

# Meeting 21<sup>st</sup> Century Demographic Data Needs—Implementing the American Community Survey

Issued December 2004

*Report 11: Testing Voluntary Methods - Additional Results*



## AMERICAN COMMUNITY SURVEY

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## EXECUTIVE SUMMARY

At the request of Congress, the Census Bureau conducted a test to provide answers to key questions about the impact, if any, that a change to voluntary methods would have on mail response, survey quality, and costs of the American Community Survey (ACS). Meeting 21<sup>st</sup> Century Demographic Data Needs - Implementing the American Community Survey, Report 3: Testing the Use of Voluntary Methods, answers these key questions (U.S. Census Bureau, 2003). This report provides additional results from that test including greater detail for some of the measures included in the initial report. This report also examines if different mandatory and voluntary messages had an effect on the willingness of respondents to return questionnaires in the mail (mail cooperation) and their willingness to provide complete survey data (data completeness). The major findings included in this report are summarized below.

**The use of a more direct presentation of the voluntary message resulted in a slight additional decrease in mail cooperation (see page 4).** The overall mail cooperation rate fell by 20.7 percentage points (U.S. Census Bureau, 2003) when the survey used a current mandatory versus a standard voluntary message. An additional 4 percentage-point decline occurred when a more direct voluntary message was used.

**The revised mandatory mail treatment materials, designed to increase user friendliness, resulted in only a slight increase in mail cooperation (see page 6).** The ACS has been using essentially the same mandatory mail materials since 1995. Over the last few years, Census Bureau advisory committee members have recommended that the ACS design more user-friendly mail materials. New mandatory mail materials were included as part of this test. When the mail cooperation rates for the revised materials were compared to the existing materials, a 1.9 percentage point increase was recognized. Gains were only found, however, overall and for the High Response Area stratum.

**The patterns of mail responses over time were remarkably similar across all four treatments (see page 6).** A tracking of daily mail check-in rates shows a very consistent flow of mail responses across all treatments for the first two weeks. The gap between the mandatory and the voluntary treatments was not immediately apparent. Differences emerged about 16 days after the forms were mailed out with the mandatory treatments gaining about 10 additional percentage points of response over the voluntary treatments. The timing suggests that this may simply reflect the end of the first major wave of responses prompted by the initial packages and the Thank you/reminder card. It is also likely that some of the late responders to the mandatory treatments who were prompted by the reminder card didn't respond at this time to the voluntary treatments. Additional contacts (e.g., the replacement mailing and the start of computer-assisted telephone interviewing) had a greater—although similar—effect on the two mandatory treatments than the two voluntary treatments.

**The more direct voluntary message had only a minor additional impact on data quality (see pages 11 and 12).** The interview rate, which measures the proportion of the initial sample that is

interviewed across all modes, fell 11.6 percentage points when the survey changed from current mandatory to standard voluntary (U.S. Census Bureau, 2003). An additional 1.6 percentage point drop in the interview rate occurred when a more direct voluntary message was used. Similarly, the response rate of 97.6 percent (under current mandatory methods) dropped to 93.4 percent under standard voluntary methods (U.S. Census Bureau, 2003). The response rate was 92.9 percent when a direct voluntary message was used. All of these approaches still resulted in low levels of survey noninterviews.

**The level of missing data on mail return forms was not statistically significantly different when the survey was explained to be voluntary versus mandatory (see page 12).** A review of data completeness rates showed no major differences in the levels of overall data completeness for mail returns received when the survey was voluntary versus mandatory. This confirms earlier conclusions that when respondents decided to complete the form, they were equally likely to complete all items regardless of whether the survey was mandatory or voluntary. Some small statistically significant differences were seen in the completeness of data collected during telephone and personal visit follow-up. The wording of the voluntary message had no effect on data completeness overall or at the sample stratum level but did have a small statistically significant effect on data completeness of mail returns.

**Most of the items had similar levels of nonresponse in both a voluntary ACS and a mandatory ACS (see page 15).** All ACS questions were grouped into a set of topics. Statistically significant differences were found when item nonresponse was compared at the topic level. Most of these rates were, however, very similar regardless of whether the data were collected using voluntary or mandatory methods.

## **1. INTRODUCTION**

This is the second report documenting the findings of the American Community Survey (ACS) test of the use of voluntary methods that was implemented in March through June of 2003. U.S. Census Bureau (2003) provides answers to key questions about the impact that a change to voluntary methods was found to have on ACS mail response, survey quality, and costs. That report compared performance and quality measures for the 2003 Standard Voluntary treatment with the 2002 Current Mandatory treatment. This report includes tables which provide greater detail for several of these key questions. In addition, this report examines the effect on respondent cooperation of the wording and placement of mandatory and voluntary messages.

Prior to the Voluntary Test, the ACS used one set of mail materials. We refer to this as the Current Mandatory treatment. The Census Bureau was in the process of redesigning these materials when this test was requested. We decided therefore to test, as part of the Voluntary Test, a new set of mandatory materials--called the Standard Mandatory treatment. The revised mandatory mail materials were included to evaluate revised survey letters that model letters recently developed for other demographic surveys, such as the Survey of Income and Program Participation, to battle the decline in survey response rates (Landreth, 2003). Two sets of voluntary mail materials were also developed--the Standard Voluntary treatment and the Direct Voluntary treatment--to test the effect of two different approaches to presenting the message that the survey was voluntary. This report includes detailed analysis of the revised mandatory treatment and the two voluntary mail treatments that were tested in the mail portion of this test.

## **2. BACKGROUND**

### **2.1 Design of the ACS**

The Census Bureau conducts the ACS continuously on independent monthly samples of addresses. Since 2000, the ACS has selected a sample of about 70,000 addresses in 1,240 counties nationwide each month. In full implementation, this monthly sample size will increase to approximately 250,000 addresses spread across all 3,141 counties. The data for each sample address are collected over a three-month period, using three sequential modes of data collection--mail, telephone, and personal visit follow-up. For example, data collection for the March 2003 sample started when we mailed a survey questionnaire in late February. Most mail responses were received in the month of March. In April, interviewers conducted a telephone follow-up operation to collect data for nonresponding addresses for which a telephone number was available. At the end of April, a sample of the addresses that did not respond by mail or telephone was selected for personal visit follow-up.

This combination of data collection activities has been very successful. In 2001 and 2002, the survey response rates were 96.7 and 97.7 percent, respectively. More than half of the sample addresses mailed back their completed forms.

## 2.2 Mail Data Collection in the ACS

Costs vary significantly by mode of data collection; personal visit follow-up is by far the most expensive mode. As mentioned earlier, the Census Bureau first attempts to collect ACS data using mailout/mailback methods. To maximize the rate of mail response the ACS uses multiple mail contacts.

- A prenotice letter is sent a few days before the questionnaire to tell the household about the survey and encourage their response.
- An initial mailing package includes the survey questionnaire, a brochure and a letter with details about the survey provides explanations of why they should respond.
- A thank you or reminder postcard is sent a few days after the initial mailing package to thank the household for responding and to remind those who haven't as yet responded that a prompt response is appreciated.
- A replacement questionnaire, sent only to nonresponding households about three weeks after the first mailing package, is accompanied by another letter that tells the household that we have not as yet received their questionnaire and urges them to respond.

The ACS mails the initial questionnaires and replacement questionnaires in an out-going envelope with the message - **The American Community Survey Enclosed: Your Response is Required by Law**. This message has been shown to improve mail response rates in mandatory census tests by about 10 percentage points (Dillman et al, 1996).

## 3. METHODOLOGY

### 3.1 Sample Design and Experimental Treatments

The ACS sample cases for March and April 2003, about 138,000 addresses, formed the universe for the ACS Voluntary Test. U.S. Census Bureau, 2003, details the sample design for this test. Two strata were defined based on tract-level long form mail return rates from Census 2000 - High Response Areas (HRAs) and Low Response Areas (LRAs). Table 1 documents the sample sizes for the four Voluntary Test mail treatments by stratum. As the table shows, 75 percent of the sample was evenly split between the two voluntary mail treatments and the remaining 25 percent of the sample was evenly split between the two mandatory mail treatments. Similarly, 75 percent of the total sample was allocated to HRAs and 25 percent of the sample was allocated to LRAs. Asiala, 2003 and Tersine, 2003, include details of the stratification and sample selection. These are the sample universes used throughout this report.

**Table 1. Distribution of Sample Across Mail Treatment and Strata**

| Stratum             | Total Voluntary Test Sample | Current Mandatory Treatment | Standard Mandatory Treatment | Standard Voluntary Treatment | Direct Voluntary Treatment |
|---------------------|-----------------------------|-----------------------------|------------------------------|------------------------------|----------------------------|
| Overall             | 137,899                     | 17,237                      | 17,236                       | 51,712                       | 51,714                     |
| High Response Areas | 103,307                     | 12,913                      | 12,913                       | 38,740                       | 38,741                     |
| Low Response Areas  | 34,592                      | 4,324                       | 4,323                        | 12,972                       | 12,973                     |

### 3.2 Preparatory Materials

We designed the sample for the ACS Voluntary Test to study four experimental mail treatments—two mandatory and two voluntary. One mandatory mail treatment was identical to the mail treatment used in prior years and provided a control to previous years; we call this the Current Mandatory treatment. The other mandatory mail materials had been revised with an eye toward increased user-friendliness; we call this the Standard Mandatory treatment. Appendix A includes the messages used for the 2003 Current Mandatory and Standard Mandatory mail materials. Both of these treatments relied on an envelope with a prominent message that the survey was required by law. Major differences in the two treatments include moving much of the information from the letter into a brochure.

We also designed materials for two voluntary mail treatments. One used a standard survey approach to explain the voluntary nature of the survey, the approach that the Census Bureau uses for its current surveys. That treatment is called the Standard Voluntary treatment. A second voluntary treatment explained more directly that the survey was voluntary; we call this the Direct Voluntary treatment. In this report, various performance and quality measures for the 2003 Direct Voluntary treatment are compared to the 2003 Standard Voluntary treatment to evaluate the effect of the wording of the voluntary message. Appendix A also highlights the key messages used to convey that the survey was voluntary in the mail materials for the 2003 Standard Voluntary treatment and the 2003 Direct Voluntary treatment.

### 3.3 Quality and Performance Measures

Most of the data used in this report are combined sample data from March and April 2003 with comparisons made across mail treatments in 2003. Additional comparisons are made of some of these 2003 treatments to combined sample data from March and April 2002. We calculated all quality and performance measures nationally and at the stratum level. They include:

- Mail Cooperation Rates* - measures of respondent behavior in the mail data collection mode,
- Daily Mail Check-in Rates* - measures of the pattern of mail response over time,
- Interview Mode Distributions* - measures of how the ACS interviewed occupied households across the three modes of data collection,
- Survey Response Rates* - measures of unit nonresponse,

*Interview Rates* - measures of the impact of subsampling and nonresponse on the final number of completed interviews, and  
*Data Completeness Rates* - measures of item nonresponse.

The tables in the results section compare the quality and performance measures for the different combinations of these voluntary and mandatory treatments. In this report, we refer to the four 2003 experimental treatments using the following notation:

Current Mandatory = 2003 CM  
Standard Mandatory = 2003 SM  
Standard Voluntary = 2003 SV  
Direct Voluntary = 2003 DV

The Current Mandatory treatment used in 2002 is shown as 2002 CM.

### **3.4 Statistical Testing**

The tables round the rates and differences to one decimal place. Due to rounding, the difference column may not always reflect the exact difference between the two displayed estimates. The tables include the margins of error of each difference, indicating the 90 percent confidence interval around the difference. The 90 percent confidence interval tells us that if all possible samples under the sample design were selected independently and surveyed under the same conditions, approximately 90 percent would fall within the range of the estimates provided. We calculated direct estimates of the standard errors for all estimates in this report using standard ACS variance estimation methods. The table notes those differences determined to be statistically significant at the 90 percent confidence level.

## **4. RESULTS**

### **4.1 Respondent Cooperation**

Cooperation rates are the best measure of respondent behavior because they measure the rate of response for only those persons or households who are contacted. The universe for calculating cooperation rates is the subset of occupied units that were contacted. In this report, we calculated mail cooperation rates to answer questions about whether the wording of the messages used to convey that the survey was mandatory or voluntary had an impact on the behavior of the public in choosing to participate in the ACS. Appendix B includes a more detailed definition of the cooperation rate.

#### ***4.1.1 What impact did the wording of the voluntary message have on mail cooperation?***

The change to standard voluntary methods from the current mandatory methods used in 2002 and 2003 resulted in a significant drop in mail cooperation—20.7 percentage points nationally,

22.1 percentage points in high response areas, and 16.0 percentage points in low response areas (U.S. Census Bureau, 2003).

Two voluntary treatments were included in this test—the Standard Voluntary treatment and the Direct Voluntary treatment. The Standard Voluntary and Direct Voluntary treatments included several important differences in how the voluntary nature of the survey was explained to respondents. The prenotice letter and the thank you/reminder postcard used in the Standard Voluntary treatment did not mention that the survey was voluntary as they did in the Direct Voluntary treatment. The letters included in the initial and replacement mailing packages and the ACS brochures used different wording and placement of the voluntary messages. The Direct Voluntary messages were more prominent and used the phrase, “Your participation in this voluntary survey is very important.” The Standard Voluntary treatment letter explained, “Your participation in the survey is important, however, you may decline to answer any or all questions”.

To determine if alternative wording and placement of the voluntary message had an effect on respondent behavior, we compared the mail cooperation rates for the 2003 Standard Voluntary treatment to the 2003 Direct Voluntary treatment. Table 2 below shows that the mail cooperation rate for the more direct voluntary message was 4 percentage points lower (34.8 percent versus 38.8 percent). High response areas show a greater percentage point drop than low response areas but the relative drop was very similar across strata (about 10 percent). In both strata, about 10 percent of the households responding to the Standard Voluntary materials did not respond when the Direct Voluntary materials were used.

**Table 2. Mail Cooperation Rates (2003 SV compared with 2003 DV)**

| Stratum             | 2003 Standard Voluntary (in percent) | 2003 Direct Voluntary (in percent) | Difference (DV - SV) (in percentage points) | Margin of Error of Difference (in percentage points) | Is the Difference Statistically Significant? |
|---------------------|--------------------------------------|------------------------------------|---|--|--|
| Overall             | 38.8                                 | 34.8                               | -4.0  | ± 0.8  | Yes  |
| High Response Areas | 42.4                                 | 38.0                               | -4.4  | ± 0.9  | Yes  |
| Low Response Areas  | 27.7                                 | 24.8                               | -2.8  | ± 1.4  | Yes  |

KEY: DV=Direct Voluntary; SV=Standard Voluntary  
 2003 Standard Voluntary results are based on the March and April 2003 sample designated for the Standard Voluntary mail treatment and followed up by telephone and/or personal visit using voluntary methods.  
 2003 Direct Voluntary results are based on the March and April 2003 sample designated for the Direct Voluntary mail treatment and followed up by telephone and/or personal visit using voluntary methods.

**4.1.2 In a mandatory survey, did a more user-friendly design improve rates of mail cooperation?**

This test included two mandatory treatments—the Current Mandatory treatment and the Standard Mandatory treatment. Both mandatory treatments used the same out-going envelope message reminding the respondent that their response was required by law. The Current Mandatory materials were the existing materials. All of the mailing pieces included in the Standard

Mandatory materials were revised. The prenotice letter was lengthened to make the most important information more prominent earlier in the letter. The letters in the initial and replacement mailing packages were shortened and regulatory information was moved into a redesigned brochure. The thank you/reminder postcard was shortened. See Appendix A for details.

To determine if these changes resulted in improved cooperation, the mail cooperation rates were compared for the 2003 Current Mandatory treatment and the 2003 Standard Mandatory treatment. As the data in Table 3 show, mail cooperation rates were slightly higher for the more user-friendly materials, nationally and for the high response area stratum. There was no change in mail cooperation for the low response area stratum. This overall increase of 1.9 percentage points equates to about a 3.3 percent increase in mail cooperation. The ACS continues to look at ways to improve mail cooperation in low response areas. With the May 2003 mailout, the ACS returned to mandatory methods for mail data collection. Based on these results, the ACS has replaced the Current Mandatory materials with the Standard Mandatory mail treatment materials.

**Table 3. Mail Cooperation Rates (2003 CM compared with 2003 SM)**

| Stratum             | 2003 Current Mandatory<br>(in percent) | 2003 Standard Mandatory<br>(in percent) | Difference<br>(SM - CM)<br>(in percentage points) | Margin of Error<br>of Difference<br>(in percentage points) | Is the<br>Difference<br>Statistically<br>Significant? |
|---------------------|--|---|---|--|---|
| Overall             | 57.3                                   | 59.2                                    | 1.9   | ± 1.3  | Yes   |
| High Response Areas | 61.5                                   | 63.9                                    | 2.5   | ± 1.5  | Yes   |
| Low Response Areas  | 43.9                                   | 44.1                                    | 0.2   | ± 2.7  | No  |

KEY: SM=Standard Mandatory; CM=Current Mandatory

2003 Standard Voluntary results are based on the March and April 2003 sample designated for the Standard Voluntary mail treatment and followed up by telephone and/or personal visit using voluntary methods.

2003 Direct Voluntary results are based on the March and April 2003 sample designated for the Direct Voluntary mail treatment and followed up by telephone and/or personal visit using voluntary methods.

#### ***4.1.3 What was the difference in the timing of mail responses?***

A respondent's willingness to respond to a mail survey, like the ACS, can be influenced by many factors. In this test, any of the contacts listed in Table 4 could have influenced a respondent to complete and return the requested survey questionnaire. To understand the pattern of mail responses and attempt to assess the potential contributions of these contacts on the final mail response, we graphed the daily mail check-in rates for the four treatments. The graph combines data for March and April. Refer to Appendix B for details on how the mail check-in rate was calculated. Responses were not checked in on weekends, resulting in some dates showing no increases (Saturdays and Sundays) and other days showing accumulated increases (Mondays).



**Table 4. Contact Summary**

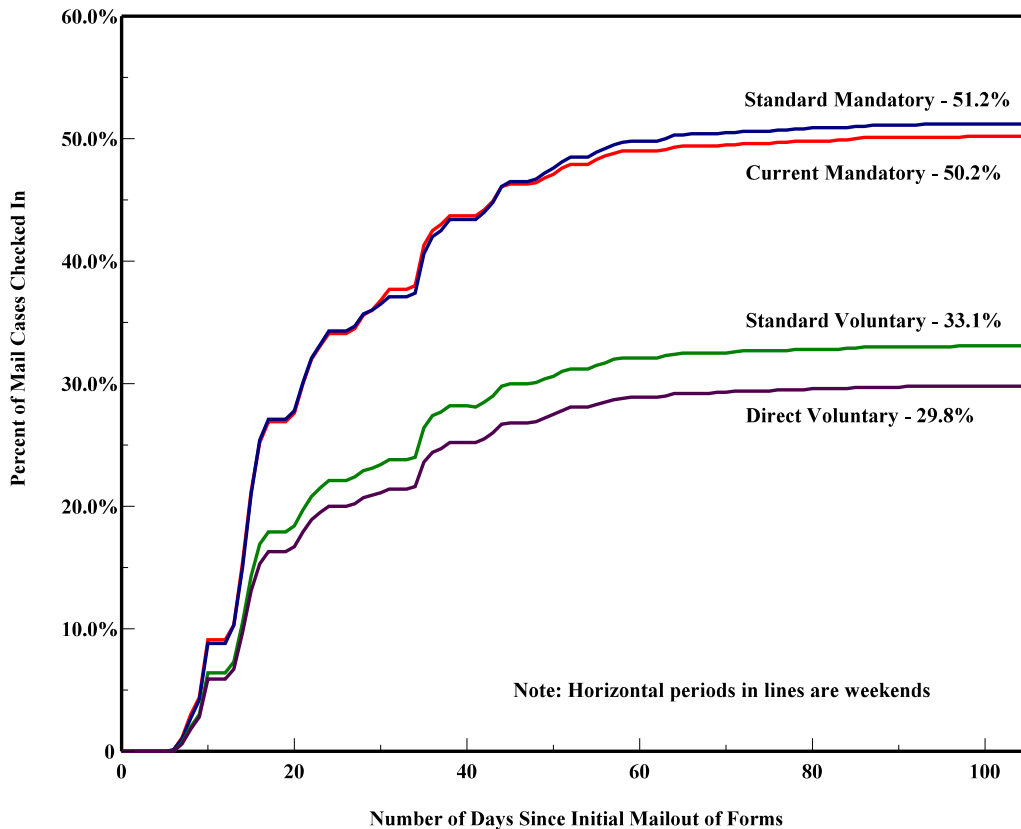
| <b>Type of Contact</b>                               | <b>Timing</b>         |
|--|-----------------------|
| Prenotice letter                                     | 3 days before mailout |
| Initial mailing package (envelope, letter, brochure) | Mailout               |
| Thank you/reminder postcard                          | 3 days after mailout  |
| Replacement mailing package                          | 24 days after mailout |
| Start of Computer-Assisted Telephone Interviewing    | 30 days after mailout |

Interpreting daily mail check-in rates requires the recognition that it takes several days from when a contact begins (for example, a replacement mailing package being mailed out) to when the impact can be noted. This is due to the time required for materials to be received in the mail, time for respondents to react to the materials and time for responses to be returned by mail to the Census Bureau for check-in.

The data in Figure 1 show the daily mail check-in rates for each of the four treatments. The two mandatory treatments track nearly identically until quite late in the response period (about 45 days after the mailout). The two voluntary treatments also show very similar patterns of response with about a 2 percentage point difference emerging about 16 days after the initial mailout and widening to about 3 or 4 percentage points after about 40 days. This may be explained by the different messages in the Thank you/reminder postcards. Recall that the Direct Voluntary treatment mentioned the voluntary status of the survey while the Standard Voluntary postcards did not. The potential gain of the postcard may have been negated due to the voluntary message.

Of course, the greatest differences are seen when comparing the voluntary and mandatory rates. Although the mail check-in rates are much higher for the two mandatory treatments, the overall patterns are remarkably similar. In the time period of 10 to 15 days both treatments had their greatest gains but the mandatory treatments gained an additional 10 percentage points before beginning to level off. This is very likely the combined effect of the information provided to respondents in the prenotice letter, initial mailing packages and the thank you/reminder postcard. A greater proportion of “late responders” are found in the mandatory panels. The second set of increases, seen about 36 days after the initial mailout are likely due to both the replacement mailing and the start of computer-assisted telephone interviewing. Previous analysis of ACS mail response patterns has shown that these phone calls often serve as a prompt for households to return their mail forms.

**Figure 1: Daily Mail Check-In Rates**



**4.1.4 How were the interviews distributed across the three modes of data collection when the survey was voluntary versus mandatory? Did this vary by race or ethnicity?**

U.S. Census Bureau (2003) compared interview mode distributions for selected racial and ethnic groups and found that the change to standard voluntary methods resulted in a shift of respondents participating by mail to respondents participating in telephone or personal visit. Although some differences were found in the final response rates, greater differences were found in the proportion of respondents changing mode of collection. There are two important reasons to look at interview mode distributions—cost and reliability. Personal visit interviews are much more costly than mail or telephone interviews so a drop in the proportion of interviews collected by mail or telephone signals an increase in survey costs. In addition, because the ACS selects only a subsample of nonrespondents after mail and telephone to go to personal visit follow-up, there are reliability implications. An increase in the proportion of interviews collected by personal visit implies that not only will we have fewer total interviews but a greater number of interviews with large weights because they were collected during personal visit follow-up. Both of these factors impact the reliability of final survey estimates.

Table 5 provides a comparison of the proportion of the total ACS interviews that were collected from each mode of data collection, by race and ethnicity of the householder. The 2002 Current

Mandatory treatment is compared with the 2003 Standard Voluntary treatment. The results show that the major impact of a change to voluntary was a drop in the percent of interviews collected by mail. For White households the drop was nearly 20 percentage points. For Black households the drop was over 13 percentage points and for Asian households the drop was nearly 18 percentage points. Although the drop in the percent of interviews conducted by mail was nearly 9 percentage points for American Indian and Alaska Native households and close to 7 percentage points for Other races, these drops in mail were made up with a large increase in the percent of households interviewed by phone. The result was no significant change in the percent of households interviewed by personal visit. All other race groups had significant increases in the percent of interviews conducted by personal visit.

The impact of the change to voluntary methods was greatest for non Hispanic households (about a 19 percentage point drop in the percent interviewed by mail). Hispanic households also show a large decrease - over 12 percentage points.

**Table 5. Interview Mode Distributions, by Detailed Race and Ethnicity (2002 CM compared with 2003 SV)**

| Race/Ethnicity and Mode              |                                      | 2002<br>Current<br>Mandatory<br>(in percent) | 2003<br>Standard<br>Voluntary<br>(in percent) | Difference<br>(2003 - 2002)<br>(in percentage<br>points) | Margin of Error<br>of Difference<br>(in percentage<br>points) | Is the<br>Difference<br>Statistically<br>Significant? |
|--------------------------------------|--------------------------------------|--|---|--|---|---|
| Mail                                 | Overall                              | 58.9   | 40.5  | -18.4  | ± 0.7   | Yes   |
|                                      | White                                | 63.3   | 43.4  | -19.9  | ± 0.7   | Yes   |
|                                      | Black                                | 35.2   | 22.2  | -13.1  | ± 1.5   | Yes   |
|                                      | American Indian and<br>Alaska Native | 36.6   | 27.8  | -8.8   | ± 3.4   | Yes   |
|                                      | Asian                                | 57.0   | 39.1  | -17.8  | ± 2.6   | Yes   |
|                                      | Other Races                          | 31.0   | 24.2  | -6.8   | ± 4.6   | Yes   |
|                                      | Hispanic                             | 32.2   | 20.1  | -12.2  | ± 1.8   | Yes   |
|                                      | Not Hispanic                         | 61.1   | 42.1  | -19.1  | ± 0.7   | Yes   |
|                                      | Telephone                            | Overall                                      | 9.5   | 15.1   | 5.6   | ± 0.4   |
| White                                |                                      | 9.0  | 14.9  | 5.9  | ± 0.4   | Yes   |
| Black                                |                                      | 11.3   | 16.0  | 4.6  | ± 1.3   | Yes   |
| American Indian and<br>Alaska Native |                                      | 14.3   | 22.3  | 8.0  | ± 3.7   | Yes   |
| Asian                                |                                      | 7.5  | 11.8  | 4.3  | ± 1.7   | Yes   |
| Other Races                          |                                      | 16.8   | 21.7  | 4.9  | ± 2.0   | Yes   |
| Hispanic                             |                                      | 11.0   | 14.8  | 3.8  | ± 1.3   | Yes   |
| Not Hispanic                         |                                      | 9.5  | 15.4  | 5.9  | ± 0.4   | Yes   |
| Personal<br>Visit                    |                                      | Overall                                      | 31.6  | 44.3   | 12.7  | ± 0.7   |
|                                      | White                                | 27.7   | 41.7  | 14.0   | ± 0.8   | Yes   |
|                                      | Black                                | 53.4   | 61.8  | 8.4  | ± 1.9   | Yes   |
|                                      | American Indian and<br>Alaska Native | 49.1   | 49.9  | 0.9  | ± 5.9   | No  |
|                                      | Asian                                | 35.6   | 49.1  | 13.5   | ± 3.9   | Yes   |
|                                      | Other Races                          | 52.2   | 54.1  | 1.9  | ± 3.4   | No  |
|                                      | Hispanic                             | 57.0   | 65.1  | 8.4  | ± 2.4   | Yes   |
|                                      | Not Hispanic                         | 29.4   | 42.6  | 13.2   | ± 0.8   | Yes   |

KEY: 2002 Current Mandatory results are based on the March and April 2002 sample designated for the Current Mandatory mail treatment and followed up by telephone and/or personal visit using mandatory methods.

2003 Standard Voluntary results are based on the March and April 2003 sample designated for the Standard Voluntary mail treatment and followed up by telephone and/or personal visit using voluntary methods.

Note: The race and ethnicity of the household are based on the unedited response of person 1. If the Hispanic origin or race questions were not answered for person 1 in the household, the household is not included in the distribution. A household may be in more than one race category if person 1 reported more than one race, but a household cannot be both Hispanic and not Hispanic.

## 4.2 Data Quality

### 4.2.1 *What impact did the wording of the voluntary message have on the percentage of the initial sample that was interviewed?*

The ACS uses a two-phase sample design and therefore the final ACS sample is defined as the combination of (1) cases interviewed by mail and telephone and (2) the subsample of nonresponse cases that are interviewed by personal visit. The interview rate is the ratio of the final number of completed interviews to the initial (or first phase) sample. Cases subsampled out in the personal visit stage are included in the denominator of the interview rate. Interview rates are important to monitor as mail and telephone cooperation decreases because they provide a direct measure of the associated reduction in the final count of survey interviews. This is an important measure of the reliability of survey estimates. Appendix B provides additional details and definitions. U.S. Census Bureau (2003) reported an 11.6 percentage point drop in the interview rate when the survey changed from mandatory to voluntary. The Standard Voluntary Treatment was used in that comparison. This report assesses whether additional losses in interviews would have been realized if the Direct Voluntary treatment was used. Table 6 compares the 2003 Standard Voluntary treatment with the 2003 Direct Voluntary treatment and shows that the interview rate is significantly decreased when a more direct voluntary message is included in the mail materials. This was true overall and for both strata. Therefore, the specific choice of message in explaining the voluntary nature of the survey had an impact on the final interview rates.

**Table 6. Interview Rates (2003 SV compared with 2003 DV)**

| Interview Rate      | 2003<br>Standard<br>Voluntary<br>(in percent) | 2003<br>Direct<br>Voluntary<br>(in percent) | Difference<br>(DV-SV)<br>(in percentage<br>points) | Margin of Error<br>of Difference<br>(in percentage<br>points) | Is the<br>Difference<br>Statistically<br>Significant? |
|---------------------|---|---|--|---|---|
| Overall             | 60.2  | 58.6  | -1.6   | ± 0.6   | Yes   |
| High Response Areas | 63.0  | 61.2  | -1.8   | ± 0.7   | Yes   |
| Low Response Areas  | 52.0  | 50.9  | -1.1   | ± 1.0   | Yes   |

KEY: DV=Direct Voluntary; SV=Standard Voluntary

2003 Standard Voluntary results are based on the March and April 2003 sample designated for the Standard Voluntary mail treatment and followed up by telephone and/or personal visit using voluntary methods.

2003 Direct Voluntary results are based on the March and April 2003 sample designated for the Direct Voluntary mail treatment and followed up by telephone and/or personal visit using voluntary methods.

### 4.2.2 *What was the effect of the more direct voluntary message on unit nonresponse?*

The switch from the 2002 Current Mandatory treatment to the 2003 Standard Voluntary treatment resulted in a 4.2 percentage point decline in the survey response rate (U.S. Census Bureau, 2003). It is of interest to also assess if the more direct wording used in the Direct Voluntary treatment resulted in additional loss in survey response. To study this we compared the 2003 Standard Voluntary treatment with the 2003 Direct Voluntary treatment.

Table 7 shows that the use of the more direct voluntary message did not result in a statistically significant decrease in the survey response rate overall or at the stratum level. When interviewers visited nonresponding households in person, they were equally likely to convince a respondent to cooperate regardless of which voluntary materials they had received.

**Table 7. Weighted Survey Response Rates (2003 SV compared with 2003 DV)**

| Weighted Survey Response Rate | 2003<br>Standard<br>Voluntary<br>(in percent) | 2003<br>Direct<br>Voluntary<br>(in percent) | Difference<br>(DV-SV)<br>(in percentage<br>points) | Margin of Error<br>of Difference<br>(in percentage<br>points) | Is the<br>Difference<br>Statistically<br>Significant? |
|-------------------------------|---|---|--|---|---|
| Overall                       | 93.3  | 92.9  | -0.4   | ± 0.5   | No  |
| High Response Areas           | 93.5  | 93.2  | -0.3   | ± 0.6   | No  |
| Low Response Areas            | 92.9  | 92.0  | -0.8   | ± 1.1   | No  |

KEY: DV=Direct Voluntary; SV=Standard Voluntary  
 2003 Standard Voluntary results are based on the March and April 2003 sample designated for the Standard Voluntary mail treatment and followed up by telephone and/or personal visit using voluntary methods.  
 2003 Direct Voluntary results are based on the March and April 2003 sample designated for the Direct Voluntary mail treatment and followed up by telephone and/or personal visit using voluntary methods.

#### **4.2.3 What impact did the use of voluntary methods and the wording of the voluntary message have on levels of item nonresponse?**

It is important to assess the completeness of data at the item level to understand if the messages used to explain the voluntary nature of the survey resulted in respondents providing different amounts of survey data. We calculated summary data completeness rates for all occupied housing units at the national and stratum levels. We define summary data completeness rates as the ratio of the total number of valid responses for all data items to the total number of data items requiring a response. Refer to Appendix C for details on the calculation of data completeness rates. The data set used to calculate the completeness rates reflects the completeness of the data before they were edited. Consequently, the rates reflect the condition of the returned questionnaires and interviews, which may differ slightly from the completeness of the final data. Tables 8 through 10 display summary data completeness rates.

Small, but significant, decreases in the overall levels of data completeness were found when the survey changed from 2002 Current Mandatory to 2003 Standard Voluntary methods (U.S. Census Bureau, 2003). We were interested in exploring in greater detail where those differences might exist and if the two voluntary treatments led to two different levels of item completion. Table 8 compares data completeness rates for the 2002 Current Mandatory treatment with the 2003 Standard Voluntary treatment, looking at the impact across each data collection mode. Most of the rates across both treatments were close to 94 percent, implying that about 6 percent of the data that should have been provided, was not provided. No significant differences are found for forms completed by mail. This suggests that the households choosing to respond by mail, despite the change to voluntary, were equally likely to complete items on the form. Significant differences are seen for telephone and personal visit interviews overall and in the HRA strata. These increases in missing data levels are however, quite small.

**Table 8. Data Completeness Rates, by Mode (2002 CM compared with 2003 SV)**

| Stratum and Mode  |                     | 2002<br>Current<br>Mandatory<br>(in percent) | 2003<br>Standard<br>Voluntary<br>(in percent) | Difference<br>(2003 - 2002)<br>(in percentage<br>points) | Margin of Error<br>of Difference<br>(in percentage<br>points) | Is the<br>Difference<br>Statistically<br>Significant? |
|-------------------|---------------------|--|---|--|---|---|
| Mail              | Overall             | 94.5   | 94.2  | -0.3   | ±0.4  | No  |
|                   | High Response Areas | 94.8   | 94.5  | -0.3   | ±0.4  | No  |
|                   | Low Response Areas  | 93.0   | 92.8  | -0.2   | ±0.7  | No  |
| Telephone         | Overall             | 94.6   | 93.7  | -1.0   | ±0.5  | Yes   |
|                   | High Response Areas | 94.7   | 93.6  | -1.1   | ±0.6  | Yes   |
|                   | Low Response Areas  | 94.4   | 93.9  | -0.5   | ±0.8  | No  |
| Personal<br>Visit | Overall             | 94.8   | 94.3  | -0.6   | ±0.6  | Yes   |
|                   | High Response Areas | 94.9   | 94.1  | -0.8   | ±0.6  | Yes   |
|                   | Low Response Areas  | 94.7   | 94.6  | -0.1   | ±0.7  | No  |
| All Modes         | Overall             | 94.6   | 94.1  | -0.5   | ±0.4  | Yes   |
|                   | High Response Areas | 94.8   | 94.2  | -0.6   | ±0.4  | Yes   |
|                   | Low Response Areas  | 94.0   | 94.0  | 0.0  | ±0.6  | No  |

KEY: 2002 Current Mandatory results are based on the March and April 2002 sample designated for the Current Mandatory mail treatment and followed up by telephone and/or personal visit using mandatory methods.  
2003 Standard Voluntary results are based on the March and April 2003 sample designated for the Standard Voluntary mail treatment and followed up by telephone and/or personal visit using voluntary methods.

Table 9 compares the data completeness for the 2003 Standard Voluntary treatment with the 2003 Direct Voluntary treatment. The incremental loss in data completeness over the Standard Voluntary treatment was only seen in the mail mode. No statistically significant differences were found overall or for data collected by telephone or personal visit.

**Table 9. Data Completeness Rates by Mode (2003 SV compared with 2003 DV)**

| Stratum and Mode  |                     | 2003<br>Standard<br>Voluntary<br>(in percent) | 2003<br>Direct<br>Voluntary<br>(in percent) | Difference<br>(DV-SV)<br>(in percentage<br>points) | Margin of Error<br>of Difference<br>(in percentage<br>points) | Is the<br>Difference<br>Statistically<br>Significant? |
|-------------------|---------------------|---|---|--|---|---|
| Mail              | Overall             | 94.2  | 93.6  | -0.5   | ± 0.2   | Yes   |
|                   | High Response Areas | 94.5  | 93.9  | -0.6   | ± 0.2   | Yes   |
|                   | Low Response Areas  | 92.8  | 92.3  | -0.5   | ± 0.5   | Yes   |
| Telephone         | Overall             | 93.7  | 93.8  | 0.1  | ± 0.3   | No  |
|                   | High Response Areas | 93.6  | 93.9  | 0.3  | ± 0.4   | No  |
|                   | Low Response Areas  | 93.9  | 93.7  | -0.2   | ± 0.7   | No  |
| Personal<br>Visit | Overall             | 94.2  | 94.3  | 0.1  | ± 0.3   | No  |
|                   | High Response Areas | 94.1  | 94.2  | 0.2  | ± 0.4   | No  |
|                   | Low Response Areas  | 94.6  | 94.5  | -0.1   | ± 0.5   | No  |
| All Modes         | Overall             | 94.1  | 94.0  | -0.1   | ± 0.2   | No  |
|                   | High Response Areas | 94.2  | 94.0  | -0.1   | ± 0.2   | No  |
|                   | Low Response Areas  | 94.0  | 93.8  | -0.2   | ± 0.3   | No  |

KEY: DV=Direct Voluntary; SV=Standard Voluntary  
2003 Standard Voluntary results are based on the March and April 2003 sample designated for the Standard Voluntary mail treatment and followed up by telephone and/or personal visit using voluntary methods.  
2003 Direct Voluntary results are based on the March and April 2003 sample designated for the Direct Voluntary mail treatment and followed up by telephone and/or personal visit using voluntary methods.

#### ***4.2.4 Did the use of voluntary methods lead to higher levels of item nonresponse for certain racial or ethnic groups?***

Summary data completeness rates were produced by race and ethnicity of the householder. To determine if certain households were more likely to have been effected by a change from mandatory to voluntary, comparisons were made between the 2002 Current Mandatory treatment and the 2003 Standard Voluntary treatment. Table 10 shows that only minor decreases were found in levels of data completeness and those differences were for White and non Hispanic households. No reductions in data completeness were found for Black, American Indian and Alaska Native, Asian, other race or Hispanic households.



**Table 10. Data Completeness Rates, by Detailed Race and Ethnicity (2002 CM compared with 2003 SV)**

| Race/Ethnicity                    | 2002<br>Current<br>Mandatory<br>(in percent) | 2003<br>Standard<br>Voluntary<br>(in percent) | Difference<br>(2003 - 2002)<br>(in percentage<br>points) | Margin of Error<br>of Difference<br>(in percentage<br>points) | Is the<br>Difference<br>Statistically<br>Significant? |
|-----------------------------------|--|---|--|---|---|
| Overall                           | 94.6   | 94.1  | -0.5   | ± 0.4   | Yes   |
| White                             | 95.2   | 94.5  | -0.7   | ± 0.4   | Yes   |
| Black                             | 93.8   | 93.8  | 0.0  | ± 0.7   | No  |
| American Indian and Alaska Native | 94.5   | 95.0  | 0.5  | ±1.0  | No  |
| Asian                             | 94.7   | 94.9  | 0.2  | ±0.8  | No  |
| All Other Races                   | 95.3   | 95.9  | 0.6  | ±0.8  | No  |
| Hispanic                          | 95.2   | 95.6  | 0.4  | ± 0.6   | No  |
| Not Hispanic                      | 95.1   | 94.4  | -0.7   | ± 0.4   | Yes   |

KEY: 2002 Current Mandatory results are based on the March and April 2002 sample designated for the Current Mandatory mail treatment and followed up by telephone and/or personal visit using mandatory methods.

2003 Standard Voluntary results are based on the March and April 2003 sample designated for the Standard Voluntary mail treatment and followed up by telephone and/or personal visit using voluntary methods.

Note: The race and ethnicity of the household are based on the unedited response of person 1. If the Hispanic origin or race questions were not answered for person 1 in the household, the household is not included in the distribution. A household may be in more than one race category if person 1 reported more than one race, but a household cannot be both Hispanic and not Hispanic.

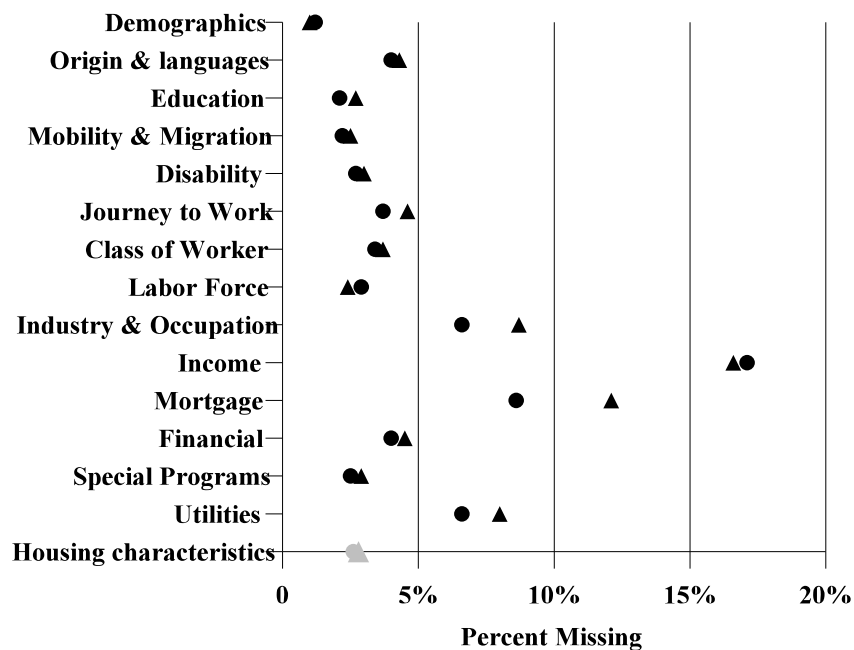
#### ***4.2.5 Did the use of voluntary methods impact the completeness of any specific questions?***

Data completeness rates were calculated at the item or question level and combined to produce the summary data completeness rates in the previous set of tables. The individual item-level data completeness rates were analyzed to answer the question about whether the change to voluntary methods resulted in any specific questions being left unanswered more frequently. To summarize this information, topics were created based on sets of similar questions. For example, “demographics” includes questions on sex, age, relationship, Hispanic origin, and race while “education” includes questions on educational attainment and school enrollment.

Figure 2 graphs topic-level item nonresponse rates for the 2002 Current Mandatory treatment and the 2003 Standard Voluntary treatment. The rates reflect item nonresponse across all modes. Note that, as opposed to previous rates that summarized the completeness of the data, these graphs display the complement—the level of missing data. Therefore, the higher numbers identify the questions with the greater level of nonresponse. The item nonresponse rates for the 2002 Current Mandatory treatment are shown as circles. The rates for the 2003 Standard Voluntary treatment are shown as triangles. Statistically significant differences between the item nonresponse rates are bolded. In nearly all instances the differences between the two item nonresponse rates are statistically significant. The rates are, however, very similar. The items with the greatest differences were the utilities questions (8.0 percent - SV and 6.6 percent - CM), the industry and occupation questions (8.6 percent - SV and 6.5 percent - CM) and the mortgage questions (12.4 percent - SV and 8.9 percent - CM). We believe that the utilities and mortgage questions show higher overall rates because the SV cases were more likely to have been interviewed in personal visit versus mail. Historical data on nonresponse for utilities and

mortgage indicate that higher nonresponse exists in data collected by personal visit. This is likely to be due to the hassle factor of having to retrieve records to answer these questions completely.

**Figure 2. Topic-Level Item Nonresponse Comparisons  
2002 CM compared with 2003 SV**



- KEY:
1. CM = Current Mandatory; SV = Standard Voluntary
  2. 2002 Current Mandatory treatment results are shown as circles; 2003 Standard Voluntary treatment results are shown as triangles.
  3. Whenever the difference between the two item nonresponse rates was determined to be significant, the symbols for both the 2002 CM treatment and the 2003 SV treatment are bolded.

## 5. CONCLUSIONS

Although designed to answer questions about cost and quality implications of changing the ACS from a mandatory to a voluntary survey, the data from this test allowed us to investigate additional research questions about respondent behavior. The planned revision of mandatory materials to a more user-friendly presentation was confirmed as a positive step. The difference between the two voluntary approaches was found to be fairly negligible except for mail cooperation rates which varied by about 4 percentage points.

A closer look at item level completeness by mode, strata, and treatment revealed that consistently complete data were collected regardless of mode or treatment and for both high and low response area strata. The amount of missing data ranged from a high of under 8 percent (for mail responses in low response areas with the direct voluntary treatment) to a low of just over 5 percent (for personal visit interviews in high response areas with the mandatory treatment). No

individual survey questions were identified that had major increases in item nonresponse when the survey was conducted using voluntary methods.

## **6. REFERENCES**

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## **Appendix A. Summary of Differences in 2003 Mandatory and Voluntary Mail Materials**

### **Messages on the Envelope**

#### ***Current and Standard Mandatory***

The American Community Survey  
Form Enclosed

**YOUR RESPONSE IS  
REQUIRED BY LAW**

#### ***Standard and Direct Voluntary***

The American Community Survey  
Form Enclosed

**YOUR RESPONSE IS  
IMPORTANT TO YOUR  
COMMUNITY**

### **Messages in the Mailing Package Letters**

#### ***Current Mandatory***

Paragraph 1: Please take about 40 minutes of your time to assist your community greatly by completing and mailing back your copy of the American Community Survey, as required by law. We are conducting this survey under the authority of Title 13, United States Code, sections 141-193, and 221. That same law protects your privacy—Section 9 requires us to keep all information about you and your household strictly confidential. We may use this information only for statistical purposes. In addition, Title 13 imposes severe criminal sanctions if any U.S. Census Bureau employee violates these provisions. Title 13 also imposes penalties for not responding to the American Community Survey.

Paragraph 2: The confidential information you provide will greatly benefit you, your family, and the town, city, or area in which you live. Participating in this survey will also help to achieve the goal of substituting the American Community Survey for the long form in the 2010 decennial census.

Last paragraph on page 1: Again, I assure you that **your answers are kept strictly confidential**. The same law that requires your response also guarantees your privacy. Only people sworn to protect the confidentiality of your information can see your form.

## **Appendix A. Summary of Differences in 2003 Mandatory and Voluntary Mail Materials**

### ***Standard Mandatory***

Paragraph 1: I recently sent a letter to your household about the American Community Survey. Enclosed is a questionnaire and information about the survey. Please complete the questionnaire and mail it back as soon as possible in the postage-paid envelope

Paragraph 3: The U.S. 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.

### ***Standard Voluntary***

Paragraph 1: I recently sent a letter to your household about the American Community Survey. Enclosed is a questionnaire and information about the survey. Please complete the questionnaire and mail it back as soon as possible in the postage-paid envelope.

Paragraph 3: The U.S. Census Bureau chose your address, not you personally, as part of a randomly selected sample. The Census Bureau is required by U.S. law to keep your answers confidential. Your participation in the survey is important; however, you may decline to answer any or all questions. The enclosed brochure answers frequently asked questions about the survey.

### ***Direct Voluntary***

Paragraph 1: I recently sent a letter to your household about the American Community Survey. Enclosed is a questionnaire and information about the survey. Please complete the questionnaire and mail it back as soon as possible in the postage-paid envelope. Your participation in this voluntary survey is very important to your country and to your community; however, you may decline to answer any or all questions.

Paragraph 3: The U.S. Census Bureau chose your address, not you personally, as part of a randomly selected sample. The Census Bureau is required by U.S. law to keep your answers confidential. The enclosed brochure answers frequently asked questions about the survey.

### **Message in the Brochure Accompanying the Form**

(Not used for the Current Mandatory Treatment)

## **Appendix A. Summary of Differences in 2003 Mandatory and Voluntary Mail Materials**

### ***Standard Mandatory***

#### **Do I have to answer the questions on the American Community Survey?**

Yes. The duty to respond is similar to the responsibility of all citizens to serve on a jury if called to participate. The Census Bureau is conducting the American Community Survey under the authority of Title 13, U.S. Code, Sections 141 and 193. The survey is approved by the Office of Management and Budget and is mandatory. Title 13, as changed by Title 18, imposes a penalty for not responding. We estimate this survey will take about 38 minutes to complete.

### ***Standard and Direct Voluntary***

#### **Do I have to answer the questions on the American Community Survey?**

Your participation in this voluntary survey is very important to your country and to your community. You may decline to answer any or all questions. The Census Bureau is conducting the survey under the authority of Title 13, United States Code, Section 182. This survey is approved by the Office of Management and Budget. We estimate this survey will take about 38 minutes to complete.

## **Appendix B. Definitions of Mail Cooperation Rate, Mail Check-in Rate, Survey Response Rate, Interview Mode Distributions, and Interview Rate**

Survey cases can be categorized into four outcomes:

- (1) interviews (including partial interviews with sufficient data);
- (2) eligible cases that are not interviewed (nonrespondents);
- (3) cases of unknown eligibility; and
- (4) cases that are not eligible.

Cases that are determined not to be eligible are not included in the universe for calculation of cooperation or response rates, or interview mode distributions, but they are used in the calculation of check-in and interview rates. Ineligible cases include businesses or demolished housing units, and initially selected addresses that are not included in the subsample for personal visit follow-up. Let X = ineligible cases (final, after all attempts). In the ACS, there are no cases with unknown eligibility, so all eligible cases can be coded as one of the following:

Interviews:

- I = Complete interviews (mail, telephone, and personal visit combined)
- I(m) = Complete mail interviews
- I(t) = Complete telephone interviews
- I(p) = Complete personal visit interviews
- P = Partial interviews (mail, telephone, and personal visit combined)
- P(m) = Partial mail interviews
- P(t) = Partial telephone interviews
- P(p) = Partial personal visit interviews

Eligible cases that are not interviewed (nonrespondents):

- R = Refusals (final, after all attempts)
- R(m) = Refusal to the mail attempt
- R(t) = Refusal to telephone attempt
- R(p) = Refusal to personal visit attempt
- NC = Non contacts (final, after all attempts)
- NC(m) = Non contact to mail attempt
- NC(t) = Non contact to telephone attempt
- NC(p) = Non contact to personal visit attempt
- O = Other Noninterviews (final, after all attempts)
- O(m) = Other Noninterviews to mail attempt
- O(t) = Other Noninterviews to telephone attempt
- O(p) = Other Noninterviews to personal visit attempt
- UH = Unknown, if household/occupied HU
- UO = Unknown, other

## **Appendix B. Definitions of Mail Cooperation Rate, Mail Check-in Rate, Survey Response Rate, Interview Mode Distributions, and Interview Rate**

These codes are used to produce cooperation and check-in rates. Note that for the mail rates, refusals and other noninterviews cannot be distinguished since the reason for nonresponse is unknown. All rates are weighted to reflect the probabilities of selection. The cooperation rates are also weighted to reflect subsampling for personal visit follow-up.

### **1. Mail Cooperation Rate**

The cooperation rate is defined as the proportion of all cases interviewed of all eligible units ever contacted. We use cooperation rate 2 from the AAPOR standard definitions. (See American Association for Public Opinion Research. 2000, p. 38.) This definition counts partial interviews as respondents. The denominator for the mail cooperation rate is all occupied units included in the mailout. Specifically,

$$\text{Mail Cooperation Rate} = \frac{I(m) + P(m)}{I(m) + P(m) + R(m) + O(m)} * 100$$

### **2. Mail Check-in Rate**

The mail check-in rate is defined as the proportion of all cases that returned a questionnaire of all cases that were mailed. We use mail check-in rates to evaluate the status of the mail operation. Specifically,

$$\text{Mail Check-in Rate} = \frac{I(m) + P(m)}{(I + P) + (R + NC + O + X)} * 100$$



## Appendix B. Definitions of Mail Cooperation Rate, Mail Check-in Rate, Survey Response Rate, Interview Mode Distributions, and Interview Rate

### 3. Interview Mode Distributions

Interview mode distributions are defined as the ratio of completed occupied interviews from a specific mode (e.g., mail) to the total completed occupied interviews. Partial interviews are considered respondents. Specifically,

$$\textit{Percent Mail} = \frac{I(m) + P(m)}{I + P} * 100$$

$$\textit{Percent Telephone} = \frac{I(t) + P(t)}{I + P} * 100$$

$$\textit{Percent Personal Visit} = \frac{I(p) + P(p)}{I + P} * 100$$

### 4. Interview Rates

Interview rates are defined as the number of complete interviews with reporting units divided by the number of units in the initial (or first phase) sample. The interview rate measures the impact of subsampling and nonresponse on the final number of completed interviews. Specifically,

$$\textit{Interview Rate} = \frac{(I + P)}{(I + P) + (R + NC + O + X)} * 100$$

## **Appendix B. Definitions of Mail Cooperation Rate, Mail Check-in Rate, Survey Response Rate, Interview Mode Distributions, and Interview Rate**

### **5. Survey Response Rate**

Weighted survey response rates are defined as the number of complete interviews with reporting units divided by the number of eligible reporting units in the sample. We used response rate 6 from the AAPOR standard definitions. (See American Association for Public Opinion Research, 2000, p. 38.) It assumes that there are no cases of unknown eligibility and includes partial interviews as respondents. Specifically,

$$\textit{Weighted Survey Response Rate} = \frac{(I + P)}{(I + P) + (R + NC + O)} * 100$$

## Appendix C. Definition of Data Completeness Rates

For a given item, people or units can be classified into one of three main groups:

- (1) Eligible to respond to the item,
- (2) Not eligible to respond to the item, or
- (3) Unknown eligibility.

All data completeness rates are based on people or units determined to be eligible to respond to an item. A person or unit is not in universe for a particular item without definitive information to determine eligibility to answer the question.

The responses for all eligible people or units can be categorized into one of the following two groups: nonresponse or valid response. Therefore, responses to item x as can be classified as follows:

- $N_x$  = nonresponse to item x due to one of the following reasons: don't know, refused, illegal value, other nonresponse  
 $V_x$  = response to item x determined to be valid

The data completeness rate does not measure correctness of the data, only whether or not a valid response was obtained. A valid response doesn't take the consistency of the response or following the proper skip patterns on the questionnaire into account.

The item-level data completeness rate is calculated as the ratio of the number of eligible units or people having a valid response to an item to the total number of units or people eligible to have responded to that item. Therefore, the item-level data completeness rate for item x is computed as follows:

$$\textit{Item-Level Data Completeness Rate for Item } x = \frac{V_x}{N_x + V_x} * 100$$

The overall data completeness rate is a measure of the completeness of the entire questionnaire. It is defined as the ratio of the total number of items for which a valid response was given to the total number of items for which a response was required. Specifically,

$$\textit{Overall Data Completeness Rate} = \frac{\sum_x V_x}{\sum (N_x + V_x)} * 100$$