminder Postcard

ACS-23(2015) (7-2015)



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

A message from the Director, U.S. Census Bureau . . .

Within the last few weeks, the U.S. Census Bureau mailed an American Community Survey questionnaire package to your address. **You are required by U.S. law to respond to this survey.** The Census Bureau is required by U.S. law to keep your answers confidential. If you have already responded, thank you. If you have not, please complete the questionnaire and send it now, or complete the survey online now at <https://respond.census.gov/acs>.

Your response is critically important to your local community and to your country. If you do not respond, a Census Bureau interviewer may contact you by personal visit to complete the survey.

If you would like to complete the survey by telephone or need assistance, please call our toll-free number (1-800-354-7271).

Thank you.

A handwritten signature in black ink, appearing to read "John H. Thompson".

John H. Thompson