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2012 AMERICAN COMMUNITY SURVEY RESEARCH AND EVALUATION REPORT
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MEMORANDUM FOR ACS Research and Evaluation Steering Committee

From: James B. Treat (**signed 01/20/2012**)
Chief, American Community Survey Office

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American Community Survey Office

Subject: Evaluation of the Puerto Rico Community Survey – Operational
Feasibility and Quality

Attached is the final American Community Survey Research and Evaluation report on the Puerto Rico Community Survey (PRCS). This report looks across operations and across five years of data collection to summarize the operational feasibility and quality of the PRCS.

If you have any questions about this report, please contact Deborah Griffin at (301) 763-2855.

Attachment

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Evaluation of the Puerto Rico Community Survey - Operational Feasibility and Quality

FINAL REPORT

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AMERICAN COMMUNITY SURVEY OFFICE

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INTRODUCTION

The American Community Survey (ACS) produces annually updated data products describing the demographic, social, economic, and housing characteristics of the United States. The Puerto Rico Community Survey (PRCS) is the equivalent survey in Puerto Rico. Both the ACS and the PRCS use three sequential modes of data collection—mail, telephone, and personal visit. In the first mode of data collection a questionnaire is sent to a sample address for a response to be returned by mail. If the housing unit does not respond by mail and a phone number is available, the case is followed up by telephone using Computer Assisted Telephone Interviewing (CATI) methods. For a subsample of the initial sample cases that cannot be completed by mail or telephone, an interviewer is sent to the address to conduct an interview in person using Computer Assisted Personal Interviewing (CAPI) methods.

The PRCS began data collection in November 2004. The first set of estimates was released in 2006, based on data collected between January and December of 2005. While we monitor operations each month in Puerto Rico, we have not undertaken a comprehensive review of data collection activities in Puerto Rico. The purpose of this report is to look across operations and across five years of data collection to summarize the operational feasibility and quality of the PRCS. Operational feasibility means demonstrating operations are completed on time, within budget, and the data products meet quality standards. This report will assess operational feasibility by answering a series of questions about workloads, costs, and response rates. This report will also assess operational effectiveness using information about the mailability of sample addresses to support mail operations and the availability of telephone numbers to support CATI operations. We assess quality by summarizing measures of unit and item nonresponse and coverage.

As is true in the ACS, we collect data in the PRCS for the population living in both housing units and group quarters. This report focuses only on the operations associated with PRCS housing unit data collection.

RESEARCH QUESTIONS

1. What are the PRCS workloads for each mode of data collection - mail, CATI, and CAPI? How stable are these workloads over time? How do the estimated workloads compare with the actual workloads each month?
2. How successful is the PRCS in getting completed interviews for the housing unit sample? How do these rates compare with those for the ACS? Are there any areas in Puerto Rico that appear to have relatively high rates of noninterviews? What are the major reasons for noninterviews?
3. How effective is mail data collection in Puerto Rico?
4. How effective is CATI data collection in Puerto Rico?

5. How effective is CAPI data collection in Puerto Rico?
6. What proportion of the housing unit sample is interviewed in each mode?
7. How large is the Failed Edit Follow-up (FEFU) workload? What are the FEFU rates?
8. What proportion of the sample addresses in Puerto Rico has a mailable address? Is this constant over time or changing? Where in Puerto Rico do we have trouble using the mail mode of data collection?
9. For what proportion of the PRCS sample mailable addresses can we obtain a telephone number? What proportion of the PRCS nonresponse universe has a telephone number? How good are those numbers?
10. What can we say about population coverage in Puerto Rico?
11. What are the costs per case by mode of data collection in Puerto Rico?
12. What proportion of the initial sample in Puerto Rico results in a completed interview?
13. How complete are the data collected for Puerto Rico? Have the item allocation rates increased over time?

METHODOLOGY

This report summarizes data from the 2005, 2006, 2007, 2008, and 2009 PRCS. In most instances we reviewed existing state level summaries or reports to pull relevant statistics for this analysis. The control and data capture files were the source for most results. We also analyzed planning and progress reports from American Community Survey Office (ACSO) staff. Staff in ACSO provided cost data.

We include both weighted and unweighted estimates in this report. We never answer questions on workloads or the outcome codes associated with the sample using weighted estimates. But response rates and other descriptors of quality are always weighted to account for the specific samples selected and allow us to generalize about either the published data's quality or the general public's cooperation.

The results section includes specific definitions of the various rates cited in this report. Statistical testing at a 90 percent confidence level was used to determine if differences are statistically significant.

LIMITATIONS

We do not note any major limitations of these results.

RESULTS

Data Collection Workloads

We sample approximately 36,000 housing unit addresses for the PRCS each year. The annual housing unit sample is divided into 12 monthly sample panels – one for each of the 12 calendar months. We distribute the main sample addresses evenly across these 12 panels and add new addresses from the supplemental sample into selected panels only.¹ Each PRCS sample panel includes about 3,000 addresses.

Table 1 summarizes the annual PRCS workloads by mode of data collection in 2005 through 2009. All workloads are unweighted. Due to the lack of growth in the housing unit inventory on the Master Address File (MAF) between the time of the main sample and when the supplemental sample would have been selected, essentially no supplemental sample addresses were selected for the PRCS in 2005 through 2009.² The sample in Table 1 is the total number of addresses selected for the PRCS housing unit sample and includes primarily the addresses selected for the main sample. The mail workload includes all mailable sample addresses.³

The CATI workload includes all mailable sample addresses that did not respond by mail and had an available phone number. These are the cases that were sent to the CATI operation. During that operation we determine that some sample addresses are out of scope due to nonfunctioning phone numbers or other reasons. For our analysis those addresses remain in this workload tally. The CAPI workload includes all sample addresses that were selected for CAPI. These addresses include a subsample of mailable addresses without a mail or CATI response and a subsample of unmailable addresses. The CAPI subsampling rate for all unmailable addresses in both the U.S. and Puerto Rico has always been 2-in-3. Initially the PRCS CAPI subsampling rate for mailable addresses was 1-in-3 but starting with the May 2005 sample panel this subsampling rate was increased to 1-in-2.

Table 1 displays annual workloads along with percentages relative to the total sample. The sum of these percentages will always exceed 100 percent because many ACS sample cases fall into multiple workloads. A sample case could be a mail and CATI nonrespondent and also be subsampled for CAPI. Such a case would be tallied in the workload for each of these three operations. The sum of these workloads is an indicator of data collection efficiency, acknowledging the sample cases that need to go through

¹ The main sample is selected in the fall of the previous year. The supplemental sample, selected after the start of the calendar year, is designed to supplement the housing unit coverage by including new addresses since the fall sample selection.

² Puerto Rico addresses are different than stateside addresses. Puerto Rico addresses are often two line addresses which may incorporate an urbanizacion, apartment complex name, condominium name, barrio, or other types of information that are not typically part of a stateside address. This presents challenges for address matching. As a consequence the Census Bureau does not process address updates from sources such as the postal service.

³ A mailable address meets Census Bureau completeness criteria to be sent to the United States Postal Service for mail delivery.

multiple contact attempts. This rate is also sensitive to changes in subsampling rates and telephone number acquisition rates. In 2005 the combined workloads represented about 130 percent of the sample. In 2006 through 2009 that rate was about 150 percent. Much of that difference is due to the CAPI subsampling rate increase that began in May 2005 and the increase in the CATI workload due to the addition of new sources of phone numbers.

The annual mail workloads of between 26,000 and 29,000 reflect between 72 and 79 percent of the sample addresses each year. This contrasts with mail workloads representing about 95 percent of the U.S. sample. The lower rate of mailable addresses in Puerto Rico explains this difference (see pages 17-19). Between 2005 and 2009 the annual mail workload variations were primarily due to changes in our definitions of a mailable address.

Table 1. Annual PRCS Workloads by Mode – 2005 through 2009

Year	Sample	Mail Workload	% of Sample	CATI Workload	% of Sample	CAPI Workload	% of Sample	Combined Workloads	% of Sample
2009	36,089	27,526	76.3	10,787	29.9	15,261	42.3	53,574	148.4
2008	36,089	26,962	74.7	10,758	29.8	15,329	42.5	53,049	147.0
2007	36,066	28,518	79.1	11,977	33.2	14,755	40.9	55,250	153.2
2006	35,834	28,228	78.8	11,849	33.1	14,422	40.2	54,499	152.1
2005	36,122	25,912	71.7	7,187	19.9	14,764	40.9	47,863	132.5

Source: Cepietz (2009a), Cepietz (2009b), Marquette (2011a)

With the exception of 2005, the PRCS CATI workloads range from about 11,000 to 12,000 cases each year which is about a third of the sample. The low rate in 2005 resulted from a lack of sources of phone numbers. Incomplete addresses and less complete telephone number sources keep this rate fairly low relative to the U.S. rate (39 percent).

Each year about 40 percent of the PRCS sample (about 15,000 addresses) is sent to CAPI. This is much higher than the U.S. workload proportion (19 percent) and is due in part to the high PRCS CAPI subsampling rate. We subsample all mailable addresses in all areas in Puerto Rico at a rate of 1-in-2. This high workload is also a consequence of the low rate of response by mail (details on pages 10-12).

To budget and staff for each data collection operation, ACSO managers monitor monthly workloads. Figures 1a, 1b, 1c, and 1d summarize the PRCS monthly workloads for the first mailing, second mailing, CATI, and CAPI operations. Appendix 1 provides the actual workloads by panel and operation.

There are two monthly mail workloads – one for the first mailing and another for the second (reminder) mailing. We project a PRCS monthly mail workload of 2,400 for the first mailing and 2,160 for the second mailing. Figures 1a and 1b compare the projected and actual monthly workloads between January 2005 and December 2009. Due to changes in the definitions of mailable addresses in Puerto Rico, the actual workloads for the first and second mailings are often below the projection and show some variability

across months. Since the second mailing workload is dependent on mail response, we expected to see the additional variability for the second mailing.

We can attribute the changes in these two workloads to three specific changes in the definition of a mailable address. In January 2006 we created new MAF mailing label algorithm values based on information contained in the location description address field.⁴ As a consequence some addresses previously classified as unmailable became mailable, thus increasing the mail workload. Research on the effectiveness of this change resulted in the decision to revise the criteria and convert these addresses back to unmailables. This change took effect in July 2008, explaining the drop in the mail workload (Hefter, 2009). Geography division developed an alternative definition of mailability starting with the April 2009 sample panel. This revised definition appears to have increased the universe of mailable addresses once again, back to the levels observed in 2006 and 2007.

We should look more closely at these changes and the impact on the undeliverable rates by the postal service and the mail response rates for addresses with different potential mailability classifications.

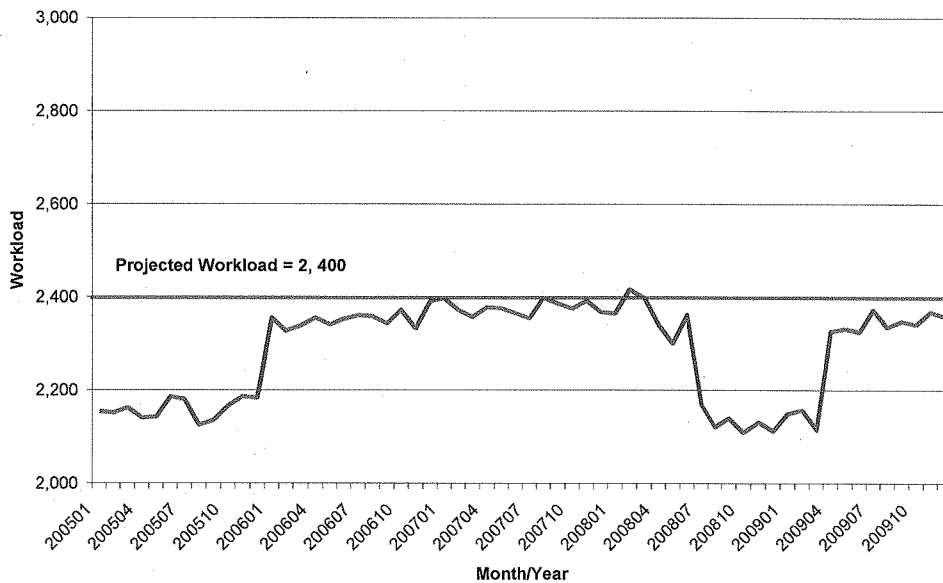


Figure 1a. PRCS Monthly Workloads – First Mailing
Source: Klein (2011).

⁴ The Census Bureau worked with a contractor to improve the Puerto Rico MAF. Updates made to the July 2005 MAF extract would have impacted the 2006 PRCS sample panel.

In addition to reflecting the major workload changes due to these definitional changes in mailability, the second mailing workloads in Figure 1b also reflect monthly variations in levels of early mail responses. Despite similar first mailing workloads in January and February of 2005, 2006, 2007, and 2008, the second mailing workloads in these years are consistently higher in January. This could be due to respondent behavior or to delays in processing mail responses in the early part of the year.

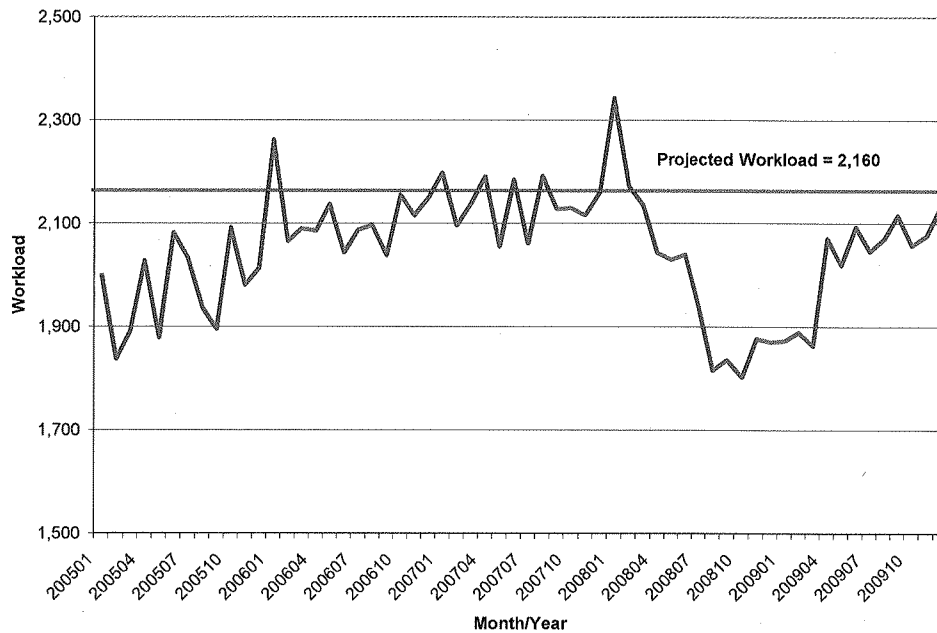


Figure 1b. PRCS Monthly Workloads – Second Mailing
Source: Klein (2011).

Figure 1c summarizes the CATI workloads by data collection month. ACSO staff indicates there are no projected monthly CATI workloads, so no benchmark is provided. A pattern, similar to the pattern for the mail workloads, is seen. The increases and decreases in mailable addresses impacted these workloads. Initially the CATI workloads were low as limited sources were available to obtain phone numbers for addresses in Puerto Rico. While improvements have been made, this is still an issue.

Figure 1d summarizes the CAPI workloads by data collection month. As was true with CATI there are no projected monthly CAPI workloads, so no comparison is provided. With the exception of the first few months, the CAPI workloads are stable over time, averaging between 1,200 and 1,300 cases. Observed variability is a consequence of increases in the CAPI subsampling rate in July 2005 and varying rates of mail and CATI response. To phase into CAPI data collection in Puerto Rico the sample was intentionally smaller in early 2005.

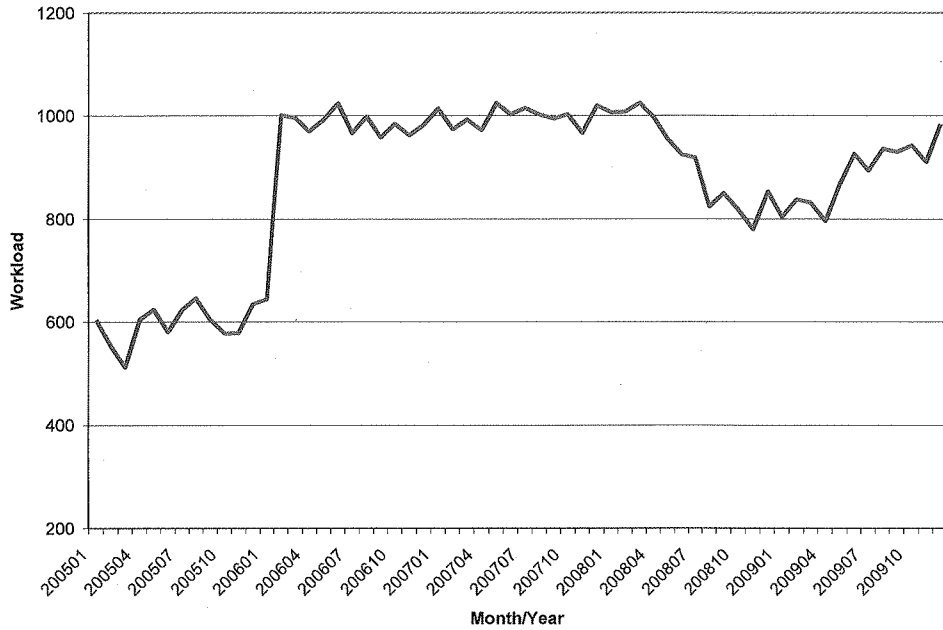


Figure 1c. PRCs Monthly Workloads – CATI
 Source: Alvarado (2011).

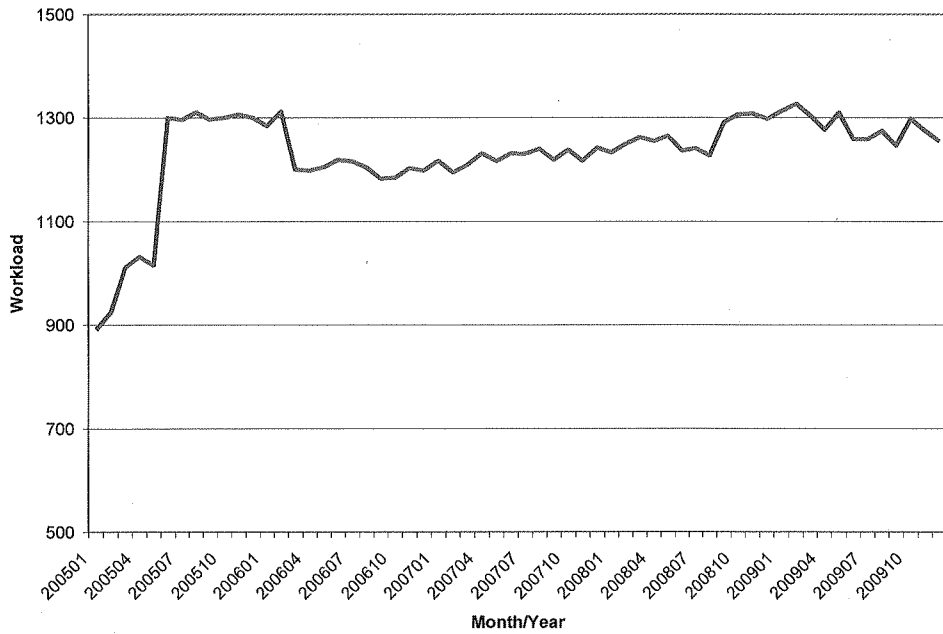


Figure 1d. PRCs Monthly Workloads – CAPI
 Source: Alvarado (2011).

Survey Response

We calculate the survey response rates for the PRCS as the ratio of the weighted estimate of interviews from all three data collection modes to the weighted estimate of all cases eligible to be interviewed, times 100. The PRCS response rates in 2005 through 2009 ranged from 98.0 to 98.4 percent as shown in Table 2. The ACS response rates (for the United States) are similar. All rates and associated standard errors are provided in Appendix 2. Only in 2005 and 2006 were the PRCS rates significantly higher than the ACS rates. The survey response rates for the PRCS have been stable over this five year period. While the survey response rate for Puerto Rico was significantly higher in 2005 when compared with 2009, both rates are high.

Table 2. Comparison of PRCS and ACS Response Rates – 2005 through 2009

Year	PRCS Response Rates (%)	ACS Response Rates (%)	Difference (%) (PRCS – ACS)	Statistically Significant?
2009	98.1	98.1	0.0	No
2008	98.1	98.0	0.0	No
2007	98.1	98.0	0.1	No
2006	98.0	97.8	0.2	Yes
2005	98.4	97.6	0.8	Yes

Note: Rounded values of 0.0 indicate value is less than 0.05.

Source: Castro (2008), Cepietz (2009c), and Marquette (2011b)

While survey response rates for the island of Puerto Rico are high, we analyzed survey response rates below the island level to determine if any specific, smaller areas might have nonresponse problems. In 2008, Springer (2009) studied survey response rates for selected sub-island areas. He used PRCS 1-year estimates from 2005, 2006, and 2007 and 2005-2007 PRCS 3-year estimates to calculate rates for 88 geographic areas with populations of 20,000 or more. His research excluded survey response rates for the smallest geographic areas (with fewer than 20,000 people) because they could only be calculated based on 5-year estimates that were not available in 2008. Springer found the survey response rates for the largest areas to be consistent across the three years. The rates were in the high nineties, showing excellent levels of response. The lowest rates, for these large sub-island areas, were still high. Based on these results, he did not identify any difficulties in acquiring survey responses for any sub-island areas within Puerto Rico.

With the 2010 release of quality measures for all municipios we now can study response rates for all areas. Table 3 summarizes the median municipio-level survey response rate as well as the minimum and maximum response rates.

Table 3. Descriptive Statistics for Municipio-Level Survey Response Rates

Number of Municipios	Median (%)	Min (%)	Max (%)
78	98.5	91.0	100.0

Source: U.S. Census Bureau (2011c).

The U.S. Census Bureau Statistical Quality Standards define serious data quality issues as existing when unit response rates (survey response rates) are below 60 percent (U.S. Census Bureau, 2011b). Figure 2 displays the municipio-level response rates relative to the standard and demonstrates that every municipio exceeded the stated requirement. Appendix 4 includes the specific survey response rate for each municipio.

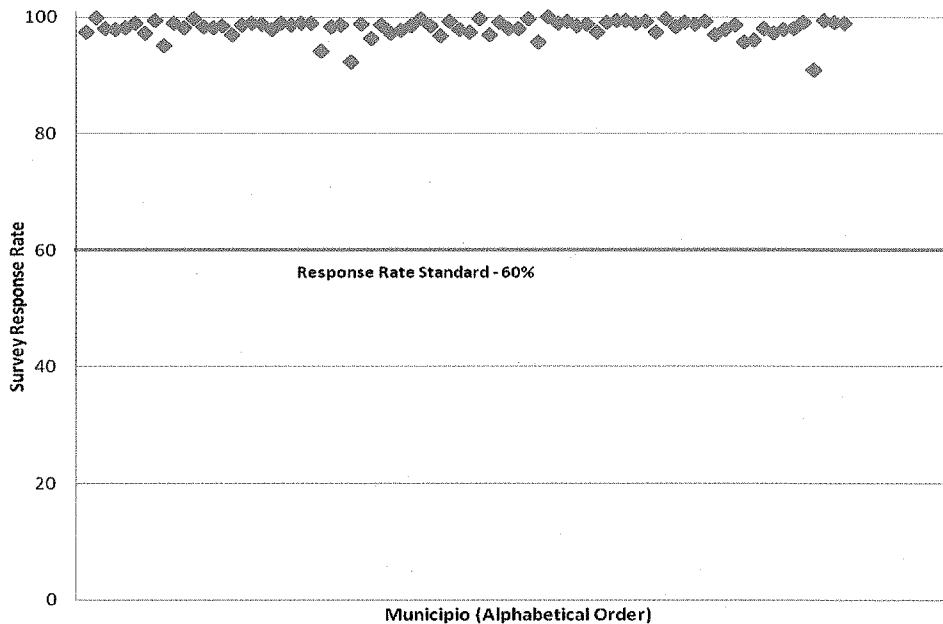


Figure 2. Distribution of Municipio-Level Survey Response Rates
 Source: 2005 – 2009 ACS 5-Year Estimates, U.S. Census Bureau (2011c).

We examined noninterview reasons to explain why interviews could not be completed in Puerto Rico. The documented reason for a noninterview is, in most instances, the final reason noted for noninterviews during CAPI. Some noninterviews, however, are classified during processing based on the amount of data provided. Table 4 is based on the ACS Quality Measures (U.S. Census Bureau, 2011a) and shows the survey noninterview rates by reason in both the United States and Puerto Rico. For example, in 2008, 0.5 percent of all eligible PRCS sample addresses were noninterviews due to a refusal. The sum of the survey noninterview rates across all reasons is 100 minus the survey response rate. Like the survey response rates, we weight the reasons for noninterviews and they therefore describe the reasons for noninterviews in the United States and in Puerto Rico, not in the specific sample selected.

The PRCS reasons for noninterview are consistent over time. In Puerto Rico, refusal, unable to locate, and no one home are the main reasons for noninterviews, but the incidence rates for each are low. The reasons for U.S. noninterviews are similar. The inability to locate a sample housing unit in Puerto Rico could be due to the address designations and descriptions on the MAF for Puerto Rico. We should conduct research

to assess if improvements to the MAF after the 2010 Census reduce the level of this type of nonresponse. There are many potential causes for refusals, ranging from confusion about the survey to aversion to the government. Researching why people are refusing to participate in the PRCS could help us to better understand whether the refusals are for reasons that are within our means to address.

Table 4. PRCS and ACS Survey Noninterview Rates by Reason – 2005 through 2009

Year	Area	Refusal (%)	Unable to Locate (%)	No One Home (%)	Temporarily Absent (%)	Language Problem (%)	Insufficient Data (%)	Other (%)
2009	Puerto Rico	0.4	0.4	0.6	0.1	0.0	0.0	0.2
2008	Puerto Rico	0.5	0.4	0.6	0.1	0.0	0.1	0.2
2007	Puerto Rico	0.5	0.6	0.4	0.1	0.0	0.3	0.2
2006	Puerto Rico	0.6	0.5	0.2	0.1	0.0	0.2	0.4
2005	Puerto Rico	0.4	0.6	0.2	0.2	0.0	0.2	0.3
2009	United States	0.8	0.0	0.6	0.1	0.0	0.2	0.3
2008	United States	0.8	0.0	0.6	0.1	0.0	0.2	0.3
2007	United States	0.9	0.2	0.5	0.1	0.0	0.4	0.2
2006	United States	1.0	0.3	0.5	0.1	0.0	0.4	0.3
2005	United States	1.0	0.4	0.5	0.1	0.0	0.3	0.3

Source: Census Bureau (2011a).

Mail Data Collection

Table 5 summarizes the weighted mail response rates for Puerto Rico and the United States. We weighted all rates and therefore they describe the success of conducting mail interviews in Puerto Rico and in the United States. Standard errors for these rates are provided in Appendix 2.

Table 5 includes two mail response rates. The early mail response rate approximates response before the second mailing. The final mail response rate reflects additional responses that may be due to mailing a second questionnaire, as well as mail responses prompted by CATI and CAPI attempts. The numerator for the early mail response rate is a weighted estimate of the mail responses that were received within 25 days of being mailed. The numerator for the final mail response rate is the weighted estimate of all mail responses. The denominator for both mail rates is the weighted estimate of the cases that were eligible to respond by mail. The eligible universe for the mail response rate is an estimate of all mailable occupied addresses. In the PRCS and the ACS, we consider undeliverable addresses to be eligible addresses.⁵ Undeliverable addresses, though technically ineligible to respond by mail, are included in the denominator for the mail response rates because they are inconsistently identified by the postal service. Including

⁵ An undeliverable address is an address that was considered to be mailable but was identified by the United States Postal Service as undeliverable. This can occur when the address was considered incomplete, the unit was vacant, or for some other reason.

undeliverable addresses in the denominator may slightly depress the true level of public cooperation by mail.

Table 5. PRCS and ACS Mail Response Rates – 2005 through 2009

Year	Early Mail Response Rate (%)		Final Mail Response Rate (%)	
	Puerto Rico	United States	Puerto Rico	United States
2009	18.6	34.9	32.9	57.2
2008	18.2	34.8	32.5	56.6
2007	16.0	34.0	30.9	55.3
2006	16.2	35.0	30.8	55.9
2005	15.9	36.7	30.6	57.1

Source: Castro (2008), Cepietz (2009c) and Marquette (2011b).

In Puerto Rico both the early and the final mail response rates increased from 2005 to 2009. In the United States the early mail response rates decreased between 2005 and 2009 but the final mail response rates increased slightly. In 2008, a form design change boosted mail response in both Puerto Rico and the U.S. relative to 2007. The increase observed in Puerto Rico is also a consequence of changes in the definition of mailable addresses that were applied in 2008.⁶ For details see Hefter (2009). The slight increase in mail response between 2008 and 2009 for the U.S. was not expected and is also likely more a consequence of minor changes in the definitions of unmailable addresses than of changes in public cooperation.

The second mailing is successful in increasing the PRCS and the ACS mail response rates. The observed increase of about 15 percentage points between the early and final PRCS mail response rates could be due to the second mailing or to other factors including CATI phone call reminders.

In 2009 the final mail response rates in Puerto Rico were about 25 percentage points lower than the final United States mail response rates. This could be partially explained by the quality of addresses on the Puerto Rico MAF if mailable addresses cannot be delivered by the postal service. Census 2000 used an update/leave methodology in Puerto Rico (where census enumerators, rather than the Postal Service, deliver census questionnaires.) The MAF therefore did not necessarily include mailing addresses. MAF improvements after the 2010 Census should help improve the effectiveness of the mail mode in Puerto Rico. Pages 17-19 provide additional information about barriers to mail response in Puerto Rico. Analyzing undeliverable-as-addressed (UAA) rates or calculating mail cooperation rates excluding UAAs could help us understand the degree to which address limitations impact mail response. Testing alternative messaging in Puerto Rico may help us find a way to increase levels of mail response.

⁶ As a consequence some addresses that would have been eligible for the mail and CATI operations were now only eligible for CAPI. These addresses had low mail response rates so their elimination boosted the overall mail response rates.

Figure 3 summarizes mail response rates by sample panel for Puerto Rico since the start of the survey. While some monthly variation exists, and an increase can be seen in 2008 and 2009, the mail response rates in Puerto Rico have remained stable.

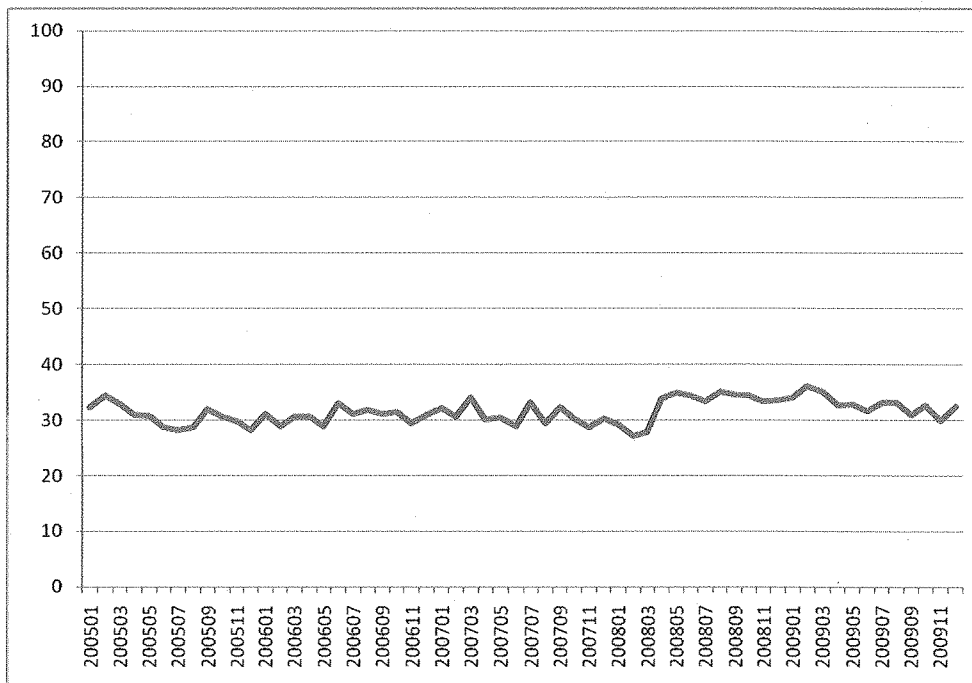


Figure 3. PRCS Mail Response Rates by Sample Panel
Source: Cepietz (2011).

Telephone Data Collection

Table 6 compares weighted CATI response rates for Puerto Rico over time, providing benchmarks with U.S. CATI response rates. The numerator for the CATI response rate is the weighted estimate of all CATI interviews. The denominator for the CATI response rate is the sum of the weighted estimate of the number of cases that were confirmed to be eligible to respond by CATI and the weighted estimate of the number of cases with an unknown eligibility status. A case will have an unknown eligibility status if, after repeated attempts, no one answers or no indication is provided that the telephone number is incorrect. Unlike the CATI workload discussed earlier, this denominator acknowledges that during the CATI operation we may obtain information that clarifies eligibility. Specifically, during CATI a telephone number may be found to be out-of-service or connect to an address other than the sample address. We include such cases in the CATI workload, but not in the CATI response rate denominator.

The CATI response rate is the best measure of our ability to obtain a completed interview for sample cases we believe have good phone numbers. Including the cases with unknown eligibility in the denominator makes this a conservative estimate. We weight all rates and they therefore describe the success of conducting CATI interviews over time

in Puerto Rico and in the United States. See Appendix 2 for the standard errors associated with these rates.

Table 6. PRCS and ACS CATI Response Rates – 2005 through 2009

Year	Puerto Rico (%)	United States (%)
2009	59.3	55.0
2008	61.8	54.5
2007	65.0	58.9
2006	67.6	59.6
2005	73.6	60.4

Source: Castro (2008), Cepietz (2009c) and Marquette (2011b).

In Puerto Rico the CATI response rates have decreased by approximately 14 percentage points since 2005. While we also see declines in the United States, the initial high CATI response rates seen in Puerto Rico in 2005 have dropped to rates more similar to those in the United States. But even in 2009 the reduced CATI response rates are higher for Puerto Rico than the United States. Recall from Table 1 the PRCS CATI workload for 2005 was quite low. The increase in available phone numbers in subsequent years may have contributed to lower CATI response rates if these numbers either reach less cooperative households or result in more noncontacts. The deteriorating quality of Census 2000 as a primary source of telephone numbers could explain these lower rates as phone numbers that appear to be valid may be classified as a CATI noninterview due to a noncontact. Pages 19-20 provide more information about phone number acquisition.

Figure 4 summarizes the CATI response rates by monthly sample panel. This is not the same as the month of CATI data collection. CATI interviews for the January sample panel, for example, take place in February.

Monthly variation in CATI response rates is evident in Figure 4, as is the decline in the effectiveness of CATI in the PRCS. In addition to measuring respondent cooperation and our ability to obtain successful phone numbers, the CATI response rates reflect the call center's effectiveness in managing the PRCS workload. Monthly variation can result from changes in staffing and total hours worked. These effects are hard to disentangle.

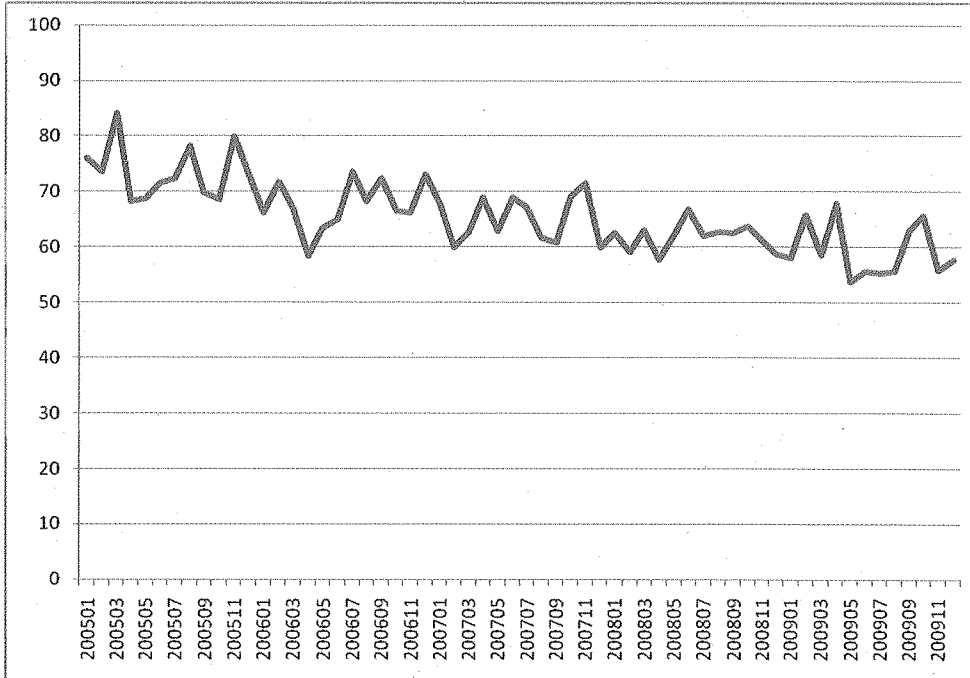


Figure 4. PRCS CATI Response Rates by Sample Panel
 Source: Cepietz (2011).

Personal Visit Data Collection

Table 7 compares CAPI response rates for Puerto Rico and the United States over time. As was true for the mail and CATI rates, we weight these CAPI response rates and they therefore describe the success of conducting CAPI interviews in Puerto Rico and in the United States. The numerator for the CAPI response rate is the weighted estimate of all CAPI responses. The denominator for the CAPI response rate is the sum of the weighted estimate of the number of cases that were eligible to respond by CAPI and the weighted estimate of the number of cases with an unknown eligibility status. Unlike mail and CATI response rates, we consider both occupied and vacant units to be eligible for CAPI. Ineligible units are sample addresses determined during CAPI to be nonexistent, commercial, or part of a group quarters. The CAPI response rate is our best measure of the ability to obtain a completed interview at all legitimate housing units assigned to the CAPI operation.

Table 7. PRCS and ACS CAPI Response Rates – 2005 through 2009

Year	Puerto Rico (%)	United States (%)
2009	97.5	95.6
2008	97.4	95.4
2007	97.6	95.6
2006	97.3	94.9
2005	97.9	94.3

Source: Castro (2008), Cepietz (2009b) and Cepietz (2011).

The CAPI response rates for Puerto Rico are high, consistent with the high CAPI response rates in the United States. Each year of this series the CAPI rates for Puerto Rico were significantly higher than those in the United States. The differences in the 2009 and 2005 CAPI response rates are statistically significant in both the United States and in Puerto Rico, however, the rates moved in different directions. In the United States the CAPI response rate improved while in Puerto Rico the rate dropped. Appendix 2 includes the standard errors for these CAPI response rates.

Figure 5 summarizes the response rates for the CAPI operation by sample panel. This differs from the month of CAPI data collection. The January sample panel in Figure 5 summarizes CAPI interviewing that took place in March. Little monthly variation exists in the CAPI response rates in Puerto Rico. We observe high CAPI response rates every month.

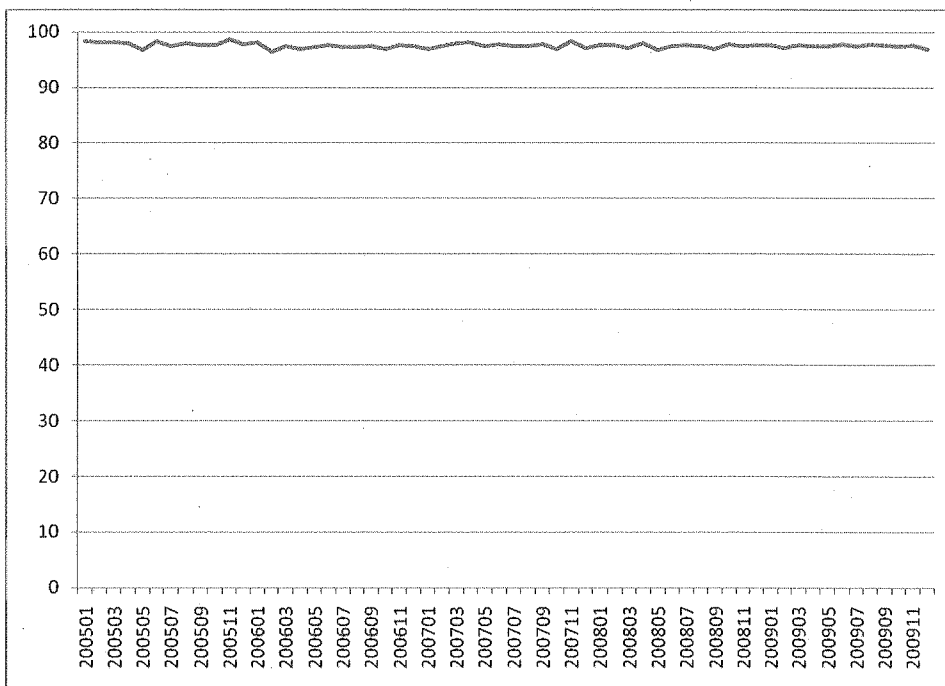


Figure 5. PRCS CAPI Response Rates by Sample Panel
Source: Cepietz (2011).

Mode Distribution of Interviews

Once data collection for a sample panel is complete, we can determine the proportion of the PRCS sample that was interviewed by mail, CATI, and CAPI. We use unweighted mode distributions based on outcome codes. The numerators for these estimates are a simple tally of the number of completed interviews by mail, CATI, and CAPI. The denominator is the total sample. Table 8 includes these unweighted distributions for Puerto Rico for 2005 through 2009. Table 8 also displays the distributions of sample addresses that were noninterviews after CAPI, addresses determined to be ineligible for the survey (nonexistent or commercial addresses) and other outcomes (largely a count of the addresses that we did not select for the CAPI subsample).

Table 8. PRCS Sample Disposition Summary – 2005 through 2009

Year	Mail (%)	CATI (%)	CAPI (%)	Noninterviews (%)	Ineligibles (%)	Other (%)
2009	20.6	3.6	38.5	1.0	2.1	34.2
2008	20.1	4.1	38.8	1.0	2.0	33.9
2007	20.3	5.7	37.5	1.0	1.8	33.8
2006	20.5	6.7	36.9	1.0	1.7	33.1
2005	19.1	5.5	37.9	0.8	1.6	35.0

Source: Cepietz (2009d), Cepietz (2010) and Marquette (2011c).

The proportion of the sample interviewed by mail has been consistent over time – about 20 percent. We see much more variability in the CATI proportion which has always been low (5-6 percent) but continues to decline to rates below 4 percent. We interview about 38 percent of the sample during CAPI. Noninterviews and ineligibles remain low. The “Other” rate indicates that as a consequence of CAPI subsampling we do not interview about a third of the initial sample in Puerto Rico.

Failed Edit Follow-up

Failed Edit Follow-up (FEFU) is a part of the mail data collection operation that collects missing information for mail returned questionnaires. The goal of FEFU is to obtain more consistent and complete data and reduce item nonresponse. During FEFU we review all mail returned questionnaires for both content and coverage. The content edits identify questionnaires that have unacceptable levels of inconsistent or missing responses. The coverage edits identify large households that lacked space on the form to provide full information for all household members and households that provided contradictory information about the number of persons for whom data should be provided. We attempt to recontact the household by phone to collect these data.

The workloads in Table 9 are based on FEFU associated with the January through December monthly sample panels and do not necessarily reflect the year when the FEFU interviews took place. We define the FEFU workload as the number of mail responses that failed at least one of the edits and had a valid telephone number. The workload therefore underestimates the total number of cases that failed these edits, because it

excludes cases that failed the edits but lacked a valid telephone number.⁷ The FEFU rate is a simple ratio of the FEFU workload to the mail responses. In this analysis the workloads are unweighted, only allowing us to make inferences to the specific samples that fail each month. Table 9 also summarizes the proportion of the FEFU workload that failed for coverage (which includes cases failing only for coverage reasons and cases failing for both content and coverage reasons) and the cases failing only for content reasons.

Table 9. PRCS FEFU Workloads – 2005 through 2009

Year	Total FEFU Workload	FEFU Rate (%)	Percent of Total Failures Failing for Coverage Alone or Coverage and Content	Percent of Total Failures Failing for Content Alone
2009	3613	48.5	9.4	90.6
2008	3483	47.9	8.5	91.5
2007	3574	48.9	12.5	87.6
2006	3746	51.0	11.7	88.3
2005	3283	47.5	12.7	87.2

Source: Cepietz (2009d), Cepietz (2010), Marquette (2011c), and Clark (2011).

We send between 3,000 and 4,000 PRCS mail returns to FEFU each year. This represents about 50 percent of the mail responses. In 2009 we sent about 32.8 percent of all mail returns in the U.S. to FEFU (Clark, 2011). This indicates the mail returned questionnaires in Puerto Rico are less complete than those received in the United States. We do not know the reasons for these higher failure rates. A majority of FEFU failures in Puerto Rico are due to content problems alone. Cases failing for coverage (or coverage and content) account for only about 10-12 percent of all FEFU failures in both the U.S. and Puerto Rico.

Mailability of Addresses

Since implementing the PRCS, we have seen low mail response rates in Puerto Rico. Table 5 outlined these rates and Table 8 showed that when the survey was completed, a far smaller proportion of the data for Puerto Rico is based on mail responses. This section attempts to determine why the mail mode is less effective in Puerto Rico. We analyzed mailable rates to see whether this issue is due to a problem with the quality and completeness of addresses in the frame.

An unmailable address is an address on the MAF determined to be ineligible for mailing. No questionnaires are given to the postal service to deliver to unmailable sample addresses. An unmailable address lacks critical delivery information and in some instances could be only a location description. In Puerto Rico we have revised the definition of an unmailable address several times.

We used the following definition to calculate mailable rates in this report. No weighting was necessary because we used the full sampling universe to produce these rates. We

⁷ This is not expected to be a major limitation as most mail returns provide telephone numbers.

calculated these rates for each municipio and for Puerto Rico. Appendix 3 lists municipio-level mailable rates for 2009.

$$\text{Mailable Rate} = \frac{\text{Mailable addresses in the sampling universe}}{\text{Total addresses in the sampling universe}} \times 100$$

Table 10 summarizes these rates over time. In 2005 the definition of a mailable address in Puerto Rico was extrapolated from the algorithm used to determine mailability in the United States. Starting in January 2006 alternative sources were used to refine the requirements for mailability, resulting in a higher mailable rate (Hefter, 2009.) In 2006, 2007, and 2008, the mailable rates were identical due to the minimal changes in the housing inventory and the use of consistent definitions. Between July 2008 and April 2009 additional revisions in the definitions led to a drop in mailable rates. The April 2009 definitions reflect a shift to a new methodology resulting in a more conservative classification and thus, lower mailable rates.

Table 10. PRCS Mailable Rates – 2005 through 2009

Year	Mailable Rate (%)
2009	71.2
2008	79.0
2007	79.0
2006	79.0
2005	70.0

Source: Roebuck (2005), Hefter (2005), Hefter (2007a), Hefter (2007b), and Hefter (2008).

The mailable rate for 2009 in the United States was 97.4 percent, much higher than the rate in Puerto Rico. If the percent of mailable addresses in Puerto Rico increases after the 2010 Census, the PRCS could be more effective in the mail mode (and more cost effective in general). If mailability drops, cost for the PRCS could increase.

Table 11 summarizes the variability in the mailable rates at the municipio level in 2009. Most of the 78 total municipios have mailable rates between 50 and 80 percent. The more rural areas are typically the ones with low mailable rates. For example, in 2009, San Juan (the capital city) had a mailable rate of 90.7 percent while Culebra (a rural area) had the lowest mailable rate of 9.8 percent. These data show that specific municipios could be targeted for special address updating or review activities to try to improve the mailability of their addresses.

Table 11: Distribution of Municipio-Level Mailable Rates – 2009 PRCS

Percent Mailable	Percent of Municipios
Less than 30	1.3
30.1 to 40.0	6.4
40.1 to 50.0	10.3
50.1 to 60.0	28.2
60.1 to 70.0	21.8
70.1 to 80.0	24.4
80.1 to 90.0	3.8
Greater than 90.0	3.8

Source: Hefter (2008).

The changes in the mailable rates impact the denominators which, in turn, affect the mail response rates. Specifically, in 2008 when the definition of an unmailable address was revised, a spike in mail response was noted. This is because a set of addresses with a low likelihood of response were now eliminated from the denominator.

Acquisition of Telephone Numbers

The control files include a flag indicating if a telephone number is available for each sample address. We usually acquire these telephone numbers from a vendor but some phone numbers are remnants from Census 2000. In Puerto Rico only two sources of telephone numbers exist for CATI –Census 2000 and the Puerto Rico Telephone Company (PRTC). We do not use commercial vendors to obtain telephone numbers for CATI in Puerto Rico. Telephone numbers obtained from the PRTC, like those from Census 2000, are dated.⁸ The overwhelming majority of phone numbers used in 2005-2009 came from Census 2000. Fewer than 20 percent of the phone numbers came only from the PRTC in 2005 and that rate has dropped each year. In 2009 not a single address had the PRTC as its sole source for a phone number (Daily, 2011).

We calculated a telephone number availability rate based on the proportion of PRCS mailable sample addresses without a mail response on the date that the CATI workload was identified (essentially the cases that could have been eligible for CATI) with a telephone number. For example, in 2009 over 22,000 mailable addresses in the PRCS were nonrespondents after mail attempts. Telephone numbers were available for just over 10,000 of these cases which became the CATI workload. This rate is 47.6 percent. We do not weight these rates and they therefore describe the impact on the workloads. In 2009 the rate for the ACS was 58.3 percent. The ACS rates are consistently higher, although also low.

As noted earlier, in 2005 the CATI workload was far smaller than the CATI workloads in later years due to problems with obtaining telephone numbers and matching addresses.⁹

⁸ The PRTC files were received in early 2005.

⁹ The difficulty matching Puerto Rico addresses could explain why matching the addresses to the PRTC list doesn't result in many new phone numbers for CATI.

The availability rates for the PRCS have been consistent in 2006 through 2009 with fewer than 50 percent of the nonresponse cases with mailable addresses having an available telephone number. This appears to be an area with a potential to improve CATI efficiency. Obtaining telephone numbers for a greater proportion of these cases could reduce survey costs by allowing more interviews to be conducted in this mode. ACSO staff are exploring the option of requesting phone numbers for addresses in Puerto Rico from the commercial vendors that are used for the ACS.

The telephone numbers that the 2010 Census collected cannot be used in the ACS or the PRCS.¹⁰ We expect this to have a negative impact on the telephone availability rates in both the U.S. and Puerto Rico over time as the telephone numbers from 2000 age. We will need to rely more on commercial vendors.

Table 12. PRCS and ACS Telephone Number Availability Rates – 2005 through 2009

Year	PRCS Telephone Number Availability Rate (%)	ACS Telephone Number Availability Rate (%)
2009	47.6	58.3
2008	48.5	60.4
2007	49.9	63.6
2006	48.5	64.4
2005	32.8	61.3

Source: Liu (2011).

These availability rates do not tell us about the quality of the available telephone numbers. We recommend research to determine how frequently an available telephone number is confirmed to reach the sample address, how often the number is out-of-service, and how often the number reaches the wrong address.

Population Coverage

The coverage rate is the ratio of the PRCS estimate of the total resident population to the independent population estimate for Puerto Rico, times 100. The total resident population includes persons in both housing units and group quarters. We weight the PRCS estimates to reflect the probability of selection into the sample, the subsampling for personal visit follow-up, and nonresponse adjustments. In Puerto Rico, we calculate separate coverage rates for males and females. We do not calculate housing unit coverage rates for Puerto Rico because independent housing unit estimates are not available. Population coverage error can be due to deficiencies in the sampling frame, which deteriorates over the decade, survey nonresponse, and under or over reporting of persons in responding households.

Table 13 shows the coverage rates for the PRCS over time and the associated margins of error. We provide rates and margins of error for the United States as benchmarks.

¹⁰ The request for phone numbers in the 2010 Census specifically indicated that the numbers would only be used for follow up in the 2010 Census.

Table 13: PRCS and ACS Coverage Rates – 2005 through 2009

Year	Universe	Coverage Rates and Margins of Error (%)		
		Total (MOE)	Male (MOE)	Female (MOE)
2009	Puerto Rico	79.5 (0.7)	78.0 (0.9)	80.9 (0.9)
2008	Puerto Rico	80.4 (0.9)	78.3 (1.1)	82.3 (1.0)
2007	Puerto Rico	82.8 (0.7)	81.3 (0.9)	84.2 (0.8)
2006	Puerto Rico	86.9 (0.8)	85.3 (1.0)	88.4 (0.9)
2005	Puerto Rico	89.7 (0.8)	88.3 (0.9)	91.0 (1.0)
2009	United States	94.2 (0.2)	93.0 (0.2)	95.3 (0.2)
2008	United States	93.8 (0.2)	92.6 (0.2)	95.0 (0.2)
2007	United States	94.2 (0.2)	93.2 (0.2)	95.2 (0.2)
2006	United States	94.4 (0.1)	93.4 (0.1)	95.3 (0.2)
2005	United States	95.1 (0.2)	93.9 (0.2)	96.2 (0.2)

Source: Census Bureau (2011a).

U.S. Census Bureau (2011b) identifies serious data quality issues when coverage rates are below 70 percent, a standard that has been met in the PRCS. Comparisons show that in each of these years the coverage rates in the United States were higher than those in Puerto Rico for the total population, for males, and for females. Comparisons confirm the coverage rates for males were about 3 percentage points lower than the rates for females every year in Puerto Rico. We also find differential undercoverage of males in the United States.

The PRCS coverage rates in 2009 are lower than those in 2005 confirming the expected decline in coverage as the MAF becomes less current. Figure 6 displays the total population coverage rates for the United States and Puerto Rico over time. We see a similar, but less severe, decline in coverage in the United States. When comparing 2009 with 2005, we found statistically significant differences in coverage in both the United States and in Puerto Rico for the total population, males, and females. This greater loss of coverage in Puerto Rico is likely due to minimal sources of address updating in Puerto Rico relative to the United States across the decade. The 2009 frame for Puerto Rico is basically the frame that was in place in 2005. The Delivery Sequence File (DSF) is the largest source of ongoing updates to the MAF but we currently do not use this file to update addresses in Puerto Rico because complexities exist in matching Puerto Rico addresses. The lack of DSF updates to the frame in Puerto Rico, could explain why the coverage rates decrease each year.

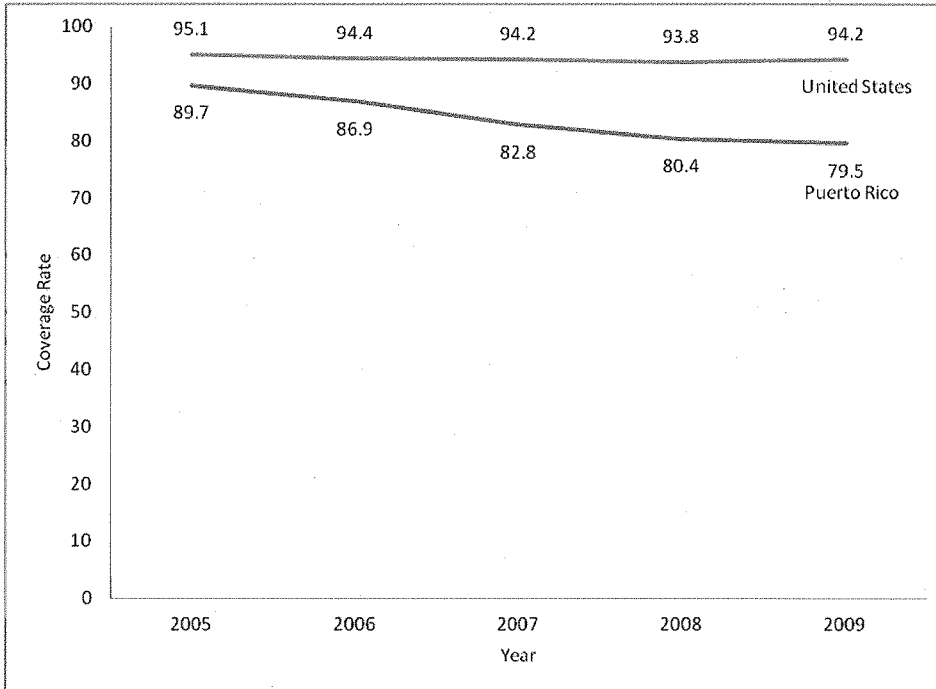


Figure 6. PRCS and ACS Coverage Rates - 2005 through 2009
 Source: Census Bureau (2011a).

Costs

We can only estimate the costs by mode of data collection in Puerto Rico for the CAPI operation. Due to the complexity of isolating PRCS costs for the mail, Failed Edit Follow Up, Telephone Questionnaire Assistance, and CATI operations, we currently do not track these costs separately.

Table 14 outlines the costs for CAPI by fiscal year. Annual variations in costs per case could be due to several factors other than cost efficiencies. The costs in Table 14 include all costs charged by Field division to the CAPI operation and therefore include costs of training, observations, and reinterviews, as well as production. Years with higher per case costs could therefore be years with greater training needs, including the first two years. CAPI is an expensive mode of data collection. The PRCS CAPI costs average between \$110 and \$150 per case. In 2009 the per case CAPI costs in the U.S. were estimated to be about \$144 (Griffin, 2011.)

Table 14: PRCS CAPI Costs – 2005 through 2009

Fiscal Year	CAPI Workload	Cost for CAPI	Costs Per Case
2009	15,261	\$1,683,000	\$110
2008	15,329	\$1,870,000	\$122
2007	14,755	\$1,706,000	\$116
2006	14,422	\$2,037,000	\$141
2005	14,764	\$2,264,000	\$153

Source: U.S. Census Bureau (2005), U.S. Census Bureau (2006), U.S. Census Bureau (2007), U.S. Census Bureau (2008), and U.S. Census Bureau (2009).

Sample Selected and Completed Interviews

Table 15 displays the number of initial addresses selected for the housing unit sample in the PRCS in 2005 through 2009 and the count of final housing unit interviews (occupied and vacant units) when data collection and processing activities were completed. Each year the final sample size used to produce PRCS estimates includes about 22,000 – 23,000 interviews. The lower number of final interviews in 2005 is likely driven by the lower CAPI subsampling rate that was in place for part of the year. The ratio of interviews to sample provides a measure of the loss in sample due to nonresponse, ineligible sample addresses, and subsampling prior to CAPI. In Puerto Rico in 2009 only about 63 percent of the initial sample resulted in a completed interview. In the United States that rate was slightly higher, about 67 percent.

Table 15. PRCS Initial Addresses and Final Interviews – 2005 through 2009

Year	Initial Addresses Selected	Final Interviews	Ratio of Interviews to Sample (%)
2009	36,089	22,649	62.8
2008	36,089	22,704	62.9
2007	36,066	22,837	63.3
2006	35,834	23,125	64.5
2005	36,122	21,813	60.4

Source: U.S. Census Bureau (2011a).

Item Nonresponse

We use item allocation rates to measure levels of item nonresponse in the ACS and the PRCS. The allocation rate for a specific item is the proportion of the values for that item that are based on an allocation (as opposed to a response or an assignment) out of the total required responses.¹¹ We produce two composite measures of item allocation each year. The first measures the overall rate of allocated values across all population items. The second measures the completeness of housing data by combining allocations across all housing items. We weight these allocation rates and they therefore describe overall

¹¹ An assignment occurs when other information provided about a person or housing unit can be used to provide a value for a missing item (e.g., name can be used to assign a value of sex.)

data quality. You can think of a 5.0 percent overall housing allocation rate as indicating about 5 percent of the data used to produce PRCS estimates of housing characteristics were based on allocated responses.

Table 16 summarizes these two overall item allocation rates for the U.S. and Puerto Rico in 2007 through 2009.¹² Appendix 4 displays these overall allocation rates for every municipio based on the 2005-2009 ACS 5-year estimates.

The completeness of population data has declined slightly in both the U.S. and in Puerto Rico but allocation rates remain low. In 2009 only about 4 percent of the values used to produce Puerto Rico population characteristics were allocated. In the U.S. the population allocation rate is about 5 percent. In contrast, the completeness of housing data has improved over time in both the U.S. and Puerto Rico where the overall housing allocation rates are currently similar. In 2009 about 5 percent of the values used to produce housing estimates in Puerto Rico were based on allocated responses.

Table 16. Overall Item Allocation Rates – 2007 through 2009

Year	Overall Population Allocation Rates and Margins of Error (%)		Overall Housing Allocation Rates and Margins of Error (%)	
	Puerto Rico	United States	Puerto Rico	United States
2009	3.7 (0.2)	4.9 (0.0*)	4.9 (0.1)	4.5 (0.0*)
2008	3.9 (0.2)	6.2 (0.0*)	4.5 (0.1)	4.8 (0.0*)
2007	2.8 (0.1)	4.4 (0.0*)	6.2 (0.1)	5.0 (0.0*)

Note: Rounded values of 0.0 indicate value is less than 0.05.

Source: U.S. Census Bureau (2011a) and Bennett (2011).

The municipio-level rates shown in Appendix 4 confirm that we are meeting high levels of completeness for all municipios across Puerto Rico. Based on the 2005-2009 ACS 5-year estimates, the median municipio-level overall item allocation rate for population items was 2.9 percent with values ranging from 1.4 percent to 4.3 percent. The median overall housing item allocation rate was 6.4 percent with a range of values from 2.8 percent to 8.5 percent. The Census Bureau’s statistical quality standards define item nonresponse as a serious data quality issue when item response (100 - allocation rate) is below 70 percent (U.S. Census Bureau, 2011b.) The overall rates suggest compliance but individual items warrant review.

Figure 7 displays the item allocation rates associated with the 2009 PRCS (111 items). While the rates for most items are low, 13 items had allocation rates of about 10 percent or greater. The following items had some of the highest allocation rates in 2009: yearly mobile home costs, property value, year built, and year last married. In the U.S. all of these items had allocation rates of about 10 percent or greater. Mobile homes are a rare form of housing in Puerto Rico. In 2009 only 13 sample cases were determined to be mobile homes so some respondents may not understand the question and choose not to provide a response. At the island-level only this one item (yearly mobile home costs) has an allocation rate greater than 30 percent that might suggest data quality issues.

¹² Standard errors were not available for 2005 and 2006 so those rates are excluded from this table.

We should also study the PRCS allocation rates by mode to determine if any questions may be behaving poorly in the mail mode, warranting questionnaire changes, or in the CATI or CAPI modes, suggesting the need for possible improvements in translations or training.

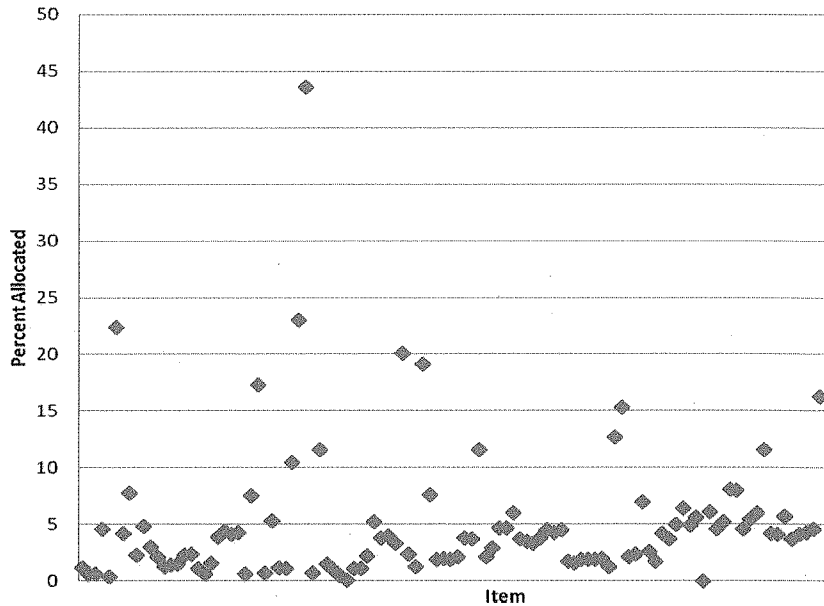


Figure 7. Item Allocation Rates – 2009 PRCS
Source: U.S. Census Bureau (2011a).

CONCLUSIONS

The Census Bureau has been conducting the PRCS since 2005. This review of operations in PRCS finds few surprises and concludes operational feasibility has been demonstrated for all modes of data collection. High levels of unit and item response indicate these operations are successful in obtaining complete survey data from the housing unit population.

The following areas warrant attention or research.

- Low levels of mailable addresses in Puerto Rico result in smaller workloads for mail operations. We hope address updates from the 2010 Census may improve mailability of ACS questionnaires in Puerto Rico. We suggest follow up research based on the 2011 and 2012 PRCS. If the 2010 Census did not significantly improve mailability, we should consider targeting parts of Puerto Rico for address improvement activities. We should also study rates of postal service UAAs for Puerto Rico.

- In addition, mail response rates for mailable addresses lag about 25 percentage points behind the United States. Combined with low mailability, these two factors result in low levels of completed mail interviews. We should consider conducting research on messaging in Puerto Rico to see if we can boost mail response by improving respondent understanding of the survey's value. Unique messaging may be important in Puerto Rico.
- Mail returned questionnaires continue to fail content edits at a high rate. More research is needed to understand the reasons for these failures and if we need to consider any changes in the format, question wording, or translations of the questionnaires that are mailed in Puerto Rico.
- CATI response rates in Puerto Rico, as in the United States, continue to decline. While the PRCS rates exceed the ACS rates, we have good reason to expect this downward trend to continue. We need to try to obtain more complete phone numbers, improve contact rates, and reduce refusals.
- Given the low rate of response by mail and phone, we subsample out more than a third of the initial sample resulting in a low rate of completed interviews relative to the initial sample. This reduction in completed interviews impacts the reliability of survey estimates for Puerto Rico. This rate of sample loss is higher than the United States rate. We should try to increase the workloads that are eligible for mail and CATI by improving mailability and deliverability of questionnaires by the postal service and by obtaining additional telephone numbers from commercial vendors.
- The address frame for the PRCS deteriorates over time due to minimal address updating sources and problems with address matching of Puerto Rico addresses. To address coverage declines throughout the upcoming decade the Census Bureau should develop, test, and implement address matching that could support frame improvements. If DSF updates could be made in Puerto Rico the housing unit universe would be more accurate and a greater proportion of sample addresses might be mailable.
- A few items (yearly mobile home costs, property value, year built, and year last married) have high levels of item nonresponse. Research should try to understand why this is occurring and if some of these problems are mode-specific.
- A comprehensive review of sampling error in PRCS estimates (e.g., median coefficients of variation by size of area) would provide a more complete picture of quality.

The Census Bureau should undertake periodic review of survey measures, such as those included in this report, for the PRCS to stay abreast of possible operational and data quality issues. Analysis of Group Quarters operations in Puerto Rico is recommended.

REFERENCES

- Alvarado, H. 2011. ACS Actual Monthly Workloads. *ACSO Spreadsheets*.
- Bennett, A. 2011. Special tabulation of ACS and PRCS item allocation rates and associated standard errors.
- Castro, E. 2008. American Community Survey and Puerto Rico Community Survey: Margins of Error for the 2000-2007 Housing Unit Response Rates by Mode. *2008 American Community Survey Sampling Memorandum Series #ACS08-S-20*
- Cepietz, E. 2009a. American Community Survey and Puerto Rico Community Survey: 2008 Housing Unit Workload Count by Mode. *2008 American Community Survey Sampling Memorandum Series #ACS08-S-30*
- Cepietz, E. 2009b. American Community Survey and Puerto Rico Community Survey: 2005-2007 Housing Unit Workload Counts by Mode. *2008 American Community Survey Sampling Memorandum Series #ACS08-S-31*
- Cepietz, E. 2009c. American Community Survey and Puerto Rico Community Survey: 2008 Housing Unit Response Rates and Margins of Error by Mode. *2008 American Community Survey Sampling Memorandum Series #ACS08-S-28*
- Cepietz, E. 2009d. American Community Survey and Puerto Rico Community Survey: 2005-2007 Unweighted Sample Disposition Counts. *2009 American Community Survey Sampling Memorandum Series #ACS09-S-14*
- Cepietz, E. 2010. American Community Survey and Puerto Rico Community Survey: 2008 Unweighted Sample Disposition Counts. *2008 American Community Survey Sampling Memorandum Series #ACS08-S-29*
- Cepietz, E. 2010. American Community Survey and Puerto Rico Community Survey: 2005 - 2009 Housing Unit Response Rates and Margins of Error by Mode by Panel. *2009 American Community Survey Sampling Memorandum Series #ACS09-S-27 DRAFT*
- Clark, S. 2011. Special tabulation of ACS and PRCS Failed Edit Follow Up workloads.
- Daily, D. 2011. Phone Vendor Comparison report.
- Griffin, D. 2011. Cost and Workload Implications of a Voluntary American Community Survey. 2011 American Community Survey Research and Evaluation Report Memorandum Series #ACS11-RER-01. <http://www.census.gov/acs/www/library>.
- Hefter, S. 2005. M06 ACS Sampling Database. Internal spreadsheet with 2006 sampling results.

- Hefter, S. 2007a. M07 ACS Sampling Database. Internal spreadsheet with 2007 sampling results.
- Hefter, S. 2007b. M08 ACS Sampling Database. Internal spreadsheet with 2008 sampling results.
- Hefter, S. 2008. M09 ACS Sampling Database. Internal spreadsheet with 2009 sampling results.
- Hefter, S. 2009. Puerto Rico Community Survey: Issues Affecting the 2008 Sample. *2008 American Community Survey Sampling Memorandum Series #ACS08-S-32*
- Keathley, D. (2007). Telephone Edit Follow Up Data for the American Community Survey. *2007 American Community Survey Research Memorandum Series #ACS07-R-3*
- Klein, D. 2011. American Community Survey/Puerto Rico Community Survey Schedule for Mail Data Collection Operations – 2005, 2006, 2007, 2008, 2009. *Internal Documentation*.
- Liu, R. 2011. Special tabulation of ACS and PRCS CATI cases by availability of telephone numbers.
- Marquette, E. 2011a. American Community Survey and Puerto Rico Community Survey: 2009 Housing Unit Workload Counts by Mode. *2009 American Community Survey Sampling Memorandum Series #ACS09-S-28*
- Marquette, E. 2011b. American Community Survey and Puerto Rico Community Survey: 2009 Housing Unit Response Rates and Margins of Error by Mode. *2009 American Community Survey Sampling Memorandum Series #ACS09-S-29*
- Marquette, E. 2011c. American Community Survey and Puerto Rico Community Survey: 2009 Unweighted Housing Unit Sample Disposition Counts. *2009 American Community Survey Sampling Memorandum Series #ACS09-S-30*
- Roebuck, J. 2005. Rate of Unmailable Addresses in the ACS 2005 Puerto Rico Sample (PRCS). *Memorandum for the Record*.
- Springer, M. 2009. PRCS Response Rates for Areas with Populations of 20,000 and Greater. *Unpublished Data*.
- U.S. Census Bureau. 2005. September Financial Management Report for Fiscal Year 2005.
- U.S. Census Bureau. 2006. September Financial Management Report for Fiscal Year 2006.

U.S. Census Bureau. 2007. September Financial Management Report for Fiscal Year 2007.

U.S. Census Bureau. 2008. September Financial Management Report for Fiscal Year 2008.

U.S. Census Bureau. 2009. September Financial Management Reports for Fiscal Year 2009.

U.S. Census Bureau. 2011a. ACS Quality Measures Webpage.
http://www.census.gov/acs/www/methodology/sample_size_and_data_quality/

U.S. Census Bureau. 2011b. U.S. Census Bureau Statistical Quality Standards.
<http://www.census.gov/msdir/standards.htm>

U.S. Census Bureau. 2011c. American Factfinder. 2005-2009 PRCS 5-Year estimates.
<http://factfinder.census.gov>

APPENDICES

Appendix 1

PRCS Monthly Workloads

Data Collection Month	Sample Panel	2005	2006	2007	2008	2009
First mailing						
January	January	2,154	2,355	2,397	2,365	2,150
February	February	2,151	2,327	2,372	2,416	2,157
March	March	2,162	2,339	2,357	2,398	2,115
April	April	2,140	2,355	2,377	2,340	2,326
May	May	2,142	2,341	2,376	2,300	2,331
June	June	2,186	2,353	2,365	2,362	2,325
July	July	2,180	2,360	2,354	2,169	2,372
August	August	2,125	2,359	2,398	2,121	2,335
September	September	2,136	2,343	2,386	2,139	2,348
October	October	2,166	2,372	2,375	2,109	2,341
November	November	2,187	2,333	2,392	2,131	2,368
December	December	2,183	2,391	2,368	2,112	2,358
Second mailing						
January	January	2,002	2,262	2,198	2,343	1,873
February	February	1,837	2,065	2,096	2,173	1,889
March	March	1,893	2,090	2,138	2,135	1,863
April	April	2,028	2,085	2,191	2,043	2,071
May	May	1,878	2,137	2,055	2,030	2,019
June	June	2,082	2,043	2,185	2,040	2,093
July	July	2,034	2,087	2,061	1,937	2,046
August	August	1,937	2,096	2,192	1,815	2,070
September	September	1,895	2,038	2,128	1,836	2,116
October	October	2,092	2,155	2,130	1,802	2,057
November	November	1,980	2,115	2,116	1,877	2,076
December	December	2,013	2,149	2,160	1,870	2,132
CATI						
January	February	604	644	1014	1007	804
February	March	554	1001	974	1008	838
March	April	512	996	993	1025	831
April	May	605	970	972	997	796
May	June	624	993	1025	955	868
June	July	581	1024	1003	925	927
July	August	624	966	1015	919	894
August	September	646	999	1003	824	936
September	October	605	958	995	850	930
October	November	578	984	1003	818	943
November	December	579	962	967	780	911
December	January	635	982	1020	853	984
CAPI						
January	March	891	1284	1217	1233	1313
February	April	924	1312	1195	1249	1327
March	May	1011	1200	1209	1262	1305
April	June	1032	1198	1231	1255	1277
May	July	1015	1205	1216	1265	1310
June	August	1300	1219	1231	1236	1259
July	September	1296	1216	1230	1241	1259
August	October	1311	1204	1240	1227	1275
September	November	1297	1183	1219	1291	1246
October	December	1300	1184	1238	1306	1298
November	January	1306	1203	1217	1308	1275
December	February	1300	1198	1242	1298	1255

Source: Cepietz (2209a), Cepietz (2009b), and Marquette (2011a)

ACS and PRCS Response Rates by Mode with Standard Errors

Rate/Year	Estimated Rates		Standard Errors	
	ACS	PRCS	ACS	PRCS
Survey Response Rate				
2005	97.63	98.39	0.02	0.10
2006	97.80	98.02	0.02	0.10
2007	98.03	98.14	0.01	0.11
2008	98.02	98.06	0.02	0.10
2009	98.10	98.09	0.02	0.10
Early Mail Response Rate				
2005	36.68	15.94	0.04	0.21
2006	34.98	16.21	0.04	0.26
2007	34.04	16.02	0.04	0.25
2008	34.77	18.21	0.04	0.26
2009	34.91	18.60	0.04	0.26
Final Mail Response Rate				
2005	57.11	30.61	0.04	0.36
2006	55.91	30.75	0.05	0.35
2007	55.33	30.85	0.04	0.32
2008	56.60	32.53	0.05	0.36
2009	57.22	32.86	0.04	0.36
CATI Response Rate				
2005	60.39	73.60	0.12	1.10
2006	59.59	67.55	0.11	0.92
2007	58.94	64.99	0.09	0.95
2008	54.52	61.76	0.13	1.23
2009	54.97	59.27	0.12	1.25
CAPI Response Rate				
2005	94.29	97.87	0.04	0.13
2006	94.94	97.30	0.04	0.13
2007	95.60	97.57	0.03	0.15
2008	95.37	97.42	0.04	0.13
2009	95.61	97.47	0.04	0.13

Source: Castro (2008), Cepietz (2009c), and Marquette (2011b).

PRCS Mailable Rates – Municipio Level

	2009
Municipio	Percent Mailable Addresses
PRCS Total	71.2
Culebra Municipio	9.8
Quebradillas Municipio	30.2
Vieques Municipio	34.9
Maricao Municipio	35.4
Orocovis Municipio	37.1
Isabela Municipio	39.0
Barceloneta Municipio	42.2
Rincón Municipio	43.3
Lares Municipio	44.5
Jayuya Municipio	46.1
Las Marías Municipio	46.9
Ciales Municipio	47.2
Villalba Municipio	48.2
Cabo Rojo Municipio	48.6
Vega Alta Municipio	50.1
Patillas Municipio	50.5
Utua Municipio	51.2
Aguada Municipio	51.5
Añasco Municipio	51.6
Naguabo Municipio	51.8
San Sebastián Municipio	52.6
Moca Municipio	53.0
Cidra Municipio	53.0
Lajas Municipio	54.2
Adjuntas Municipio	54.9
San Germán Municipio	55.1
Maunabo Municipio	55.9
Morovis Municipio	56.1
Comerío Municipio	56.7
Aguadilla Municipio	57.3
Aibonito Municipio	57.5
Aguas Buenas Municipio	57.8
Florida Municipio	58.4
Manatí Municipio	58.5
Juncos Municipio	58.6
Hatillo Municipio	59.3
Peñuelas Municipio	60.5
Camuy Municipio	60.6
Las Piedras Municipio	61.0

PRCS Mailable Rates – Municipio Level

Municipio	2009 Percent Mailable Addresses
Corozal Municipio	61.5
Arecibo Municipio	61.5
Hormigueros Municipio	62.6
Coamo Municipio	63.1
Cayey Municipio	63.6
Guánica Municipio	64.8
Naranjito Municipio	65.1
Río Grande Municipio	65.1
Guayanilla Municipio	65.1
Loíza Municipio	65.6
San Lorenzo Municipio	66.0
Barranquitas Municipio	66.2
Canóvanas Municipio	68.3
Salinas Municipio	69.5
Luquillo Municipio	70.0
Vega Baja Municipio	70.2
Juana Díaz Municipio	70.5
Mayagüez Municipio	71.4
Ceiba Municipio	71.9
Yabucoa Municipio	71.9
Sabana Grande Municipio	72.4
Humacao Municipio	72.8
Yauco Municipio	74.1
Arroyo Municipio	74.8
Toa Baja Municipio	75.5
Dorado Municipio	76.3
Santa Isabel Municipio	76.3
Trujillo Alto Municipio	76.6
Cataño Municipio	77.2
Toa Alta Municipio	78.0
Fajardo Municipio	79.3
Caguas Municipio	79.8
Gurabo Municipio	79.9
Guaynabo Municipio	80.1
Guayama Municipio	80.7
Ponce Municipio	85.9
Carolina Municipio	90.2
San Juan Municipio	90.7
Bayamón Municipio	91.2

Source: Hefter (2009), 2009 ACS

Selected Quality Measures by Municipio (2005-2009 PRCS 5-Year Estimates)

Municipio	TOTAL POPULATION (Estimated)	TOTAL HOUSING UNITS (Estimated)	Survey Response Rate (%)	Overall Allocation Rate Population Items (%)	Overall Allocation Rate Housing Items (%)
Adjuntas Municipio	1351	573	97.5	3.4	8.2
Aguada Municipio	3014	1256	99.9	1.8	4.6
Aguadilla Municipio	4207	1911	98.0	3.0	6.8
Aguas Buenas Municipio	2170	846	97.9	3.9	5.8
Aibonito Municipio	2070	812	98.2	2.6	2.8
Añasco Municipio	1921	832	98.9	3.0	6.5
Arecibo Municipio	6252	2874	97.2	2.1	6.7
Arroyo Municipio	1185	528	99.4	2.7	7.1
Barceloneta Municipio	1403	617	95.1	2.1	8.5
Barranquitas Municipio	1787	678	99.0	2.7	3.2
Bayamón Municipio	17653	6981	98.2	3.4	6.4
Cabo Rojo Municipio	3060	1731	99.7	2.9	5.0
Caguas Municipio	10610	4267	98.4	3.3	5.9
Camuy Municipio	2099	940	98.2	2.9	6.9
Canóvanas Municipio	2753	1117	98.5	2.6	5.9
Carolina Municipio	13225	5628	97.0	3.5	6.3
Cataño Municipio	2184	848	98.7	3.2	7.0
Cayey Municipio	3432	1447	99.0	2.2	4.3
Ceiba Municipio	881	526	98.8	3.0	7.8
Ciales Municipio	1599	614	97.9	2.9	8.0
Cidra Municipio	3142	1226	98.9	1.9	3.8
Coamo Municipio	2817	1129	98.6	2.7	3.2
Comerio Municipio	1635	650	98.9	3.5	6.5
Corozal Municipio	2402	922	99.0	3.1	5.3
Culebra Municipio	308	230	94.2	2.1	6.4
Dorado Municipio	2430	1068	98.3	2.2	4.0
Fajardo Municipio	2704	1283	98.7	3.1	6.4
Florida Municipio	702	315	92.4	1.7	8.3
Guánica Municipio	1562	734	98.8	3.7	5.3
Guayama Municipio	2756	1213	96.3	4.0	8.0
Guayanilla Municipio	1804	711	98.6	2.6	4.5
Guaynabo Municipio	7233	3076	97.3	3.0	6.7
Gurabo Municipio	2567	1012	97.8	3.8	7.3
Hatillo Municipio	2306	973	98.5	3.5	7.1
Hormigueros Municipio	1241	576	99.8	2.3	5.1
Humacao Municipio	3977	1787	98.5	3.0	7.7
Isabela Municipio	2759	1307	96.8	2.6	6.8
Jayuya Municipio	1062	405	99.3	2.0	6.9
Juana Díaz Municipio	3417	1330	97.9	2.6	6.9
Juncos Municipio	2227	925	97.4	2.3	6.2
Lajas Municipio	1752	805	99.8	2.0	4.5
Lares Municipio	2355	977	97.0	2.3	5.8
Las Marías Municipio	971	362	99.1	2.4	6.4

Las Piedras Municipio	2126	907	98.0	3.4	7.6
Loíza Municipio	2194	903	98.0	3.3	6.0
Luquillo Municipio	1587	818	99.7	3.0	6.4
Manatí Municipio	2819	1252	95.8	4.1	7.8
Maricao Municipio	398	192	100.0	1.4	5.7
Maunabo Municipio	872	359	99.0	3.6	6.5
Mayagüez Municipio	6812	3172	99.3	3.0	5.3
Moca Municipio	2317	1005	98.5	3.3	6.9
Morovis Municipio	1938	716	98.8	2.1	5.8
Naguabo Municipio	1473	640	97.4	2.1	6.8
Naranjito Municipio	1946	733	99.1	3.0	5.3
Orocovis Municipio	1795	691	99.4	2.5	7.5
Patillas Municipio	1441	631	99.4	2.6	6.1
Peñuelas Municipio	1896	675	98.9	2.2	4.6
Ponce Municipio	13029	5235	99.2	3.1	5.7
Quebradillas Municipio	1540	651	97.4	2.6	6.7
Rincón Municipio	1070	571	99.7	1.8	3.8
Río Grande Municipio	3351	1469	98.4	3.0	6.1
Sabana Grande Municipio	2064	880	99.1	3.7	5.4
Salinas Municipio	2023	902	98.8	3.3	8.2
San Germán Municipio	2682	1190	99.3	2.4	6.5
San Juan Municipio	30644	14314	97.0	4.0	6.4
San Lorenzo Municipio	2937	1180	97.9	4.3	5.4
San Sebastián Municipio	3046	1347	98.7	3.0	6.7
Santa Isabel Municipio	1708	677	95.8	3.5	8.0
Toa Alta Municipio	4447	1612	96.1	2.5	4.9
Toa Baja Municipio	6374	2632	98.0	2.8	5.2
Trujillo Alto Municipio	5279	2054	97.3	2.9	5.6
Utuado Municipio	2433	1054	97.9	3.1	6.4
Vega Alta Municipio	2768	1163	98.1	2.1	4.6
Vega Baja Municipio	4393	1815	99.1	3.1	6.1
Vieques Municipio	620	341	91.0	3.3	6.5
Villalba Municipio	1871	671	99.5	2.1	6.7
Yabucoa Municipio	2910	1152	99.1	2.6	6.5
Yauco Municipio	3752	1543	99.0	3.8	5.4

Source: U.S. Census Bureau (2011c), 2005-2009 ACS 5-Year Estimates