

## The Reliability of ACS 5-Year Estimates of Race Groups and American Indian and Alaska Native Populations<sup>1</sup>

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The Census Bureau measures demographic, social, and economic characteristics of the United States population through the American Community Survey (ACS). Starting with the 2005–2009 ACS 5-year estimates, the ACS annually provides these data for small geographies and small race groups. The focus of this evaluation was to assess the reliability of the 5-year estimates for five main race groups: White, Black, Asian, American Indian and Alaska Native (AIAN) and Native Hawaiian and Other Pacific Islander (NHOPI); for specific AIAN tribal groupings; and for detailed Asian (e.g., Chinese), and detailed NHOPI race groups. For the analyses we used the 2006–2010 ACS 5-year Selected Population Tables. We used the coefficients of variation of estimates of a broad range of characteristics as measures of reliability. The ACS sample was designed to assure certain levels of reliability for estimates of geographic areas. A key point the study established was that the reliability of estimates of small race groups was comparable to that of geographic areas of similar population size. Further, we found that race groups and tribal groupings of similar population size had similar levels of reliability.

### 1. Introduction

The American Community Survey (ACS) collects data similar to what the Decennial Census Long Form collected in the 2000 and earlier Censuses. One of the highest priorities is to produce high quality and reliable data for small areas and populations. Due to the smaller sample size than the Census Long Form, the ACS must accumulate sample data across five years to produce estimates for the smallest areas and populations. Now that several sets of 5-year estimates are available, analysts who have used the long form data in the past now look to use the 5-year ACS data to meet their needs in research and for social policy purposes.

Some data users have raised concerns that the 5-year ACS estimates do not provide sound estimates for small population groups. The focus of this report was to assess the reliability of characteristics by major race groups, and by American Indian/Alaska Native (AIAN) tribal groupings. In this study we examined the level of reliability for 297 key characteristics produced from the 2006–2010 5-year ACS estimates at various geographic summary levels. These results also serve as a benchmark for monitoring any changes in reliability in the future.

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<sup>1</sup> This report is released to inform interested parties of ongoing research and to encourage discussion of work in progress. Any views expressed on statistical issues are those of the authors and not necessarily those of the U.S. Census Bureau.

This report is an extract of the larger Census Bureau report by King et al (2015). This source report includes additional results for AIAN tribal groupings, results for American Indian reservations and Alaska Native Village Statistical areas (AIR/ANVSA), results by detailed Asian and Native Hawaiian and Other Pacific Islander (NHOPI) and Asian groups, in addition to greater background discussion of ACS race concepts, ACS sampling, and extensive appendices of tables.

We note that we did not have the data available in the same format for a direct analysis of detailed Hispanic groups. However, for similar analyses with Hispanic groups we found the coefficients of variation (CVs) for estimates of Hispanic groups comparable to those of race groups with similar sizes.

## 2. Research Questions

All research questions pertained to the 297 characteristics for the 2006-2010 5-year ACS estimates.

1. What was the reliability of estimates for the major race groups at various levels of geography?
2. How did the reliability of the in-combination population for AIAN tribal groupings compare to that of their alone population?
3. How did the reliability of the estimates of characteristics for the tribal grouping at the national level compare with that of the total population in a place of similar population size?
4. How did the reliability of the estimates for the population living On Reservations compare with the reliability for the population living Off Reservations by AIAN tribal grouping?

## 3. Background

### 3.1 Race Concepts

This report presents reliability results of ACS estimates for major race groups and for AIAN tribal groupings. The Census Bureau collects data on six major race groups: White, Black or African American, American Indian or Alaska Native, Asian, NHOPI, and some other race (Humes et al, 2011). The Census Bureau also asks for the detailed race groups for Asians and for NHOPI persons, and the tribes for AIAN persons. A person who reports just one major race group is counted as belonging to that race group 'alone'. A person who reports more than one major race group counts as belonging to both race groups 'in-combination'. For example, a person who reports that they are White and Asian is counted both as White alone or in combination and as Asian alone or in combination. A race group's alone or in-combination (AOIC) population is defined as the union of its alone population and those persons who include the group in-combination with one or more other race groups.

### 3.2 ACS Sampling

This discussion describes the ACS sampling for the data years 2006 through 2010, the data used in the study. There have been refinements in the years 2011-2013, in addition to an overall increase in the sampling rates. For details on the 2010 ACS sampling methodology see the 2010 ACS Accuracy of the Data (U.S. Census Bureau, 2011). For

details on the 2013 ACS sampling methodology see the 2013 ACS Accuracy of the Data (U.S. Census Bureau, 2014).

There are two phases to the ACS sampling of the household population: the address selection, and the subsampling of nonresponding addresses. The first phase sampling rate for a given block is determined by the measure of size of the governmental unit which contains it, by the measure of size of the census tract which contains it, and by its mail response rate. The measure of size for a geographic entity is defined as its number of occupied housing units.

The reliability of estimates is a direct function of the sample design, with higher sampling rates leading to more reliable estimates. Consistent with the goal of the ACS replacing the decennial census sample or long form data, the ACS sample is designed to obtain reliable estimates for smaller geographic entities and governmental units. Consequently, the sampling rates are higher for blocks in smaller governmental units. In particular, they are higher for those with a measure of size less than or equal to 1,200, which have sampling rates from 3.3 percent to 10 percent. Further, for blocks in governmental entities with a measure of size greater than 1,200, those blocks in tracts with a measure of size less than 2,000 are sampled at higher rates.

In addition, to ensure reliable measurements of AIAN people in AIR/ANVSAs, the measure of size for the AIR/ANVSA is multiplied by the proportion AIAN person (AOIC according to the 2010 Census) to obtain a revised, proportionately lower measure of size. This revised, lower measure of size often leads to higher sampling rates in AIR/ANVSAs areas.

In the second phase of ACS sampling nonresponding addresses are sampled for computer assisted personal interviewing. The sampling rates are 33.3 percent, 40 percent, 50 percent, and 66.7 percent, depending on the degree of nonresponse. With greater nonresponse, the sampling rate is higher. This is another way to improve reliability for small geographies.

## **4. Methodology**

### **4.1 Source of Data**

We used a subset of estimates available in the 2006-2010 ACS 5-Year Selected Population Tables (SPT) released in May of 2012 to produce most of estimates of reliability. This data product was the first the Census Bureau released with this level of statistical detail for race groups and tribal groupings since the Census 2000 Summary File #4 (SF4) was released about ten years earlier. The SPT are a 5-year data product covering years 2006-2010. We chose this product over the regular 5-year 2006-2010 data products because it contains estimates by race group and tribal groupings in finer detail. However, for the On and Off Reservation and for the in-combination populations we had to create special tabulations.

Published ACS estimates of characteristics are typically grouped into four profiles, the social, economic, housing unit, and demographic profiles. In this research we examined 297 social, economic, and housing unit characteristics from the first three of these profiles. This number excludes characteristics such as household relationships and ancestry. It also excludes any characteristics coming from the demographic profile, such as race. Generally, this analysis looked at the CVs of percent distribution of estimates of

characteristics, rather than those of the count. For example, the percent of family households and the percent foreign born was included in the analysis, and not the total number of family households or the total number of the foreign born. However, for some characteristics only estimates of counts were available, in which case the CVs of these counts were used in the analysis. Furthermore, the analyses included means and averages, though not medians.

#### **4.2 Measure of Reliability**

We evaluated the reliability by computing the measure known as the coefficient of variation (CV). The CV is equal to the standard error (SE) of an estimate divided by the estimate itself, multiplied by 100 to put it in the form of a percentage. The use of CVs entails noteworthy limitations, however. In particular, when the estimate is close to zero, the CV approaches infinity. That said, the way we used CVs in this report was mostly robust to such limitations. When we compared race groups, all were using the same characteristics measured the same way, so we had comparable CVs. An important exception was when there existed large differences in the prevalence of a characteristic between different groups. This situation is described in Section 6.1.

#### **4.3 Presentation of Results**

With millions of published ACS 5-year estimates the decision of how to summarize measures of reliability was not obvious. We picked estimates of common interest to data users, the published characteristics at commonly used geographic summary levels. Furthermore, we decided on the quartiles and the median of CVs as measures of the distribution of reliability, though other choices such as the mean were defensible. Throughout the report we refer to the first and third quartiles as Q1 and Q3.

### **5. Analyses**

In this section we describe the analyses we conducted. Each analysis addressed the research question of the corresponding number.

#### **1. Examination of the reliability of Alone populations of the Major Race groups**

For this set of results we examined the CVs for the social, economic, and housing characteristics of the American Indian (AI) alone, the Alaska Native (AN) alone, the White alone, the Black alone, the Asian alone, and the NHOPI alone populations. There was no distinction made for persons identifying themselves as having Hispanic origins. Results by characteristic are provided at the national, state, county, and tract summary levels. For the national level we present the CV for each characteristic for each major race group. For the subnational geographic areas we determined medians of the distribution of CVs across the geography for each characteristic by major race group. For example, for each characteristic we determined the median CV across the 51 state equivalents.

#### **2. Examination of the In-Combination Population of Tribal Groupings**

We compared the reliability of estimates of the alone population to the in-combination population for the tribal groupings for which the ACS publishes estimates of characteristics. This comparison was done at the national level across the 297 characteristics.

### 3. Places of similar sizes to Tribal Groupings

This analysis addressed the question of whether the reliability of estimates of tribal groupings was as good as that of places with populations sizes comparable to those of the tribal groupings. For both the places and tribal groupings we determined quartiles across the 297 characteristics at the national level.

### 4. Examination of the reliability of estimates of the AIAN population living “On Reservation” and “Off Reservation”

We assessed the On and the Off Reservation populations by tribal grouping. The required data was not readily available in the SPT and required a special tabulation. We defined the living on a reservation population as those who resided on any AIR/ANVSA and were published in the SPT.

## 6. Results

We start with results for the major race groups by summary level.

### 6.1 How did the CVs of the Race Alone population estimates compare?

Tables 1, 3, 4, and 5 provide the median CV results for the alone population of the four major race groups and AI and AN by a few selected characteristics for nation, state, county, and tract, respectively. For results with the full set of 297 characteristics see King et al (2015).

#### 6.1.1 Examining the Reliability of Estimates by Race Alone Populations at the National Level

In Table 1, the CVs of estimates of characteristics of the White alone, Black alone, and Asian alone population were less than one percent. The CVs of estimates of characteristics foreign born, family income, and housing unit value were noticeably larger for the AI, AN, and NHOPI groups. Their larger CVs were likely due to their smaller population sizes. We see the relationship between CV and population size again in Section 6.3, which compares estimates of AIAN populations to the estimates of places of similar size.

#### 6.1.2 The Role of the Prevalence of a Characteristic in a Population in Determining the CV of its Estimate

We see some exceptions to the pattern of lower CVs with larger populations. For example, in Table 1 Asians had lower CVs than Whites or Blacks for several characteristics, namely percentage foreign born and percentage spoke a language other than English at home. This was despite Asians having much smaller populations than Whites or Blacks. This counterintuitive result was due to the low prevalence of these characteristics among Whites and Blacks. We see this same pattern in Tables 3, 4, and 5, among other places in this report.

This phenomenon is understood when one compares the prevalence of foreign born and spoke a language other than English at home among the major race groups White, Black, and Asian, as shown in Table 2. The proportion foreign born of Whites and Blacks is a

fraction of that of Asians.<sup>2</sup> Similarly, the proportion of spoke a language other than English at home of Whites and Blacks is a fraction of that of Asians.<sup>3</sup> As pointed out earlier in Section 4.2, the CV of a percentage goes to infinity as the percentage gets smaller. The smaller proportion foreign born and spoke a language other than English at home drove the CVs for estimates of Whites and Blacks higher.

Table 1. Coefficients of Variation of Estimates of Select Characteristics for the Nation for Race Alone Populations

	American Indian	Alaska Native	White	Black	Asian	NHOPI
Total Population	2,023,781	114,955	224,895,700	37,978,752	14,185,493	491,673
Characteristics						
High School Grad	0.6%	1.7%	0.2%	0.3%	0.7%	1.4%
Foreign Born	2.2%	13.2%	0.2%	0.4%	0.1%	1.7%
Spoke a Language other than English at Home	0.8%	2.1%	0.1%	0.4%	0.1%	1.3%
Employed	0.4%	1.2%	0.1%	0.1%	0.1%	0.6%
Family Income \$50,000 to \$74,999	1.0%	4.3%	0.1%	0.3%	0.5%	2.6%
All Persons in Poverty	0.9%	2.7%	0.5%	0.3%	0.7%	2.5%
Owner-Occupied Housing Unit Value \$150,000 to \$199,999	1.5%	6.1%	0.1%	0.4%	0.8%	5.1%

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

For information on confidentiality protection, sampling error, nonsampling error, and definitions, please see [http://www.census.gov/acs/www/data\\_documentation/documentation\\_main/](http://www.census.gov/acs/www/data_documentation/documentation_main/)

<sup>2</sup> The number of Foreign Born broken down by major race group (alone) was presented in the U.S. Census Bureau Brief, "Race and Hispanic Origin of the Foreign-Born Population in the United States", (Grieco, 2010).

<sup>3</sup> The estimates of proportion of spoke a language other than English at home broken down by major race group (alone) were taken from the U.S. Census Brief, "People Who Spoke a Language Other Than English at Home by Hispanic Origin and Race", (Johnson et al, 2010).

Table 2. Proportion Foreign Born and Spoke a Language other than English at Home

	Foreign Born	MOE	Spoke a Language other than English at Home	MOE
White Alone	7.8%	0.1%	14.5%	0.1%
Black or African American Alone	8.0%	0.1%	7.9%	0.1%
Asian Alone	67.3%	0.2%	77.1%	0.3%

Sources: 2007 and 2009 American Community Survey 1-year Data

For information on confidentiality protection, sampling error, nonsampling error, and definitions, please see [http://www.census.gov/acs/www/data\\_documentation/documentation\\_main/](http://www.census.gov/acs/www/data_documentation/documentation_main/)

### *6.1.3 Examining the Reliability of Characteristics by Race Alone Populations at the State Level*

Recall that results were based on areas for which characteristic data were published. For some race groups only a small fraction of areas had published estimates of characteristics. The top lines in tables 3, 4, and 5 indicate the number of geographic areas for which characteristic data was published and thus contributed to the analysis. For example, in Table 3 we see that only seven states contributed to the analysis for Alaska Native. Thus the median CVs in the column for Alaska Native were based on seven estimates.

Table 3. Median Coefficients of Variation Across States of Select Characteristics for Major Race Group Alone Populations

	American Indian	Alaska Native	White	Black	Asian	NHOPI
Number of State Equivalents Used	51	7	51	51	51	40
Average Population of Race Group in States Used	39,682	15,023	4,409,720	744,681	278,147	12,190
Characteristics						
High School Grad	6.1%	20.1%	0.5%	1.6%	4.5%	17.0%
Foreign Born	20.9%	40.2%	1.6%	5.9%	1.0%	17.2%
Spoke a Language other than English at Home	9.9%	33.6%	1.2%	4.6%	1.0%	15.0%
Employed	3.7%	10.6%	0.2%	0.9%	1.2%	7.4%
Family Income \$50,000 to \$74,999	12.9%	43.0%	0.8%	3.6%	6.3%	32.4%
All Persons in Poverty	8.2%	20.8%	1.2%	2.4%	6.7%	25.3%
Owner-Occupied Housing Unit Value \$150,000 to \$199,999	15.5%	48.9%	0.9%	4.7%	7.4%	41.0%

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

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As expected, the CVs were larger for smaller populations. This observation was seen when comparing race groups for all summary levels. We also see this when we compared

CVs at a higher summary level, such as the nation, to those of lower summary levels, such as the state.

At the state summary level, Table 3 shows the highest of median CVs were less than two percent, six percent, and eight percent for White, Black, and Asian alone populations respectively. For the AI alone population, the percent foreign born had the highest median CV at roughly 20 percent. For the AN and NHOPI alone populations, the characteristic owner-occupied housing unit value \$150,000 to \$174,999 had the highest median CVs, with both over 40 percent. For the Asian population, the median CVs of estimates of foreign born and spoke a language other than English at home were noticeably smaller than those of other race groups with larger populations. This was likely due to these characteristics being more prevalent in the Asian population.

Table 4. Median Coefficient of Variation Across Counties of Select Characteristics for Major Race Group Alone Populations

	American Indian	Alaska Native	White	Black	Asian	NHOPI
Number of Counties Used	521	28	3,136	1,581	742	60
Average Population of Race Group in Counties Used	3,276	3,389	71,713	23,869	18,704	6,286
Characteristics						
High School Grad	18.1%	12.2%	4.1%	10.1%	22.1%	17.8%
Foreign Born	58.0%	70.4%	23.5%	47.3%	5.1%	21.9%
Spoke a Language other than English at Home	30.3%	17.7%	15.8%	38.0%	5.6%	13.9%
Employed	9.9%	10.2%	2.3%	7.3%	6.7%	8.0%
Family Income \$50,000 to \$74,999	38.3%	31.1%	8.3%	27.1%	30.1%	35.1%
All Persons in Poverty Threshold	25.8%	21.6%	11.0%	15.9%	31.3%	32.7%
Owner-Occupied Housing Unit Value \$150,000 to \$199,999	48.9%	39.6%	11.2%	36.4%	37.7%	63.8%

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

For information on confidentiality protection, sampling error, nonsampling error, and definitions, please see [http://www.census.gov/acs/www/data\\_documentation/documentation\\_main/](http://www.census.gov/acs/www/data_documentation/documentation_main/)

#### 6.1.4 Examining the Reliability of Characteristics by Race Populations at the County Level

Table 4 shows that most of the county-level median CVs for the AN and NHOPI alone populations were less than or roughly equal to the medians at the state level with the



exception of foreign born for AN and housing unit value for NHOPI. When compared to the state table, the median CVs for White, Black, Asian and AI alone populations were typically about three times larger or more.

As we saw in Table 3, for the Asian population, the median CVs for estimates of foreign born and spoke a language other than English at home were noticeably smaller than other race groups with larger populations. Again, this was likely due to these characteristics being more prevalent in the Asian population.

### 6.1.5 Examining Reliability of Characteristics by Race Populations at the Tract Level

In Table 5, we see most of the median CVs for the AI and AN alone populations at the tract level were less than or roughly equal to the median CVs at the county level with the exception of foreign-born and housing unit value. When comparing the tract-level CVs to the county-level CVs in Table 4, we note that the White alone population's median CVs were roughly three times as great, and the Black and Asian alone populations roughly twice as great.

Table 5. Median Coefficients of Variation Across Tracts of Select Characteristics for Major Race Group Alone Populations

	American Indian	Alaska Native	White	Black	Asian	NHOPI
Number of Tracts Used	468	38	66,713	13,305	4,187	46
Average Population of Race Group in Tracts Used	1,431	1,596	3,345	2,019	1,517	1,199
Characteristic						
High School Grad	19.5%	13.3%	14.5%	19.7%	38.2%	18.4%
Foreign Born	94.6%	87.2%	40.1%	61.1%	8.3%	66.9%
Spoke a Language other than English at Home	34.9%	24.0%	33.8%	61.4%	7.0%	33.6%
Employed	12.8%	10.7%	6.3%	11.9%	9.7%	13.2%
Family Income 50,000 to 74,999	45.0%	35.4%	26.6%	45.6%	50.9%	40.2%
All Persons in Poverty	27.7%	26.9%	35.2%	32.0%	59.9%	40.4%
Owner-Occupied Housing Unit Value \$150,000 to \$199,999	63.3%	42.2%	30.6%	59.6%	78.8%	56.9%

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

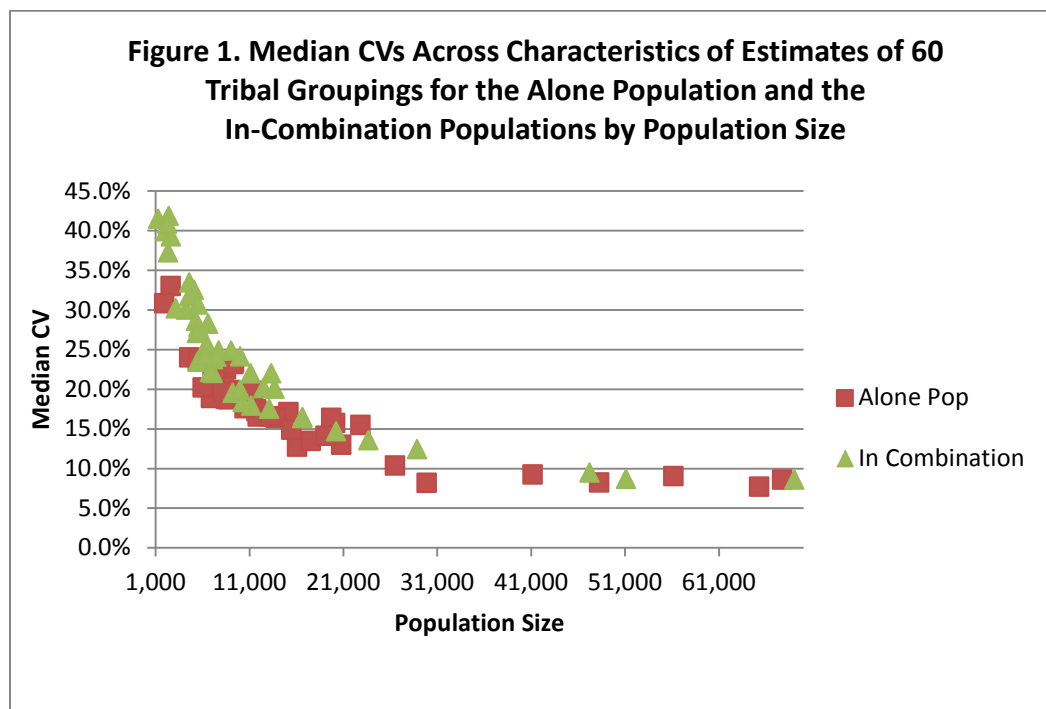
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## **6.2 How did the reliability of a tribal grouping's alone population estimates compare with the reliability of its in-combination population?**

There were 60 tribal groupings with published estimates of characteristics for the AOIC population. King et al (2015) provide the median CVs of estimates of characteristics for

their AOIC, alone, and in-combination populations. Only 50 of these 60 tribal groupings have published characteristic data for the alone population. The in-combination population is the balance of the AOIC population once the alone population has been removed.

When the AOIC and in-combination populations were similar in size, so were their median CVs. Figure 1 illustrates this point well, as the median CVs for both populations groups adhere closely to the same curve relating median CV to population size. The Y-axis plots the median CV of 60 tribal groupings, both alone and in combination, for the total population across the 297 characteristics. The X-axis plots the total population of the 60 tribal groupings for their alone and their in-combination populations.

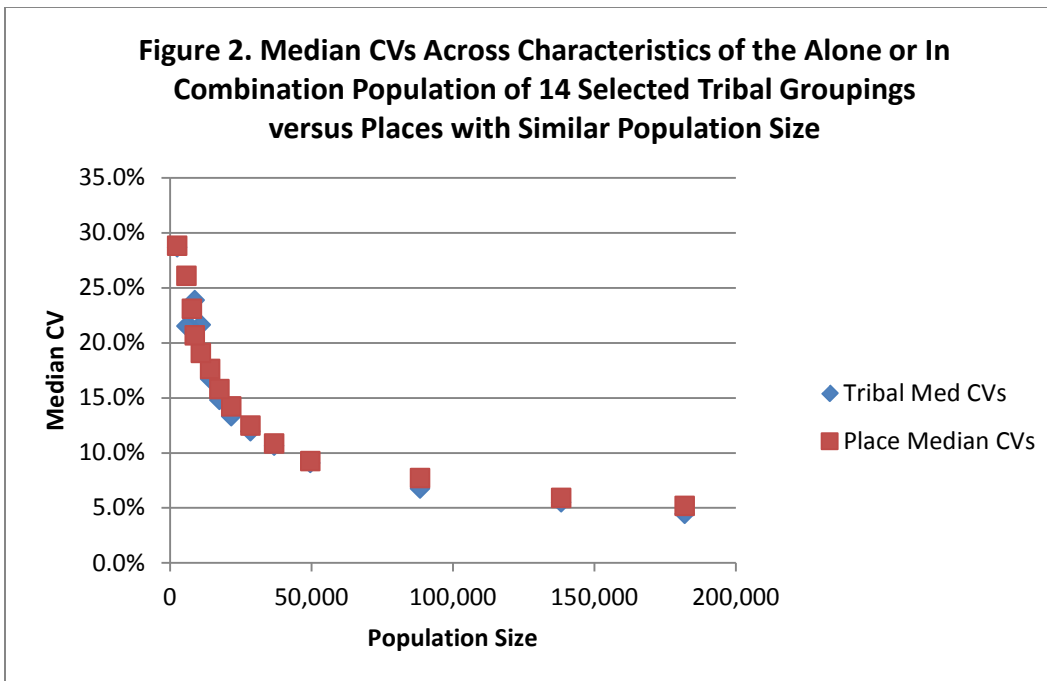


Source: 2006-2010 American Community Survey 5-year Data

For information on confidentiality protection, sampling error, nonsampling error, and definitions, please see [http://www.census.gov/acs/www/data\\_documentation/documentation\\_main/](http://www.census.gov/acs/www/data_documentation/documentation_main/)

### 6.3 How did the reliability of the American Indian/Alaska Native population or tribal grouping estimates compare with the reliability of the same estimates for an area of similar size?

In this section we examined the reliability of estimates of characteristics of selected tribal Groupings with that of places of similar size. In Figure 2 we plotted the median CVs across the 297 characteristics for 14 selected tribal groupings. Paired with each tribal grouping was the median of those places whose range contained the CV of the tribal grouping. For example, paired with the median CV of Alaskan Athabascan was the median taken across all places in the range of 25,000 to 35,000 population. With larger populations we see smaller CVs, and tribal groupings had CVs similar to those of places with similar populations.



Source: 2006-2010 American Community Survey 5-year Data  
 For information on confidentiality protection, sampling error, nonsampling error, and definitions, please see [http://www.census.gov/acs/www/data\\_documentation/documentation\\_main/](http://www.census.gov/acs/www/data_documentation/documentation_main/)

Table 6 shows the distribution of CVs at the national level for estimates of the AOIC population of a select set of tribal groupings with populations of about 25,000 or less. They are presented with the CV distribution for places of similar population size. We see tribal groupings tended to have smaller differences between the Q1 CV and the Q3 CV than what we see for places of a similar population size. Median CVs for both populations were below 30 percent. For tribal groupings, the Q3 CVs stayed below 30 percent until the population dropped below 14,000. For places, most Q3 CVs stayed below 30 percent until the population size dropped below 20,000. However, these tribal groupings have Q3 CVs that were smaller than those of the places. See King et al (2015) for these results for the 60 tribal groupings with published AIOC populations.

Table 6. Coefficients of Variation of National Estimates Across Characteristics of Selected Tribal Groupings Alone-or-in-Combination Populations Compared to Places of Similar Size

Tribal Groupings	Alone-or-in-Combination Population			Places of Similar Size			
	Popula- tion	Q1 CV	Median CV	Q3 CV	Q1 CV	Median CV	Q3 CV
Alaskan Athabascan	25,155	6.6%	11.8%	20.8%	5.6%	12.5%	24.9%
Aleut	19,409	8.0%	14.4%	25.0%	7.2%	15.8%	31.0%
Ute	13,683	9.1%	16.8%	28.7%	8.1%	17.6%	34.1%
Houma	10,925	11.2%	21.6%	35.7%	8.8%	19.1%	36.9%
Cree	9,702	10.2%	18.5%	31.1%	9.6%	20.7%	39.5%
Chippewa Cree	7,751	10.8%	19.2%	32.4%	10.7%	23.1%	43.6%
Assiniboine Sioux	5,900	12.2%	21.5%	38.1%	12.4%	26.1%	48.1%

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

For information on confidentiality protection, sampling error, nonsampling error, and definitions, please see [http://www.census.gov/acs/www/data\\_documentation/documentation\\_main/](http://www.census.gov/acs/www/data_documentation/documentation_main/)

#### **6.4 How did the reliability of the tribal grouping estimates for the population living On Reservation compare with the reliability of the same tribal grouping estimates for the population living Off Reservation?**

For the next table, we look at the CVs for the On and Off Reservation population. Table 7 gives the weighted counts and CV distribution results for the Q1 CV, the median CV and the Q3 CV for the On Reservation and the Off Reservation populations for seven selected tribal groupings. Table 7 shows results for the AOIC population for the tribal groupings. See King et al (2015) for details of the other 53 tribal groupings. As seen in other parts of this report, the size of the median CVs and distribution of CVs depended generally on the population size of the tribal grouping.

Interestingly, for several tribal groupings, the On Reservation median CVs were smaller than those of the Off Reservation despite having smaller populations. We see this for Chippewa Cree AOIC tribal grouping, and for the Assiniboine Sioux for alone population. This could be due to the higher sampling rates of AIR/ANVSAs with low percentages of AIAN persons (a higher sampling rate means proportionally more sample selected; see Section 3.2 for a description of the ACS sampling). However, for most tribal groupings, the size of the On and Off Reservation populations differed, so we cannot make useful direct comparisons.

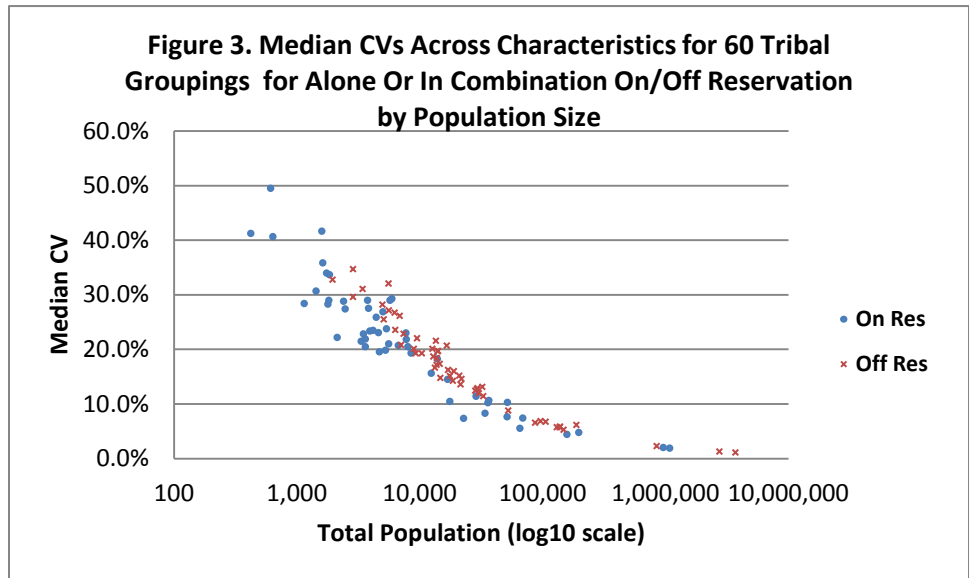
Table 7. First Quartile, Median, and Third Quartile Coefficients of Variation Across Characteristics of Estimates of the Alone-or-in-Combination On and Off Reservation Populations By Selected Tribal Groupings

Tribal Grouping	On Reservation				Off Reservation			
	Alone or In Combination Population	Q1 CV	Median CV	Q3 CV	Alone or In Combination Population	Q1 CV	Median CV	Q3 CV
Alaskan Athabascan	3,600	11.9%	21.6%	35.7%	21,555	7.5%	13.1%	22.2%
Aleut	1,748	18.7%	33.7%	53.1%	17,661	8.5%	15.0%	26.7%
Assiniboine Sioux	2,463	14.9%	27.0%	46.6%	3,437	17.0%	30.9%	52.6%
Chippewa Cree	2,129	13.2%	22.2%	41.3%	5,622	14.3%	27.1%	43.5%
Cree	421	26.6%	41.6%	68.3%	9,281	10.5%	18.9%	33.1%
Houma	5,933	14.4%	28.7%	50.8%	4,992	15.3%	27.7%	45.7%
Ute	4,172	13.0%	22.6%	37.7%	9,511	12.0%	21.7%	37.2%

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

For information on confidentiality protection, sampling error, nonsampling error, and definitions, please see [http://www.census.gov/acs/www/data\\_documentation/documentation\\_main/](http://www.census.gov/acs/www/data_documentation/documentation_main/)

Figure 3 shows the median CVs across the 297 characteristics for the On and Off Reservation populations of the 60 tribal groupings by total population. Again, as we would expect, we see a clear relationship between CV and population size, with larger populations leading to smaller CVs. In particular, On and Off populations with similar population sizes had similar CVs, though there may be a tendency for the On Reservation CVs to be a little lower than similarly sized Off Reservation CVs. If this was true, it could be attributable to the higher sampling rates in some AIR/ANVSAs.



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

For information on confidentiality protection, sampling error, nonsampling error, and definitions, please see [http://www.census.gov/acs/www/data\\_documentation/documentation\\_main/](http://www.census.gov/acs/www/data_documentation/documentation_main/)

## 7. Summary

The main observation is that the reliability of a population's estimates was largely dependent on the size of the population. In this sense, different population groups are measured with roughly equal reliability. A key point the study established was that the reliability of estimates of small tribal groupings was comparable to that of geographic areas of similar population size. Furthermore, we found that race groups and tribal groupings of similar population size had similar levels of reliability. For a fixed sample size, two populations of similar size tended to have comparable CVs for their estimates.

A major conclusion is that the ACS sample design, which focuses on producing sound estimates of small geographies, obtains sound estimates for similarly small population groups. Another study, which would examine the effects of the 2011 sample increase on the reliability of 5-year ACS estimates, may be worth pursuing.

Lastly, while the CVs for the total population of the AIR/ANVSA were generally determined by the total population size, there was evidence that AIR/ANVSAs had lower CVs due to higher sampling rates.

Several specific observations follow.

### *By Race Group and Tribal Grouping*

- Race groups and tribal groupings with similar population sizes generally had comparable estimate CVs.
- The CVs of estimates of the alone population and the in-combination population were comparable when the population sizes were similar.
- Tribal groupings and places/communities with similar population size totals generally had comparable CVs.
- Tribal groupings with similarly sized On Reservation and Off Reservation populations generally had comparable CVs.
- Tribal groupings with different proportions of population for the On Reservation and the Off Reservation had smaller CVs for estimates in the larger of the two groups. However, results were usually comparable with the results of other populations of similar size.

### *By Characteristic*

- The sizes of CVs were driven by size of the population at all geographic summary levels, but at the smaller summary levels (county and AIR/ANVSA) the prevalence of the characteristic also played a role.
- The median CVs of estimates of characteristics of the American Indian alone and Alaska Native alone populations were larger than those of the White alone, Black alone, and Asian alone populations. The size of the NHOPI alone population median CVs compared to those of the American Indian alone and Alaska Native alone varied by summary level. These differences were consistent with population sizes.

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