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MEMORANDUM FOR   ACS Research and Evaluation Advisory Group

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Subject: Analysis of the American Community Survey and Puerto Rico
                               Community Survey Coverage

Attached is the final American Community Survey Research and Evaluation report for the Analysis of the American Community Survey (ACS) and Puerto Rico Community Survey (PRCS) Coverage. We compared the ACS and PRCS estimates before controls to the 2010 Census counts to obtain estimates of coverage.

If you have any questions concerning this report, please contact Mark Asiala at 301-763-3605, John Jordan at 301-763-2938, or Michael Beaghen at 301-763-2981.

Attachment

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Analysis of the American Community Survey and Puerto Rico Community Survey Coverage

FINAL REPORT

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1.   Introduction

The Census Bureau measures demographic, social, and economic characteristics of the United States population and housing through the American Community Survey (ACS). Coverage is the measure of completeness of the estimates of housing units (HU), persons living within HUs, and group quarters (GQ). Undercoverage exists when HUs, GQs, or people do not have a chance of being selected in the sample. Overcoverage exists when HUs, GQs, or people have more than one chance of selection in the sample, or are included in the sample when they should not have been. The Census Bureau produces ACS coverage rates for the nation and states every year based on comparisons of the ACS estimates before controls to the Census Bureau's Population Estimates Program (PEP) estimates (U.S. Census Bureau, 2012a). However, a comprehensive and exhaustive analysis of the coverage of the ACS data has not been undertaken since 1999 (Shapiro and Waksberg, 1999), before the full implementation of the ACS. A more current and thorough study of ACS coverage rates may help the Census Bureau focus its resources better by identifying areas that may warrant special efforts.

In this report we estimated ACS coverage by comparing the ACS estimates before controls to the 2010 Census counts. The 2010 Census offered a unique opportunity to measure the coverage of the recently produced 2010 ACS 1-year and 2006-2010 ACS 5-year estimates, as it provided an up-to-date listing of housing units and population for comparison. Previous published measures of the ACS coverage were based on comparisons to the PEP estimates, which were themselves based on the Census 2000 and not as up to date. Furthermore, comparing to the 2010 Census counts allowed for detailed estimates of coverage of small geographies or race/ethnic groups not afforded by comparisons to the PEP.

An earlier report appeared on the coverage of the American Indian/Alaska Native (AIAN) persons and of people living in AIAN[1] areas. This earlier report used essentially the same methodology as the current report and its results are included here. The current report examines person coverage of basic demographics groups, housing unit coverage, and coverage for the national, state, and tract-level geographies. It also includes a separate analysis of the coverage of HUs and persons in the Puerto Rico Community Survey (PRCS).

2.   Background

The Census Bureau regularly measures the coverage of its surveys as part of its evaluations of data quality. There is a long history of decennial census coverage evaluation (National Research Council, 2004, and the U.S. Census Bureau, 2012b) going back to the 1940 decennial census. Most recently, the 2010 Census coverage was measured by the Census Coverage Measurement (CCM) program (Mule, 2012, and Mule and Konicki, 2012). The Census Bureau annually

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[1] AIAN areas include but are not restricted to American Indian reservations and trust lands, tribal jurisdiction statistical areas, Alaska native regional corporations, Alaska native village statistical areas, and tribal designated statistical areas. Note further that AIAN areas do not include Hawaiian homelands. For a complete listing and detailed description of types of AIAN areas go to the Census Bureau webpage, http://www.census.gov/geo/www/2010census/gtc/gtc_aiannha.html.

publishes ACS quality measures on the ACS Web site (U.S. Census Bureau, 2012c), including national coverage rates of the total resident population broken down by sex and several race/ethnic groups, the GQ population, and state-level estimates of coverage of the total resident population broken down by sex, and of housing units. Similarly, the Census Bureau publishes monthly coverage rates for the Current Population Survey (CPS) by three major race/ethnic groups (U.S. Census Bureau, 2012d).

Historical patterns of decennial census coverage measurement show greater coverage for non-Hispanic whites, for females, and for persons 65 years and older. Similarly, we have seen greater coverage in the CPS for non-Hispanic whites. While coverage rates by geography are not as well studied, the decennial census has a history of differential coverage across regions, with midwestern states having the highest coverage, followed by states in the northeast (National Research Council, 2004), and with several southern and western states having had historic patterns of lower coverage. The coverage ratios of persons in the CPS are consistently lower than those of the ACS (U.S. Census Bureau, 2012d).

For perspective, we provide in Table 1 the historical coverage ratios for the ACS going back to 2005 when the ACS housing unit sample was implemented in its full size (Table 1 shows only a subset of the historical coverage rates available on the Census Bureau Web site; U.S. Census Bureau, 2012c). The 2005 data year is comparable to later years for HUs only as it does not include the GQ population, which was not included in the ACS until 2006. We point out that the coverage of HUs and of total resident population was higher in 2010 than in previous years. This was because the 2010 ACS sample frame benefited from the 2010 Census address canvassing operation (U.S. Census Bureau, 2010). Further, the 2010 PEP estimates to which the pre-controlled ACS estimates were compared were more accurate as they were based on the 2010 Census. Another reason for higher HU coverage in 2010 was that, in addition to correctly added HUs, the address canvassing deleted many units and re-added them. Both the deleted and added units were potentially on the ACS sample frame. Ideally, the ACS should have identified these as duplicated address listings, but we have reason to suspect that it did not do so consistently. Many of these potentially duplicated HUs may have been identified by the ACS as vacant, which may be a contributing factor to the ACS's greater estimate of the vacancy rate than the 2010 Census (Cresce, 2012). The causes for the difference between the ACS vacancy rate and the 2010 Census rate, and the impact of the 2010 Census on the 2010 ACS are currently being researched at the Census Bureau (Hefter and Anderson, 2012).

Table 1: Historic ACS Coverage Ratios[2]

Year	Housing Units	Total Resident Population	Male	Female
2010	0.991	0.946	0.940	0.953
2009	0.989	0.942	0.930	0.953
2008	0.987	0.938	0.926	0.950
2007	0.985	0.942	0.932	0.952
2006	0.987	0.944	0.934	0.953
2005	0.985	0.951	0.939	0.962

Source: 2005-2010 American Community Survey 1-year Data and 2005-2010 Population Estimates Program Estimates

The ACS estimates are controlled to equal the PEP estimates by age, sex, race, and Hispanic origin at the weighting area level. An ACS weighting area is a county or a set of less populous counties that meet a minimum population or number of person interviews requirement. Adjustment of the ACS estimates to agree with PEP controls corrects for coverage error. (It also reduces the sampling error, and makes ACS estimates consistent with other published Census Bureau estimates). Consequently, the coverage error we measure in this study has been reduced by controlling. Ultimately, the measures of coverage the pre-controlled ACS estimates that we present pertain to the ACS sampling frame, the ACS data collection, and the ACS interviewing, and less to the published ACS estimates. We can expect the controls to be most effective in the year of a decennial census or those just following one, as the PEP will be most accurate in those years. The efficacy of the controls in reducing coverage error has been explored in Asiala, Beaghen, and Albright (2008).

3.   Methodology

We estimated coverage by determining the ratio of ACS pre-controlled estimates to 2010 Census counts[3]. To the extent this coverage ratio was larger than 1.0, we had overcoverage. To the extent it was below 1.0, we had undercoverage. All comparisons entailed hypothesis tests, with standard errors (SE) and margins of error (MOE) calculated by the production ACS successive differences replication methodology (U.S. Census Bureau, 2009).

3.1   Coverage of Housing Units

We investigated HU coverage for the 2010 ACS 1-year estimates, calculating the coverage ratio for the nation and states. We calculated the coverage ratio as the ratio between the pre-controlled ACS estimate and the 2010 Census count. These pre-controlled weights reflected the inverse of the probability of selection, and the non-interview adjustments, in addition to other

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[2] The ACS Sample Size and Data Quality Web site shows coverage rates in percent, which are coverage ratios multiplied by 100.

[3] Estimates of coverage in this study were calculatedly differently than how they were calculated for the ACS Sample Size and Data Quality Web site, as the latter calculated coverage by comparing the ACS estimates to the 2010 Population Estimates Program estimates.

finer weight adjustments, but not the controls to the PEP estimates, the final housing unit adjustment factor, or rounding. See U.S. Census Bureau (2009) for details on the ACS HU weighting.

$$\text{Coverage Ratio} = \frac{\text{2010 1-year ACS pre-controlled estimate(number of housing units)}}{\text{2010 Census count(number of housing units)}}$$

For the nation, we compared the coverage between categories of HUs such as owner versus renter (in classifying owner versus renter, we excluded units occupied without paying rent, vacant units that were recreational, migratory workers, or other vacant), single unit versus multi-unit, and occupied and vacant.

We examined the distribution of the coverage ratios of HUs by counties, looking at the means, medians and quartiles. In addition to a national-level analysis, we conducted an analysis stratified by the total population of the county. These strata included those counties for which the ACS 1-year estimates are published (65,000 or more), those counties for which 3-year but not 1-year ACS estimates are published (20,000 to 64,999), and those counties for which only 5-year ACS estimates are published (below 20,000). This smallest stratum was further subdivided into counties with 0-4,999, 5,000-9,999, and 10,000-19,999. For this analysis we used the 1-year ACS estimates because using the 3-year or 5-year data would have confounded population change over time with coverage. (See Section 6 on limitations for discussion on this matter).

3.2   Coverage of the Household Population

We investigated the coverage of the household population for the 2010 ACS 1-year results for the nation and states. We also estimated how much of the household person coverage error was attributable to HU error. Similar attributions of person coverage error to HU coverage error have been done for the decennial census, such as Bray (2012), who estimated overcoverage in the 2010 Census due to HU duplication. We calculated the coverage as the ratio between the pre-controlled ACS estimate and the 2010 Census count. These pre-controlled weights reflected the HU weighting adjustments described in Section 3.1.

$$\text{Coverage Ratio} = \frac{\text{2010 1-year ACS pre-controlled estimate (household population)}}{\text{2010 Census count (household population)}}$$

To estimate the household person coverage error attributable to within-household person coverage error and to HU coverage error, we factored the total coverage ratio as follows.

$$\text{Total-coverage ratio } = \text{ within-household-coverage ratio } \times \text{ HU coverage ratio}$$

The within-household-coverage ratio was calculated as the ratio of the pre-controlled household population total over the total number of persons weighted by each person's HU weight.

A more direct way to estimate the within-household-coverage and person coverage due to HU coverage would have been to multiply the estimated coverage error (the difference between the uncontrolled ACS and the 2010 Census count) for occupied HUs by the estimated persons per household. However, we chose not to take this approach because inconsistencies in the way the 2010 Census and ACS reported vacant and occupied HUs might have led to unsound results (see the discussion in Section 2 on ACS measurement of vacancy rates).

3.3   Group Quarters Population Coverage

To determine coverage of the GQ population, we calculated the coverage ratio as the ratio of the 2010 pre-controlled ACS estimate of the GQ Population to the 2010 Census count of the GQ population. We did this for the nation, states, and Puerto Rico and by the seven major GQ types. These pre-controlled weights reflected the inverse of the probability of selection and non-interview adjustments, but not controls to the PEP nor the rounding. See U.S. Census Bureau (2009) for details on the ACS GQ person weighting.

$$\text{Coverage Ratio} = \frac{\text{2010 1-year ACS pre-controlled estimate(GQ Population)}}{\text{2010 Census count(GQ Population)}}$$

3.4   Coverage of the Total Resident Population

For the nation and each state, we determined the coverage ratios for various demographic groups defined by race, ethnicity, age, and sex, as follows below. For the nation we determined coverage ratios for additional race/ethnic combinations not shown below. For Puerto Rico we determined only the sex and age group coverage ratios. Note that the total resident population refers to the combined household and GQ populations.

Age Group Tabulations
0-4, 5-14, 15-17, 18-19, 20-24, 25-29, 30-34, 35-44, 45-49, 50-54, 55-64, 65-74, 75 or older

Race/Ethnicity Tabulations
Hispanic any race
Non-Hispanic White alone or in combination
Non-Hispanic Black alone or in combination
Non-Hispanic AIAN alone or in combination
Non-Hispanic Asian alone or in combination
Non-Hispanic Native Hawaiian and Other Pacific Islander alone or in combination
Non-Hispanic Some Other Race alone

We calculated the coverage ratio as the ratio of the 2010 ACS 1-year pre-controlled estimate of the demographic group to the 2010 Census count of that same demographic group. We also did this for the largest 20 AIAN tribal groupings, for specific Hispanic origin groups, and for the six

largest Asian groups. These pre-controlled weights reflected the adjustments described in Sections 3.1 and 3.3.

$$\text{Coverage ratio} = \frac{\text{2010 1-year ACS pre-controlled estimate (demographic group)}}{\text{2010 Census count (demographic group)}}$$

3.5   Coverage of American Indian/Alaska Native Persons and of the Population in American Indian/Alaska Native Areas

A subset of the analyses described in this section was released in an earlier Census Bureau report. Again, to produce estimates of coverage, we compared the 2010 ACS 1-year estimates to the 2010 Census counts. We estimated the coverage for AIAN areas aggregated over the nation and for the 20 largest AIAN areas individually (according to the 2010 Census). For the estimates of AIAN areas aggregated over the nation, we determined the coverage ratios for sex, for the same age groups which we did for the nation, and the race groups shown below (taken together AIAN alone and AIAN in combination only equal AIAN alone or in combination). Note that all coverage ratios were calculated for the total resident population.

Race Group Tabulations
AIAN alone or in combination
AIAN alone
AIAN in combination only

We calculated the coverage ratios as the ratio of the 2010 ACS 1-year pre-controlled estimate of the demographic group to the 2010 Census count of that same demographic group. The pre-controlled estimates reflected the same adjustments described in Sections 3.1 and 3.3.

When we examined the AIAN person coverage for geographies such as states and AIAN areas we produced coverage ratios for the race group "AIAN alone and in combination with one or more other races". We preferred it to race group "AIAN alone" because it was more robust to race reporting discrepancies between the 2010 Census and the ACS. This was because persons who answered differently in the ACS and 2010 Census on AIAN alone versus AIAN alone or in combination would agree on AIAN alone or in combination. However, when we examined the person coverage of the 20 largest AIAN tribal groupings we produced coverage ratios for "AIAN alone, one tribal group reported", because these are the detailed tribal groupings for which the ACS releases estimates. Note that the 2010 Census Brief, "The American Indian and Alaska Nation Population: 2010", provides estimates of totals for both of these categorizations of AIAN persons.

We also determined the nationwide coverage of ACS estimates of the 20 largest AIAN tribal groupings. In addition to calculating the coverage as the ratio of the pre-controlled 2010 ACS 1-year estimate and the 2010 Census count, we also calculated it as the ratio of 2006-2010 ACS 5-year pre-controlled estimates of the number of AIAN persons to the 2010 Census count to obtain more reliable estimates of coverage for smaller tribal groupings.

3.6   Differences in Coverage Amongst Tracts

In the tract-level analyses we searched for area-level coverage effects, that is, area effects that went beyond what we already knew about the type of HU or the demographics of the population. For example, we hypothesized that coverage might differ in more densely populated areas from less densely populated areas. This area effect would not have been detected in any of our measures that look at the characteristics of HUs, GQs, or persons.

For the tract-level analysis we classified tracts by several characteristics of interest: population density, owner/renter, and racial homogeneity (based on 2010 Census data). We calculated the coverage ratios as the ratio of the 2006-2010 ACS 5-year pre-controlled estimate with the 2010 Census count. The potential confounding of change over time by using the 5-year data was not considered a serious limitation for this analysis because we were interested in the relative comparisons between the different groups of tracts. That said, one must be cognizant of this limitation when examining the data (see the discussion in Section 6).

The groupings of tracts were broken down as indicated below. We conducted a univariate analysis for each of these classifications.

a. **Population Density**: We determined the density of the population as the ratio of the 2010 Census count of the number of people in that tract divided by the area of that tract. We then characterized the tracts as dense (highest third), moderately dense (middle third), and sparse (lowest third).

$$\text{Density} = \frac{2010 \text{ Census count}}{\text{Area of tract}}$$

b. **Owner/Renter**: We categorized tracts by percentage of renter in each tract. These categorizations were: predominantly renter (percentage of renter was at least 60 percent), mixed (percentage of renter was at least 40 percent and less than 60 percent), and predominantly owner (percentage renter was less than 40 percent).

c. **Racial/Ethnic Homogeneity**: The first step in determining racial/ethnic homogeneity was assigning persons in the 2010 Census to one of seven racial/ethnic groups (Hispanic, non-Hispanic white, non-Hispanic Black, non-Hispanic Asian, non-Hispanic AIAN, non-Hispanic Native Hawaiian and Other Pacific Islander (NHPI), and non-Hispanic Some Other Race). If someone was Hispanic, we categorized them as Hispanic regardless of race. Otherwise if they were non-Hispanic, we simply categorized them by their race group. We then categorized tracts into three groups: homogeneous (largest racial/ethnic group described above made up at least 75 percent of the tract in the 2010 Census), mostly homogeneous (largest racial/ethnic group made up between 50 and 75 percent of the tract), and heterogeneous (largest racial/ethnic group made up less than 50 percent of the tract).

d. **Coverage of Blacks by Degree of Concentration:** We investigated the hypothesis that coverage of Blacks was lower in areas where Blacks were more concentrated (Shapiro and Waksberg, 1999). We categorized tracts into three groups by the proportion of the population who were non-Hispanic Black alone or in combination: 75 percent or more, 50 percent – 75 percent and less than 50 percent. We then measured and compared the ratio of coverage of non-Hispanic Blacks alone and in combination in each these three categories.

Note that in these tract-level analyses, we investigated coverage for the total resident population, without further breakdown by household or GQ residency, or by demographic groups.

4. Analysis of Coverage of the Puerto Rico Community Survey

We calculated separate coverage estimates for the PRCS. Thus throughout this study national estimates excluded Puerto Rico and estimates for Puerto Rico are not found in tables with states. To better illuminate HU coverage in the PRCS we compared the pre-controlled 2009 PRCS 1-year estimate to the 2010 Census count. Since the HU sample frame for the PRCS was not updated between decennial censuses the coverage estimate is meaningful only the year of the decennial census or perhaps the next year. In the years thereafter the coverage of HUs becomes progressively worse. Thus, the 2009 comparison is the least favorable to the PRCS. However, it better illustrates the PRCS HU coverage we can expect in the years following the 2010 Census.

For the PRCS coverage we did not examine race or ethnicity coverage in the PRCS, since the great majority of people in Puerto Rico are Hispanic. Consequently, the analysis of PRCS person coverage was limited to examining the coverage of sex and age groups, where we used the same age groups as defined for the stateside analysis.

5. Calculation of Variances and Hypothesis Testing

To calculate variances of ACS estimates or functions of variances such as the SE and the MOE, the method of successive difference replication is employed (U.S. Census Bureau, 2009). In this study we used the replicates corresponding to the pre-controlled weights. Because the census counts are constants, the estimated variance of the coverage ratio, C, was the ACS estimate of variance divided by the census count squared.

$$\text{Var}(C) = \text{Var}\left(\frac{\text{ACS Estimate}}{\text{Constant}}\right) = \frac{\text{Var}(\text{ACS Estimate})}{\text{Constant}^2}$$

The general formula for the variance of a difference follows, where C_1 and C_2 are the two coverage ratios of interest.

$$\text{Var}(C_1\text{-}C_2) = \text{Var}(C_1) + \text{Var}(C_2) - 2\text{Covariance}(C_1,C_2)$$

When the estimates of coverage ratios for two groups are independent, the variance of the difference between two coverage ratios reduces to the sum of the variance of the two coverage

ratios, C_1 and C_2. Estimated coverage ratios are independent if we are comparing different geographies; otherwise there is a non-zero covariance term. For computational ease we used approximations for non-independent comparisons. If we compared coverage ratios for different groups within the same geography, then there was negative covariance. For three or more groups we ignored this covariance. With just two groups, e.g., male and female, the correlation is -1.0 and we approximated by assuming the covariance equal to the larger of the two estimated variances. If a smaller geography or group of geographies was a subset of a larger geography (e.g., AIAN areas versus the nation), then the covariance is weakly positive. This covariance was also ignored in the calculations.

Census Bureau policy requires 90 percent confidence, so for a difference to be statistically significant, the absolute value of the test statistic must be greater than 1.645. When we made multiple comparisons between observations, we employed the Bonferroni method (Neter, Wasserman, and Kutner, 1985), which adjusts the cutoff value upward to account for the multiple comparisons.

6.   Limitations

We recognize several important limitations that readers must be aware of. An obvious limitation of the coverage ratio calculated by comparing to the 2010 Census was that the Census results themselves suffer from coverage error (Mule, 2012). If the ACS and the 2010 Census had equal coverage error for a given group, the coverage ratio would nonetheless be 1.0. That said, we believe the 2010 Census coverage error was generally small enough to make our method useful.

Further, there were data collection differences between the ACS and the 2010 Census that lead to differences in estimates which were not related to coverage. As discussed in the background (Section 2), there were differences in the 2010 ACS 1-year and 2010 Census classification of HUs as vacant or occupied, which affected the interpretation of HU coverage. Importantly, there were differences in coverage ratios of specific race groups that are likely attributable to differences in race reporting between the ACS and 2010 Census. Some estimates of coverage of race and ethnic groups were confounded by these phenomena and cannot be interpreted as measures of coverage. Previous research on race reporting differences includes Bennett and Griffin (2002), and Raglin and Leslie (2002), who examined race and ethnicity reporting differences between the Census 2000 Supplementary Sample (the pilot study for the ACS) and the Census 2000. Also, Pinal and Schmidley (2005) examined race and ethnicity reporting differences between the CPS and the Census 2000.

Another limitation of this research that requires discussion involved different temporal frames of reference. The 2010 Census counts refer to a point in time, April 1, 2010, whereas the ACS estimates are period estimates. These differences were more severe for the comparisons to the 5-year estimates. The coverage differences we saw between the pre-controlled 2006-2010 ACS 5-year estimates and the 2010 Census were confounded with any changes over the 5-year period. This limitation affected the tract-level analyses we conducted, which were made strictly with the 5-year estimates. We can see the trend in total population in Table 2.

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Table 2: ACS Estimates of Total Population for the United States

Year	Total Population
2006	299,398,484
2007	301,621,157
2008	304,059,724
2009	307,006,550
2010	309,349,689

Source: 2006-2010 American Community Survey 1-year Data

The confounding of time with estimates of coverage for the 2010 ACS 1-year estimates was smaller, though we would expect differences between the April 1, 2010 Census date and the January 1, 2010 through December 31, 2010 time period which the pre-controlled ACS estimates reflected.

Lastly, it must be emphasized that the estimates of coverage ratios were subject to sampling variation. In particular, the reliability of the ACS data for smaller populations or for smaller geographies requires attention. For some of the geographic or demographic breakdowns these sampling errors could be large; readers must consider the MOE when examining coverage ratios. While we attempted to make this study both comprehensive and detailed, we had to be conscientious of the reliability of the estimates. Thus, the most detailed demographic breakdowns were for the national level estimates. For smaller geographies, such as AIAN area or state, we looked at more limited univariate breakdowns of demographics. In sum, both nonsampling and sampling errors affected the coverage ratios shown in this report and their interpretation.

7.   Results and Discussion

Throughout this section, when we say that an estimate is undercovered or overcovered, it is understood that the difference of the estimate of the coverage ratio from 1.0 was statistically significant at the 90 percent confidence level.

7.1   Coverage of Housing Units

In Table 3 we see there was a small undercoverage of HUs, with a coverage ratio of 0.991.

Table 3: Coverage of Housing Units for the United States

2010 Census Count of HUs	2010 ACS 1-year Estimate of HUs	Coverage Ratio	MOE
131,704,730	130,556,040	0.991	0.001

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

In Table 4 we see there was a net undercoverage of occupied housing units in the ACS (0.973). In contrast, there was a net overcoverage of the vacant housing units in the ACS (1.135).

However, the higher coverage ratio for vacant units was most likely an artifact of differences in ACS and 2010 Census field determinations of vacancy status. The ACS had a higher vacancy rate than the 2010 Census, which is a topic of ongoing research; see Hefter and Anderson (2012) and Cresce (2011).

Table 4: National Housing Unit Coverage by Occupancy Status

	2010 Census Number of HUs	Coverage Ratio	MOE
Occupied	116,716,292	0.973	0.002
Vacant	14,988,438	1.135	0.010

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

Table 5 shows HU coverage by type of structure (single unit versus multi-unit). We see there was a net undercoverage of single-unit HUs in the ACS, whereas there was a net overcoverage of mult-unit housing units in the ACS. This is not consistent with 2010 Census results, which show better coverage for single units than multi-units (Mule and Konicki, 2012). The difference in coverage seen between single units and multi-units may result from classification differences by ACS and 2010 Census field staff and merits more research.

Table 5: National Housing Unit Coverage by Type of Structure

	2010 Census Number of HUs	Coverage Ratio	MOE
Multi-unit	30,906,706	1.111	0.003
Single unit	100,798,024	0.955	0.002

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

Table 6 shows the coverage ratios by owner and renter occupied HUs. Both owner and renter HUs were undercovered at the national level (0.973 and 0.976; the difference is not statistically significant).

Table 6: National Coverage of Housing Units by Tenure

	2010 Census Count	Coverage Ratio	MOE
Owner	80,330,466	0.973	0.003
Renter	40,919,739	0.976	0.003

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

Table 7 shows the HU coverage ratios by state. Of the 51 state or state equivalents, 36 showed undercoverage, seven showed overcoverage, while there were eight whose observed coverage ratio was not significantly different than 1.0. The range of the coverage ratios was relatively small, ranging from 0.965 for Wyoming to 1.024 for Delaware. There was no apparent regional pattern to the state coverage ratios of HUs.

Table 7: State Coverage of Housing Units

State	2010 Census Number of HUs	Coverage Ratio	MOE
AL	2,171,853	0.974	0.005
AK	306,967	0.975	0.010
AZ	2,844,526	0.970	0.004
AR	1,316,299	0.987	0.006
CA	13,680,081	0.991	0.001
CO	2,212,898	0.990	0.004
CT	1,487,891	0.994	0.004
DE	405,885	1.024	0.011
DC	296,719	0.994	0.010
FL	8,989,580	0.976	0.002
GA	4,088,801	0.978	0.004
HI	519,508	0.982	0.009
ID	667,796	0.990	0.007
IL	5,296,715	0.999	0.003
IN	2,795,541	0.995	0.003
IA	1,336,417	0.989	0.005
KS	1,233,215	0.993	0.005
KY	1,927,164	0.996	0.005
LA	1,964,981	0.976	0.005
ME	721,830	1.022	0.006
MD	2,378,814	0.991	0.003
MA	2,808,254	1.000	0.003
MI	4,532,233	0.998	0.002
MN	2,347,201	0.989	0.003
MS	1,274,719	1.000	0.007
MO	2,712,729	0.990	0.004
MT	482,825	0.976	0.007
NE	796,793	0.995	0.006
NV	1,173,814	0.971	0.006
NH	614,754	1.003	0.007
NJ	3,553,562	0.999	0.003
NM	901,388	0.991	0.006
NY	8,108,103	1.003	0.002
NC	4,327,528	0.980	0.003
ND	317,498	0.987	0.009
OH	5,127,508	0.999	0.003
OK	1,664,378	0.984	0.004
OR	1,675,562	0.996	0.005

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

Table 7 Continued: State Coverage of Housing Units

State	2010 Census Number of HUs	Coverage Ratio	MOE
PA	5,567,315	0.995	0.002
RI	463,388	1.006	0.008
SC	2,137,683	0.985	0.005
SD	363,438	0.991	0.009
TN	2,812,133	0.994	0.004
TX	9,977,436	0.993	0.002
UT	979,709	1.009	0.006
VT	322,539	0.984	0.008
VA	3,364,939	0.988	0.003
WA	2,885,677	1.003	0.003
WV	881,917	1.013	0.007
WI	2,624,358	0.994	0.003
WY	261,868	0.965	0.013

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

In Table 8 we see the distribution of the coverage ratios of HUs for counties. We see a general pattern of lower coverage for smaller counties. The lowest mean coverage ratio, 0.952, was observed for those with populations below 5,000. The coverage ratio for counties with populations of 20,000-64,999, 0.988, was higher than that for counties with populations of 1-19,999, 0.967; and the coverage of counties with 65,000+, 0.993, was higher than that for 20,000-64,999. Not surprisingly, there was a greater dispersion in the coverage ratios for smaller counties. Note that we used 2010 ACS 1-year data only, including counties of population size 1-64,999 for which only multi-year ACS estimates are released. We did this because we did not want to confound population growth over time with coverage (see Section 6, Limitations). However, analyses with 5-year data showed a similar pattern with progressively lower estimates of coverage for smaller counties.

Table 8: County Distribution of Housing Unit Coverage

Population of County	First Quartile	Median	Third Quartile	Mean	MOE of Mean	Number of counties
65,000+	0.983	0.995	1.005	0.993	0.001	807
20,000-64,999	0.962	0.993	1.019	0.988	0.002	1,036
1-19,999	0.918	0.976	1.025	0.967	0.003	1,300
10,000-19,999	0.934	0.979	1.020	0.971	0.005	604
5,000-9,999	0.919	0.983	1.030	0.973	0.008	393
1-4,999	0.882	0.957	1.028	0.952	0.014	303
All counties	0.955	0.991	1.014	0.981	0.001	3,143

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

7.2   Coverage of the Household Population

In this section we present coverage ratios of the household population for the nation and states. Further, we factored the household population coverage ratio into two multiplicative components: the within-household coverage and the HU coverage. We did this factoring to understand to what extent the household population coverage error was due to within-household coverage error and to what extent it was due to HU coverage error.

Table 9: National Household Population Coverage for 2010 ACS 1-year Estimates

ACS Pre-controlled Estimate of the Household Population (MOE)	ACS Estimate after Accounting for Housing Unit Coverage Error but not Within-household Coverage Error (MOE)	2010 Census Household Population	Overall Coverage Ratio (MOE)	Within-household Coverage Ratio (MOE)	Housing Unit Coverage (MOE)
286,215,134 (488,813)	288,759,541 (369,644)	300,758,215	0.952 (0.002)	0.960 (0.002)	0.991 (0.001)

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

We determined the overall coverage ratio of the household population, 0.952, by dividing the ACS pre-controlled estimate of the household population, 286,215,134, by the 2010 Census count of the household population, 300,758,215. We calculated the within-household coverage ratio, 0.960, by dividing the ACS estimate after accounting for HU coverage error but not within-household coverage error 288,759,541, by the census household population count, 300,758,215. We calculated the coverage because of HU coverage, 0.991, by dividing the ACS pre-controlled estimate of the household population, 286,215,134, by the ACS estimate after accounting for HU error but not within-household coverage error, 288,759,541.

In Table 9 we see that the household population (0.952) was undercovered at the national level. This coverage error was equal to the within-household population coverage error (0.960) multiplied by the housing unit coverage error (0.991). Thus most of the coverage error is attributable to the within-household coverage error.

From Table 9 we can determine that there were an estimated 2,544,407 people who were not covered because of HU error; this is the difference between the ACS estimate after accounting for housing unit error but not within-household coverage error, 288,759,541, and the ACS pre-controlled estimate of the household population, 286,215,134. Further, there were an estimated 11,998,674 people who were not counted because of within-household coverage error; this is the difference between the 2010 Census count of the household population, 300,758,215, the ACS estimate after accounting for housing unit error but not within-household coverage error, 288,759,541.

In Table 10, we see the coverage ratios for the household population in each state broken down in the same manner as in Table 9. The overall coverage ratios for the household population ranged from 0.882 in Washington DC to 0.999 in Utah. Note that most of the coverage error in Washington DC was due to within-household coverage error. Subtracting as we did with the national estimates for Table 9, we can determine that there were an estimated 63,201 people in Washington DC who were not counted because they were missed from the within HU coverage, while there were only an estimated 3,154 who were not counted because of HU coverage error.

Table 10: State Household Population Coverage

State	ACS Pre-controlled Estimate of the Household Population	MOE	ACS estimate after Accounting for Housing Unit Error but not Within-household Coverage Error	MOE	Census Household Population	Cover-age Ratio	MOE
AL	4,261,069	48,416	4,378,751	43,745	4,663,920	0.914	0.010
AK	657,661	16,421	674,943	16,052	683,879	0.962	0.024
AZ	5,749,863	52,043	5,925,827	48,477	6,252,633	0.920	0.008
AR	2,679,512	32,709	2,721,761	29,409	2,836,987	0.944	0.012
CA	34,448,180	111,449	34,748,701	103,766	36,434,140	0.945	0.003
CO	4,757,062	43,202	4,800,975	37,796	4,913,318	0.968	0.009
CT	3,323,734	36,720	3,347,308	33,333	3,455,945	0.962	0.011
DE	833,562	20,487	819,423	17,553	873,521	0.954	0.023
DC	495,347	11,700	498,501	10,751	561,702	0.882	0.021
FL	16,474,489	84,927	16,887,221	76,039	18,379,601	0.896	0.005
GA	8,682,204	70,086	8,876,586	57,959	9,434,454	0.920	0.007
HI	1,216,563	23,675	1,240,691	23,266	1,317,421	0.923	0.018
ID	1,493,359	25,758	1,504,742	22,868	1,538,631	0.971	0.017
IL	12,057,469	63,159	12,081,373	57,852	12,528,859	0.962	0.005
IN	6,066,219	47,920	6,105,881	42,689	6,296,879	0.963	0.008
IA	2,893,423	27,121	2,928,192	23,043	2,948,243	0.981	0.009
KS	2,654,255	29,456	2,674,355	26,507	2,774,044	0.957	0.011
KY	4,048,778	42,729	4,064,649	36,943	4,213,497	0.961	0.010
LA	4,108,153	42,526	4,206,613	36,654	4,405,945	0.932	0.010
ME	1,285,504	17,732	1,257,237	16,342	1,292,816	0.994	0.014
MD	5,368,809	49,625	5,415,851	44,229	5,635,177	0.953	0.009
MA	6,129,806	47,446	6,131,526	42,110	6,308,747	0.972	0.008
MI	9,298,587	54,783	9,319,329	50,793	9,654,572	0.963	0.006
MN	5,051,189	42,287	5,108,614	38,692	5,168,530	0.977	0.008
MS	2,733,748	38,951	2,732,371	32,440	2,875,333	0.951	0.014
MO	5,589,271	45,073	5,640,718	41,617	5,814,785	0.961	0.008
MT	906,770	15,746	928,694	14,471	960,566	0.944	0.016
NE	1,732,331	26,926	1,740,442	22,848	1,775,176	0.976	0.015
NV	2,466,905	31,656	2,541,128	30,133	2,664,397	0.926	0.012
NH	1,259,039	20,128	1,255,191	17,798	1,276,366	0.986	0.016
NJ	8,288,840	54,977	8,291,507	44,084	8,605,018	0.963	0.006
NM	1,880,727	26,654	1,901,805	25,547	2,016,550	0.933	0.013
NY	18,287,620	74,599	18,233,668	72,641	18,792,424	0.973	0.004
NC	8,742,752	56,917	8,920,881	51,321	9,278,237	0.942	0.006
ND	631,376	11,927	640,850	10,585	647,535	0.975	0.018
OH	10,944,933	61,436	10,960,307	53,597	11,230,238	0.975	0.005

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

Table 10 Continued: State Household Population Coverage

State	ACS Pre-controlled Estimate of the Household Population	MOE	ACS estimate after Accounting for Housing Unit Error but not Within-household Coverage Error	MOE	Census Household Population	Coverage Ratio	MOE
OK	3,443,630	28,384	3,501,580	27,450	3,639,334	0.946	0.008
OR	3,649,261	36,247	3,666,321	35,226	3,744,432	0.975	0.010
PA	11,742,201	59,388	11,808,814	50,175	12,276,266	0.956	0.005
RI	971,536	19,694	965,738	18,254	1,009,904	0.962	0.020
SC	4,202,473	44,572	4,268,821	38,030	4,486,210	0.937	0.010
SD	754,743	14,722	765,076	13,799	780,130	0.967	0.019
TN	5,884,564	47,256	5,927,038	43,330	6,192,633	0.950	0.008
TX	23,296,386	102,166	23,494,544	89,000	24,564,422	0.948	0.004
UT	2,714,050	32,794	2,688,150	28,041	2,717,733	0.999	0.012
VT	577,207	12,811	586,732	12,095	600,412	0.961	0.021
VA	7,388,455	58,749	7,483,035	53,229	7,761,190	0.952	0.008
WA	6,434,684	50,673	6,418,730	45,403	6,585,165	0.977	0.008
WV	1,741,866	25,847	1,718,176	21,048	1,803,612	0.966	0.014
WI	5,396,589	41,139	5,422,634	35,872	5,536,772	0.975	0.007
WY	518,378	13,021	537,542	12,656	549,914	0.943	0.024

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

7.3   Coverage of the Total Resident Population

In this section we describe the coverage of the total resident population (the combined household and GQ populations) by major demographic groups and by region and state. First, Table 11 shows the overall ACS person coverage. There was a net undercoverage of all persons (0.948) living in the United States. The ACS coverage ratio was higher than the CPS coverage ratio, which has ranged from about 0.87 to 0.88 from 2008 to 2011 (U.S. Census Bureau, 2012c).

Table 11: National Total Resident Population Coverage for 2010 ACS 1-year Estimates

2010 Census Count	Coverage Ratio	MOE
308,745,538	0.948	0.002

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

In Table 12 we see females (0.954) had a higher overall coverage than males (0.942), though both were undercovered at the national level. This was consistent with other demographic surveys such as the 2010 Census and the CPS. In contrast, the difference in the coverage ratios between the two sexes in the CPS is typically greater, at two to three percentage points difference.

Table 12: National Coverage by Sex

	2010 Census Count	Coverage Ratio	MOE
Female	156,964,212	0.954	0.002
Male	151,781,326	0.942	0.002

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

Table 13 shows the coverage ratios by age group. At the national level, all age groups were undercovered, however, coverage varied by the age group. The 18-19 (0.898)[4] and 20-24 (0.891) had the lowest coverage. Coverage ratios for the oldest age groups, 65-74 (0.983)[5] and 75+ (0.981), were higher than other age groups. Higher coverage ratios for the older age groups were consistent with the coverage results of the 2010 Census (Mule, 2012); in contrast to the ACS, the 2010 Census had greater undercoverage for the 30-34, 35-44, and 45-49 age groups than for the 18-29 age groups.

Table 13: National Coverage by Age

Age Group	2010 Census Count	Coverage Ratio	MOE
0-4	20,201,362	0.948	0.004
5-14	41,025,851	0.960	0.003
15-17	12,954,254	0.950	0.005
18-19	9,086,089	0.898	0.006
20-24	21,585,999	0.891	0.004
25-29	21,101,849	0.918	0.004
30-34	19,962,099	0.944	0.004
35-44	41,070,606	0.942	0.003
45-49	22,708,591	0.943	0.004
50-54	22,298,125	0.954	0.004
55-64	36,482,729	0.968	0.004
65-74	21,713,429	0.983	0.006
75+	18,554,555	0.981	0.006

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

In Table 14 we examined to what extent low coverage ratios in the 18-19 and 20-24 age groups were being driven by residents of college/university student housing and military GQs. We know there were high concentrations of people 18-19 and 20-24 in these GQ facilities, and further, we know they have lower coverage ratios in the ACS. Residents in college/university student housing were counted across all twelve months, though they are typically not residents in the summer, while the 2010 Census counted them in April[6]. Also, the 2010 Census counted deployed military personnel while the ACS does not. (We discuss the coverage of these GQ facilities again in Section 7.5). When we excluded persons in these two major GQ types, the

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[4] The difference in coverage between the 18-19 and 20-24 age groups is not statistically significant.

[5] The difference in coverage between the 65-74 and 75+ age groups is not statistically significant.

[6] Starting with the 2013 ACS, the ACS will not conduct interviews in the summer months at college/university student housing.

coverage ratios for the 18-19 (0.929) and 20-24 (0.914) age groups were still lower than the overall national coverage ratio.

Table 14: National Coverage for Select Age Excluding College Dorms and Military Facilities

Age Group	2010 Census Count	Coverage Ratio	MOE
18-19	7,691,696	0.929	0.006
20-24	20,291,515	0.914	0.004

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

Table 15 shows the coverage ratios by age group crossed with sex. There were no large differences in coverage ratios between the sexes for many age groups. However, for age groups 25-29, 30-34, 35-44, 45-49, and 50-54, the coverage ratios for males were significantly less than for females. Thus the higher overall coverage ratio for females is attributable to the differences in these age groups.

Table 15: Sex by Age at the National Level

	Age Group	2010 Census Count	Coverage Ratio	MOE
Female	0-4	9,881,935	0.947	0.005
	5-14	20,056,351	0.960	0.003
	15-17	6,298,045	0.948	0.007
	18-19	4,438,632	0.891	0.009
	20-24	10,571,823	0.898	0.006
	25-29	10,466,258	0.937	0.005
	30-34	9,965,599	0.957	0.005
	35-44	20,634,607	0.953	0.003
	45-49	11,499,506	0.951	0.004
	50-54	11,364,851	0.964	0.005
	55-64	18,881,581	0.975	0.005
	65-74	11,616,910	0.985	0.006
	75+	11,288,114	0.976	0.006
Male	0-4	10,319,427	0.950	0.006
	5-14	20,969,500	0.961	0.004
	15-17	6,656,209	0.952	0.006
	18-19	4,647,457	0.905	0.008
	20-24	11,014,176	0.884	0.005
	25-29	10,635,591	0.900	0.006
	30-34	9,996,500	0.931	0.005
	35-44	20,435,999	0.931	0.003
	45-49	11,209,085	0.934	0.005
	50-54	10,933,274	0.944	0.005
	55-64	17,601,148	0.960	0.005
	65-74	10,096,519	0.980	0.007
	75+	7,266,441	0.988	0.008

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

In Table 16 we see that though Hispanics (0.931) and non-Hispanics (0.951) were both undercovered at the national level, coverage of Hispanics was lower. Again, this is a pattern seen in other demographic surveys such as the CPS.

Table 16: National Coverage by Ethnicity

Ethnicity	2010 Census Count	Coverage Ratio	MOE
Hispanic	50,477,594	0.931	0.004
Non-Hispanic	258,267,944	0.951	0.002

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

The five race groups in Table 17a include both Hispanic and non-Hispanic persons. White alone or in combination (0.977) had the highest coverage ratio, with the exception of AIAN alone or in combination (0.971), whose coverage was not significantly different.

Table 17a: National Coverage by Race Alone or in Combination

Race	2010 Census Count	Coverage Ratio	MOE
White alone or in combination	231,040,398	0.977	0.002
Black alone or in combination	42,020,743	0.907	0.004
AIAN alone or in combination	5,220,579	0.971	0.008
Asian alone or in combination	17,320,856	0.939	0.006
NHPI alone or in combination	1,225,195	0.884	0.026

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

Table 17b shows coverage by race alone. White alone (0.979) had the highest coverage rate, followed by Asian alone (0.950). Also, note that the coverage of AIAN alone (0.810) was substantially lower than that of AIAN alone or in combination (0.971). We believe this difference is at least in part attributable to race reporting differences between the ACS and the 2010 Census (we discuss this matter more in the section on AIAN person coverage). We did not include some other race (SOR) alone or in combination in Table 17a because many of those persons would be included in the other five race-alone groups. SOR alone (0.723) had the lowest coverage ratio, and while many indicating SOR alone were Hispanic, this was also potentially due to race reporting issues.

Table 17b: National Coverage by Race Alone

Race	2010 Census Count	Coverage Ratio	MOE
White alone	223,553,265	0.979	0.002
Black alone	38,929,319	0.904	0.004
AIAN alone	2,932,248	0.810	0.012
Asian alone	14,674,252	0.950	0.007
NHPI alone	540,013	0.884	0.043
Some other race alone	19,107,368	0.723	0.007

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

Table 18 shows coverage by race alone or in combination crossed with ethnicity. The ACS showed lower coverage ratios for Blacks and Hispanics, which was consistent with the decennial census and other surveys; see CPS (U.S. Census Bureau, 2012d) and 2010 Census Coverage Measurement (Mule, 2012). Coverage of Hispanics by race group was generally lower than coverage of the corresponding non-Hispanic race group combination, which is consistent with lower overall coverage of Hispanics. A notable exception was Hispanic white (1.089), which was higher than non-Hispanic white (0.961). This was likely an artifact of differences of how Hispanics identified themselves by race in the ACS and in 2010 Census.

Table 18: National Coverage by Ethnicity and Race Alone or in Combination

Ethnicity	Race Alone or in Combination	2010 Census Count	Coverage Ratio	MOE
Hispanic	White	29,184,290	1.089	0.007
	Black	1,897,218	0.826	0.020
	AIAN	1,190,904	0.766	0.024
	Asian	598,146	0.749	0.027
	NHPI	210,307	0.593	0.041
	Some Other Race	20,714,218	0.699	0.007
Non-Hispanic	White	201,856,108	0.961	0.003
	Black	40,123,525	0.911	0.004
	AIAN	4,029,675	0.978	0.011
	Asian	16,722,710	0.946	0.006
	NHPI	1,014,888	0.944	0.030
	Some Other Race	1,033,866	0.829	0.025

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

In Table 19 we examined the coverage of the Hispanic population broken down by six Hispanic origin groups. With the exception of Central American/Dominican Republic, the coverage ratios of Hispanic origin groups were below 1.0. The lowest coverage ratio, 0.515, for the other Hispanic category, was unusually low. This was likely an artifact of reporting differences between the ACS and 2010 Census, with more respondents in the 2010 Census reporting other Hispanic, and more reporting a specific Hispanic origin group in the ACS.

Table 19: National Coverage by Hispanic Origin Group

Hispanic Origin Group	2010 Census Count	Coverage Ratio	MOE
Mexican	31,796,431	0.965	0.006
Puerto Rican	4,623,470	0.938	0.013
Cuban	1,785,366	0.934	0.021
Central American/Dominican Republic	5,414,123	1.004	0.016
Latin/South American	3,021,314	0.953	0.019
Other Hispanic	3,836,890	0.515	0.009

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

In Table 20 we see coverage of the seven largest Asian subgroups. Asian Indian (0.932)[7], Filipino (0.915), and Japanese (0.966) were all undercovered. For the other four groups the coverage ratio was not statistically different from 1.0.

Table 20: National Coverage of Largest Asian Groups

Asian Group	2010 Census Count	Coverage Ratio	MOE
Chinese, no Taiwan	3,139,236	0.992	0.015
Asian Indian	2,846,914	0.932	0.015
Filipino	2,556,174	0.915	0.013
Vietnamese	1,548,614	0.989	0.024
Korean	1,423,901	0.979	0.024
Japanese	763,485	0.966	0.025
Pakistani	363,720	0.949	0.060

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

The National Research Council (2004) noted patterns of coverage by states in the 1990 and 2000 Censuses, with southern states tending towards lower coverage and midwestern and northeastern states tending towards higher coverage. The 2010 Census coverage results maintain this general pattern (Mule, 2012). These general patterns also bear out in the 2010 ACS 1-year estimates, as seen in Table 21, which shows the coverage ratios for census regions (see U.S. Census Bureau, 2012e, for the definitions of the regions). The South (0.947) and the West (0.947) have lower coverage ratios than the Northeast (0.963[8]) and Midwest (0.964).

Table 21: ACS Coverage of the Total Resident Population by Census Region

Region	Coverage Ratio	MOE
Northeast	0.963	0.003
Midwest	0.964	0.003
South	0.932	0.002
West	0.947	0.002

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

Table 22 shows the coverage rates for the total population by state and broken down by sex by state. The coverage ratios of states generally followed the same pattern as the nation in coverage of the total population. All states were undercovered except for Utah (0.992), whose coverage ratio was not significantly different from 1.0. The lowest coverage ratio was in Washington DC (0.860), which may be partly explained by high concentrations of Blacks and Hispanics.

The southern states, AL, FL, GA, LA, NC, SC had coverage ratios in the range of 0.893 to 0.938, and all of the midwestern states (as defined by the Census: IL, IN, IA, KS, MI, MN, MS, NE, ND, OH, SD, WI) had coverage ratios equal to or greater than the national coverage ratio.

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[7] The coverage ratio for Asian Indian is not statistically significantly different from that of Filipino or Japanese.
[8] The coverage ratio for the Northeast is not statistically significantly different from that of the Midwest.

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Table 22: Coverage Rates of States by Sex

State	Male Coverage Ratio	MOE	Female Coverage Ratio	MOE	Total Coverage Ratio	MOE
AL	0.899	0.011	0.921	0.012	0.910	0.010
AK	0.933	0.028	0.972	0.030	0.952	0.024
AZ	0.913	0.010	0.920	0.010	0.917	0.008
AR	0.927	0.013	0.963	0.015	0.945	0.013
CA	0.935	0.004	0.951	0.003	0.943	0.003
CO	0.965	0.011	0.970	0.011	0.967	0.009
CT	0.948	0.012	0.961	0.012	0.955	0.010
DE	0.929	0.027	0.966	0.025	0.948	0.023
DC	0.841	0.028	0.876	0.025	0.860	0.019
FL	0.884	0.006	0.902	0.005	0.893	0.004
GA	0.925	0.009	0.924	0.008	0.924	0.007
HI	0.897	0.020	0.919	0.021	0.908	0.018
ID	0.950	0.019	0.979	0.019	0.964	0.017
IL	0.951	0.006	0.966	0.006	0.958	0.005
IN	0.956	0.009	0.966	0.010	0.961	0.007
IA	0.968	0.011	0.982	0.012	0.975	0.009
KS	0.944	0.012	0.961	0.014	0.953	0.010
KY	0.961	0.013	0.961	0.012	0.961	0.010
LA	0.918	0.012	0.948	0.011	0.933	0.010
ME	0.976	0.017	0.992	0.015	0.984	0.013
MD	0.949	0.010	0.947	0.009	0.948	0.008
MA	0.954	0.007	0.972	0.009	0.963	0.007
MI	0.952	0.007	0.967	0.006	0.959	0.006
MN	0.970	0.009	0.972	0.010	0.971	0.008
MS	0.947	0.016	0.957	0.016	0.952	0.013
MO	0.945	0.010	0.968	0.009	0.956	0.007
MT	0.933	0.019	0.946	0.021	0.939	0.016
NE	0.970	0.018	0.971	0.017	0.970	0.015
NV	0.924	0.014	0.923	0.016	0.923	0.012
NH	0.968	0.019	0.996	0.018	0.982	0.016
NJ	0.963	0.008	0.965	0.008	0.964	0.007
NM	0.911	0.018	0.937	0.015	0.924	0.013
NY	0.960	0.006	0.975	0.005	0.968	0.004
NC	0.932	0.008	0.943	0.008	0.938	0.006
ND	0.968	0.021	0.968	0.023	0.968	0.018
OH	0.964	0.007	0.978	0.007	0.971	0.005
OK	0.932	0.010	0.952	0.010	0.942	0.008
OR	0.958	0.012	0.977	0.011	0.968	0.010

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

Table 22 Continued: Coverage Rates of States by Sex

State	Male Coverage Ratio	MOE	Female Coverage Ratio	State	Total Coverage Ratio	MOE
PA	0.948	0.006	0.958	0.006	0.953	0.005
RI	0.949	0.020	0.952	0.024	0.950	0.019
SC	0.926	0.012	0.938	0.010	0.932	0.010
SD	0.959	0.024	0.964	0.022	0.962	0.020
TN	0.942	0.009	0.952	0.009	0.947	0.007
TX	0.939	0.004	0.949	0.005	0.944	0.004
UT	0.983	0.015	1.002	0.013	0.992	0.012
VT	0.946	0.025	0.953	0.023	0.950	0.021
VA	0.942	0.010	0.951	0.009	0.946	0.008
WA	0.971	0.010	0.973	0.008	0.972	0.008
WV	0.947	0.016	0.973	0.017	0.960	0.014
WI	0.967	0.010	0.975	0.009	0.971	0.008
WY	0.935	0.029	0.955	0.032	0.945	0.024

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

The pattern of coverage by sex for the states was generally similar to that of the nation. We saw higher coverage ratios for females for 20 state equivalents, whereas for no state did males have higher coverage ratios (Georgia and Nevada had observed coverage rates for males which were higher than that of females, but these differences were not statistically significant). There was no significant difference in the coverage ratios of the sexes in remaining 31 states.

Table 23 shows the coverage of total population for each state broken down by age group. Generally, the coverage ratios of the age groups followed a pattern similar to that of the nation. For example, of the 51 state equivalents, 45 had coverage ratios for the 65-74 age group higher than that of the 20-24 age group. The other six state equivalents had no significant difference in coverage between the 20-24 and 65-74 age groups.

Table 23: Person Coverage of States by Age Group (MOEs are below the estimates)

State	0-4	5-14	15-17	18-19	20-24	25-29	30-34	35-44	45-49	50-54	55-64	65-74	75+
AL	0.904	0.910	0.948	0.852	0.837	0.879	0.883	0.914	0.912	0.906	0.934	0.932	0.987
	0.037	0.027	0.037	0.047	0.028	0.039	0.031	0.022	0.026	0.026	0.021	0.023	0.027
AK	0.993	1.000	1.027	0.843	0.956	0.845	0.934	0.909	0.926	1.019	0.957	0.924	1.012
	0.089	0.067	0.099	0.124	0.124	0.067	0.079	0.060	0.068	0.075	0.057	0.086	0.124
AZ	0.894	0.903	0.913	0.838	0.867	0.879	0.899	0.921	0.933	0.945	0.940	0.981	0.956
	0.028	0.024	0.036	0.044	0.031	0.028	0.028	0.020	0.037	0.027	0.020	0.023	0.031
AR	0.939	0.958	0.993	0.920	0.888	0.914	0.928	0.953	0.921	0.960	0.966	0.936	0.988
	0.052	0.034	0.049	0.063	0.057	0.041	0.045	0.027	0.036	0.034	0.031	0.036	0.049
CA	0.950	0.957	0.949	0.904	0.900	0.913	0.951	0.939	0.927	0.949	0.953	0.972	0.971
	0.012	0.010	0.013	0.019	0.013	0.012	0.013	0.008	0.010	0.011	0.008	0.010	0.012
CO	0.972	0.984	0.951	0.911	0.920	0.967	0.998	0.957	0.954	0.967	0.973	0.976	1.002
	0.035	0.025	0.034	0.041	0.036	0.036	0.031	0.022	0.028	0.030	0.024	0.026	0.034
CT	0.966	0.963	0.931	0.870	0.923	0.921	0.911	0.945	0.955	0.956	0.965	1.015	1.007
	0.048	0.028	0.047	0.051	0.036	0.039	0.038	0.022	0.034	0.029	0.025	0.029	0.031
DE	0.962	0.981	1.019	0.828	0.845	0.950	0.927	0.914	0.874	0.954	0.999	0.972	1.037
	0.090	0.074	0.103	0.096	0.082	0.091	0.080	0.049	0.051	0.067	0.052	0.065	0.065
DC	0.901	0.805	0.877	0.675	0.709	0.812	0.940	0.871	0.877	0.898	0.892	1.001	0.975
	0.089	0.082	0.148	0.090	0.063	0.062	0.066	0.054	0.076	0.069	0.063	0.082	0.088
FL	0.878	0.908	0.898	0.825	0.824	0.863	0.891	0.887	0.906	0.909	0.917	0.923	0.903
	0.017	0.014	0.021	0.026	0.016	0.015	0.017	0.013	0.014	0.014	0.011	0.014	0.012
GA	0.907	0.911	0.924	0.808	0.877	0.912	0.945	0.929	0.924	0.942	0.965	0.948	0.958
	0.023	0.018	0.024	0.033	0.023	0.025	0.025	0.014	0.021	0.023	0.020	0.025	0.021
HI	0.837	0.931	0.986	0.835	0.781	0.865	0.879	0.886	0.987	0.948	0.959	0.942	0.906
	0.059	0.049	0.076	0.101	0.067	0.062	0.060	0.041	0.047	0.050	0.036	0.063	0.047
ID	0.966	0.977	1.014	0.827	0.861	0.911	0.881	1.023	0.943	0.943	1.009	0.996	1.043
	0.056	0.045	0.059	0.075	0.057	0.065	0.056	0.040	0.053	0.051	0.039	0.050	0.057
IL	0.970	0.969	0.967	0.923	0.911	0.942	0.937	0.963	0.953	0.956	0.974	0.978	0.979
	0.021	0.016	0.022	0.032	0.019	0.020	0.021	0.013	0.015	0.016	0.014	0.017	0.019
IN	0.946	0.974	0.943	0.948	0.928	0.922	0.950	0.941	0.939	0.975	0.991	1.005	0.996
	0.027	0.023	0.032	0.038	0.029	0.026	0.026	0.019	0.022	0.024	0.021	0.027	0.029
IA	0.990	1.012	0.978	0.938	0.875	0.926	1.016	0.988	0.954	0.955	0.988	0.997	0.992
	0.028	0.027	0.045	0.052	0.037	0.036	0.035	0.025	0.029	0.034	0.029	0.032	0.029
KS	0.929	0.936	0.918	0.907	0.921	0.936	0.947	0.931	0.956	0.957	0.972	1.046	1.021
	0.035	0.031	0.064	0.055	0.046	0.039	0.045	0.030	0.036	0.035	0.028	0.038	0.034
KY	0.944	0.978	0.940	0.955	0.944	0.915	0.960	0.925	0.947	0.950	1.017	0.998	0.982
	0.036	0.029	0.040	0.057	0.044	0.037	0.032	0.024	0.032	0.028	0.024	0.033	0.028
LA	0.951	0.965	0.900	0.864	0.869	0.885	0.941	0.934	0.929	0.914	0.961	0.969	0.968
	0.031	0.027	0.050	0.048	0.035	0.034	0.035	0.024	0.027	0.029	0.020	0.025	0.033
ME	0.937	1.011	0.987	0.904	0.876	0.991	0.917	0.993	0.988	1.005	1.025	1.011	0.979
	0.067	0.044	0.073	0.079	0.060	0.064	0.060	0.038	0.040	0.047	0.039	0.045	0.046
MD	0.947	0.963	0.947	0.899	0.863	0.950	0.916	0.938	0.947	0.957	0.964	0.995	1.007
	0.039	0.023	0.038	0.040	0.029	0.030	0.033	0.019	0.025	0.024	0.020	0.028	0.030
MA	1.000	0.973	0.974	0.890	0.888	0.908	0.975	0.950	0.962	0.948	0.982	1.036	1.002
	0.032	0.021	0.033	0.053	0.030	0.026	0.024	0.018	0.020	0.023	0.018	0.023	0.025
MI	0.972	0.969	0.966	0.894	0.883	0.938	0.947	0.951	0.971	0.972	0.974	0.990	0.993
	0.027	0.016	0.022	0.025	0.022	0.023	0.023	0.015	0.017	0.016	0.014	0.017	0.020
MN	0.974	0.970	0.974	0.966	0.903	0.957	0.962	0.953	0.957	0.990	1.015	1.005	0.987
	0.029	0.026	0.034	0.043	0.032	0.030	0.025	0.019	0.023	0.023	0.017	0.024	0.024
MS	0.957	0.950	0.955	0.932	0.950	0.903	0.924	0.928	0.960	0.962	0.960	1.032	0.968
	0.052	0.037	0.047	0.062	0.051	0.042	0.040	0.027	0.037	0.041	0.030	0.039	0.043

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

Table 23 Continued: Person Coverage of States by Age Group (MOEs are below the estimates)

State	0-4	5-14	15-17	18-19	20-24	25-29	30-34	35-44	45-49	50-54	55-64	65-74	75+
MO	0.966	0.952	0.929	0.896	0.904	0.957	0.968	0.941	0.951	0.967	0.968	1.006	0.989
	0.031	0.025	0.030	0.046	0.029	0.028	0.032	0.020	0.022	0.024	0.019	0.024	0.024
MT	0.973	0.899	0.905	0.866	0.885	0.889	0.929	0.931	0.898	0.985	0.978	1.007	0.982
	0.063	0.050	0.078	0.090	0.079	0.069	0.073	0.052	0.057	0.059	0.043	0.052	0.060
NE	0.933	0.976	0.943	1.004	0.933	0.937	0.988	0.975	0.932	0.958	1.011	1.002	1.004
	0.056	0.037	0.056	0.067	0.044	0.049	0.048	0.032	0.045	0.041	0.033	0.044	0.059
NV	0.943	0.951	0.951	0.868	0.859	0.901	0.964	0.930	0.920	0.880	0.919	0.927	0.936
	0.043	0.036	0.056	0.062	0.046	0.046	0.044	0.027	0.036	0.039	0.029	0.041	0.040
NH	0.936	0.957	0.900	0.991	0.946	0.912	0.996	0.978	1.003	0.982	1.018	1.075	1.008
	0.064	0.053	0.072	0.123	0.069	0.064	0.070	0.038	0.053	0.047	0.043	0.052	0.061
NJ	0.973	0.971	0.949	0.959	0.922	0.913	0.955	0.960	0.959	0.969	0.969	0.997	1.013
	0.026	0.017	0.026	0.040	0.029	0.024	0.018	0.015	0.021	0.019	0.018	0.018	0.023
NM	0.908	0.927	0.899	0.880	0.852	0.893	0.959	0.885	0.903	0.926	0.983	0.981	0.971
	0.046	0.044	0.055	0.079	0.048	0.048	0.048	0.034	0.038	0.043	0.036	0.040	0.052
NY	0.966	0.992	0.993	0.946	0.908	0.912	0.927	0.954	0.956	0.984	0.984	1.028	1.018
	0.019	0.014	0.019	0.019	0.019	0.015	0.016	0.011	0.011	0.014	0.013	0.014	0.016
NC	0.947	0.963	0.926	0.892	0.862	0.910	0.950	0.930	0.935	0.929	0.965	0.975	0.935
	0.023	0.019	0.032	0.041	0.028	0.027	0.021	0.015	0.020	0.019	0.015	0.020	0.021
ND	0.942	0.984	0.996	0.874	0.911	1.008	0.930	0.923	0.969	1.009	0.989	1.005	1.007
	0.083	0.057	0.085	0.094	0.073	0.082	0.076	0.053	0.072	0.063	0.054	0.061	0.060
OH	0.996	0.991	0.983	0.899	0.905	0.959	0.983	0.962	0.949	0.966	0.984	0.991	1.000
	0.021	0.018	0.024	0.030	0.020	0.023	0.022	0.014	0.017	0.017	0.014	0.019	0.019
OK	0.955	0.953	0.916	0.890	0.886	0.918	0.938	0.933	0.928	0.953	0.987	0.942	0.980
	0.037	0.026	0.034	0.050	0.033	0.031	0.036	0.022	0.027	0.029	0.025	0.026	0.032
OR	0.942	1.022	0.992	0.886	0.905	0.906	0.964	0.972	0.962	0.939	0.991	1.009	0.977
	0.038	0.034	0.043	0.050	0.036	0.037	0.033	0.026	0.029	0.030	0.024	0.028	0.032
PA	0.932	0.968	0.931	0.884	0.893	0.923	0.946	0.946	0.948	0.982	0.981	0.981	0.979
	0.020	0.016	0.022	0.023	0.021	0.018	0.020	0.013	0.017	0.015	0.013	0.016	0.015
RI	0.943	1.016	0.980	0.882	0.879	0.907	0.965	0.974	0.992	0.901	0.925	0.986	0.944
	0.084	0.057	0.099	0.101	0.070	0.077	0.074	0.046	0.060	0.061	0.048	0.058	0.053
SC	0.929	0.923	0.901	0.875	0.871	0.921	0.926	0.934	0.938	0.939	0.947	0.977	0.992
	0.035	0.028	0.041	0.049	0.037	0.035	0.036	0.020	0.027	0.029	0.024	0.028	0.037
SD	0.856	0.972	1.008	1.144	0.906	0.921	0.910	0.960	0.979	1.006	0.934	1.000	1.035
	0.067	0.057	0.071	0.265	0.074	0.081	0.067	0.053	0.066	0.064	0.049	0.062	0.063
TN	0.940	0.953	0.937	0.892	0.877	0.941	0.951	0.950	0.928	0.967	0.946	0.999	0.985
	0.028	0.022	0.036	0.041	0.028	0.030	0.028	0.021	0.025	0.025	0.020	0.029	0.028
TX	0.942	0.958	0.960	0.895	0.902	0.913	0.930	0.943	0.942	0.943	0.959	0.980	0.982
	0.014	0.010	0.017	0.019	0.016	0.014	0.013	0.010	0.013	0.014	0.010	0.014	0.015
UT	1.017	1.027	1.000	0.918	0.912	0.972	1.037	0.995	1.008	0.951	0.974	0.984	1.034
	0.038	0.032	0.049	0.059	0.044	0.038	0.036	0.029	0.049	0.037	0.037	0.045	0.044
VT	0.911	0.936	0.973	0.838	0.906	0.892	0.900	0.890	0.956	0.958	1.038	0.985	1.040
	0.109	0.071	0.088	0.083	0.081	0.085	0.090	0.050	0.066	0.053	0.046	0.057	0.067
VA	0.945	0.973	0.916	0.892	0.867	0.921	0.953	0.942	0.955	0.957	0.959	0.976	0.989
	0.027	0.020	0.029	0.048	0.027	0.027	0.026	0.018	0.022	0.019	0.016	0.023	0.027
WA	0.993	0.978	0.978	0.908	0.940	0.954	0.976	0.964	0.944	0.953	0.990	1.001	1.029
	0.029	0.023	0.032	0.043	0.036	0.027	0.026	0.018	0.024	0.025	0.017	0.028	0.026
WV	0.989	0.942	0.974	0.892	0.874	0.918	0.998	0.961	0.974	0.908	1.004	0.973	1.001
	0.053	0.046	0.068	0.079	0.043	0.052	0.054	0.036	0.047	0.040	0.035	0.046	0.048
WI	0.951	0.974	0.972	0.962	0.897	0.936	0.953	0.959	0.970	0.998	1.004	1.015	0.994
	0.025	0.022	0.032	0.039	0.027	0.030	0.026	0.020	0.022	0.025	0.018	0.022	0.023
WY	0.976	0.938	0.992	1.011	0.798	0.838	0.964	0.964	0.950	0.944	0.995	0.957	0.984
	0.102	0.083	0.115	0.162	0.102	0.092	0.095	0.072	0.090	0.067	0.067	0.085	0.101

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

Table 24 shows the coverage of states by selected race alone or in combination and ethnicity combinations. (The corresponding MOEs are found in Table 24a). Non-Hispanic white alone or in combination had the highest coverage in five states, non-Hispanic AIAN alone or in combination had the highest coverage in 15 states, and non-Hispanic NHPI alone or in combination had the highest coverage in 14 states.

Table 24: Coverage of State by Race (Margins of Error in Table 24a)

	Non-Hispanic						Hispanic any Race
	Alone or in Combination					Alone	
	White	Black	AIAN	Asian	NHPI	Some Other Race	
AL	0.923	0.886	0.957	0.837	0.595	0.442	0.876
AK	0.922	0.926	0.944	1.199	1.072	1.062	1.162
AZ	0.937	0.912	0.875	0.830	0.914	0.636	0.887
AR	0.942	0.983	0.891	0.743	1.052	1.687	0.922
CA	0.959	0.902	0.972	0.943	0.949	0.817	0.932
CO	0.963	0.989	1.056	1.022	1.105	0.763	0.981
CT	0.964	0.871	1.020	0.954	0.573	1.201	0.964
DE	0.953	0.942	0.813	1.019	1.179	0.721	0.876
DC	0.947	0.811	0.648	0.741	0.830	0.517	0.816
FL	0.903	0.880	0.833	0.905	0.847	0.901	0.876
GA	0.946	0.893	0.832	0.957	0.721	0.861	0.869
HI	0.897	0.905	1.067	0.929	0.910	0.853	0.869
ID	0.962	1.013	1.086	0.843	1.129	0.279	0.989
IL	0.977	0.921	0.978	0.949	0.963	0.944	0.917
IN	0.969	0.912	1.300	0.880	0.399	0.856	0.951
IA	0.978	0.937	1.256	0.924	1.087	0.837	0.978
KS	0.960	0.930	1.304	0.938	0.518	0.494	0.914
KY	0.961	0.957	0.993	0.845	0.906	0.601	1.037
LA	0.948	0.891	0.947	1.005	1.884	0.932	0.997
ME	0.986	1.084	1.235	0.805	3.001	0.227	0.908
MD	0.970	0.895	0.894	1.012	0.986	0.809	0.965
MA	0.972	0.977	1.038	0.930	0.865	0.600	0.937
MI	0.968	0.908	1.063	1.019	0.974	1.208	0.953
MN	0.978	0.965	0.955	0.888	1.120	0.875	0.970
MS	0.962	0.939	0.994	0.888	0.191	1.221	0.922
MO	0.962	0.931	1.101	0.875	1.009	0.772	0.978
MT	0.948	1.083	0.828	0.802	1.135	0.565	0.932
NE	0.977	1.020	1.137	0.963	1.508	0.623	0.901
NV	0.932	0.849	0.889	0.884	0.910	1.013	0.936
NH	0.976	1.174	1.209	1.068	1.481	1.715	0.957
NJ	0.989	0.903	0.842	0.949	1.019	1.027	0.927
NM	0.952	0.949	0.806	0.900	0.768	0.789	0.921
NY	0.983	0.939	0.868	0.991	0.671	1.027	0.933
NC	0.948	0.920	1.013	0.914	0.883	0.916	0.934
ND	0.971	1.099	0.870	1.032	1.642	0.656	1.044
OH	0.974	0.954	0.984	0.980	0.967	0.955	0.998
OK	0.956	0.916	1.063	0.905	1.100	0.662	0.975
OR	0.973	0.939	0.987	0.919	0.873	1.309	0.946
PA	0.965	0.874	0.944	0.932	0.944	1.086	0.945
RI	0.963	1.019	0.845	0.906	0.540	0.705	0.896
SC	0.956	0.894	0.837	0.837	0.933	0.484	0.917

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

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Table 24 Continued: Coverage of State by Race (Margins of Error in Table 24a)

	Non-Hispanic					Alone	Hispanic any Race
	Alone or in Combination						
	White	Black	AIAN	Asian	NHPI	Some Other Race	
SD	0.969	0.805	0.922	0.857	0.526	0.887	1.012
TN	0.959	0.901	1.092	0.989	0.744	0.757	0.913
TX	0.951	0.900	1.088	0.967	0.879	1.046	0.946
UT	0.985	0.907	0.891	0.950	1.290	0.884	1.039
VT	0.944	1.280	0.748	1.288	2.823	1.403	0.975
VA	0.961	0.926	0.845	0.932	1.396	0.978	0.892
WA	0.975	0.964	1.026	0.975	0.991	0.612	0.955
WV	0.960	0.958	2.054	0.952	1.525	0.358	1.096
WI	0.979	0.941	1.049	0.911	1.065	0.816	0.939
WY	0.948	0.624	1.077	0.597	0.452	0.465	0.991

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

Table 24a: Margins of Error of Estimates of Coverage of State by Race

	Non-Hispanic					Alone	Hispanic any Race
	Alone or in Combination						
	White	Black	AIAN	Asian	NHPI	Some Other Race	
AL	0.012	0.021	0.110	0.100	0.261	0.198	0.070
AK	0.027	0.163	0.050	0.176	0.359	0.934	0.163
AZ	0.010	0.059	0.048	0.056	0.215	0.217	0.021
AR	0.015	0.045	0.112	0.103	0.528	0.882	0.090
CA	0.005	0.016	0.047	0.010	0.073	0.090	0.007
CO	0.012	0.058	0.100	0.074	0.280	0.246	0.028
CT	0.012	0.045	0.160	0.075	0.209	0.337	0.046
DE	0.028	0.065	0.223	0.116	0.811	0.453	0.118
DC	0.038	0.034	0.193	0.091	0.619	0.260	0.101
FL	0.006	0.015	0.070	0.036	0.160	0.173	0.011
GA	0.010	0.015	0.089	0.049	0.178	0.177	0.036
HI	0.028	0.129	0.183	0.026	0.048	0.508	0.073
ID	0.018	0.251	0.154	0.148	0.547	0.240	0.095
IL	0.008	0.020	0.090	0.034	0.317	0.227	0.020
IN	0.009	0.035	0.146	0.062	0.170	0.253	0.050
IA	0.011	0.086	0.166	0.097	0.439	0.600	0.077
KS	0.012	0.056	0.148	0.082	0.211	0.228	0.050
KY	0.012	0.048	0.144	0.092	0.416	0.335	0.106
LA	0.012	0.024	0.107	0.098	0.928	0.297	0.075
ME	0.013	0.226	0.205	0.183	1.917	0.193	0.191
MD	0.012	0.018	0.124	0.051	0.301	0.206	0.050
MA	0.008	0.047	0.136	0.042	0.262	0.089	0.039
MI	0.006	0.021	0.063	0.051	0.255	0.242	0.046
MN	0.009	0.054	0.100	0.056	0.317	0.318	0.057
MS	0.018	0.023	0.176	0.152	0.125	0.908	0.128
MO	0.008	0.034	0.111	0.062	0.325	0.302	0.058
MT	0.017	0.284	0.077	0.180	0.649	0.365	0.145
NE	0.017	0.105	0.209	0.165	1.114	0.348	0.074
NV	0.015	0.050	0.094	0.055	0.165	0.357	0.036
NH	0.017	0.236	0.242	0.165	1.382	1.009	0.190
NJ	0.008	0.028	0.110	0.030	0.331	0.214	0.025
NM	0.023	0.133	0.054	0.124	0.314	0.364	0.024
NY	0.006	0.015	0.057	0.026	0.141	0.109	0.016
NC	0.008	0.020	0.082	0.049	0.292	0.207	0.043
ND	0.019	0.317	0.101	0.249	1.076	0.682	0.234
OH	0.007	0.019	0.090	0.050	0.389	0.271	0.049
OK	0.010	0.049	0.034	0.082	0.349	0.332	0.055
OR	0.011	0.097	0.085	0.059	0.192	0.478	0.061
PA	0.005	0.022	0.088	0.043	0.220	0.190	0.034
RI	0.022	0.150	0.309	0.175	0.536	0.239	0.080
SC	0.013	0.023	0.109	0.102	0.443	0.136	0.075
SD	0.020	0.239	0.087	0.289	0.443	0.699	0.239

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

Table 24a Continued: Margins of Error of Estimates of Coverage of State by Race

	Non-Hispanic						Hispanic any Race
	Alone or in Combination					Alone	
	White	Black	AIAN	Asian	NHPI	Some Other Race	
TN	0.009	0.025	0.141	0.081	0.362	0.278	0.069
TX	0.007	0.017	0.060	0.029	0.152	0.166	0.009
UT	0.015	0.142	0.117	0.098	0.262	0.438	0.059
VT	0.020	0.267	0.166	0.317	3.396	1.256	0.223
VA	0.010	0.022	0.085	0.042	0.349	0.221	0.042
WA	0.009	0.054	0.066	0.034	0.141	0.157	0.037
WV	0.015	0.095	0.357	0.218	0.869	0.255	0.225
WI	0.008	0.049	0.078	0.075	0.423	0.242	0.054
WY	0.028	0.179	0.221	0.200	0.275	0.601	0.150

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

7.4 Coverage of American Indian/Alaska Native Areas and Persons

Table 25 is a good place to explain the decision to focus on the coverage of the race group AIAN alone or in combination, as opposed to AIAN alone. Clearly, there were race reporting differences between the ACS and 2010 Census for AIAN persons. Many persons who were identified as AIAN alone on the 2010 Census were identified as AIAN alone or in combination in the ACS. However, this differential race characterization is not a dilemma if we consider AIAN alone or in combination; either way a respondent was identified, AIAN alone, or AIAN alone or in combination, they were categorized the same way in the comparison between the ACS and the 2010 Census. Since the primary purpose of this research was to measure ACS coverage, to understand the coverage of AIAN persons we chose to focus analysis on the coverage of persons AIAN alone or in combination.

Table 25: National Coverage for AIAN Alone and AIAN Alone or in Combination

	2010 Census Count	Pre-controlled 2010 ACS Estimate	Coverage Ratio	MOE	Difference from 1.0 Statistically Significant
AIAN Alone	2,932,248	2,373,966	0.810	0.012	Yes
AIAN in Combination	2,288,331	2,480,613	1.084	0.020	Yes
AIAN Alone or in Combination	5,220,579	4,854,579	0.930[9]	0.011	Yes

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

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[9] Neither estimates of AIAN alone nor AIAN alone or in combination are comparable to those found on the ACS Sample Size and Data Quality Web site, as the Web site coverage rates are for an AIAN population defined for the purposes of weighting. Further, on the Web site coverage is calculated by comparing to the 2010 Population Estimates Program estimates.

In Table 25 we see that nationally, estimates of both AIAN alone (0.810) and AIAN alone or in combination (0.930) were undercovered, while AIAN in combination (1.084) was overcovered. The differences seen between AIAN alone or in combination, AIAN alone, and AIAN in combination were most likely due to differences in how race was reported, a topic which merits further research.

Table 26a shows state-level estimates of the coverage of AIAN alone or in combination persons. As we saw in Table 25, the race group AIAN alone or in combination was undercovered at the national level. However, this coverage varies greatly from state to state. Among the states with larger AIAN alone or in combination populations, we see undercoverage for AIAN alone or in combination in California[10] (0.875), Arizona (0.833), and New Mexico (0.786), whereas in Oklahoma[11] (1.075) there was overcoverage. We also see some relatively higher overcoverage ratios for the AIAN alone or in combination persons in several states with smaller AIAN alone or in combination populations, namely Wyoming (1.303) and West Virginia (2.145). We included in Table 26a the coverage ratios for the not AIAN alone or in combination population in each state for comparison; these shed light more on race reporting differences than on coverage.

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[10] The differences between the estimates of coverage for AIAN alone or in combination in Arizona, California, and New Mexico are not statistically significant from each other.
[11] The difference between the estimate of coverage for AIAN alone or in combination in Oklahoma is not statistically significant from that of Wyoming

Table 26a: Coverage of Persons AIAN Alone or in Combination versus not AIAN Alone or in Combination at the State Level

State	AIAN Alone or in Combination				Not AIAN Alone or in Combination			
	2010 Census Count	Coverage Ratio	MOE	Difference from 1.0 Statistically Significant	2010 Census Count	Coverage Ratio	MOE	Difference from 1.0 Statistically Significant
AL	57,118	0.943	0.110	No	4,722,618	0.910	0.010	Yes
AK	138,312	0.945	0.052	Yes	571,919	0.953	0.028	Yes
AZ	353,386	0.833	0.044	Yes	6,038,631	0.922	0.008	Yes
AR	47,588	0.871	0.103	Yes	2,868,330	0.947	0.013	Yes
CA	723,225	0.875	0.035	Yes	36,530,731	0.944	0.003	Yes
CO	107,832	1.025	0.083	No	4,921,364	0.966	0.009	Yes
CT	31,140	0.891	0.130	No	3,542,957	0.955	0.010	Yes
DE	9,899	0.764	0.183	Yes	888,035	0.950	0.023	Yes
DC	6,521	0.614	0.154	Yes	595,202	0.862	0.019	Yes
FL	162,562	0.848	0.069	Yes	18,638,748	0.894	0.004	Yes
GA	84,024	0.771	0.071	Yes	9,603,629	0.926	0.007	Yes
HI	33,470	1.105	0.162	No	1,326,831	0.903	0.018	Yes
ID	36,385	1.069	0.142	No	1,531,197	0.962	0.016	Yes
IL	101,451	0.806	0.070	Yes	12,729,181	0.960	0.005	Yes
IN	49,738	1.216	0.126	Yes	6,434,064	0.959	0.008	Yes
IA	24,511	1.274	0.180	Yes	3,021,844	0.973	0.009	Yes
KA	59,130	1.241	0.137	Yes	2,793,988	0.947	0.011	Yes
KY	31,355	0.988	0.130	No	4,308,012	0.961	0.010	Yes
LA	55,079	0.987	0.107	No	4,478,293	0.933	0.010	Yes
ME	18,482	1.239	0.196	Yes	1,309,879	0.980	0.013	Yes
MD	58,657	0.869	0.118	Yes	5,714,895	0.949	0.009	Yes
MA	50,705	0.914	0.105	No	6,496,924	0.964	0.007	Yes
MI	139,095	1.031	0.058	No	9,744,545	0.958	0.006	Yes
MN	101,900	0.928	0.094	No	5,202,025	0.972	0.008	Yes
MS	25,910	1.013	0.168	No	2,941,387	0.952	0.014	Yes
MO	72,376	1.149	0.118	Yes	5,916,551	0.954	0.008	Yes
MT	78,601	0.813	0.075	Yes	910,814	0.950	0.019	Yes
NE	29,816	1.110	0.171	No	1,796,525	0.968	0.015	Yes
NV	55,945	0.815	0.081	Yes	2,644,606	0.926	0.012	Yes
NH	10,524	1.189	0.216	No	1,305,946	0.981	0.016	Yes
NJ	70,716	0.835	0.097	Yes	8,721,178	0.965	0.007	Yes
NM	219,512	0.786	0.053	Yes	1,839,667	0.941	0.013	Yes
NY	221,058	0.727	0.043	Yes	19,157,044	0.970	0.004	Yes
NC	184,082	0.976	0.071	No	9,351,401	0.937	0.006	Yes
ND	42,996	0.878	0.100	Yes	629,595	0.974	0.019	Yes
OH	90,124	1.010	0.081	No	11,446,380	0.971	0.005	Yes
OK	482,760	1.075	0.034	Yes	3,268,591	0.923	0.008	Yes
OR	109,223	0.942	0.082	No	3,721,851	0.968	0.010	Yes
PA	81,092	0.870	0.077	Yes	12,621,287	0.954	0.005	Yes
RI	14,394	0.797	0.242	No	1,038,173	0.952	0.018	Yes
SC	42,171	0.812	0.099	Yes	4,583,193	0.933	0.010	Yes
SD	82,073	0.913	0.082	Yes	732,107	0.967	0.021	Yes
TN	54,874	1.080	0.127	No	6,291,231	0.946	0.008	Yes
TX	315,264	0.909	0.046	Yes	24,830,297	0.944	0.004	Yes

Table 26a Continued: Coverage of Persons AIAN Alone or in Combination versus not AIAN Alone or in Combination at the State Level

State	AIAN Alone or in Combination				Not AIAN Alone or in Combination			
	2010 Census Count	Coverage Ratio	MOE	Difference from 1.0 Statistically Significant	2010 Census Count	Coverage Ratio	MOE	Difference from 1.0 Statistically Significant
UT	50,064	0.892	0.125	No	2,713,821	0.994	0.012	No
VT	7,379	0.727	0.159	Yes	618,362	0.952	0.021	Yes
VI	80,924	0.814	0.086	Yes	7,920,100	0.948	0.008	Yes
WA	198,998	0.999	0.060	No	6,525,542	0.971	0.008	Yes
WV	13,314	2.145	0.396	Yes	1,839,680	0.951	0.014	Yes
WI	86,228	1.057	0.083	No	5,600,758	0.969	0.008	Yes
WY	18,596	1.303	0.252	Yes	545,030	0.933	0.026	Yes

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

In Table 26b we show the coverage ratios of AIAN alone, and AIAN in combination (only), for states. For reasons discussed earlier, these results are confounded with race reporting differences between the ACS and 2010 Census. We recommend Table 26a for a better understanding of the coverage of AIAN alone or in combination persons for states, as the coverage ratios shown in Table 26a are more robust to race reporting differences. Regarding Table 26b, for many states the AIAN in combination was high, higher than AIAN alone or in combination, or higher than AIAN alone. With a coverage ratio of 1.029 for AIAN in combination, California is an example. We point out that several states with large AIAN populations went against this pattern, such as Arizona and New Mexico. This is due to the presence of the Navajo Nation Reservation in these two states. We discuss this observation again later when we examine the coverage rates for AIAN areas.

Table 26b: AIAN Alone. AIAN in Combination, and AIAN Alone or in Combination by State

| State | AIAN Alone | | | AIAN in Combination | | | AIAN Alone or in Combination | |
	2010 Census Count	Coverage Ratio	MOE	2010 Census Count	Coverage Ratio	MOE	Coverage Ratio	MOE
AL	28,218	0.978	0.176	28,900	0.909	0.122	0.943	0.110
AK	104,871	0.936	0.056	33,441	0.976	0.116	0.945	0.052
AZ	296,529	0.847	0.048	56,857	0.758	0.093	0.833	0.044
AR	22,248	0.792	0.141	25,340	0.941	0.147	0.871	0.103
CA	362,801	0.722	0.040	360,424	1.029	0.051	0.875	0.035
CO	56,010	0.885	0.111	51,822	1.176	0.115	1.025	0.083
CT	11,256	0.510	0.125	19,884	1.107	0.204	0.891	0.130
DE	4,181	0.512	0.206	5,718	0.948	0.260	0.764	0.183
DC	2,079	0.597	0.297	4,442	0.622	0.171	0.614	0.154
FL	71,458	0.822	0.098	91,104	0.868	0.080	0.848	0.069
GA	32,151	0.664	0.117	51,873	0.838	0.096	0.771	0.071
HI	4,164	0.547	0.180	29,306	1.184	0.180	1.105	0.162
ID	21,441	0.993	0.176	14,944	1.179	0.187	1.069	0.142
IL	43,963	0.658	0.099	57,488	0.920	0.095	0.806	0.070
IN	18,462	0.947	0.176	31,276	1.375	0.180	1.216	0.126
IA	11,084	0.884	0.190	13,427	1.595	0.287	1.274	0.180
KS	28,150	0.964	0.148	30,980	1.493	0.205	1.241	0.137
KY	10,120	0.903	0.215	21,235	1.029	0.174	0.988	0.130
LA	30,579	0.946	0.158	24,500	1.039	0.147	0.987	0.107
ME	8,568	0.763	0.149	9,914	1.650	0.341	1.239	0.196
MD	20,420	0.840	0.246	38,237	0.884	0.139	0.869	0.118
MA	18,850	0.772	0.163	31,855	0.998	0.145	0.914	0.105
MI	62,007	0.963	0.077	77,088	1.085	0.082	1.031	0.058
MN	60,916	0.883	0.104	40,984	0.995	0.141	0.928	0.094
MS	15,030	0.873	0.194	10,880	1.206	0.304	1.013	0.168
MO	27,376	0.811	0.125	45,000	1.354	0.167	1.149	0.118
MT	62,555	0.800	0.085	16,046	0.863	0.164	0.813	0.075
NE	18,427	0.848	0.171	11,389	1.535	0.321	1.110	0.171
NV	32,062	0.749	0.102	23,883	0.904	0.147	0.815	0.081
NH	3,150	1.086	0.434	7,374	1.234	0.260	1.189	0.216
NJ	29,026	0.593	0.125	41,690	1.003	0.144	0.835	0.097
NM	193,222	0.799	0.056	26,290	0.691	0.109	0.786	0.053
NY	106,906	0.591	0.059	114,152	0.854	0.065	0.727	0.043
NC	122,110	0.784	0.077	61,972	1.355	0.133	0.976	0.071
ND	36,591	0.817	0.102	6,405	1.226	0.309	0.878	0.100
OH	25,292	0.889	0.144	64,832	1.057	0.103	1.010	0.081
OK	321,687	0.822	0.035	161,073	1.580	0.074	1.075	0.034
OR	53,203	0.904	0.107	56,020	0.978	0.098	0.942	0.082
PA	26,843	0.685	0.100	54,249	0.962	0.093	0.870	0.077
RI	6,058	0.411	0.144	8,336	1.077	0.393	0.797	0.242
SC	19,524	0.575	0.108	22,647	1.015	0.172	0.812	0.099

Table 26b Continued: AIAN Alone. AIAN in Combination, and AIAN Alone or in Combination by State

| State | AIAN Alone | | | AIAN in Combination | | | AIAN Alone or in Combination | |
	2010 Census Count	Coverage Ratio	MOE	2010 Census Count	Coverage Ratio	MOE	Coverage Ratio	MOE
SD	71,817	0.900	0.089	10,256	1.001	0.208	0.913	0.082
TN	19,994	0.872	0.198	34,880	1.198	0.172	1.080	0.127
TX	170,972	0.763	0.060	144,292	1.083	0.076	0.909	0.046
UT	32,927	0.912	0.125	17,137	0.853	0.233	0.892	0.125
VT	2,207	0.750	0.278	5,172	0.717	0.187	0.727	0.159
VA	29,225	0.817	0.148	51,699	0.812	0.103	0.814	0.086
WA	103,869	0.943	0.079	95,129	1.060	0.082	0.999	0.060
WV	3,787	0.846	0.380	9,527	2.662	0.517	2.145	0.396
WI	54,526	0.818	0.081	31,702	1.467	0.197	1.057	0.083
WY	13,336	0.902	0.237	5,260	2.322	0.760	1.303	0.252

Source: 2010 American Community Survey 1 year Data and 2010 Census Data

Table 27 shows the coverage of the total population for the 20 largest AIAN areas according to the 2010 Census and 2010 ACS 1-year estimates. (Note that the definition of AIAN areas includes Alaska native village statistical areas[12]). We see, generally, there was undercoverage of AIAN areas. It is important to note that no AIAN area had statistically significant overcoverage.

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[12] AIAN areas include but are not restricted to American Indian reservations and trust lands, tribal jurisdiction statistical areas, Alaska native regional corporations, Alaska native village statistical areas, and tribal designated statistical areas. For a complete listing and detailed description of types of AIAN areas go to the Census Bureau webpage, http://www.census.gov/geo/www/2010census/gtc/gtc_aiannha.html.

Table 27: Coverage in the 20 largest AIAN Areas

	2010 Census Count	Cover-age Ratio	MOE	Difference from 1.0 Statistically Significant
Creek OTSA[13], OK	758,622	0.946	0.023	Yes
Cherokee OTSA, OK	505,021	0.984	0.027	No
Lumbee (state) SDTSA[14], NC	490,899	0.947	0.035	Yes
Chickasaw OTSA, OK	302,861	0.924	0.041	Yes
Choctaw OTSA, OK	233,126	0.943	0.041	Yes
United Houma Nation (state) SDTSA, LA	203,077	0.963	0.060	No
Kiowa-Comanche-Apache-Fort Sill Apache OTSA, OK	197,781	0.992	0.047	No
Cheyenne-Arapaho OTSA, OK	174,108	0.913	0.042	Yes
Navajo Nation Reservation and Off-Reservation, AZ-NM-UT	173,667	0.837	0.048	Yes
Citizen Potawatomi Nation-Absentee Shawnee OTSA, OK	117,911	0.913	0.061	Yes
Cherokees of Southeast Alabama (state) SDTSA, AL	83,668	0.944	0.042	Yes
Knik ANVSA[15], AK	65,768	0.876	0.071	Yes
Sac and Fox OTSA, OK	57,450	0.873	0.074	Yes
Coharie (state) SDTSA, NC	56,432	0.906	0.062	Yes
Echota Cherokee (state) SDTSA, AL	53,622	0.885	0.092	Yes
Osage Reservation, OK	47,472	0.831	0.090	Yes
Puyallup Reservation and Off-Reservation Trust Land, WA	46,816	0.956	0.082	No
Samish TDSA[16], WA	36,727	1.004	0.066	No
Kenaitze ANVSA, AK	32,902	1.036	0.114	No
Yakama Nation Reservation and Off-Reservation Trust Land, WA	31,272	0.941	0.141	No

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

In Table 28 we see that in AIAN areas, the coverage ratios of AIAN alone or in combination[17] (0.919), AIAN alone (0.819), not AIAN alone or in combination (0.944), and of the total population (0.938) were all undercovered. The coverage ratio of AIAN in combination (only) at 1.455, was an artifact of race reporting differences. The coverage of the total population living in AIAN areas was lower than that of the total population of the nation (0.948, see Table 2).

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[13] Oklahoma Tribal Statistical Area

[14] State Designated Tribal Statistical Area

[15] Alaska Native Village Statistical Area

[16] Tribal Designated Statistical Area

[17] The differences between the coverage ratios of AIAN alone or in combination, not AIAN alone or in combination, and of the total population residing in AIAN areas are not statistically significant.

Table 28: Coverage of AIAN Alone or in Combination versus not AIAN Alone or in Combination for AIAN Areas

	2010 Census Count	Coverage Ratio	MOE	Difference from 1.0 Statistically Significant
AIAN Alone or in Combination	1,147,552	0.919	0.021	Yes
AIAN Alone	967,135	0.819	0.018	Yes
AIAN in combination	180,417	1.455	0.076	Yes
Not AIAN Alone or in Combination	3,671,188	0.944	0.011	Yes
Total Population in AIAN Areas	4,818,740	0.938	0.009	Yes

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

Table 29a shows the coverage ratios of the 20 largest AIAN areas for 2010 ACS 1-year estimates for the race group AIAN alone or in combination. For comparison it also shows the coverage ratios for the not AIAN alone or in combination population in these AIAN areas.

We make the following observations from Table 29a.

- There was overcoverage of the AIAN alone or in combination population in the Creek OTSA, OK[18] (1.146) and Cherokee OTSA, OK (1.067) areas. In contrast, there was overcoverage of the not AIAN alone or in combination in both of these areas as well (0.915 and 0.956)[19].
- There was undercoverage of the AIAN alone or in combination population in seven of the largest 20 AIAN areas.
- There was undercoverage of the not AIAN alone or in combination population in thirteen of the 20 largest AIAN areas.
- There was overcoverage of the not AIAN alone or in combination population in only the Navajo Reservation and Off-Reservation-AZ-NM-UT (1.687), though the population involved was small at 4,346 and the MOE was large.

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[18] The difference between the coverage rates of AIAN alone or in combination in Creek OTSA and that of Cherokee OTSA is not statistically significant.

[19] The difference between the coverage rates of not AIAN alone or in combination in Creek OTSA and that of Cherokee OTSA is not statistically significant.

Table 29a: Coverage of AIAN Alone or in Combination versus not AIAN Alone or in Combination for the 20 Largest AIAN Areas

	AIAN Alone or in Combination				Not AIAN Alone or in Combination			
	2010 Census Count	Cov-erage Ratio	MOE	Difference from 1.0 Statistically Significant	2010 Census Count	Cov-erage Ratio	MOE	Difference from 1.0 Statistically Significant
Creek OTSA, OK	99,451	1.146	0.088	Yes	659,171	0.915	0.023	Yes
Cherokee OTSA, OK	125,440	1.067	0.063	Yes	379,581	0.956	0.034	Yes
Lumbee (state) SDTSA, NC	71,754	0.897	0.106	No	419,145	0.955	0.038	Yes
Chickasaw OTSA, OK	41,048	1.047	0.144	No	261,813	0.904	0.043	Yes
Choctaw OTSA, OK	47,649	1.050	0.118	No	185,477	0.915	0.039	Yes
United Houma Nation (state) SDTSA, LA	9,990	0.772	0.259	No	193,087	0.973	0.064	No
Kiowa-Comanche-Apache-Fort Sill Apache OTSA, OK	16,249	1.199	0.210	No	181,532	0.974	0.046	No
Cheyenne-Arapaho OTSA, OK	13,145	0.700	0.166	Yes	160,963	0.930	0.043	Yes
Navajo Nation Reservation and Off-Reservation, AZ-NM-UT	169,321	0.815	0.049	Yes	4,346	1.687	0.482	Yes
Citizen Potawatomi Nation-Absentee Shawnee OTSA, OK	13,463	0.897	0.199	No	104,448	0.915	0.065	Yes
Cherokees of Southeast Alabama (state) SDTSA, AL	842	0.640	0.280	Yes	82,826	0.947	0.043	Yes
Knik ANVSA, AK	6,582	1.097	0.312	No	59,186	0.851	0.077	Yes
Sac and Fox OTSA, OK	8,347	0.645	0.189	Yes	49,103	0.912	0.078	Yes
Coharie (state) SDTSA, NC	1,757	0.867	0.291	No	54,675	0.907	0.062	Yes
Echota Cherokee (state) SDTSA, AL	3,590	0.577	0.323	Yes	50,032	0.907	0.092	Yes
Osage Reservation, OK	9,920	0.748	0.179	Yes	37,552	0.852	0.105	Yes
Puyallup Reservation and Off-Reservation Trust Land, WA	2,127	0.501	0.298	Yes	44,689	0.978	0.086	No
Samish TDSA, WA	801	1.366	0.487	No	35,926	0.996	0.068	No
Kenaitze ANVSA, AK	3,417	0.938	0.418	No	29,485	1.047	0.127	No
Yakama Nation Reservation and Off-Reservation Trust Land, WA	8,022	1.037	0.272	No	23,250	0.908	0.167	No

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

In Table 29b we show the coverage ratios of AIAN alone and AIAN in combination for the 20 largest AIAN areas. For reasons discussed earlier, the AIAN alone coverage is confounded with race reporting differences between the ACS and 2010 Census that the AIAN alone or in combination was more robust to. Almost all AIAN or in combination persons in the Navajo Nation Reservation identified themselves as AIAN alone. Hence their coverage ratios for AIAN alone and AIAN alone or in combination were close.

Table 29b: Coverage of AIAN Alone and AIAN in Combination for the 20 Largest AIAN Areas

	AIAN Alone			AIAN in Combination		
	2010 Census Count	Coverage Ratio	MOE	2010 Census Count	Coverage Ratio	MOE
Creek OTSA, OK	63,608	0.914	0.095	35,843	1.558	0.160
Cherokee OTSA, OK	89,808	0.804	0.066	35,632	1.731	0.136
Lumbee (state) SDTSA, NC	64,300	0.725	0.101	7,454	2.373	0.613
Chickasaw OTSA, OK	26,862	0.707	0.122	14,186	1.691	0.297
Choctaw OTSA, OK	33,869	0.741	0.108	13,780	1.809	0.293
United Houma Nation(state) SDTSA, LA	7,919	0.803	0.294	2,071	0.654	0.387
Kiowa-Comanche-Apache-Fort Sill Apache OTSA	11,138	0.969	0.196	5,111	1.700	0.474
Cheyenne-Arapaho OTSA, OK	8,896	0.709	0.201	4,249	0.681	0.241
Navajo Nation Reservation and Off-Reservation, AZ-NM-UT	166,824	0.820	0.050	2,497	0.489	0.193
Citizen Potawatomi Nation-Absentee Shawnee OTSA	8,566	0.457	0.147	4,897	1.668	0.523
Cherokees of Southeast Alabama (state) SDTSA	337	0.806	0.465	505	0.529	0.482
Knik ANVSA, AK	3,529	1.118	0.371	3,053	1.073	0.454
Sac and Fox OTSA, OK	5,798	0.536	0.193	2,549	0.892	0.341
Coharie (state) SDTSA, NC	1,192	1.045	0.372	565	0.491	0.303
Echota Cherokee (state) SDTSA, AL	2,139	0.462	0.258	1,451	0.748	0.682
Osage Reservation, OK	6,858	0.657	0.203	3,062	0.950	0.329
Puyallup Reservation and Off-Reservation Trust Land, WA	1,282	0.352	0.377	845	0.727	0.485
Samish TDSA, WA	310	1.868	0.862	491	1.048	0.513
Kenaitze ANVSA, AK	2,001	0.775	0.526	1,416	1.168	0.776
Yakama Nation Reservation and Off-Reservation Trust Land, WA	7,239	1.069	0.316	783	0.746	0.743

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

In Table 30a we see that both males (0.928) and females (0.948) were undercovered in AIAN areas. As seen in earlier in Table 12, the coverage ratio for females in AIAN areas was not significantly different than that of the nation (0.954), but the coverage ratio for males in AIAN areas was less than that of the nation (0.942).

Table 30a: Coverage in AIAN Areas by Sex

Sex	Coverage Ratio	MOE	Difference from 1.0 Statistically Significant
Female	0.948	0.010	Yes
Male	0.928	0.010	Yes

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

In Table 30b, we see that the undercoverage in AIAN areas across all age groups was statistically significant except for age groups 55-64 and 75+. Generally, the differences in the coverage ratios between the AIAN areas and the national totals were not statistically significant (see Table 13). The only exception was the 65-74 (0.948) age group, which saw higher coverage at the national level (0.983).

Table 30b: Coverage in AIAN Areas by Age Groups

Age Group	Coverage Ratio	MOE	Difference from 1.0 Statistically Significant
0-4	0.950	0.030	Yes
5-14	0.935	0.022	Yes
15-17	0.915	0.029	Yes
18-19	0.916	0.049	Yes
20-24	0.890	0.028	Yes
25-29	0.909	0.031	Yes
30-34	0.947	0.032	Yes
35-44	0.928	0.020	Yes
45-49	0.921	0.027	Yes
50-54	0.944	0.027	Yes
55-64	0.983	0.024	No
65-74	0.948	0.023	Yes
75+	0.974	0.027	No

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

In Table 30c we see the coverage ratios of females and males crossed by age group. For comparison to national results, see Table 15. In AIAN areas, the differences in the coverage ratios for females were not statistically significant from the national level. The differences in the coverage ratios for males were not statistically significant from those at the national level except for age groups 50-54[20] (0.901) and 65-74 (0.935), whose national coverage ratios were 0.944 and 0.980 respectively.

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[20] The difference between the coverage rates of male 50-54 and male 65-74 is not statistically significant.

Table 30c: Coverage in AIAN Areas broken down by Sex and Age Group

Sex	Age Group	Coverage Ratio	MOE	Difference from 1.0 Statistically Significant
Female	0-4	0.963	0.041	No
	5-14	0.946	0.029	Yes
	15-17	0.916	0.040	Yes
	18-19	0.914	0.059	Yes
	20-24	0.904	0.039	Yes
	25-29	0.914	0.035	Yes
	30-34	0.937	0.038	Yes
	35-44	0.940	0.022	Yes
	45-49	0.928	0.030	Yes
	50-54	0.985	0.033	No
	55-64	0.995	0.026	No
	65-74	0.960	0.027	Yes
	75+	0.954	0.032	Yes
Male	0-4	0.938	0.037	Yes
	5-14	0.924	0.029	Yes
	15-17	0.914	0.043	Yes
	18-19	0.919	0.064	Yes
	20-24	0.877	0.040	Yes
	25-29	0.904	0.039	Yes
	30-34	0.956	0.044	No
	35-44	0.915	0.025	Yes
	45-49	0.914	0.036	Yes
	50-54	0.901	0.030	Yes
	55-64	0.970	0.028	Yes
	65-74	0.935	0.027	Yes
	75+	1.004	0.037	No

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

In Table 31a we see that coverage ratios for most of the 20 largest tribal groupings were not significantly different from 1.0. Among the larger AIAN tribal groupings, several had coverage ratios close to 1.0, for example Cherokee[21] (1.010), Chippewa (1.003), and Sioux (1.051). Only six tribal groupings, notably Navajo (0.911), showed undercoverage.

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[21] The differences in the coverage rates between Cherokee, Chippewa, and Sioux were not statistically significant.

Table 31a: Largest 20 AIAN alone One Tribal Grouping Reported using the 1-Year ACS

Tribal Grouping	2010 Census Count	Coverage Ratio	MOE	Difference from 1.0 Statistically Significant
Navajo	286,731	0.911	0.047	Yes
Cherokee	284,247	1.010	0.044	No
Chippewa	112,757	1.003	0.070	No
Sioux	112,176	1.051	0.075	No
Choctaw	103,910	0.835	0.071	Yes
Apache	63,193	0.961	0.094	No
Lumbee	62,306	0.901	0.124	No
Pueblo	49,695	0.940	0.119	No
Creek	48,352	0.927	0.095	No
Iroquois	40,570	1.073	0.112	No
Chickasaw	27,973	0.691	0.108	Yes
Blackfeet	27,279	0.793	0.143	Yes
Inupiat	24,859	2.150	0.204	Yes
Pima	22,040	0.813	0.205	No
Yaqui	21,679	0.728	0.124	Yes
Potawatomi	20,412	0.882	0.178	No
Tohono O'Odham	19,522	1.056	0.292	No
Alaska Athabaskan	15,623	1.109	0.214	No
Tlingit-Haida	15,256	1.096	0.284	No
Puget Sound Salish	14,320	0.839	0.140	Yes

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

One tribal grouping, Inupiat (2.150), had noteworthy overcoverage. This overcoverage was possibly due to Remote Alaska cases in the Bethel, Dillingham, and Wade Hampton Census Areas, which have a relatively high concentration of Inupiats. Remote areas of Alaska provide special difficulties when interviewing, such as climate, travel, and seasonality of the population (U.S. Census Bureau, 2009). These areas have special data collection procedures, including but not limited to conducting interviews only in certain months and no mail or telephone interviews. Both the differences in the data collection methods or in the time of interview could lead to differences in ACS and 2010 Census estimates for this seasonal population.

There were large MOEs for the AIAN tribal groupings with smaller populations, which leads us to Table 31b, where we used 2006-2010 ACS 5-year data instead of 1-year data in the calculation of coverage ratios to obtain more reliable coverage estimates. However, we note that the coverage ratios of the largest tribal groupings were lower for the 5-year estimates than the 1-year estimates, probably because the comparison between 1-year and 5-year estimates are confounded with growth in population over time (see Section 6, Limitations). It is a general demographic trend in the United States that population increases over time. Thus the 5-year ACS estimates would include smaller population sizes in the earlier years, 2006-2009. We see, for example, that the Navajo coverage ratio was 0.911 for the 1-year ACS estimates compared to

0.822 for the 5-year. This difference was possibly a result of growth in the Navajo population over the 5-year period. Because of these possible confounding effects, we are reluctant to draw conclusions from Table 31b, despite the smaller MOEs.

Table 31b: Largest 20 AIAN alone One Tribal Grouping Reported Using the 2006-2010 ACS 5-Year Estimates

Tribal Grouping	2010 Census Count	Coverage Ratio	MOE	Difference from 1.0 Statistically Significant
Navajo	286,731	0.822	0.021	Yes
Cherokee	284,247	0.966	0.019	Yes
Chippewa	112,757	0.922	0.029	Yes
Sioux	112,176	0.933	0.031	Yes
Choctaw	103,910	0.797	0.027	Yes
Apache	63,193	0.896	0.040	Yes
Lumbee	62,306	0.893	0.049	Yes
Pueblo	49,695	1.116	0.050	Yes
Creek	48,352	0.843	0.039	Yes
Iroquois	40,570	1.164	0.055	Yes
Chickasaw	27,973	0.729	0.049	Yes
Blackfeet	27,279	0.846	0.050	Yes
Inupiat	24,859	1.971	0.076	Yes
Pima	22,040	0.930	0.094	No
Yaqui	21,679	0.779	0.071	Yes
Potawatomi	20,412	0.816	0.049	Yes
Tohono O'Odham	19,522	0.902	0.097	Yes
Alaska Athabaskan	15,623	0.910	0.061	Yes
Tlingit-Haida	15,256	0.956	0.078	No
Puget Sound Salish	14,320	0.873	0.088	Yes

Source: 2006-2010 American Community Survey 1 year Data and 2010 Census Data

In Table 32 we see coverage for males[22] (0.928) and females (0.931) in the AIAN alone or in combination population were less than the corresponding ratios for males and females for the nation, which were 0.942 and 0.954 respectively.

Table 32: National Coverage Ratios of AIAN Alone or in Combination by Sex

Sex	Coverage Ratio	MOE	Difference from 1.0 Statistically Significant
Female	0.931	0.013	Yes
Male	0.928	0.012	Yes

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

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[22] The difference in the coverage rate between males and females for the AIAN alone or in combination population is not statistically significant.

In Table 33, we see that the 18-19[23] (0.859), 25-29 (0.852), 30-34 (0.904), 50-54[24] (0.985), 55-64 (1.031), and 65-74 (1.019) age groups were different from the total population seen in Table 13 (0.898, 0.918, 0.944, 0.954, 0.968, and 0.983 respectively). Elsewhere, the results were not different than the total population.

Coverage for AIAN alone or in combination varied by age. The coverage of adults 55-64 (1.031) was notably higher for AIAN alone or in combination than it was for the overall population, 0.968 (seen in Table 13). The coverage of the 25-29 (0.852) and 30-34 (0.904) age groups were much lower than they were for the rest of the population for the total population (0.918 and 0.944 respectively).

Table 33: National Coverage Ratios of AIAN Alone or in Combination broken down by Age Group

Age Group	Coverage Ratio	MOE	Difference from 1.0 Statistically Significant
0-4	0.922	0.033	Yes
5-14	0.910	0.021	Yes
15-17	0.926	0.031	Yes
18-19	0.859	0.037	Yes
20-24	0.879	0.029	Yes
25-29	0.852	0.026	Yes
30-34	0.904	0.027	Yes
35-44	0.926	0.021	Yes
45-49	0.933	0.025	Yes
50-54	0.985	0.028	No
55-64	1.031	0.025	Yes
65-74	1.019	0.033	No
75+	0.989	0.038	No

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

7.5 Coverage of the Group Quarters Population

Table 34 shows the coverage ratio of GQ population in the 2010 ACS 1-year was 0.810, which was substantially lower than that of the household population, 0.952 (see Table 9). A probable contributing factor to lower GQ person coverage was that the ACS 2010 GQ sampling frame had only minimal updates since the Census 2000 listing of GQ facilities was compiled. We also note that military GQs and college/university student housing both had special reasons for low coverage rates, as we discuss shortly.

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[23] There are no statistically significant differences between the 18-19, 25-29, and 30-34 age groups.
[24] There are no statistically significant differences between the 50-54, 55-64, and 65-74 age groups.

Table 34: National Group Quarters Population Coverage

2010 Census Count	Coverage Ratio	MOE
7,987,323	0.810	0.011

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

Table 35 shows the coverage of the ACS GQ population broken down by seven major types of GQ facilities. The categorization by seven major types shown in the tables is used in assigning the weights and is a convenient categorization here (U.S. Census Bureau, 2009). Major GQ type is relevant because people in different types of GQ facilities differ from each other in consistent, predictable ways.

There was undercoverage of persons living in nursing/skilled nursing facilities (0.973), college/university student housing (0.624)[25], military GQs (0.709), and other noninstitutional facilities (0.657). In adult correctional facilities, juvenile facilities, and other health care facilities, there was no significant undercoverage or overcoverage.

Residents in college/university student housing were counted across all twelve months, though they are typically not residents in the summer, while the 2010 Census counted them in April[26]. For this reason we expected lower coverage in these GQ facilities. Also, whereas the 2010 Census counted deployed military personnel while the ACS does not, which explains at least in part the lower coverage in these facilities.

Table 35: Coverage by Major Type of Group Quarters

Major Type of GQ	2010 Census Count	Coverage Ratio	MOE
Adult correctional facilities	2,261,813	0.993	0.029
Juvenile facilities	151,315	0.879	0.129
Nursing/Skilled nursing facilities	1,502,264	0.973	0.018
Other health care facilities	76,478	0.879	0.139
College/university student housing	2,521,090	0.624	0.015
Military group quarters	339,980	0.709	0.059
Other noninstitutional facilities	1,134,383	0.657	0.024

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

In Table 36 we see a pattern in the coverage ratios by institutional (adult correctional facilities, juvenile facilities, nursing/skilled nursing facilities, and other health care facilities) and noninstitutional GQs (college/university student housing, military GQs, and other institutional facilities). The coverage of noninstitutional GQ residents was significantly less than that of noninstitutional GQ residents. Persons in many noninstitutional facilities are harder to reach because they are either seasonal such as residents of college dorms, or move on a regular basis

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[25] The estimates of coverage of college/university student housing, military GQs, and other noninstitutional facilities were not statistically different from each other.

[26] Starting with the 2013 ACS the ACS will not conduct interviews in the summer months at college/university student housing.

such as residents of military facilities. Other noninstitutional facilities include homeless shelters and halfway houses where people do not want to stay for long periods, religious facilities and soup kitchens whose residents do not remain over the long term. In contrast, institutional GQ residents stay in place over the long term and are carefully managed, with good records being kept for them.

Table 36: Coverage by Institutional and Noninstitutional Group Quarters

	2010 Census Count	Coverage Ratio	MOE
Noninstitutional	3,995,453	0.641	0.014
Institutional	3,991,870	0.979	0.019

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

In Table 37 we see the coverage ratios of the GQ population by state. The state coverage ratios were generally less than 1.0. Of the 51 state equivalents, 43 showed undercoverage of the GQ population and only Georgia (1.076) showed statistically significant overcoverage.

Table 37: Group Quarters Person Coverage by State

State	2010 Census Count	Coverage Ratio	MOE
AL	115,816	0.779	0.054
AK	26,352	0.690	0.196
AZ	139,384	0.799	0.075
AR	78,931	0.978	0.151
CA	819,816	0.820	0.030
CO	115,878	0.918	0.073
CT	118,152	0.749	0.045
DE	24,413	0.727	0.084
DC	40,021	0.547	0.070
FL	421,709	0.768	0.037
GA	253,199	1.076	0.065
HI	42,880	0.430	0.107
ID	28,951	0.637	0.068
IL	301,773	0.792	0.032
IN	186,923	0.873	0.058
IA	98,112	0.790	0.056
KS	79,074	0.812	0.091
KY	125,870	0.967	0.109
LA	127,427	0.970	0.083
ME	35,545	0.601	0.088
MD	138,375	0.770	0.061
MA	238,882	0.739	0.056
MI	229,068	0.805	0.042
MN	135,395	0.749	0.045
MS	91,964	1.001	0.094
MO	174,142	0.798	0.064
MT	28,849	0.776	0.113
NE	51,165	0.782	0.122
NV	36,154	0.738	0.086
NH	40,104	0.855	0.171
NJ	186,876	0.988	0.062
NM	42,629	0.528	0.072
NY	585,678	0.793	0.028
NC	257,246	0.770	0.051
ND	25,056	0.786	0.079
OH	306,266	0.844	0.054
OK	112,017	0.810	0.067
OR	86,642	0.669	0.052

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

Table 37 Continued: Group Quarters Person Coverage by State

State	2010 Census Count	Coverage Ratio	MOE
PA	426,113	0.853	0.046
RI	42,663	0.674	0.053
SC	139,154	0.785	0.054
SD	34,050	0.830	0.190
TN	153,472	0.823	0.074
TX	581,139	0.751	0.031
UT	46,152	0.623	0.099
VT	25,329	0.669	0.064
VA	239,834	0.768	0.058
WA	139,375	0.733	0.069
WV	49,382	0.751	0.063
WI	150,214	0.823	0.060
WY	13,712	1.032	0.335

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

Table 38 shows the coverage ratios by major type of GQ for Georgia and Florida. Its purpose is to reveal if there was one major GQ type that was driving the coverage ratios for states with relatively extreme GQ person coverage ratios. We included Georgia in this table because it was the only state that showed overcoverage of its GQ residents, and Florida because it had undercoverage and a large GQ population. We note that in general, the state by major GQ type coverage ratios are less reliable because of high sampling variation and differences in the ACS GQ sampling frame from the 2010 Census GQ enumeration listing. For this reason we did not provide all of the state by major GQ type coverage ratios.

Table 38: Group Quarters Person Coverage by Major Group Quarters Type for Select States

State	Major GQ Type	2010 Census Count	Coverage Ratio	MOE
FL	Adult correctional facilities	167,447	0.958	0.046
	Juvenile facilities	10,061	0.551	0.328
	Nursing/skilled nursing facilities	73,372	1.012	0.098
	Other health care facilities	3,620	0.692	0.440
	College/university student housing	85,243	0.511	0.094
	Military group quarters	14,618	0.443	0.164
	Other noninstitutional facilities	67,348	0.461	0.093
GA	Adult correctional facilities	103,940	1.617	0.118
	Juvenile facilities	3,967	1.042	1.106
	Nursing/skilled nursing facilities	34,738	0.998	0.146
	Other health care facilities	1,828	0.823	0.473
	College/university student housing	72,288	0.338	0.070
	Military group quarters	16,144	1.135	0.349
	Other noninstitutional facilities	20,294	1.046	0.173

Source: 2010 American Community Survey 1-year Data and 2010 Census Data

In Table 38 we see that Florida showed neither overcoverage nor undercoverage of residents living in adult correctional facilities and nursing/skilled nursing facilities, and other health care facilities. Florida had undercoverage of persons living in juvenile facilities, (0.551)[27], student/university housing (0.511), military facilities (0.443), and other noninstitutional facilities (0.461). These four major GQ types in Florida account for why Florida had a net undercoverage of GQ population. Georgia, on the other hand, showed a large overcoverage of the adult correctional facility population (1.617). The other major types of GQ facilities did not show significant overcoverage. The net overcoverage of GQ persons in Georgia is directly attributable to the larger overcoverage of persons residing in adult correctional facilities.

8. Puerto Rico Community Survey Coverage

As we explained in Section 4, for PRCS HU coverage we compared the pre-controlled 2009 PRCS 1-year estimates to the 2010 Census counts. In Table 39 we see the coverage ratio for HUs, 0.873, was much smaller than for the nation or for any states. This is because the PRCS HU sampling frame is not regularly updated the way the ACS HU sampling frame is. The comparison to 2009 exaggerates this effect modestly, as we can expect normal growth in the HU inventory from 2009 to 2010. For the 2010 PRCS 1-year pre-controlled estimate the coverage was close to 1.0 (not shown in any table).

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[27] The estimates of coverage of persons in Florida's juvenile facilities, college/university student housing, military GQs, and other noninstitutional facilities were not significantly different from each other.

Table 39: 2009 Puerto Rico Housing Unit Coverage

2010 Census	2009 ACS	Coverage Ratio	MOE
1,636,946	1,428,562	0.873	0.004

Source: 2009 Puerto Rico Community Survey 1-year Data and 2010 Census Data

The coverage ratio for the total resident population in Puerto Rico (0.942) showed undercoverage (see Table 40). This coverage ratio did not differ significantly from the United States coverage ratio of 0.948 (seen in Table 11). Note that for the PRCS we did not present the coverage ratios for the household population because of concerns about the interpretation of HU coverage error.

Table 40: Puerto Rico Person Coverage of the Total Resident Population

2010 Census Count	Coverage Ratio	MOE
3,725,789	0.942	0.009

Source: 2010 Puerto Rico Community Survey 1-year Data and 2010 Census Data

Table 41 shows the coverage in Puerto Rico by age group. For the PRCS we did not investigate the coverage of race/ethnicity. Noteworthy is that the PRCS followed a different pattern of coverage by age group than that seen in the ACS. In the ACS the coverage ratios were lowest for the age groups 18-19 and 20-24. However, in the PRCS, the age groups 25-29, 30-34, and 25-34 had lower coverage than the age groups 18-19 and 20-24. Further, the coverage of the 0-4 age group was much lower in the PRCS at 0.874 than in the ACS at 0.948 (seen in Table 13). In contrast, consistent with the ACS, in the PRCS the coverage ratios for age groups 65-74 (1.056)[28] and 75+ (1.046) were among the highest.

Table 41: Puerto Rico by Age Group

Age	2010 Census Count	Coverage Ratio	MOE
0-4	224,756	0.874	0.037
5-14	508,575	0.922	0.025
15-17	169,964	0.942	0.042
18-19	114,295	0.936	0.046
20-24	260,850	0.916	0.036
25-29	244,159	0.857	0.031
30-34	248,173	0.873	0.027
35-44	483,528	0.872	0.024
45-49	247,986	0.960	0.031
50-54	239,821	0.986	0.032
55-64	441,684	1.014	0.028
65-74	311,662	1.056	0.027
75+	230,336	1.046	0.034

Source: 2010 Puerto Rico Community Survey 1-year Data and 2010 Census Data

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[28] The estimates of coverage for the age groups 65-74 and 75+ were not significantly different.

Consistent with the ACS, the coverage ratio for females was greater than the coverage ratio for males in Puerto Rico (see Table 42).

Table 42: Puerto Rico Coverage by Sex

Female		Male		Total	
Coverage Ratio	MOE	Coverage Ratio	MOE	Coverage Ratio	MOE
0.954	0.010	0.930	0.011	0.942	0.009

Source: 2010 Puerto Rico Community Survey 1-year Data and 2010 Census Data

Coverage of GQ persons in Puerto Rico showed undercoverage at 0.664 (see Table 43), consistent with ACS GQ person coverage. However, it was substantially lower than the overall ACS GQ person coverage ratio of 0.810.

Table 43: Puerto Rico Group Quarters Population Coverage

State	2010 Census Count	Coverage Ratio	MOE	Significant
Puerto Rico	37,955	0.664	0.144	Yes

Source: 2010 Puerto Rico Community Survey 1-year Data and 2010 Census Data

9. Tract-Level Analyses of Coverage

In previous sections we examined the coverage based on groups of persons defined by individual demographic characteristics. In this section we considered the coverage of persons in groups of tracts defined by features of interest. We wanted to determine any geography effects that went beyond the characteristics of the individual persons in the tract. Thus we characterized tracts by features of interest and examined the mean coverage ratios of these tracts. The characteristics we used to group tracts were population density, proportion renter/owner, degree of race/ethnic homogeneity, and proportion non-Hispanic Black.

Note that all tracts here were given equal weight in the calculation of their coverage ratios and the results from these tables exclude tracts with zero population counts. Furthermore, the coverage ratios for tracts consistently were less than national results seen elsewhere in this paper because these analyses used 2006-2010 ACS 5-year estimates, which have systematically lower coverage ratios than the 2010 ACS 1-year estimates because of population growth (see Section 6, Limitations, for more discussion on this point).

Table 44: Tract Coverage by Population Density

	Number of Tracts	Mean Coverage Ratio of Tracts	MOE
Densest third	24,475	0.927	0.001
Middle third	24,475	0.942	0.001
Sparsest third	24,476	0.943	0.005

Source: 2006-2010 American Community Survey 5-year Data and 2010 Census Data

In Table 44, we investigated how population density of tracts affected coverage. As seen in Table 44, more densely populated areas had lower coverage ratios than sparsely populated areas. The densest third (0.927) had significantly lower coverage than the middle third[29] (0.942) and the sparsest third (0.943). Whether this difference was a result of persons or HUs having lower coverage (perhaps having more minorities), or whether there was a density effect in itself at work, is not clear from this table.

Table 45: Tract Coverage by Proportion Owner/Renter

Percent Renter	Number of Tracts	Mean Coverage Ratio of Tracts	MOE
60%+	11,642	0.912	0.004
40%-60%	14,310	0.934	0.002
Less than 40%	47,368	0.944	0.002

Source: 2006-2010 American Community Survey 5-year Data and 2010 Census Data

In Table 45, we examined coverage ratios of tracts by their proportion of owners and renters. The tracts with the 60 percent or more of renters (0.912) had a lower coverage ratios than tracts with between 40 and 60 percent renters (0.934) and less than 40 percent renters (0.944). Also, note that the difference between tracts with between 40 and 60 percent renters and less than 40 percent renters was statistically significant. The results seen here were consistent with 2010 Census Coverage Measurement results, (Mule, 2012) which showed higher coverage ratios for owners than renters. However, as with the analysis of tracts grouped by density, this analysis does not establish a geography effect that goes beyond the already known undercoverage of persons in rented HUs.

Table 46: Tract Coverage by Degree of Racial/Ethnic Homogeneity

Largest Racial/ Ethnic Group	Number of Tracts	Mean Coverage Ratio of Tracts	MOE
75%+	43,282	0.950	0.003
50%-75%	23,046	0.921	0.002
Less than 50%	7,098	0.911	0.002

Source: 2006-2010 American Community Survey 5-year Data and 2010 Census Data

For Table 46, we categorized tracts by degree of racial and ethnic homogeneity (for seven racial/ethnic groups: Hispanic, non-Hispanic white, non-Hispanic Black, non-Hispanic Asian, non-Hispanic AIAN, non-Hispanic Native Hawaiian and Other Pacific Islander, and non-Hispanic some other race). Those tracts with the highest rate of racial and ethnic homogeneity had the highest coverage ratios. The tracts with their largest racial/ethnic group making up more than 75 percent of the total population (0.950) was significantly different from tracts with their largest racial ethnic group making up between 50 and 75 percent (0.921) and less than 50 percent (0.911) of their total population. Also, note that tracts with their largest racial/ethnic group making up 50 to 75 percent of their total population was significantly

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[29] The difference in coverage between the middle third and sparsest third was not statistically significant.

different than tracts with their largest racial ethnic group making up less than 50 percent of their total population.

Table 47: Person Coverage of Tracts by Percent Black Alone or in Combination

Percent Black Alone or in Combination	Number of Tracts	Mean Coverage Ratio of the Total Population of Tracts	MOE
75%+	3,527	0.912	0.004
50%-75%	2,844	0.913	0.007
Less than 50%	67,055	0.940	0.002

Source: 2006-2010 American Community Survey 5-year Data and 2010 Census Data

In Table 47, we categorized tracts by the percentage of their population that was Black and determined the coverage ratio of their total population. Blacks have historically had lower coverage ratios in the census and other surveys. The tracts that had their black population make up more than 75 percent of its total population (0.912) was significantly different than tracts that had their black population make up less than 50 percent of its total population (0.940). The coverage ratios in tracts with predominantly black populations was significantly less than that of tracts where Blacks make up less than 50 percent of the tract's population.

Table 48: Coverage of the Black Alone or in Combination by Percent Black Alone or in Combination Population

Percent Black Alone or in Combination	Number of Tracts	Mean Coverage Ratio of Black Alone or in Combination Population of Tracts	MOE
75%+	3,527	0.889	0.004
50%-75%	2,844	0.857	0.005
Less than 50%	67,055	0.851	0.007

Source: 2006-2010 American Community Survey 5-year Data and 2010 Census Data

In Table 48, we categorized tracts by the percentage of their population that was Black and determined the coverage ratio of its black population. It was hypothesized that in areas with high concentrations of Blacks, the black population had lower coverage ratios than in tracts with low concentrations of Blacks; see Shapiro and Waksberg (1999). Our results are not consistent with this hypothesis. We see that in tracts whose black population made up more than 75 percent of its total population, the observed coverage ratio (0.889) was higher than that of tracts where Blacks made up 50 to 75 percent of the total population (0.857)[30] and less than 50 percent of the total population (0.851).

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[30] The difference in coverage between the tracts where Blacks make up 50 to75 percent of the total population and less than 50 percent of the population is not statistically significant.

In conclusion, except for tracts with concentrations of Blacks, the tract-level analyses did not provide evidence for a tract-level, geography effect that went beyond the characteristics of the persons residing in the tracts.

10.   Conclusions

The Census Bureau continually evaluates the quality of the ACS, including publishing annual measures of ACS coverage. These annually produced measures are calculated by comparison to the PEP estimates, which are both dated and limited in detail. Comparing the pre-controlled ACS estimates to the 2010 Census afforded an opportunity to examine the ACS coverage with a fully up-to-date comparison and in greater detail than we could have using the PEP estimates as done in previous years. This proved particularly valuable for examining the coverage of smaller geographic areas such as AIAN areas and tracts, and for states by demographic breakdown. That said, some of the difference between the ACS estimates and the 2010 Census measured for race and ethnicity was attributable to differences between the two surveys in data collection. These issues limit the usefulness of the coverage ratio as a measure of coverage error for race and ethnic groups.

Since we calculated coverage using pre-controlled ACS estimates, without the correction for coverage gained by controlling, the coverage ratios are more a measure of the completeness of the ACS sample frame and of ACS interviewing methods than of the coverage of the published ACS estimates. Nationally, we found patterns of person coverage similar to what has been seen in previous decennial censuses and in the CPS. Demographically, those groups with the highest coverage ratios were non-Hispanic whites, females, and people 65 years and older. We also noted higher coverage ratios in midwestern states, and lower coverage ratios in southern states. In contrast, the ACS coverage of HUs did not follow decennial census patterns. This likely has to do with the complex relationship between the ACS HU sample frame and the decennial master address file (MAF) listing from which it was derived, and with the difficulties in the ACS determinations of vacant HUs. We observed a net undercoverage of persons in the ACS, which was mostly attributable to within-household coverage rather than HU undercoverage.

In the separate analysis of the PRCS we noted overall coverage lower than that of most states, with similar higher coverage for females than males, but with different patterns of coverage for age groups.

Of particular interest was the coverage of AIAN persons and of persons living in AIAN areas. We found that the ACS coverage of people in AIAN areas was generally lower than that of the overall nation, with the coverage of several adult males age groups being lower. However, this undercoverage could not be attributed to persons identified as AIAN alone or in combination, because the coverage ratios differed for persons identified as AIAN alone versus persons identified as AIAN alone or in combination with other race groups. Furthermore, the coverage of AIAN alone or in combination varied widely by state, and the coverage between individual tribal groupings also varied widely. Ultimately, the coverage of AIAN persons and of the

population in AIAN areas cannot be generalized, but must be considered for specific AIAN areas and for specific tribal groupings.

Lastly, we examined the coverage by tract, characterizing tracts by the predominance of several features of interest. Consistent with decennial census studies, we found densely populated tracts and tracts with higher proportions of renters had lower coverage. Generally, we found more race/ethnically homogenous tracts had higher coverage. When we partitioned out Black alone or in combination, we found that Blacks who lived in tracts that had high concentrations of Black alone or in combination had higher coverage ratios than those who lived in tracts with lower concentrations of Black alone or in combination. However, except for this finding, we discovered little about how characteristics of geographic areas affected coverage beyond what we already knew about coverage based on demographic characteristics of the residents.

11.   Future Research

This research leads naturally to additional questions. An obvious one is, what is the coverage of the 2011 ACS? The only updates from the 2010 Census that the 2010 ACS sample frame incorporated were those from the 2010 Census address canvassing operation. In contrast, the 2011 ACS sample frame more fully incorporated the results of the 2010 Census. In particular, one might hope for better HU coverage on the 2011 ACS sample frame. Some of the analyses conducted here could be fruitfully redone comparing the 2011 ACS with the 2010 Census, in particular, the coverage of HUs. Also, the higher coverage of multi-unit HUs invites investigation. And clearly, there is more to understand about differences in race reporting between the ACS and the 2010 Census. A potential approach to measuring race reporting differences is to link ACS 1-year 2010 persons to the 2010 Census record and compare the race. The difference between the ACS and 2010 Census vacancy rates continues to be investigated. Lastly, the tract-level analyses might yield more insight on geographic effects with a multivariate rather than a univariate approach.

References

Asiala, M., Beaghen, M., and Albright, K. (2008). "Evaluating Use of Alternative Population Controls for American Community Survey Weighting Methodology". *2008 Joint Statistical Meetings: Proceedings of the Section on Survey Research Methods.* American Statistical Association.

Bennett, C. and Griffin, D. (2002). "Race and Hispanic Origin Data: A Comparison of Results from the Census 2000 Supplementary Survey and Census 2000". *2002 Joint Statistical Meetings: Proceedings of the Section on Survey Research Methods.* American Statistical Association.

Bray, R. (2012). "Estimates of Correct and Erroneous Enumeration with Duplicates in the 2010 U.S. Census". *2012 Joint Statistical Meetings: Proceedings of the Section on Government Statistics.* American Statistical Association.

Cresce, A. (2012). "Evaluation of Gross Vacancy Rates From the 2010 Census Versus Current Surveys: Early Findings from Comparisons with the 2010 Census and the 2010 ACS 1-Year Estimates". *Proceedings from the 2012 Federal Committee on Statistical Methodology Research Conference.*

Hefter, S. and Anderson, O. (2012). "Understanding the Causes of the Differences Between the 2010 American Community Survey and the 2010 Decennial Census Vacancy Rates". Census Bureau research memorandum in progress.

Mule, T. (2012). "2010 Census Coverage Measurement Estimation Report: Summary of Estimates of Coverage for Persons in the United States". Census Bureau memorandum, DSSD 2010 Census Coverage Measurement Memorandum Series #2010-G-01. http://www.census.gov/coverage_measurement/pdfs/g01.pdf

Mule, T. and Konicki, S. (2012). "Summary of Estimates of Coverage for Housing Units in the United States". 2010 CCM Summary Reports, G-02. http://www.census.gov/coverage_measurement/pdfs/g02.pdf

National Research Council (2004). "The 2000 Census: Counting Under Adversity". Panel to the 2000 Census. Washington, DC: The National Academies Press.

Pinal, J. del, and Schmidley, D. (2005). "Matched Race and Hispanic Origin Responses from Census 2000 and Current Population Survey February to May 2000". U.S. Census Bureau Population Division Working Paper Series. http://www.census.gov/population/www/documentation/twps0079/twps0079.pdf

Neter, J., Wasserman, W., and Kutner, M. (1985). "Applied Linear Statistical Models". pp 150-154. Homewood, Illinois: Richard D. Irwin Inc.

Raglin, D. and Leslie, T. (2002). "How Consistent is Race Reporting Between the Census and the Census 2000 Supplementary Survey?" *2002 Joint Statistical Meetings: Proceedings of the Section on Survey Research Methods.* American Statistical Association.

Shapiro, G. and Waksberg J. (1999). "Coverage Analysis for the American Community Survey". Internal Memorandum, U.S. Census Bureau.

U.S. Census Bureau (2009). "Design and Methodology: American Community Survey". Issued April 2009. http://www.census.gov/acs/www/Downloads/dm1.pdf

U.S. Census Bureau (2010). "2010 Census Press Kits: Address Canvassing Facts/Statistics" http://2010.census.gov/news/press-kits/one-year-out/address-canvasing/address-canvassing-facts-statistics.html

U.S. Census Bureau (2012a). "Population Estimates: Population and Housing Estimates". http://www.census.gov/popest/

U.S. Census Bureau (2012b). Coverage Measurement. U.S. Census Bureau Web site. http://www.census.gov/coverage_measurement/

U.S. Census Bureau (2012c). "American Community Survey: Data Quality and Sample Size". U.S. Census Bureau Web site, http://www.census.gov/acs/www/methodology/sample_size_and_data_quality/

U.S. Census Bureau (2012d). Current Population Survey: Coverage Ratios. http://www.census.gov/cps/methodology/coverage.html

U.S. Census Bureau (2012e). Census Bureau Regions and Divisions with State FIPS Codes. U.S. Census Bureau Web site. http://www.census.gov/geo/www/reg_div.txt