A Compass for Understanding and Using American Community Survey Data

What General Data Users Need to Know

Issued
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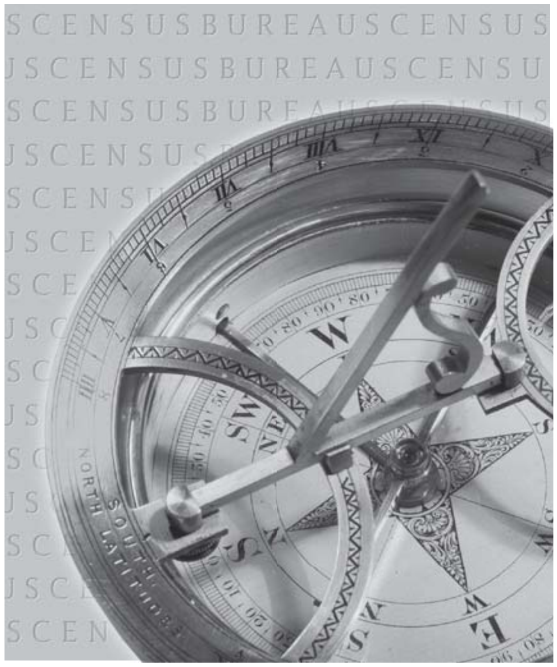

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ECONOMICS AND STATISTICS ADMINISTRATION

Contents

Foreword

The American Community Survey (ACS) is a nationwide survey designed to provide communities with reliable and timely demographic, social, economic, and housing data every year. The U.S. Census Bureau will release data from the ACS in the form of both single-year and multiyear estimates. These estimates represent concepts that are fundamentally different from those associated with sample data from the decennial census long form. In recognition of the need to provide guidance on these new concepts and the challenges they bring to users of ACS data, the Census Bureau has developed a set of educational handbooks as part of *The ACS Compass Products*.

We recognize that users of ACS data have varied backgrounds, educations, and experiences. They need different kinds of explanations and guidance to understand ACS data products. To address this diversity, the Census Bureau worked closely with a group of experts to develop a series of handbooks, each of which is designed to instruct and provide guidance to a particular audience. The audiences that we chose are not expected to cover every type of data user, but they cover major stakeholder groups familiar to the Census Bureau.

General data users

High school teachers

Business community

Researchers

Federal agencies

Media

Congress

Puerto Rico Community Survey data users (in Spanish)

Public Use Microdata Sample (PUMS) data users

Users of data for rural areas

State and local governments

Users of data for American Indians and Alaska Natives

The handbooks differ intentionally from each other in language and style. Some information, including a set of technical appendixes, is common to all of them. However, there are notable differences from one handbook to the next in the style of the presentation, as well as in some of the topics that are included. We hope that these differences allow each handbook to speak more directly to its target audience. The Census Bureau developed additional *ACS Compass Products* materials to complement these handbooks. These materials, like the handbooks, are posted on the Census Bureau's ACS Web site: <www.census.gov/acs/www>.

These handbooks are not expected to cover all aspects of the ACS or to provide direction on every issue. They do represent a starting point for an educational process in which we hope you will participate. We encourage you to review these handbooks and to suggest ways that they can be improved. The Census Bureau is committed to updating these handbooks to address emerging user interests as well as concerns and questions that will arise.

A compass can be an important tool for finding one's way. We hope *The ACS Compass Products* give direction and guidance to you in using ACS data and that you, in turn, will serve as a scout or pathfinder in leading others to share what you have learned.

Introduction

This handbook provides an overview of the U.S. Census Bureau's American Community Survey (ACS). The purpose is to help general audiences understand the basics of the ACS, its opportunities and challenges, and how to access and use the ACS data on the Census Bureau's Web site. It concludes with some concrete examples of how ACS data can be used to answer real-world questions about our society. A glossary and a series of technical appendixes are also included at the back of this handbook for those interested in more advanced ACS issues and applications.

About the American Community Survey

Every 10 years since 1790, Congress has authorized funds to conduct a national census of the U.S. population, as required by the U.S. Constitution. Recent censuses have consisted of a "short form," which included basic questions about age, sex, race, Hispanic origin, household relationship, and owner/renter status, and a "long form" used for only a sample of households that included not only the basic "short-form" questions but also detailed questions about socioeconomic and housing characteristics. The American Community Survey, a relatively new survey conducted by the Census Bureau, is ushering in the most substantial change in the decennial census in more than 60 years. The ACS is a nationwide, continuous survey designed to provide communities with reliable and timely demographic, housing, social, and economic data every year. The ACS will replace the decennial census long form in 2010 and thereafter by collecting long-form-type information throughout the decade rather than only once every 10 years. The ACS data will provide, for the first time, a continuous stream of updated information for states and local areas, and will revolutionize the way we use data to understand our communities.

The American Community Survey covers a broad range of topics about social, economic, demographic, and housing characteristics of the U.S. population as shown in Table 1. As in the decennial census, strict confidentiality laws protect all information that could be used to identify individuals or households.

Table 1. **Subjects Included in the American Community Survey**

Demographic Characteristics	Social Characteristics	Housing Characteristics
Age	Marital Status and Marital History*	Year Structure Built
Sex	Fertility	Units in Structure
Hispanic Origin	Grandparents as Caregivers	Year Moved Into Unit
Race	Ancestry	Rooms
Relationship to Householder (e.g., spouse)	Place of Birth, Citizenship, and Year of Entry	Bedrooms
	Language Spoken at Home	Kitchen Facilities
Economic Characteristics	Educational Attainment and School Enrollment	Plumbing Facilities
Income	Residence One Year Ago	House Heating Fuel
Food Stamps Benefit	Veteran Status, Period of Military Service, and VA Service-Connected Disability Rating*	Telephone Service Available
Labor Force Status	Disability	Farm Residence
Industry, Occupation, and Class of Worker		
Place of Work and Journey to Work		**Financial Characteristics**
Work Status Last Year		Tenure (Owner/Renter)
Vehicles Available		Housing Value
Health Insurance Coverage*		Rent
		Selected Monthly Owner Costs

*Marital History, VA Service-Connected Disability Rating, and Health Insurance Coverage are new for 2008.
Source: U.S. Census Bureau.

Who Uses the ACS and Why?

The ACS puts this up-to-date information about important social issues at the fingertips of people who need it, including policymakers, researchers, businesses and nongovernmental organizations, journalists, teachers, students, and the public. The federal government uses ACS information to evaluate the need for federal programs and to run those programs effectively. Nongovernmental organizations use the ACS in a variety of ways to monitor trends among important subgroups of the population, often at the state level. Journalists use ACS data to report on new or emerging social trends, or to put a piece of anecdotal evidence into a broader context. And state and local governments are using ACS information to keep track of year-to-year changes in their jurisdictions. The text box provides a few examples of how ACS data are being used.

Much of the ACS data provided on the Census Bureau's Web site are available separately by age group, race, Hispanic origin, and sex. For example, data users can compare the poverty status of children and the elderly, college enrollment rates for men and women, or housing costs for African Americans and non-Hispanic Whites. No other resource provides such a wealth of social, economic, and housing information about American society. See Appendix 8 for Web site links to additional background information about the ACS.

- **Federal agencies.** The U.S. Department of Veterans Affairs uses ACS data on the characteristics of veterans to evaluate the need for educational, employment, and health care programs to assist those who have served in the military. The Special Supplemental Food Program for Women, Infants, and Children (WIC) uses income data from the ACS to determine the potential demand for food assistance across states and counties.[1]

- **Nongovernmental organizations.** The Annie E. Casey Foundation uses ACS data to track annual changes in the well-being of children across the 50 states and the District of Columbia, including measures of child poverty, educational attainment, school enrollment, and employment status of parents. The Migration Policy Institute uses ACS data to present detailed, state-level information about the 37.5 million current U.S. residents who were born outside the United States. And the Population Reference Bureau has recently used ACS data to produce a datasheet on the U.S. labor force, including state-level estimates of people working in high-tech and other science and engineering jobs.

- **Journalists.** A recent article on commuting by CNN used ACS data to report that among large cities, New York has the highest share of workers using public transportation; Portland has the highest proportion of people who bike to work; and Boston leads large cities in the proportion of people who walk to work.[2]

- **State and local governments.** Information from the ACS is critical for state and local policymakers and planners who need up-to-date information about their communities to evaluate the need for new roads, hospitals, schools, senior centers, and other basic services. For example, the Council on Virginia's Future, which advises the Governor and the Virginia General Assembly, relies on ACS data to monitor annual trends in the travel time to work.

[1] For more information about federal uses of ACS data, see U.S. Census Bureau, Subjects Planned for the 2010 Census and American Community Survey: Federal Legislative and Program Uses, <www.census.gov/acs/www/Downloads/Final_2010_Census_and_American_Community_Survey_Subjects_Notebook.pdf>.

[2] Les Christie, "New Yorkers are top transit users: More than half ride subway or bus to work," CNNMoney.Com, June 29, 2007, <http://money.cnn.com/2007/06/13/real_estate/public_transit_commutes/index.htm>.

How the ACS Works

The ACS samples nearly 3 million addresses each year, resulting in nearly 2 million final interviews. The annual ACS sample is smaller than that of the Census 2000 long-form sample, which included about 18 million housing units. As a result, the ACS needs to combine population or housing data from multiple years to produce reliable numbers for small counties, neighborhoods, and other local areas. To provide information for communities each year, the ACS will provide 1-, 3-, and 5-year estimates.

ACS data are very timely because they are released in the year immediately following the year in which they are collected. ACS data collected from 2000 through 2004, and published from 2001 through 2005, are available for areas with 250,000 people or more, including all states, the District of Columbia, and many large counties and cities. As shown in Table 2, starting with the data collected in 2005, ACS information has been published for areas with populations of 65,000 or more. In the fall of 2008, the first 3-year estimates will be released based on data from the 2005, 2006, and 2007 surveys. By December 2009, the ACS will have sampled approximately 15 million addresses, and by 2010, the ACS will provide the first 5-year estimates of demographic, housing, social, and economic characteristics for the nation, states, cities, counties, and other small geographic areas. These 5-year estimates will then be updated annually by removing the earliest year and replacing it with the latest one, and will provide, for the first time, the ability to monitor social and economic trends in local communities.

Table 2. **Release Schedule for ACS Data**

		Year of Data Release							
Data product	**Population threshold**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
		Year(s) of Data Collection							
1-year estimates	65,000+	2005	2006	2007	2008	2009	2010	2011	2012
3-year estimates	20,000+			2005–2007	2006–2008	2007–2009	2008–2010	2009–2011	2010–2012
5-year estimates	All areas*					2005–2009	2006–2010	2007–2011	2008–2012

*Five-year estimates will be available for areas as small as census tracts and block groups.
Source: U.S. Census Bureau.

Differences Between the ACS and the Decennial Census

While the main function of the decennial census is to provide *counts* of people for the purpose of congressional apportionment and legislative redistricting, the primary purpose of the ACS is to measure the changing social and economic *characteristics* of the U.S. population. As a result, the ACS does not provide official counts of the population in between censuses. Instead, the Census Bureau's Population Estimates Program will continue to be the official source for annual population totals, by age, race, Hispanic origin, and sex. For more information about population estimates, visit the Census Bureau's Web site at <www.census.gov/popest/estimates.php>, or see Appendix 7 of this handbook. ACS estimates are controlled to match the Census Bureau's annual population estimates, by age, sex, race, and Hispanic origin.

Although the questions used in the ACS are very similar to those included on the long form used in Census 2000, there are some important differences between the two surveys. While the decennial census has provided a snapshot of the U.S. population once every 10 years, the ACS has been described as a "moving video image, continually updated to provide much needed data about our nation in today's fast-moving world."[3]

Because ACS data are collected continuously, they are not always comparable with data collected from the decennial census. For example, in the case of employment statistics, both surveys ask about employment status during the week prior to the survey. However, data from the decennial census are typically collected between March and August, whereas data from the ACS are collected nearly every day and reflect employment throughout the year. Differences in these responses may in turn affect data on commuting, occupation, and industry.[4] Other factors that may also have an impact on the data, such as seasonal variation in population and minor differences in question wording and question order, are described in more detail in Appendix 2 of this handbook. Additional guidance on making comparisons between ACS and census data is also provided in the section on "Making Comparisons" in Appendix 4.

Readers should also note that in 2006, the ACS began including samples of the population living in group quarters (e.g., jails, college dormitories, and nursing homes) for the first time. As a result, 2006 ACS data may not be comparable with data from earlier ACS surveys. This is especially true for estimates of young adults and the elderly, who are more likely than other groups to be living in group quarters facilities.

[3] Kathleen B. Cooper, "Halfway to the 2010 Census: The Countdown and Components to a Successful Decennial Census," paper presented to the House Subcommittee on federalism and the census, U.S. House of Representatives, Washington, DC, April 19, 2005, <www.ogc.doc.gov/ogc/legreg/testimon/109f/Cooper0419.htm>.

[4] U.S. Census Bureau, "Meeting 21st Century Demographic Data Needs—Implementing the American Community Survey, Report 5: Comparing Economic Characteristics With Census 2000," Washington DC, 2004, <http://www.census.gov/acs/www/Downloads/Report05.pdf>.

Geographic Areas Covered in the ACS

The ACS data are tabulated for a variety of different geographic areas ranging in size from broad geographic regions (Northeast, Midwest, South, and West) to cities, towns, neighborhoods, and census block groups. Table 3 shows the type and number of geographic areas included in the ACS, as well as the type of ACS estimates each will receive. The table is not exhaustive; it only covers major types of geographic areas. The information is based on geographic boundaries and population counts in 2007 and is therefore subject to change in future years.

Prior to December 2008, ACS data were only available for geographic areas with at least 65,000 people, including regions, divisions, states, DC, Puerto Rico, congressional districts, Public Use Microdata Areas (PUMAs),[5] and many large counties, metropolitan areas, cities, school districts, and American Indian areas. Starting in December 2008, 3-year estimates will be available for all areas with at least 20,000 people, and by 2010, we will have 5-year estimates for geographic areas down to the block group level. This means that by 2010, there will be 1-, 3-, and 5-year estimates—three sets of numbers—available for the state of Virginia, for example. Less populous areas, such as Bath County in Virginia's Shenandoah Valley, will receive only 5-year estimates. As the number of areas in column 1 makes clear, the vast majority of areas will receive only 5-year estimates.

Table 3. **Major Geographic Areas and Type of ACS Estimates Received**

Type of geographic area	Total number of areas	Percent of total areas receiving . . .		
		1-year, 3-year, & 5-year estimates	3-year & 5-year estimates only	5-year estimates only
States and District of Columbia	51	100.0	0.0	0.0
Congressional districts	435	100.0	0.0	0.0
Public Use Microdata Areas*	2,071	99.9	0.1	0.0
Metropolitan statistical areas	363	99.4	0.6	0.0
Micropolitan statistical areas	576	24.3	71.2	4.5
Counties and county equivalents	3,141	25.0	32.8	42.2
Urban areas	3,607	10.4	12.9	76.7
School districts (elementary, secondary, and unified)	14,120	6.6	17.0	76.4
American Indian areas, Alaska Native areas, and Hawaiian homelands	607	2.5	3.5	94.1
Places (cities, towns, and census designated places)	25,081	2.0	6.2	91.8
Townships and villages (minor civil divisions)	21,171	0.9	3.8	95.3
ZIP Code tabulation areas	32,154	0.0	0.0	100.0
Census tracts	65,442	0.0	0.0	100.0
Census block groups	208,801	0.0	0.0	100.0

* When originally designed, each PUMA contained a population of about 100,000. Over time, some of these PUMAs have gained or lost population. However, due to the population displacement in the greater New Orleans areas caused by Hurricane Katrina in 2005, Louisiana PUMAs 1801, 1802, and 1805 no longer meet the 65,000-population threshold for 1-year estimates. With reference to Public Use Microdata Sample (PUMS) data, records for these PUMAs were combined to ensure ACS PUMS data for Louisiana remain complete and additive.

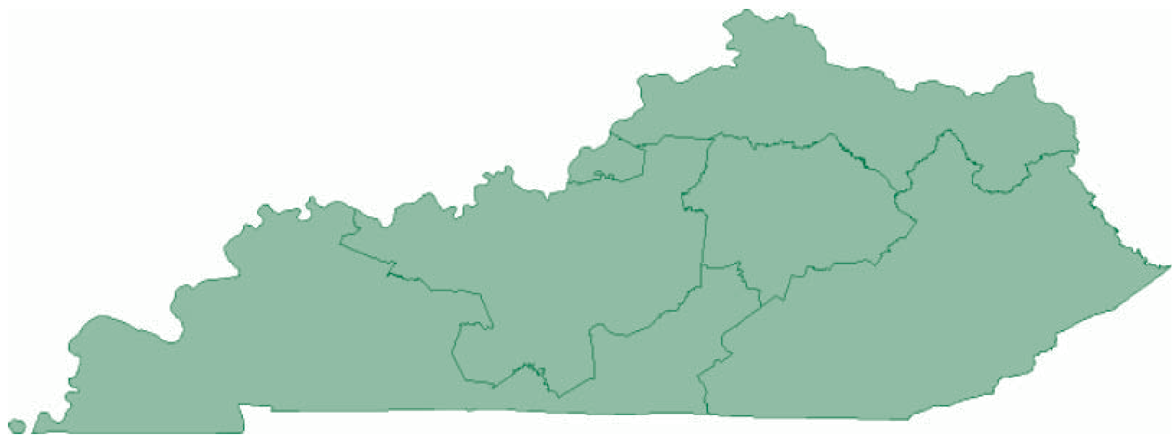
Source: U.S. Census Bureau, 2008. This tabulation is restricted to geographic areas in the United States. It was based on the population sizes of geographic areas from the July 1, 2007, Census Bureau Population Estimates and geographic boundaries as of January 1, 2007. Because of the potential for changes in population size and geographic boundaries, the actual number of areas receiving 1-year, 3-year, and 5-year estimates may differ from the numbers in this table.

[5] Public Use Microdata Areas, or PUMAs, are census-constructed geographic areas, each with approximately a population of 100,000. PUMAs do not cross state lines.

In Figures 1 through 4, sample maps for a single state—Kentucky—show users some of the key geographic areas available through the ACS: congressional districts, PUMAs, counties, and tracts.

Congressional districts are redrawn after each census for the purpose of electing the members of the U.S. House of Representatives. Each of Kentucky's six congressional districts (shown in Figure 1) includes approximately 700,000 people. ACS data on congressional districts can be used to compare the home districts of the 435 House members, including how they are changing over time. The Census Bureau released congressional district-level data starting in 2001, based on the 2000 ACS.

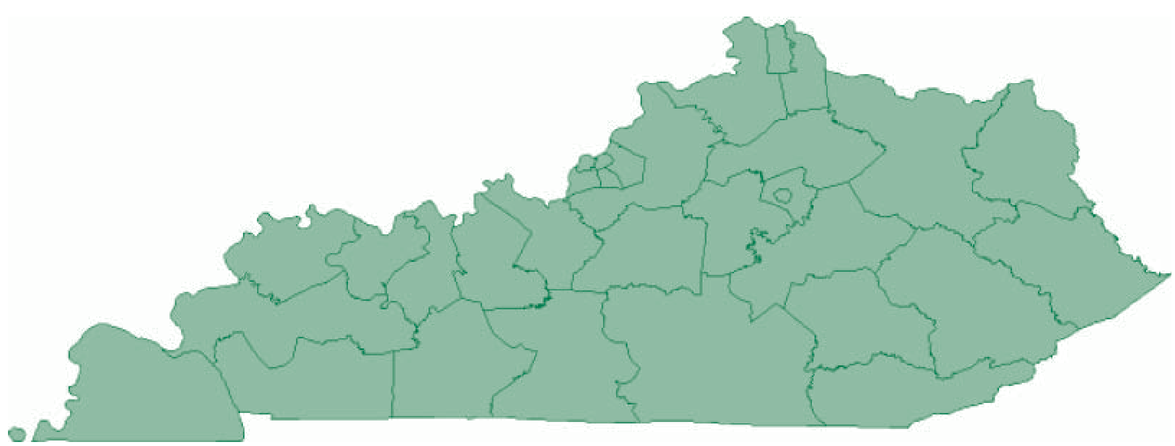
Figure 1. **110th Congressional Districts in Kentucky**



Source: U.S. Census Bureau, 110th Congressional Districts Geographic Products, accessed at <www.census.gov/geo/www/cd110th/main110th.html>.

The Census Bureau also divides each state into a series of PUMAs each of which has a minimum population of 100,000. They are constructed based on county, neighborhood, and city boundaries and are not allowed to cross state lines. Typically, counties with large populations are subdivided into multiple PUMAs, while PUMSs in more rural areas are made up of groups of contiguous counties. PUMAs are especially useful for rural areas because, unlike counties, they all meet the 65,000-population threshold that is needed to produce single-year ACS estimates. See Table 3's footnote. Kentucky's PUMAs are shown below in Figure 2. The Census Bureau released PUMA-level data starting in 2006, based on the 2005 ACS.

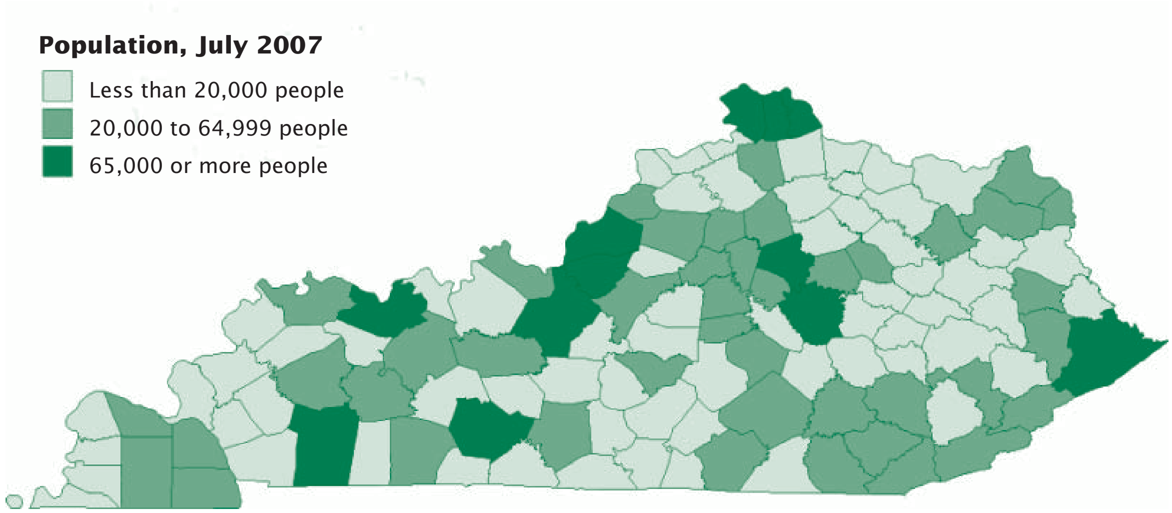
Figure 2. **Census Public Use Microdata Areas in Kentucky**



Source: U.S. Census Bureau, Cartographic Boundary Files, accessed at <www.census.gov/geo/www/cob/bdy_files.html>.

Counties are also important because they are the primary legal subdivision within each state. Of Kentucky's 120 counties (see Figure 3), there are 12 for which single-year estimates are available, 43 that will have 3-year estimates starting in 2008, and 65 that will have 5-year estimates available each year starting in 2010.

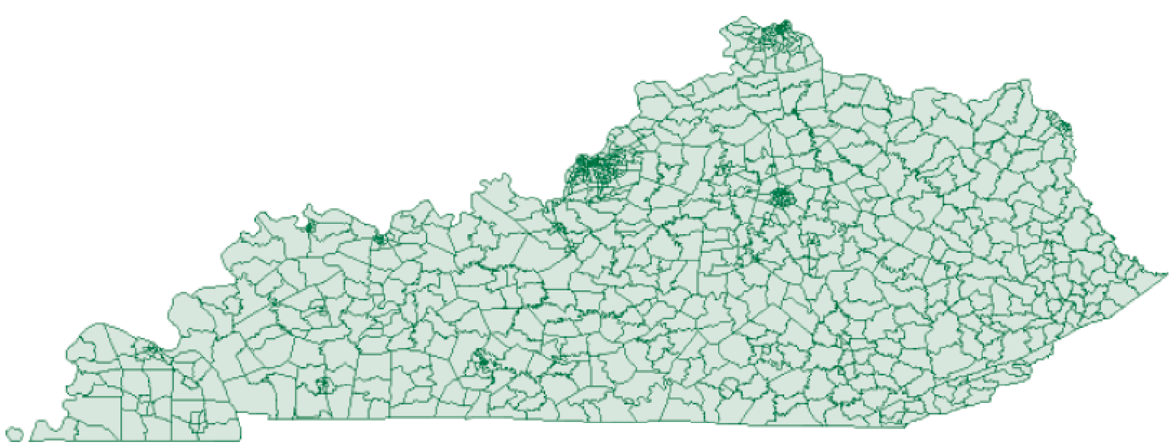
Figure 3. **Counties in Kentucky by Population Size, 2007**



Source: U.S. Census Bureau, County Population Estimates, accessed at <www.census.gov/popest/counties/asrh/cc-est2007-alldata-21,csv>.

Census tracts are small geographic areas—with an average of about 4,000 people each—that are commonly used to present information for small towns, rural areas, and neighborhoods. ACS data are not currently available at the tract level because of their small population sizes, with the exception of 34 ACS test counties scattered around the country.[6] Figure 4 shows the type of geographic detail that will be available once enough data are collected to produce reliable data for local areas.

Figure 4. **Census Tracts in Kentucky**



Source: U.S. Census Bureau, Cartographic Boundary Files, accessed at <www.census.gov/geo/www/cob/bdy_files.html>.

[6] Five-year estimates for census tracts in the 34 of the 36 ACS test counties are available on the Census Bureau's Web site at <www.census.gov/acs/www/AdvMeth/Multi_Year_Estimates/online_data_year.html>.

Benefits and Challenges of ACS Data

The ACS provides several advantages over the information that has been collected in the past through the decennial census long-form samples. The main benefits of the ACS are timeliness and access to annual data for states, local areas, and small population subgroups. The ACS will deliver useful, relevant data, similar to data from previous census long forms, but updated every year instead of every 10 years.

Federal, state, and local governments and planners rely on demographic, housing, social, and economic data in their budget formulations and to allocate funds. For example, ACS data can be used to determine funding levels for food stamp programs or to help decide where to build a new school, highway, or day care center. Corporations, small businesses, and individuals can use these data to develop business plans, to set strategies for expansion or starting a business, and to determine trends in their service areas to meet current and future needs.

Small towns and rural communities have much to gain from the ACS. Lacking the staff and resources to conduct their own research, many local communities rely on decennial census information that becomes increasingly outdated throughout the decade, or use local administrative records that are not comparable with information collected in neighboring areas.[7]

The ACS also provides tools for those who want to conduct their own research. The ACS includes a Public Use Microdata Sample (PUMS) file each year that enables researchers to create custom universes and tabulations from individual ACS records that have been stripped of personally identifiable information. The 2006 ACS PUMS file includes about 1.2 million housing units, about two-thirds of the 2 million housing units that were interviewed and included in the published ACS tabulations for 2006.[8]

The use of professional, highly trained, permanent interviewers has improved the accuracy of ACS data compared with those from the decennial census long-form sample. This strategy has effectively reduced the number of refusals to complete the ACS questionnaire. ACS interviewers also obtain more complete information than decennial census interviewers. For example, a comparison between ACS and Census 2000 data for the Bronx showed that while the Census 2000 had a higher initial mail response rate than the ACS, it was less effective than the ACS during follow-up phases, when information is collected from nonrespondents.[9] As a result, ACS item allocation rates are lower, and nonsampling error is reduced.

The main challenges for ACS data users are understanding and using multiyear estimates and the relatively large confidence intervals associated with ACS data for smaller geographic areas and subgroups of the population. Both of these issues are addressed in more detail below. ACS data will be produced every year, but in exchange for this benefit, the sample size of the ACS needs to be smaller than that of the Census 2000 long-form sample.

By 2010, data users will have access to 5-year estimates of ACS data. The sample size based on 5-year period estimates of ACS data is still smaller than the long-form sample in the decennial census, resulting in larger standard errors in the ACS 5-year estimates. Census Bureau researchers expect that the higher sampling error in the ACS is offset, to some extent, by a reduction in nonsampling error, due to the use of experienced ACS interviewers and the refusal to allow survey data to be obtained from neighbors.[10]

Finally, the ACS includes several questions that are very similar to those collected in other federal surveys—especially the Current Population Survey (CPS), the American Housing Survey, and the Survey of Income and Program Participation. In some cases, there are clear guidelines about which data to use. For example, the CPS is the official source of income and poverty data. It includes detailed questions on these topics and should be used in reporting national trends in these subject areas. The Census Bureau recommends that ACS information on income and poverty be used to supplement CPS data for areas below the state level and for population subgroups (such as age, sex, race, Hispanic origin, type of household) at the state level. See the fact sheet available at <http://www.census.gov/Press-Release/www/2007/acs_vs_cps.htm>. For states, generally the Census Bureau recommends using the ACS, though the CPS is still valuable as a source for examining historical state income and poverty trends.[11]

Refer to Appendix 8, particularly the section "ACS Design, Methodology, Operations" for more information. Further information on the methodology of the ACS is available on the Census Bureau Web site.

[7] David Swanson and George Hough, "An Evaluation of the American Community Survey: Preliminary Results From a County Level Analysis of the Oregon Test Site," paper presented at the Annual Meeting of the Mississippi Academy of Sciences, Biloxi, Mississippi, February 19–20, 2004, <http://www.olemiss.edu/depts/population_studies/WorkingPapers/MAS_ACS_FINAL_REV1a.pdf>.

[8] The ACS includes nearly 3 million addresses in its initial sample each year. However, a subsample of the addresses that do not respond via mail or telephone is selected to be visited in person, resulting in approximately 2 million final interviews each year.

[9] Joseph J. Salvo, "Making it in the Bronx: First the Yankees, Next the ACS? Analysis of Nonresponse in the Bronx Test Site," and Susan P. Love "Making it in the Bronx: A Supplement," papers presented at the American Community Survey Research Group Session, March 11, 2003, <http://www.census.gov/acs/www/AdvMeth/Papers/Papers43_intro.htm>.

[10] Charles H. Alexander, "American Community Survey Data for Economic Analysis," paper presented to the Census Advisory Committee of the American Economic Association, Washington, DC, October 18–19, 2001, <http://www.census.gov/acs/www/Downloads/ACS/Paper32.doc>.

[11] U.S. Census Bureau, "U.S. Census Bureau Guidance on Using 2007 Income and Poverty Estimates From the Current Population Survey and American Community Survey," <http://www.census.gov/Press-Release/www/2007/guidance_acs_cps.htm>.

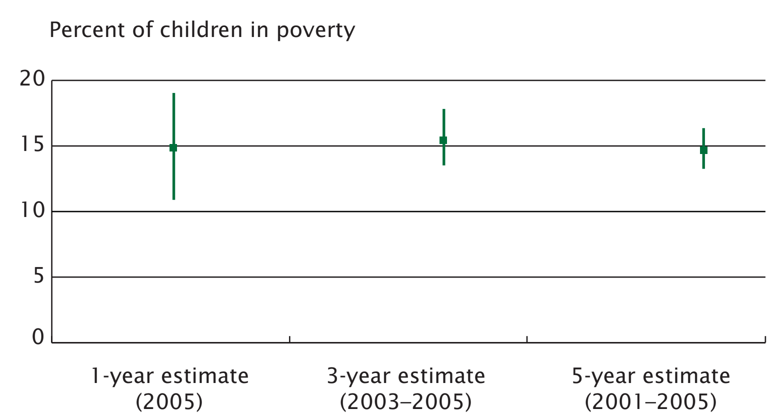
Understanding Single-Year and Multiyear Estimates

Multiyear estimates are likely to confuse some data users, in part because of their statistical properties, and in part because this is a new product from the Census Bureau. The ACS will provide all states and communities that have at least 65,000 residents with single-year estimates of demographic, housing, social, and economic characteristics—a boon to government agencies that need to budget and plan for public services like transportation, medical care, and schools. For geographic areas with smaller populations, the ACS samples too few households to provide reliable single-year estimates. For these communities, several years of data will be pooled together to create reliable 3-year or 5-year estimates.

Single-year, 3-year, and 5-year estimates from the ACS are all "period" estimates that represent data collected over a period of time (as opposed to "point-in-time" estimates, such as the decennial census, that approximate the characteristics of an area on a specific date). While a single-year estimate includes information collected over a 12-month period, a 3-year estimate represents data collected over a 36-month period, and a 5-year estimate includes data collected over a 60-month period. Therefore, ACS estimates based on data collected from 2005–2007 should not be called "2006" or "2007" estimates. Nor should 2005–2009 period estimates be labeled "2007" estimates, even though that is the midpoint of the 5-year period. Multiyear estimates should be labeled to indicate clearly the full period of time (e.g., "The child poverty rate in 2005–2007 was X percent"). For more information about understanding single-year and multiyear estimates, see Appendix 1 of this handbook.

The primary advantage of using multiyear estimates is the increased statistical reliability of the data for less populated areas and small population subgroups. An example of 1-, 3-, and 5-year estimates for Rockland County, New York, is shown in the chart in Figure 5. The lines above and below the point estimates represent the confidence intervals, or ranges of uncertainty, around each estimate. As you can see, the level of precision improves dramatically with the 3- and 5-year estimates as indicated by the shorter lines.

Figure 5. **Child Poverty Rate in Rockland County, New York, Selected Year**



Source: U.S. Census Bureau, American Community Survey.

Making Comparisons With Multiyear Estimates

One of the challenges for data users is deciding how to compare geographic areas with different population sizes. Estimates for areas with fewer than 20,000 people are produced only in the form of 5-year estimates, while single-year estimates are available for areas with populations of 65,000 or more. To facilitate such geographic comparisons, the Census Bureau plans to publish 5-year estimates for all geographic areas and 3-year estimates for all areas with 20,000 or more residents. The Census Bureau encourages comparing estimates based only on the same survey year(s). For example, suppose someone wanted to compare estimates for Nantucket, a small island off the coast of Massachusetts, with estimates for Boston. Even though the ACS publishes 1-year estimates for Boston, only 5-year estimates will be published for Nantucket. Thus, in 2010, when 5-year estimates for smaller geographic areas become available, compare 2005–2009 estimates for Nantucket with 2005–2009 estimates for Boston, even though more recent, single-year estimates are available for Boston.

Other alternatives for presenting ACS data for less populated areas include showing single-year estimates for large counties in Massachusetts and then combining the remaining counties into a state "residual" by subtracting the available single-year data from the state total. Or, you could present data for PUMAs, since they meet the 65,000-population threshold required for single-year estimates and are often used as a substitute for county-level data.[12]

While multiyear estimates provide valuable data for small geographic areas, using them to look at trends for small populations can be challenging because they rely on pooled data for 3 or 5 years. For example, comparisons of 3-year estimates from 2005 to 2007 and 2006 to 2008 are unlikely to show much difference because two of the years overlap (both sets of estimates include the same data collected in 2006 and 2007). The overlap is even greater for the 5-year estimates used for areas with fewer than 20,000 people. The Census Bureau suggests comparing periods that do not overlap—comparing 2005–2007 estimates with 2008–2010 estimates, for example. This means waiting longer to identify a trend. However, in areas undergoing fundamental shifts in the size or composition of the population, change may be so substantial that it will be obvious after only a few years. Additional guidance on the use and interpretation of single-year and multiyear estimates is provided in Appendix 1.

Data users also need to use caution in looking at trends involving income or other measures that are adjusted for inflation, such as rental costs, home values, and energy costs. Appendix 5 provides information on the adjustment of single-year and multiyear ACS estimates for inflation. Note that inflation adjustment is based on a national-level consumer price index: it does not adjust for differences in costs of living across different geographic areas.

Understanding Margin of Error

All data that are based on samples, such as the ACS and the census long-form samples, include a range of uncertainty. Two broad types of error can occur: sampling error and nonsampling error. Nonsampling errors can result from mistakes in how the data are reported or coded, problems in the sampling frame or survey questionnaires, or problems related to nonresponse or interviewer bias. The Census Bureau tries to minimize nonsampling errors by using trained interviewers and by carefully reviewing the survey's sampling methods, data processing techniques, and questionnaire design. Appendix 6 includes a more detailed description of different types of errors in the ACS and other measures of ACS quality.

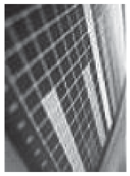
Sampling error occurs when data are based on a sample of a population rather than the full population. Sampling error is easier to measure than nonsampling error and can be used to assess the statistical reliability of survey data. For any given area, the larger the sample and the more months included in the data, the greater the confidence in the estimate. The Census Bureau reported the 90-percent confidence interval on all ACS estimates produced for 2005 and earlier. With the release of the 2006 ACS data, *margins of error* are now provided for every ACS estimate. Ninety-percent confidence intervals define a range expected to contain the *true* value of an estimate with a level of confidence of 90 percent. Margins of error are easily converted into these confidence ranges. For example, the 2006 ACS *Data Profile* for Massachusetts, shown in Figure 6, shows that 1,175,784 married-couple families resided in the state in 2006. By adding and subtracting the margin of error from the point estimate, we can calculate the 90-percent confidence interval for that estimate:

1,175,784 – 11,265 = 1,164,519 = Lower-bound interval
1,175,784 + 11,265 = 1,187,049 = Upper-bound interval

Therefore, we can be 90 percent confident that the true number of married-couple families in Massachusetts falls somewhere between 1.16 million and 1.19 million. Detailed information about sampling error and instructions for calculating confidence intervals and margins of error are included in Appendix 3 of this handbook.

[12] Although Public Use Microdata Areas typically follow county boundaries, this is not always the case, particularly in some New England states.

Figure 6. **Sample Estimate and Margin of Error in American FactFinder**



Massachusetts
Selected Social Characteristics in the United States: 2006
Data Set: **2006 American Community Survey**
Survey: **American Community Survey**

Social - Education, Marital Status, Relationships, Fertility, Grandparents...
Economic - Income, Employment, Occupation, Commuting to Work...
Housing - Occupancy and Structure, Housing Value and Costs, Utilities...
Demographic - Sex and Age, Race, Hispanic Origin, Housing Units...
Narrative - Text profile with graphs for easy analysis...

NOTE. Although the American Community Survey (ACS) produces population, demographic and housing unit estimates, it is the Census Bureau's Population Estimates Program that produces and disseminates the official estimates of the population for the nation, states, counties, cities and towns and estimates of housing units for states and counties.

For more information on confidentiality protection, sampling error, nonsampling error, and definitions, see Survey Methodology.

Selected Social Characteristics in the United States: 2006	Estimate	Margin of Error
HOUSEHOLDS BY TYPE		
Total households	**2,446,485**	**+/-10,151**
Family households (families)	1,565,973	+/-11,720
With own children under 18 years	735,720	+/-11,952
Married-couple families	1,175,784	+/-11,265
With own children under 18 years	528,590	+/-9,699
Male householder, no wife present	100,087	+/-4,978
With own children under 18 years	40,522	+/-3,436
Female householder, no husband present	290,102	+/-8,097
With own children under 18 years	166,608	+/-7,082
Nonfamily households	880,512	+/-10,736
Householder living alone	707,650	+/-11,082
65 years and over	249,309	+/-6,720

Source: U.S. Census Bureau, American FactFinder, accessed at <http://factfinder.census.gov>.

The margin of error around an estimate is important because it helps you draw conclusions about the data. Small differences between two estimates may not be statistically significant if the confidence intervals of those estimates overlap. However, the Census Bureau cautions data users not to rely on overlapping confidence intervals as a test for statistical significance, because this method will not always produce accurate results. Instead, the Census Bureau recommends following the detailed instructions for conducting statistical significance tests in Appendix 4 of this handbook.

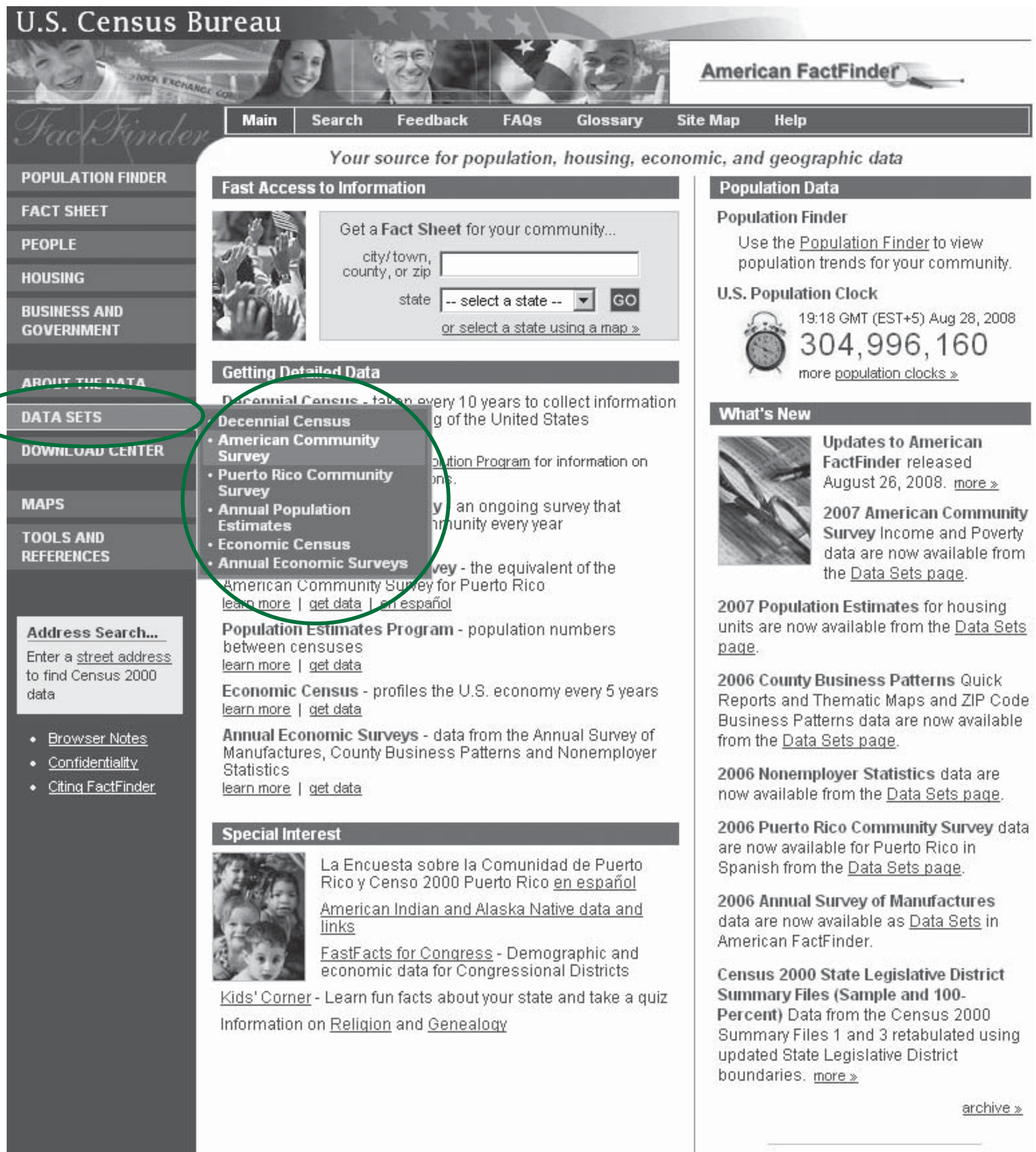
In some cases, data users will need to construct custom ACS estimates by combining data across multiple geographic areas or population subgroups or it may be necessary to derive a new percentage, proportion, or ratio from published ACS data. In such cases, additional calculations are needed to produce confidence intervals and margins of error for the derived estimates. Appendix 3 provides detailed instructions on how to make these calculations. Note that these error measures do not tell us about the magnitude of nonsampling errors.

Some advanced data users will also want to construct custom ACS estimates from the Census Bureau's PUMS. There are separate instructions for conducting significance tests for PUMS estimates, available on the Census Bureau's American FactFinder (AFF) Web site at <http://factfinder.census.gov/home/en/acs_pums_2006.html>. (Click on *2006 PUMS Accuracy* if using the 2006 ACS PUMS.) Readers can also consult the PUMS Handbook in this handbook series.

Accessing ACS Data

All ACS data are available through the Census Bureau's American FactFinder (AFF) Web site at <http://factfinder.census.gov>.[13] From the AFF home page, click on *Data Sets*, and then choose the *American Community Survey* from the list of options in the drop-down menu, as shown in Figure 7. There is a separate link to the *Puerto Rico Community Survey*—first conducted in 2005—for those interested in the latest data for Puerto Rico.[14]

Figure 7. **American FactFinder Web Site**



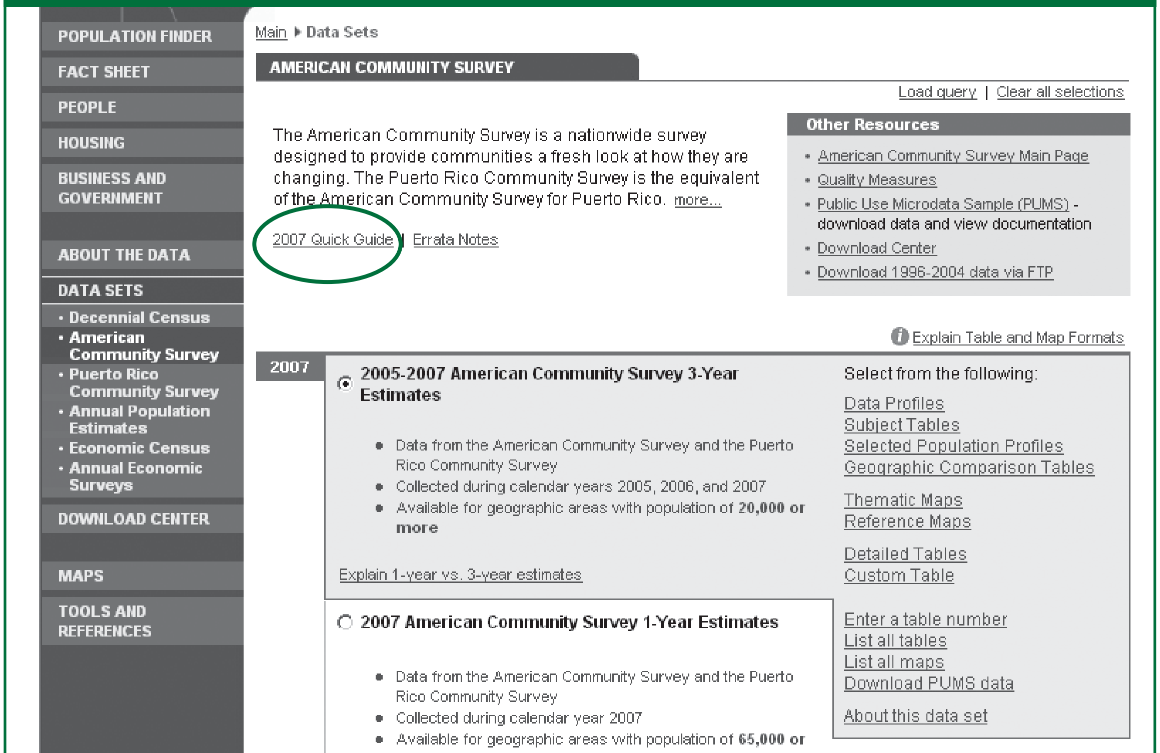
Source: U.S. Census Bureau, American FactFinder, accessed at <http://factfinder.census.gov>.

[13] The only exceptions are the ACS Summary Tables available for download through the Census Bureau's File Transfer Protocol (FTP) server, at <http://www2.census.gov/acs2006/Final_Summaryfile/>. These files are designed for advanced users with SAS or SPSS programming capabilities.

[14] Data for Puerto Rico can be accessed from both the ACS and the Puerto Rico Community Survey data sets.

Figure 8 is a screen shot of the data sets page. For the 2007 ACS, two data sets are shown—the 1-year estimates (based on the 2007 ACS) and the 3-year estimates (based on the 2005–2007 ACS). Tabs also index 2005 and 2006 ACS data sets. The AFF will default to the most recent data set but users can choose from any of these data sets. It is important for all users to understand that once a data set is selected, the accessed tables will all correspond to this specific data set. All tables are clearly labeled, identifying the data set. The *2007 Quick Guide*, circled in Figure 8, provides detailed descriptions of the different ACS data products that are available.

Figure 8. **ACS Data Products Available Through the American FactFinder Web Site**



Source: U.S. Census Bureau, American FactFinder, accessed at <http://factfinder.census.gov>.

Figure 9 is another screenshot of the data sets page that shows the links to the various data products available from the 2007 ACS. Many of the ACS data products are similar to those available for Census 2000, but several new data products are also available. All of the tables and graphs are easy to use and include measures of statistical reliability.

Figure 9. **Data Sets Page**

Source: U.S. Census Bureau, American FactFinder, accessed at <http://factfinder.census.gov>.

The set of ACS data products are described below. Table 4 provides a quick summary.

- **Data profiles, ranking tables, and narrative profiles.** The *data profiles* and *ranking tables* are good places to start for novice data users. *Data profiles* provide separate fact sheets on the social, economic, demographic, and housing characteristics for different geographic areas, while *ranking tables* provide state-level rankings of key ACS variables. *Narrative profiles* also provide clear, concise textual descriptions of the data included in the *data profiles*. They must be accessed by selecting *data profiles* from the menu.

- **Geographic comparison tables.** Those interested in geographic comparisons for areas other than states may be interested in the *geographic comparison tables*, which allow comparison of ACS data across a variety of geographic areas, including metropolitan areas, cities, counties, and congressional districts.

- **Thematic maps.** The *thematic maps* provide graphic displays of the data available through the *geographic comparison tables*. Different shades of color are used to display variations in the data across geographic areas. Data users can also highlight areas with statistically different values from a selected state, county, or metropolitan area of interest.

- **Subject tables.** For information about a particular topic (e.g., employment, education, and income), start with the *subject tables*, which provide pretabulated numbers and percentages for a wide variety of topics, often available separately by age, gender, or race/ethnicity.

- **Selected population profiles.** The most detailed race/ethnic data are available through the *selected population profiles*, which provide summary tables separately for over 100 detailed race, ethnic, and tribal groups. Beginning with the 2007 ACS, the *selected population profiles* also include country of birth. Data are currently unavailable for many of these tables because the ACS does not publish single-year estimates for groups with fewer than 65,000 people in a given area. However, more of these data tables will be available with the release of 3- and 5-year estimates.

- **Comparison profiles.** The *comparison profiles* show data side-by-side from the 2006 ACS and the 2007 ACS, indicating where there is a statistically significant difference between the two sets of estimates. Comparison profiles are only available for 1-year estimates.

- **Detailed tables and summary files.** The *detailed tables* are the best source for advanced data users or those who want access to the most comprehensive ACS tables. For more advanced users, *detailed tables* are also available for download through the ACS *Summary File* on the Census Bureau's FTP Web site <www.census.gov/acs/www/Special/acsftp.html>.

- **Public Use Microdata Sample files.** Those with expertise in using SAS, SPSS, or STATA may also be interested in the *Public Use Microdata Sample (PUMS) files*, which contain a sample of individual records of people and households that responded to the survey (stripped of all identifying information). The PUMS files permit analysis of specific population groups and custom variables that are not available through the American FactFinder. For example, PUMS data users can look at the proportion of children ages 5 to 11 living in low-income working families, or the number of scientists and engineers earning more than $75,000. Data users can also combine multiple years of PUMS data to produce data for relatively small population subgroups (e.g., American Indian physicians). More information about the PUMS is available in the PUMS Handbook.

- **Custom tables.** The *custom tables* option allows someone to customize specific detailed tables to meet his or her needs. You can extract selected rows of data from one or more detailed tables to create a table with just the estimates you want to include.

Table 4. **Quick Summary of Key ACS Data Products**

Data product	Geographic areas covered	Description
Data profiles	All*	Provide broad social, economic, housing, and demographic profiles.
Narrative profiles	All*	Summarize the information in the data profiles using concise, nontechnical text.
Selected population profiles	All*	Provide broad social, economic, and housing profiles for a large number of race, ethnic, and ancestry groups.
Ranking tables	States, DC, Puerto Rico	Provide state rankings of estimates across 86 key variables.
Subject tables	All*	Similar to data profiles but include more detailed ACS data, classified by subject.
Detailed tables	All*	Provide access to the most detailed ACS data and cross-tabulations of ACS variables.
Geographic comparison tables	All*	Compare geographic areas other than states (e.g., counties or congressional districts) for key variables.
Thematic maps	All*	Interactive, online maps that can be used to display ACS data.
Custom tables	All*	Allow the user to extract specific rows of data from the ACS detailed tables.
Summary files	All*	Provide access to the detailed tables through a series of comma-delimited text files on the Census Bureau's FTP site <www2.census.gov>.
Public Use Microdata Sample files	States, DC, Puerto Rico, PUMAs	Provide access to ACS microdata for data users with SAS and SPSS software experience.

*Note: Data will be available for local areas and small population subgroups with the release of 3-year and 5-year estimates.

Case Studies Using ACS Data

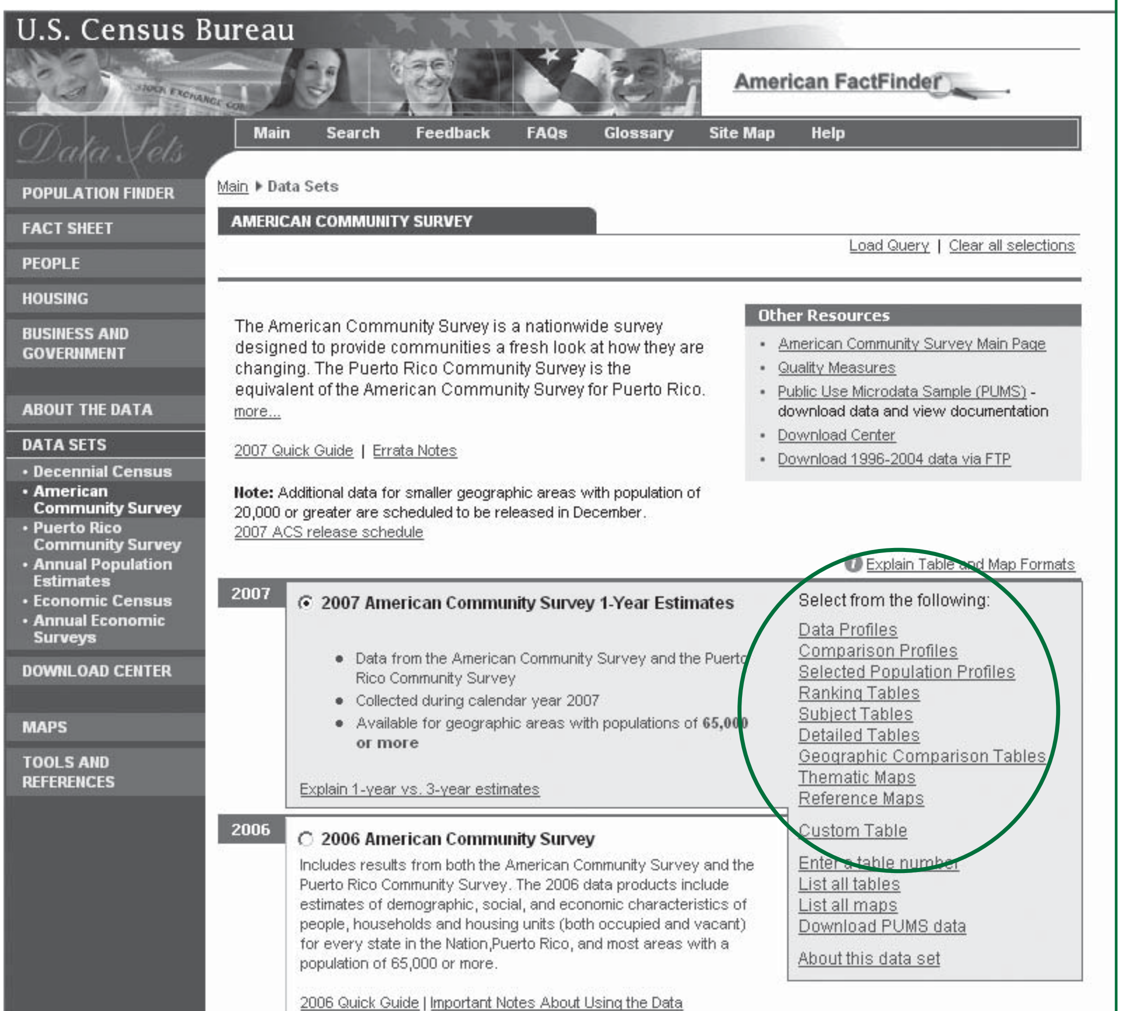
By now you should have a fairly good understanding of the ACS, the opportunities it provides, and its limitations. In this last section, we provide some concrete examples of how ACS data can be used to answer specific questions about social and economic patterns in the United States.

Case Study #1: The Local Official

Bill is a public official in Miami-Dade County, FL. In 2005, the city adopted a plan to reduce the poverty rates through a series of job training initiatives. Have these initiatives improved economic health in the city?

Bill starts his analysis by going to the American FactFinder. Figure 10 displays the list of data products from the 2007 ACS. He selects the 2007 ACS *Data Profile* and then selects his geographic area, Miami-Dade County.

Figure 10. **ACS Products Available Through American FactFinder: Data Profiles**



Source: U.S. Census Bureau, American FactFinder, accessed at <http://factfinder.census.gov>.

The 2007 ACS *Data Profile* includes five summaries, one focuses on economic characteristics. This profile indicates that Miami-Dade County's poverty rate for all people was 15.3 percent with a margin of error of 0.7 percentage points. Next, he uses the navigation tools in the left sidebar to view the same ACS table for the 2006 ACS. This 2006 profile indicates a poverty rate of 16.4 percent (± 0.6).

He pastes the poverty data from these tables into a spreadsheet, including confidence intervals around each estimate.[15] Based on the point estimates, it appears that the poverty rate has declined.

Figure 11. **Example of ACS Data Profiles and Options for Viewing Tables**

2007 Data Profiles:

- Social
- **Economic**
- Housing
- Demographic
- Narrative

2007 Comparison Profile

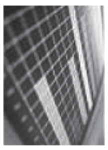
View this table...

- **from 2007**
- from 2006
- from 2005

View this table...

for other geographies (state, county, place...)

- Subject Definitions
- Quality Measures



Miami-Dade County, Florida

Selected Economic Characteristics: 2007

Data Set: **2007 American Community Survey 1-Year Estimates**

Survey: **American Community Survey**

Social - Education, Marital Status, Relationships, Fertility, Grandparents...
Economic - Income, Employment, Occupation, Commuting to Work...
Housing - Occupancy and Structure, Housing Value and Costs, Utilities...
Demographic - Sex and Age, Race, Hispanic Origin, Housing Units...
Narrative - Text profile with graphs for easy analysis...

NOTE. Although the American Community Survey (ACS) produces population, demographic and housing unit estimates, it is the Census Bureau's Population Estimates Program that produces and disseminates the official estimates of the population for the nation, states, counties, cities and towns and estimates of housing units for states and counties.

For more information on confidentiality protection, sampling error, nonsampling error, and definitions, see Survey Methodology.

Selected Economic Characteristics: 2007	Estimate	Margin of Error	Percent	Margin of Error
EMPLOYMENT STATUS				
Population 16 years and over	**1,910,219**	**+/-2,344**	**100%**	**(X)**
In labor force	1,178,665	+/-10,343	61.7%	+/-0.5
Civilian labor force	1,177,141	+/-10,359	61.6%	+/-0.6
Employed	1,116,107	+/-10,530	58.4%	+/-0.6
Unemployed	61,034	+/-4,571	3.2%	+/-0.2
Armed Forces	1,524	+/-604	0.1%	+/-0.1
Not in labor force	731,554	+/-10,703	38.3%	+/-0.5

PERCENTAGE OF FAMILIES AND PEOPLE WHOSE INCOME IN THE PAST 12 MONTHS IS BELOW THE POVERTY LEVEL				
All families	11.8%	+/-0.8	(X)	(X)
With related children under 18 years	16.1%	+/-1.2	(X)	(X)
With related children under 5 years only	13.8%	+/-2.9	(X)	(X)
Married couple families	7.6%	+/-0.8	(X)	(X)
With related children under 18 years	8.4%	+/-1.1	(X)	(X)
With related children under 5 years only	6.3%	+/-2.4	(X)	(X)
Families with female householder, no husband present	23.4%	+/-2.1	(X)	(X)
With related children under 18 years	31.4%	+/-2.8	(X)	(X)
With related children under 5 years only	33.8%	+/-7.9	(X)	(X)
All people	15.3%	+/-0.7	(X)	(X)
Under 18 years	20.2%	+/-1.6	(X)	(X)
Related children under 18 years	19.5%	+/-1.6	(X)	(X)
Related children under 5 years	20.2%	+/-2.3	(X)	(X)
Related children 5 to 17 years	19.3%	+/-1.7	(X)	(X)
18 years and over	13.9%	+/-0.6	(X)	(X)
18 to 64 years	12.4%	+/-0.6	(X)	(X)
65 years and over	20.0%	+/-1.2	(X)	(X)
People in families	12.3%	+/-0.9	(X)	(X)
Unrelated individuals 15 years and over	30.1%	+/-1.4	(X)	(X)

Source: U.S. Census Bureau, 2007 American Community Survey

Source: U.S. Census Bureau, American FactFinder, accessed at <http://factfinder.census.gov>.

[15] One way to present confidence intervals in Excel is to use "Stock" charts to display the data.

Bill is interested in the overall change from 2006 to 2007, but he is not sure from the data whether the decrease over this time period represents a statistically significant change. He uses the instructions included in Appendix 4 of this handbook to find the formulas he needs to test for a significant difference between two ACS estimates. First, he needs to calculate the standard error associated with each of the two estimates:

$$SE = \frac{MOE_{ACS}}{1.645}$$

Where MOE_{ACS} is the ACS published margin of error for the estimate.

For the 2007 estimate: $SE = \frac{0.7}{1.645} = 0.43$

For the 2006 estimate: $SE = \frac{0.6}{1.645} = 0.36$

He then uses a second formula to test whether the difference between the two estimates is significant at the 90-percent confidence level:

$$\left| \frac{\hat{X}_1 - \hat{X}_2}{\sqrt{SE_1^2 + SE_2^2}} \right| > Z_{CL}$$

Where X_1 is the 2007 estimate and X_2 is the 2006 estimate, SE_1 is the standard error for the 2007 estimate and SE_2 is the standard error for the 2006 estimate.

Z_{CL} is the critical value for the desired confidence level (=1.645 for 90 percent)[16]

$$\left| \frac{15.3 - 16.4}{\sqrt{(0.43)^2 + (0.36)^2}} \right| > 1.645$$

Since 1.96 is larger than 1.645, the difference between the two estimates is statistically significant, and Bill concludes that the poverty rate in Miami-Dade County has dropped since 2005. He tells his constituents that the data seem to show some improvement in the poverty rate but it is too soon to tell if this is a real trend or a short-term fluctuation in the numbers.

Case Study #2: The Small Business Owner

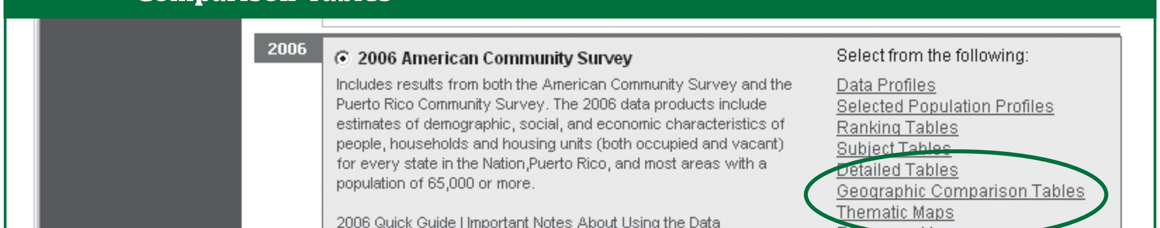
Kathy runs a computer sales company in a small Midwestern city and is interested in relocating her business to a larger metropolitan area with a more highly educated workforce. How can she use ACS data to help decide where to move?

She starts by going to the American FactFinder and selecting the *Geographic Comparison Tables* associated with the 2006 ACS data file.

On the *Select Geography* page, she selects *United States—Metropolitan and Micropolitan Statistical Area; and for Puerto Rico* and then clicks *Next*. This brings her to the *Select Tables* page, where she chooses Table GCT1503 (Percent of People Who Have Completed an Advanced Degree). She clicks on *Show Results*, which brings up the table she requested. She uses the *Print/Download* tab (see Figure 13) to download the data into a spreadsheet, where she can rank the percentages from highest to lowest.

In the spreadsheet, she removes the *micropolitan areas* and *metropolitan divisions* from her list in order to focus on the larger metropolitan statistical areas. Next, she creates a bar chart that displays the areas with the highest proportions of people with advanced degrees, along with the margins of error. In this chart, the darker bars represent the lower confidence intervals, and the

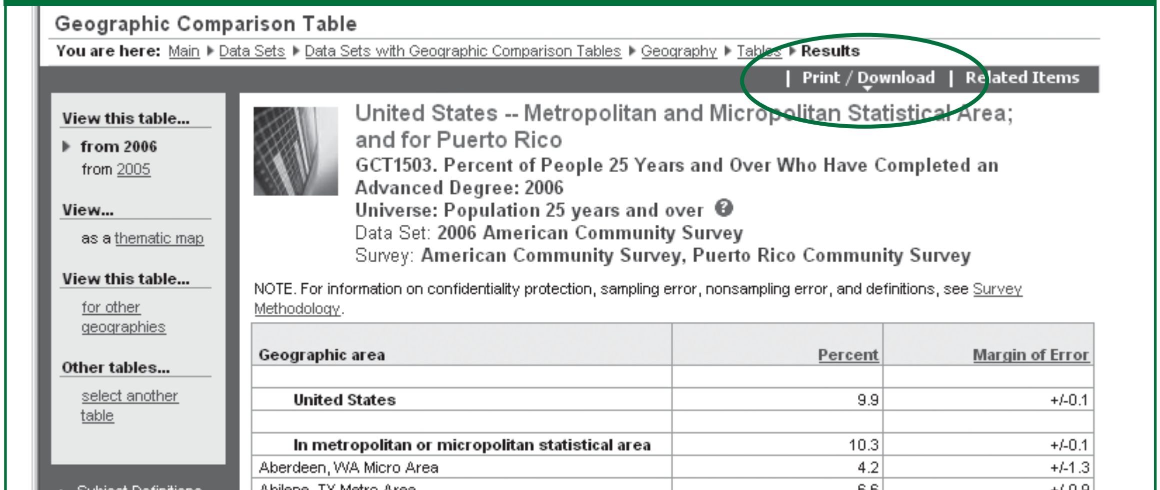
Figure 12. **ACS Products Available Through American FactFinder: Geographic Comparison Tables**



Source: U.S. Census Bureau, American FactFinder, accessed at <http://factfinder.census.gov>.

[16] The value 1.65 must be used for ACS single-year estimates for 2005 or earlier, as that was the value used in deriving from the standard error the published measure of error in those years (MOE for 2005, CI prior to 2005).

Figure 13. **Print/Download Data From American FactFinder: 2006**

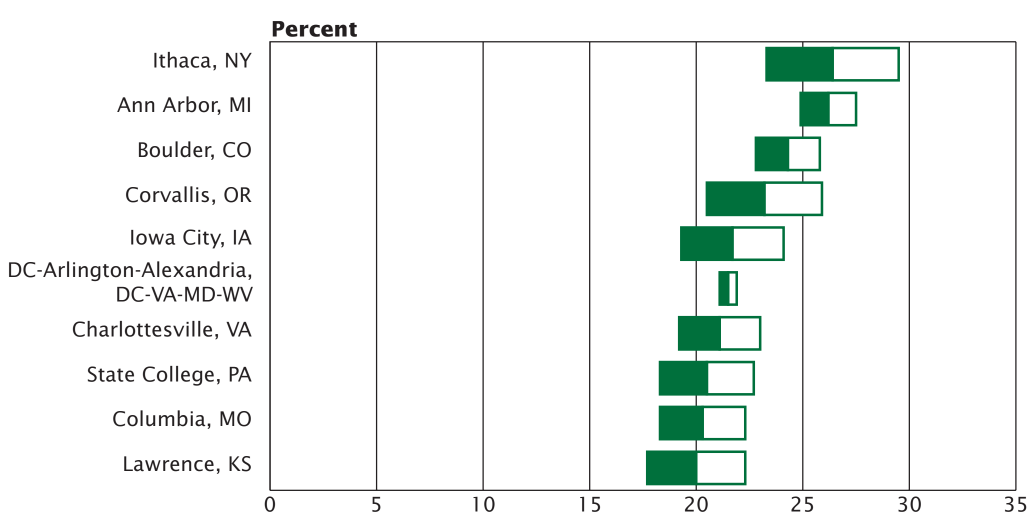


Source: U.S. Census Bureau, American FactFinder, accessed at <http://factfinder.census.gov>.

lighter bars represent the upper confidence intervals. The overall width of the bars gives some indication of the reliability of the estimates. (Less reliable estimates have longer bars.)

Based on her preliminary data, Ithaca, New York, Ann Arbor, Michigan, or Boulder, Colorado, seem like good places to open a new business. However, she understands that the proportion of people with advanced degrees in these three metropolitan statistical areas may not be statistically different from several other large metropolitan statistical areas. She also may want to create similar graphs for other variables of interest, including household income, commuting times, age distribution, occupation, or industry. She notices that many of these areas with highly educated populations are also home to large universities, so she wants to look further into the data to see whether people living in these communities also have the buying power that she needs to sell her products.

Figure 14. **People Aged 25 and Older With Advanced Degrees by Metro Area: 2006**



Note: Because of sampling variability, some of the estimates in this chart may not be statistically different from one another or from estimates for other geographic areas not shown in this chart.

Source: U.S. Census Bureau, 2006 American Community Survey.

Case Study #3: The Librarian

John is a librarian at the New York City Public Library. A reporter from a major newspaper just called him because he wants to write a story on the richest place in America and the people who live there.

John explains the current limitations of the ACS data. Right now, he can only get information for geographic areas with at least 65,000 people, and there is uncertainty associated with all of the ACS estimates, particularly for smaller geographic areas. But he tells the reporter he will see what he can find.

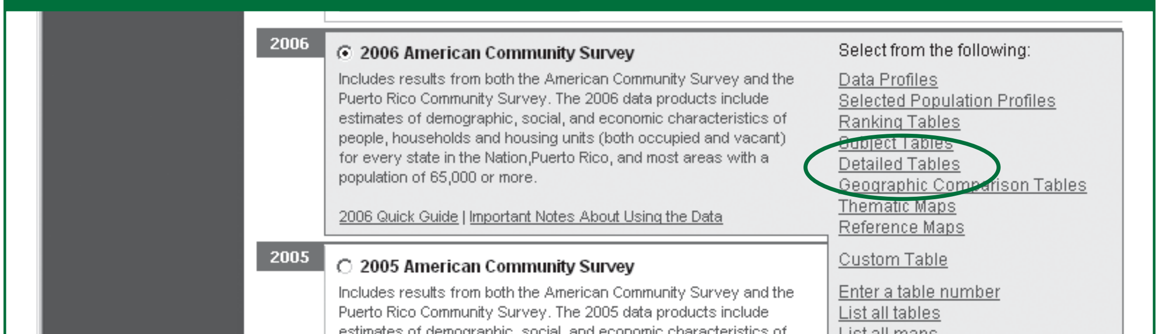
He starts by going to the American FactFinder and pulling up the 2006 *Detailed Tables*.

The default menu allows him to select geographic areas within a specific state, but the *geo within geo* menu provides additional options for selecting geographic areas. For example, John can select all states within the nation or output data for places that are fully or partially contained within congressional districts, metropolitan statistical areas, or counties.

Figure 16 shows the *geo within geo* tab, which allows him to extract data for all large places (this includes cities and towns with a population of 65,000 or more) in the United States and Puerto Rico. He uses the drop-down menu to select "Show me all places," "Within Nation," and "All Places." On the next page, he browses the *Subject* menu and selects the *Income (Households and Families)* topic, which is listed under *Economic Characteristics*.

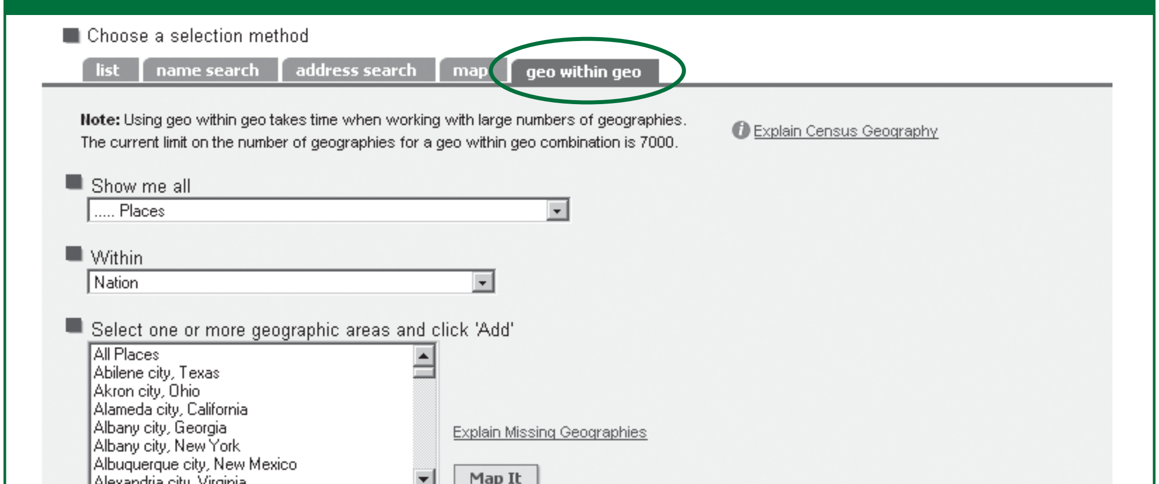
He selects Table B19013 (Median Household Income) and clicks on the button to show the results. However, since data are displayed online only for the first few places, he decides to use the *Print/Download* tab to export the full table into a spreadsheet.

Figure 15. **ACS Products Available Through American FactFinder: *Detailed Tables***



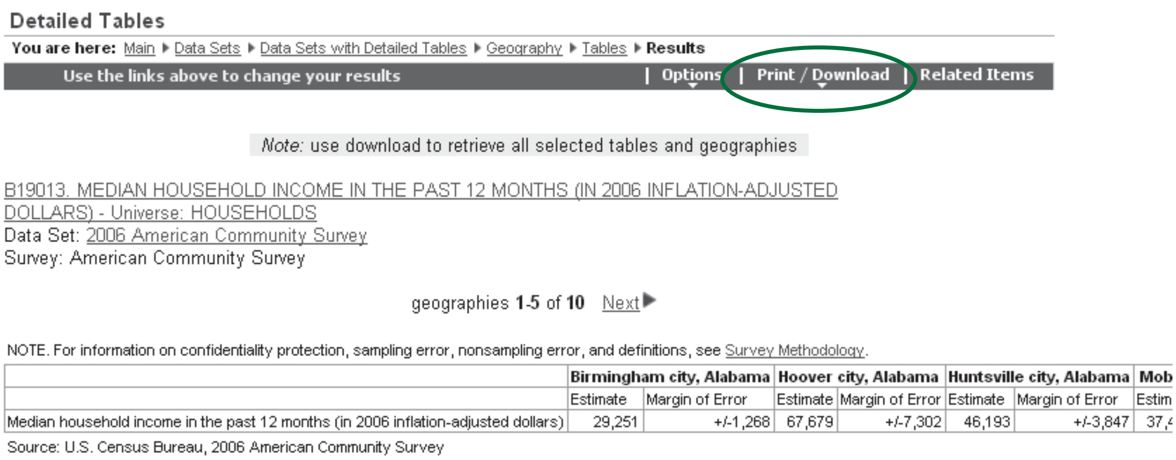
Source: U.S. Census Bureau, American FactFinder, accessed at <http://factfinder.census.gov>.

Figure 16. **Using the "Geo Within Geo" Tab in American FactFinder**



Source: U.S. Census Bureau, American FactFinder, accessed at <http://factfinder.census.gov>.

Figure 17. **Printing/Downloading Data From American FactFinder**


Detailed Tables

You are here: Main ▸ Data Sets ▸ Data Sets with Detailed Tables ▸ Geography ▸ Tables ▸ **Results**

Use the links above to change your results | Options | Print / Download | Related Items

Note: use download to retrieve all selected tables and geographies

B19013. MEDIAN HOUSEHOLD INCOME IN THE PAST 12 MONTHS (IN 2006 INFLATION-ADJUSTED DOLLARS) - Universe: HOUSEHOLDS
Data Set: 2006 American Community Survey
Survey: American Community Survey

geographies **1-5** of **10** Next

NOTE. For information on confidentiality protection, sampling error, nonsampling error, and definitions, see Survey Methodology.

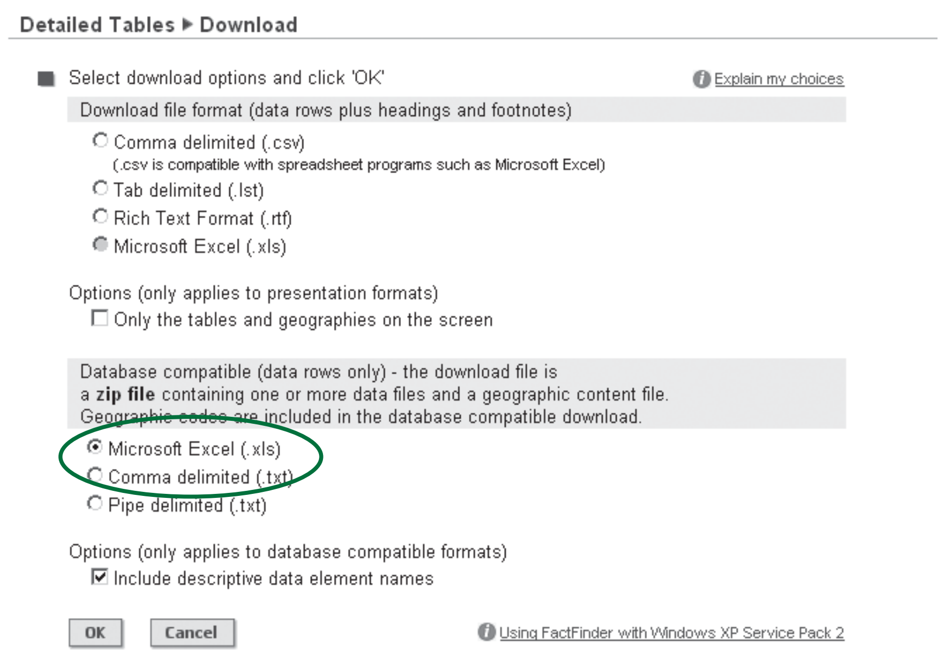
	Birmingham city, Alabama		Hoover city, Alabama		Huntsville city, Alabama		Mob
	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error	Estim
Median household income in the past 12 months (in 2006 inflation-adjusted dollars)	29,251	+/-1,268	67,679	+/-7,302	46,193	+/-3,847	37,4

Source: U.S. Census Bureau, 2006 American Community Survey

Source: U.S. Census Bureau, American FactFinder, accessed at <http://factfinder.census.gov>.

Figure 17 is a screenshot of the detailed table and the Print/Download option. He chooses to download the data in a zipped Excel file, since the table includes a large number of cells. Figure 18 shows the downloading screenshot.

Figure 18. **Downloading Data From American FactFinder Into Excel**


Detailed Tables ▸ Download

Select download options and click 'OK' — Explain my choices

Download file format (data rows plus headings and footnotes)
- Comma delimited (.csv) (.csv is compatible with spreadsheet programs such as Microsoft Excel)
- Tab delimited (.lst)
- Rich Text Format (.rtf)
- Microsoft Excel (.xls)

Options (only applies to presentation formats)
- Only the tables and geographies on the screen

Database compatible (data rows only) - the download file is a **zip file** containing one or more data files and a geographic content file. Geographic codes are included in the database compatible download.
- Microsoft Excel (.xls)
- Comma delimited (.txt)
- Pipe delimited (.txt)

Options (only applies to database compatible formats)
- Include descriptive data element names

OK Cancel Using FactFinder with Windows XP Service Pack 2

Source: U.S. Census Bureau, American FactFinder, accessed at <http://factfinder.census.gov>.

Given the reporter's criteria, Yorba Linda, California, topped the list. Rather than just considering data for that single place, John puts together the following table (Table 5) showing median household income levels for the 10 "richest" places in the country. He also warns the journalist about the margin of error around the estimates. Finally, he directs the reporter to the *Data Profiles* on the American FactFinder to learn more about the characteristics of people and housing in these selected areas.

Table 5. **Median Household Income in the Past 12 Months for Ten of the Highest Income Places With 65,000 or More People: 2006**

	Ten of the highest median household income, 2006	Margin of error (+/–)
Yorba Linda city, California	$121,075	$9,806
Pleasanton city, California	$105,956	$7,124
Newport Beach city, California	$103,068	$6,884
Flower Mound town, Texas	$101,452	$7,934
Newton city, Massachusetts	$101,001	$6,540
Chino Hills city, California	$100,394	$6,360
Highlands Ranch CDP, Colorado	$97,627	$4,906
Naperville city, Illinois	$97,077	$4,378
Frisco city, Texas	$95,591	$3,841
Sugar Land city, Texas	$95,330	$11,816

Note: Because of sampling variability, some of the estimates in this table may not be statistically different from one another or from estimates for other geographic areas not listed in the table.

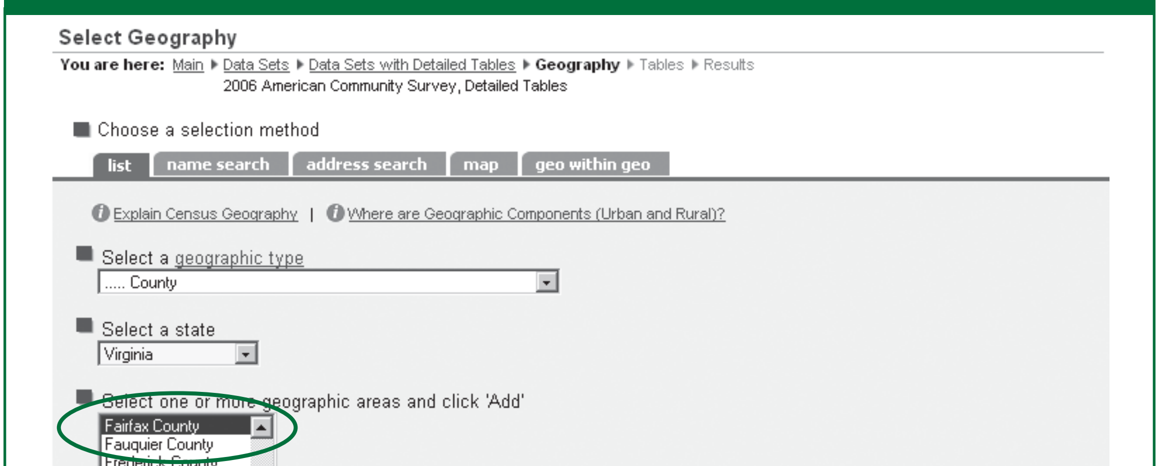
Source: U.S. Census Bureau, 2006 American Community Survey.

Case Study #4: The Local Planner (for More Advanced Users)

As a member of the planning commission for Fairfax County, Virginia, Sharon is interested in the changing demographics of the county's population. She wants to know how the county's newcomers compare with the existing population and how this might affect the demand for services in the coming years. In particular, she wants to compare the proportion of newcomers to the county who are below the poverty level with Fairfax County's general (nonmoving) population.

She starts by going to the 2006 *Detailed Tables* in the American FactFinder (see Figure 15 from Case Study #3). She then selects *Fairfax County, Virginia,* from the list of geographic areas available (see Figure 19).

Figure 19. **Selecting Geographies in American FactFinder**

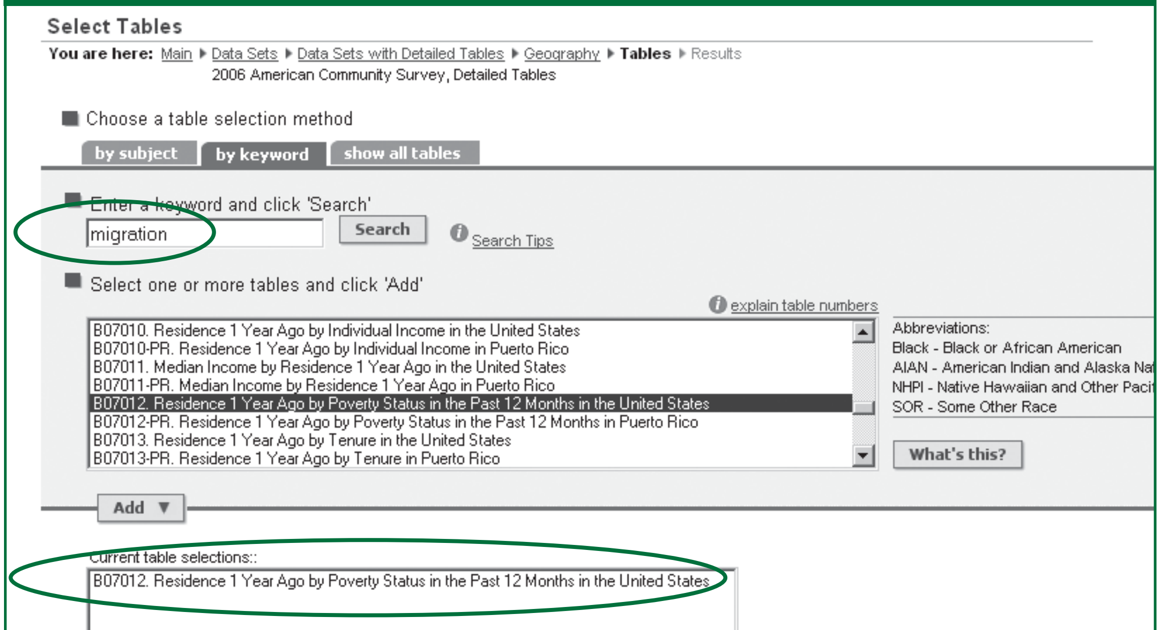


Source: U.S. Census Bureau, American FactFinder, accessed at <http://factfinder.census.gov>.

On the next page, she uses a *Keyword* search to pull up a list of all of the migration tables (see Figure 20). From that list, she chooses Table B07012 (Residence 1 Year Ago by Poverty Status).

The next page shows her a table with the results. In order to calculate poverty rates and their associated margins of error, she first needs to put the data into a spreadsheet. Since this is a small table, she uses her mouse to copy and paste the data directly into a spreadsheet program. Others may prefer to download the data using the *Print/Download* option, as shown in Figure 17.

Figure 20. **Choosing Variables in American FactFinder**



Source: U.S. Census Bureau, American FactFinder, accessed at <http://factfinder.census.gov>.

Figure 21. **Example of Migration Data Available in American FactFinder**

Detailed Tables

You are here: Main ▸ Data Sets ▸ Data Sets with Detailed Tables ▸ Geography ▸ Tables ▸ **Results**

Use the links above to change your results | **Options** | **Print / Download** | **Related Items**

B07012. RESIDENCE 1 YEAR AGO BY POVERTY STATUS IN THE PAST 12 MONTHS IN THE UNITED STATES - Universe: POPULATION 1 YEAR AND OVER IN THE UNITED STATES FOR WHOM POVERTY STATUS IS DETERMINED
Data Set: 2006 American Community Survey
Survey: American Community Survey

NOTE. For information on confidentiality protection, sampling error, nonsampling error, and definitions, see Survey Methodology.

	Fairfax County, Virginia	
	Estimate	Margin of Error
Total:	989,679	+/-2,099
Below 100 percent of the poverty level	52,416	+/-6,432
100 to 149 percent of the poverty level	27,790	+/-5,461
At or above 150 percent of the poverty level	909,473	+/-8,545
Same house 1 year ago:	848,119	+/-11,683
Below 100 percent of the poverty level	33,347	+/-4,747
100 to 149 percent of the poverty level	21,755	+/-4,740
At or above 150 percent of the poverty level	793,017	+/-12,243
Moved within same county:	57,528	+/-7,264
Below 100 percent of the poverty level	5,007	+/-1,902
100 to 149 percent of the poverty level	3,189	+/-2,823
At or above 150 percent of the poverty level	49,332	+/-6,747
Moved from different county within same state:	35,140	+/-5,106
Below 100 percent of the poverty level	5,387	+/-2,225
100 to 149 percent of the poverty level	1,529	+/-666
At or above 150 percent of the poverty level	28,224	+/-4,719
Moved from different state:	36,393	+/-6,080
Below 100 percent of the poverty level	6,520	+/-3,552
100 to 149 percent of the poverty level	984	+/-650
At or above 150 percent of the poverty level	28,889	+/-4,088
Moved from abroad:	12,499	+/-3,423
Below 100 percent of the poverty level	2,155	+/-1,178
100 to 149 percent of the poverty level	333	+/-417
At or above 150 percent of the poverty level	10,011	+/-3,029

Source: U.S. Census Bureau, 2006 American Community Survey

Source: U.S. Census Bureau, American FactFinder, accessed at <http://factfinder.census.gov>.

Next, she needs to derive the poverty rates for movers and nonmovers. In Appendix 3 of this handbook, she finds the formulas needed to calculate the margin of error for a derived proportion. She first needs to calculate the proportion of nonmovers who are below 100 percent of the poverty level. (She defines “nonmovers” as the population in the same house 1 year ago or who moved within the same county.)

$$\hat{p} = \frac{\hat{X}_{num}}{\hat{X}_{den}}$$

Where $\hat{X}_{num}$ is the estimate used in the numerator (number of nonmovers below poverty), the sum of the number of people living in the same house 1 year ago and who are below 100 percent of the poverty level (33.347) and the number of people who moved within the same county and who are below 100 percent of the poverty level (5,007).

$\hat{X}_{den}$ is the estimate used in the denominator (total nonmovers for whom poverty status is determined), the sum of the number of persons living in the same house 1 year ago (848,119) and the number of people who moved within the same county (57,528).

$$\hat{p} = \frac{(33{,}347 + 5{,}007)}{(848{,}119 + 57{,}528)} = .0423$$

Next she needs to calculate the margin of error associated with her derived proportion. Again, she uses the appropriate formula from Appendix 3:

$$MOE_p = \frac{\sqrt{MOE_{num}^2 - \hat{p}^2 * MOE_{den}^2}}{\hat{X}_{den}}$$

Where MOE_{num} is the margin of error of the numerator

$$(MOE_{num} = \sqrt{\sum_c MOE_c^2})$$

MOE_{den} is the margin of error of the denominator

$$(MOE_{den} = \sqrt{\sum_c MOE_c^2}).$$

And MOE_c is the margin of error of the c^{th} estimate (each individual estimate that makes up the numerator and denominator).

For the poverty rate of nonmovers:

$$MOE_p = \frac{\sqrt{\left(\sqrt{(4{,}747^2 + 1{,}902^2)}\right)^2 - (.0423)^2 * \left(\sqrt{(11{,}683^2 + 7{,}264^2)}\right)^2}}{(848{,}119 + 57{,}528)}$$

$$MOE_p = \frac{\sqrt{(5{,}114)^2 - (.0423)^2 * (13{,}757)^2}}{905{,}647}$$

$$MOE_p = \frac{\sqrt{26{,}151{,}613 - .0018 * 189{,}258{,}185}}{905{,}647}$$

$$MOE_p = \frac{5{,}081}{905{,}647} = .0056$$

Therefore, the proportion of nonmovers in poverty ($\hat{p}$) is .0423 with a margin of error (MOE_p) of .0056. Applying the same formulas to the ACS data for newcomers, and multiplying all of the results by 100, she comes up with the following table.

Since the margin of error for newcomers is relatively large, she may want to use the instructions in Appendix 4 of this handbook to test whether the difference between these two ACS estimates is statistically significant. But based on her preliminary results, she reports to the other members of the planning commission that the poverty rate for newcomers to Fairfax County—who numbered more than 84,000 just in the past year—may be more than three times higher than the poverty rate for nonmovers.

Table 6. **Poverty Rates for Nonmovers and Newcomers to Fairfax County, Virginia, 2006**

	Poverty rate	Margin of error (+/–)
Nonmovers	4.2	0.6
New county residents	16.7	4.9

Note: Nonmovers include those who did not move plus those who moved from one residence to another within Fairfax County.

Source: U.S. Census Bureau, 2006 American Community Survey.

Avoiding Pitfalls When Working With ACS Data

The ACS data are complex and cover a broad range of topics and geographic areas. Because this is a relatively new survey, many people do not fully understand how to interpret and use the ACS data. In this handbook, we have described some key mistakes to avoid and some precautions to guide you as you delve into the ACS data. These key points are summarized below.

- Use caution in comparing ACS data with data from the decennial census or other sources. Every survey uses different methods, which could affect the comparability of the numbers.
- The ACS was designed to provide estimates of the *characteristics* of the population, not to provide counts of the population in different geographic areas or population subgroups.
- Be careful in drawing conclusions about small differences between two estimates because they may not be statistically different.
- Data users need to be careful not to interpret annual fluctuations in the data as long-term trends.

- Use caution in comparing data from 2006 and later surveys with data from the 2000–2005 surveys. Unlike earlier surveys, the 2006 ACS survey includes samples of the population living in group quarters (e.g., college dorms and nursing homes), so the data may not be comparable, especially for young adults and the elderly, who are more likely than other age groups to be living in group quarters facilities.
- Data users should not interpret or refer to 3-year or 5-year period estimates as estimates of the middle year or last year in the series. For example, a 2005–2007 estimate is not a "2006 average."
- Data users should *not* rely on overlapping confidence intervals as a test for statistical significance because this method will not always provide an accurate result.

Other Resources for Working With ACS Data

Data users can find a wealth of additional information about the ACS on the Census Bureau's Web site <www.census.gov/acs>. However, sorting through all of the information available on the ACS would take a long time without a good map of the available resources. Appendix 8 provides links to online resources that data users are likely to find the most useful. These resources cover many of the topics discussed in this handbook, but in greater detail.

ACS data users may also be interested in a 2007 report by the National Research Council titled "Using the American Community Survey: Benefits and Challenges," which provides a road map to help researchers and others understand and use the ACS data effectively (available online at <http://www.nap.edu/catalog.php?record_id=11901>).

ACS Data Resources

- FactFinder Help (online help, census data information, glossary, and tutorial) <http://factfinder.census.gov/home/en/epss/main.html>
- 2007 Guide to the Data Products (Web page) <http://www.census.gov/acs/www/Products/users_guide/>
- American Community Survey Design and Methodology (technical paper) <http://www.census.gov/acs/www/Downloads/tp67.pdf>
- Accuracy of the ACS Data (online document) <http://www.census.gov/acs/www/Downloads/ACS/accuracy2007.pdf>
- ACS Sample Size (Web page) <http://www.census.gov/acs/www/SBasics/SSizes/SSizes07.htm>
- ACS Quality Measures (Web page) <http://www.census.gov/acs/www/UseData/sse/>
- 2006 Data Users Handbook (online document) <http://www.census.gov/acs/www/Downloads/Handbook2006.pdf>
- How to Use the ACS Data (Web page) <http://www.census.gov/acs/www/UseData/>
- Guidance on Comparing 2007 ACS Data (online tables) <http://www.census.gov/acs/www/UseData/compACS.htm>
- Using Different Sources of Data for Income and Poverty (online fact sheet) <http://www.census.gov/hhes/www/income/factsheet.html>

Conclusion

Data from the ACS can be extremely valuable for a variety of different purposes that include: to monitor the well-being of America's children and families, to investigate the characteristics of the U.S. workforce, to determine the economic well-being of working-poor families, or to track social, economic, and demographic changes in the general U.S. population. Many people are being cautious in their approach to the ACS, and rightly so. This is a relatively new survey with a new approach to measuring change in our communities. The ACS has great potential, particularly as a source of annual data for local areas. By providing data for communities each year, the ACS will provide critical information for communities when they need it most.

Glossary

Accuracy. One of four key dimensions of survey quality. Accuracy refers to the difference between the survey estimate and the true (unknown) value. Attributes are measured in terms of sources of error (for example, coverage, sampling, nonresponse, measurement, and processing).

American Community Survey Alert. This periodic electronic newsletter informs data users and other interested parties about news, events, data releases, congressional actions, and other developments associated with the ACS. See <http://www.census.gov/acs/www/Special/Alerts/Latest.htm>.

American FactFinder (AFF). An electronic system for access to and dissemination of Census Bureau data on the Internet. AFF offers prepackaged data products and user-selected data tables and maps from Census 2000, the 1990 Census of Population and Housing, the 1997 and 2002 Economic Censuses, the Population Estimates Program, annual economic surveys, and the ACS.

Block group. A subdivision of a census tract (or, prior to 2000, a block numbering area), a block group is a cluster of blocks having the same first digit of their four-digit identifying number within a census tract.

Census geography. A collective term referring to the types of geographic areas used by the Census Bureau in its data collection and tabulation operations, including their structure, designations, and relationships to one another. See <http://www.census.gov/geo/www/index.html>.

Census tract. A small, relatively permanent statistical subdivision of a county delineated by a local committee of census data users for the purpose of presenting data. Census tract boundaries normally follow visible features, but may follow governmental unit boundaries and other nonvisible features; they always nest within counties. Designed to be relatively homogeneous units with respect to population characteristics, economic status, and living conditions at the time of establishment, census tracts average about 4,000 inhabitants.

Coefficient of variation (CV). The ratio of the standard error (square root of the variance) to the value being estimated, usually expressed in terms of a percentage (also known as the relative standard deviation). The lower the CV, the higher the relative reliability of the estimate.

Comparison profile. Comparison profiles are available from the American Community Survey for 1-year estimates beginning in 2007. These tables are available for the U.S., the 50 states, the District of Columbia, and geographic areas with a population of more than 65,000.

Confidence interval. The sample estimate and its standard error permit the construction of a confidence interval that represents the degree of uncertainty about the estimate. A 90-percent confidence interval can be interpreted roughly as providing 90 percent certainty that the interval defined by the upper and lower bounds contains the true value of the characteristic.

Confidentiality. The guarantee made by law (Title 13, United States Code) to individuals who provide census information, regarding nondisclosure of that information to others.

Consumer Price Index (CPI). The CPI program of the Bureau of Labor Statistics produces monthly data on changes in the prices paid by urban consumers for a representative basket of goods and services.

Controlled. During the ACS weighting process, the intercensal population and housing estimates are used as survey controls. Weights are adjusted so that ACS estimates conform to these controls.

Current Population Survey (CPS). The CPS is a monthly survey of about 50,000 households conducted by the Census Bureau for the Bureau of Labor Statistics. The CPS is the primary source of information on the labor force characteristics of the U.S. population.

Current residence. The concept used in the ACS to determine who should be considered a resident of a sample address. Everyone who is currently living or staying at a sample address is considered a resident of that address, except people staying there for 2 months or less. People who have established residence at the sample unit and are away for only a short period of time are also considered to be current residents.

Custom tabulations. The Census Bureau offers a wide variety of general purpose data products from the ACS. These products are designed to meet the needs of the majority of data users and contain predefined sets of data for standard census geographic areas, including both political and statistical geography. These products are available on the American FactFinder and the ACS Web site.

For users with data needs not met through the general purpose products, the Census Bureau offers "custom" tabulations on a cost-reimbursable basis, with the American Community Survey Custom Tabulation program. Custom tabulations are created by tabulating data from ACS microdata files. They vary in size, complexity, and cost depending on the needs of the sponsoring client.

Data profiles. Detailed tables that provide summaries by social, economic, and housing characteristics. There is a new ACS demographic and housing units profile that should be used if official estimates from the Population Estimates Program are not available.

Detailed tables. Approximately 1,200 different tables that contain basic distributions of characteristics. These tables provide the most detailed data and are the basis for other ACS products.

Disclosure avoidance (DA). Statistical methods used in the tabulation of data prior to releasing data products to ensure the confidentiality of responses. See Confidentiality.

Estimates. Numerical values obtained from a statistical sample and assigned to a population parameter. Data produced from the ACS interviews are collected from samples of housing units. These data are used to produce estimates of the actual figures that would have been obtained by interviewing the entire population using the same methodology.

File Transfer Protocol (FTP) site. A Web site that allows data files to be downloaded from the Census Bureau Web site.

Five-year estimates. Estimates based on 5 years of ACS data. These estimates reflect the characteristics of a geographic area over the entire 5-year period and will be published for all geographic areas down to the census block group level.

Geographic comparison tables. More than 80 single-variable tables comparing key indicators for geographies other than states.

Geographic summary level. A geographic summary level specifies the content and the hierarchical relationships of the geographic elements that are required to tabulate and summarize data. For example, the county summary level specifies the state-county hierarchy. Thus, both the state code and the county code are required to uniquely identify a county in the United States or Puerto Rico.

Group quarters (GQ) facilities. A GQ facility is a place where people live or stay that is normally owned or managed by an entity or organization providing housing and/or services for the residents. These services may include custodial or medical care, as well as other types of assistance. Residency is commonly restricted to those receiving these services. People living in GQ facilities are usually not related to each other. The ACS collects data from people living in both housing units and GQ facilities.

Group quarters (GQ) population. The number of persons residing in GQ facilities.

Item allocation rates. Allocation is a method of imputation used when values for missing or inconsistent items cannot be derived from the existing response record. In these cases, the imputation must be based on other techniques such as using answers from other people in the household, other responding housing units, or people believed to have similar characteristics. Such donors are reflected in a table referred to as an allocation matrix. The rate is the percentage of times this method is used.

Margin of error (MOE). Some ACS products provide an MOE instead of confidence intervals. An MOE is the difference between an estimate and its upper or lower confidence bounds. Confidence bounds can be created by adding the margin of error to the estimate (for the upper bound) and subtracting the margin of error from the estimate (for the lower bound). All published ACS margins of error are based on a 90-percent confidence level.

Multiyear estimates. Three- and five-year estimates based on multiple years of ACS data. Three-year estimates will be published for geographic areas with a population of 20,000 or more. Five-year estimates will be published for all geographic areas down to the census block group level.

Narrative profile. A data product that includes easy-to-read descriptions for a particular geography.

Nonsampling error. Total survey error can be classified into two categories—sampling error and nonsampling error. Nonsampling error includes measurement errors due to interviewers, respondents, instruments, and mode; nonresponse error; coverage error; and processing error.

Period estimates. An estimate based on information collected over a period of time. For ACS the period is either 1 year, 3 years, or 5 years.

Point-in-time estimates. An estimate based on one point in time. The decennial census long-form estimates for Census 2000 were based on information collected as of April 1, 2000.

Population Estimates Program. Official Census Bureau estimates of the population of the United States, states, metropolitan areas, cities and towns, and counties; also official Census Bureau estimates of housing units (HUs).

Public Use Microdata Area (PUMA). An area that defines the extent of territory for which the Census Bureau releases Public Use Microdata Sample (PUMS) records.

Public Use Microdata Sample (PUMS) files. Computerized files that contain a sample of individual records, with identifying information removed, showing the population and housing characteristics of the units, and people included on those forms.

Puerto Rico Community Survey (PRCS). The counterpart to the ACS that is conducted in Puerto Rico.

Quality measures. Statistics that provide information about the quality of the ACS data. The ACS releases four different quality measures with the annual data release: 1) initial sample size and final interviews; 2) coverage rates; 3) response rates, and; 4) item allocation rates for all collected variables. The ACS Quality Measures Web site provides these statistics each year. In addition, the coverage rates are also available for males and females separately.

Reference period. Time interval to which survey responses refer. For example, many ACS questions refer to the day of the interview; others refer to "the past 12 months" or "last week."

Residence rules. The series of rules that define who (if anyone) is considered to be a resident of a sample address for purposes of the survey or census.

Sampling error. Errors that occur because only part of the population is directly contacted. With any sample, differences are likely to exist between the characteristics of the sampled population and the larger group from which the sample was chosen.

Sampling variability. Variation that occurs by chance because a sample is surveyed rather than the entire population.

Selected population profiles. An ACS data product that provides certain characteristics for a specific race or ethnic group (for example, Alaska Natives) or other population subgroup (for example, people aged 60 years and over). This data product is produced directly from the sample microdata (that is, not a derived product).

Single-year estimates. Estimates based on the set of ACS interviews conducted from January through December of a given calendar year. These estimates are published each year for geographic areas with a population of 65,000 or more.

Standard error. The standard error is a measure of the deviation of a sample estimate from the average of all possible samples.

Statistical significance. The determination of whether the difference between two estimates is not likely to be from random chance (sampling error) alone. This determination is based on both the estimates themselves and their standard errors. For ACS data, two estimates are "significantly different at the 90 percent level" if their difference is large enough to infer that there was a less than 10 percent chance that the difference came entirely from random variation.

Subject tables. Data products organized by subject area that present an overview of the information that analysts most often receive requests for from data users.

Summary files. Consist of detailed tables of Census 2000 social, economic, and housing characteristics compiled from a sample of approximately 19 million housing units (about 1 in 6 households) that received the Census 2000 long-form questionnaire.

Thematic maps. Display geographic variation in map format from the geographic ranking tables.

Three-year estimates. Estimates based on 3 years of ACS data. These estimates are meant to reflect the characteristics of a geographic area over the entire 3-year period. These estimates will be published for geographic areas with a population of 20,000 or more.

Appendix 1.

Understanding and Using ACS Single-Year and Multiyear Estimates

What Are Single-Year and Multiyear Estimates?

Understanding Period Estimates

The ACS produces period estimates of socioeconomic and housing characteristics. It is designed to provide estimates that describe the average characteristics of an area over a specific time period. In the case of ACS single-year estimates, the period is the calendar year (e.g., the 2007 ACS covers January through December 2007). In the case of ACS multiyear estimates, the period is either 3 or 5 calendar years (e.g., the 2005–2007 ACS estimates cover January 2005 through December 2007, and the 2006–2010 ACS estimates cover January 2006 through December 2010). The ACS multiyear estimates are similar in many ways to the ACS single-year estimates, however they encompass a longer time period. As discussed later in this appendix, the differences in time periods between single-year and multiyear ACS estimates affect decisions about which set of estimates should be used for a particular analysis.

While one may think of these estimates as representing average characteristics over a single calendar year or multiple calendar years, it must be remembered that the 1-year estimates are not calculated as an average of 12 monthly values and the multiyear estimates are not calculated as the average of either 36 or 60 monthly values. Nor are the multiyear estimates calculated as the average of 3 or 5 single-year estimates. Rather, the ACS collects survey information continuously nearly every day of the year and then aggregates the results over a specific time period—1 year, 3 years, or 5 years. The data collection is spread evenly across the entire period represented so as not to over-represent any particular month or year within the period.

Because ACS estimates provide information about the characteristics of the population and housing for areas over an entire time frame, ACS single-year and multiyear estimates contrast with "point-in-time" estimates, such as those from the decennial census long-form samples or monthly employment estimates from the Current Population Survey (CPS), which are designed to measure characteristics as of a certain date or narrow time period. For example, Census 2000 was designed to measure the characteristics of the population and housing in the United States based upon data collected around April 1, 2000, and thus its data reflect a narrower time frame than ACS data. The monthly CPS collects data for an even narrower time frame, the week containing the 12th of each month.

Implications of Period Estimates

Most areas have consistent population characteristics throughout the calendar year, and their period estimates may not look much different from estimates that would be obtained from a "point-in-time" survey design. However, some areas may experience changes in the estimated characteristics of the population, depending on when in the calendar year measurement occurred. For these areas, the ACS period estimates (even for a single-year) may noticeably differ from "point-in-time" estimates. The impact will be more noticeable in smaller areas where changes such as a factory closing can have a large impact on population characteristics, and in areas with a large physical event such as Hurricane Katrina's impact on the New Orleans area. This logic can be extended to better interpret 3-year and 5-year estimates where the periods involved are much longer. If, over the full period of time (for example, 36 months) there have been major or consistent changes in certain population or housing characteristics for an area, a period estimate for that area could differ markedly from estimates based on a "point-in-time" survey.

An extreme illustration of how the single-year estimate could differ from a "point-in-time" estimate within the year is provided in Table 1. Imagine a town on the Gulf of Mexico whose population is dominated by retirees in the winter months and by locals in the summer months. While the percentage of the population in the labor force across the entire year is about 45 percent (similar in concept to a period estimate), a "point-in-time" estimate for any particular month would yield estimates ranging from 20 percent to 60 percent.

Table 1. **Percent in Labor Force—Winter Village**

Month											
Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
20	20	40	60	60	60	60	60	60	50	30	20

Source: U.S. Census Bureau, Artificial Data.

The important thing to keep in mind is that ACS single-year estimates describe the population and characteristics of an area for the full year, not for any specific day or period within the year, while ACS multiyear estimates describe the population and characteristics of an area for the full 3- or 5-year period, not for any specific day, period, or year within the multiyear time period.

Release of Single-Year and Multiyear Estimates

The Census Bureau has released single-year estimates from the full ACS sample beginning with data from the 2005 ACS. ACS 1-year estimates are published annually for geographic areas with populations of 65,000 or more. Beginning in 2008 and encompassing 2005–2007, the Census Bureau will publish annual ACS 3-year estimates for geographic areas with populations of 20,000 or more. Beginning in 2010, the Census Bureau will release ACS 5-year estimates (encompassing 2005–2009) for all geographic areas —down to the tract and block group levels. While eventually all three data series will be available each year, the ACS must collect 5 years of sample before that final set of estimates can be released. This means that in 2008 only 1-year and 3-year estimates are available for use, which means that data are only available for areas with populations of 20,000 and greater.

New issues will arise when multiple sets of multiyear estimates are released. The multiyear estimates released in consecutive years consist mostly of overlapping years and shared data. As shown in Table 2, consecutive 3-year estimates contain 2 years of overlapping coverage (for example, the 2005–2007 ACS estimates share 2006 and 2007 sample data with the 2006–2008 ACS estimates) and consecutive 5-year estimates contain 4 years of overlapping coverage.

Table 2. **Sets of Sample Cases Used in Producing ACS Multiyear Estimates**

Type of estimate	Year of Data Release				
	2008	2009	2010	2011	2012
	Years of Data Collection				
3-year estimates	2005–2007	2006–2008	2007–2009	2008–2010	2009–2011
5-year estimates	Not Available	Not Available	2005–2009	2006–2010	2007–2011

Source: U.S. Census Bureau.

Differences Between Single-Year and Multiyear ACS Estimates

Currency

Single-year estimates provide more current information about areas that have changing population and/or housing characteristics because they are based on the most current data—data from the past year. In contrast, multiyear estimates provide less current information because they are based on both data from the previous year and data that are 2 and 3 years old. As noted earlier, for many areas with minimal change taking place, using the “less current” sample used to produce the multiyear estimates may not have a substantial influence on the estimates. However, in areas experiencing major changes over a given time period, the multiyear estimates may be quite different from the single-year estimates for any of the individual years. Single-year and multiyear estimates are not expected to be the same because they are based on data from two different time periods. This will be true even if the ACS single year is the midyear of the ACS multiyear period (e.g., 2007 single year, 2006–2008 multiyear).

For example, suppose an area has a growing Hispanic population and is interested in measuring the percent of the population who speak Spanish at home. Table 3 shows a hypothetical set of 1-year and 3-year estimates. Comparing data by release year shows that for an area such as this with steady growth, the 3-year estimates for a period are seen to lag behind the estimates for the individual years.

Reliability

Multiyear estimates are based on larger sample sizes and will therefore be more reliable. The 3-year estimates are based on three times as many sample cases as the 1-year estimates. For some characteristics this increased sample is needed for the estimates to be reliable enough for use in certain applications. For other characteristics the increased sample may not be necessary.

Table 3. **Example of Differences in Single- and Multiyear Estimates—Percent of Population Who Speak Spanish at Home**

Year of data release	1-year estimates		3-year estimates	
	Time period	Estimate	Time period	Estimate
2003	2002	13.7	2000–2002	13.4
2004	2003	15.1	2001–2003	14.4
2005	2004	15.9	2002–2004	14.9
2006	2005	16.8	2003–2005	15.9

Source: U.S. Census Bureau, Artificial Data.

Multiyear estimates are the only type of estimates available for geographic areas with populations of less than 65,000. Users may think that they only need to use multiyear estimates when they are working with small areas, but this isn't the case. Estimates for large geographic areas benefit from the increased sample resulting in more precise estimates of population and housing characteristics, especially for subpopulations within those areas.

In addition, users may determine that they want to use single-year estimates, despite their reduced reliability, as building blocks to produce estimates for meaningful higher levels of geography. These aggregations will similarly benefit from the increased sample sizes and gain reliability.

Deciding Which ACS Estimate to Use

Three primary uses of ACS estimates are to understand the characteristics of the population of an area for local planning needs, make comparisons across areas, and assess change over time in an area. Local planning could include making local decisions such as where to locate schools or hospitals, determining the need for services or new businesses, and carrying out transportation or other infrastructure analysis. In the past, decennial census sample data provided the most comprehensive information. However, the currency of those data suffered through the intercensal period, and the ability to assess change over time was limited. ACS estimates greatly improve the currency of data for understanding the characteristics of housing and population and enhance the ability to assess change over time.

Several key factors can guide users trying to decide whether to use single-year or multiyear ACS estimates for areas where both are available: intended use of the estimates, precision of the estimates, and currency of the estimates. All of these factors, along with an understanding of the differences between single-year and multiyear ACS estimates, should be taken into consideration when deciding which set of estimates to use.

Understanding Characteristics

For users interested in obtaining estimates for small geographic areas, multiyear ACS estimates will be the only option. For the very smallest of these areas (less than 20,000 population), the only option will be to use the 5-year ACS estimates. Users have a choice of two sets of multiyear estimates when analyzing data for small geographic areas with populations of at least 20,000. Both 3-year and 5-year ACS estimates will be available. Only the largest areas with populations of 65,000 and more receive all three data series.

The key trade-off to be made in deciding whether to use single-year or multiyear estimates is between currency and precision. In general, the single-year estimates are preferred, as they will be more relevant to the current conditions. However, the user must take into account the level of uncertainty present in the single-year estimates, which may be large for small subpopulation groups and rare characteristics. While single-year estimates offer more current estimates, they also have higher sampling variability. One measure, the coefficient of variation (CV) can help you determine the fitness for use of a single-year estimate in order to assess if you should opt instead to use the multiyear estimate (or if you should use a 5-year estimate rather than a 3-year estimate). The CV is calculated as the ratio of the standard error of the estimate to the estimate, times 100. A single-year estimate with a small CV is usually preferable to a multiyear estimate as it is more up to date. However, multiyear estimates are an alternative option when a single-year estimate has an unacceptably high CV.

Table 4 illustrates how to assess the reliability of 1-year estimates in order to determine if they should be used. The table shows the percentage of households where Spanish is spoken at home for ACS test counties Broward, Florida, and Lake, Illinois. The standard errors and CVs associated with those estimates are also shown.

In this illustration, the CV for the single-year estimate in Broward County is 1.0 percent (0.2/19.9) and in Lake County is 1.3 percent (0.2/15.9). Both are sufficiently small to allow use of the more current single-year estimates.

Single-year estimates for small subpopulations (e.g., families with a female householder, no husband, and related children less than 18 years) will typically have larger CVs. In general, multiyear estimates are preferable to single-year estimates when looking at estimates for small subpopulations.

For example, consider Sevier County, Tennessee, which had an estimated population of 76,632 in 2004 according to the Population Estimates Program. This population is larger than the Census Bureau's 65,000-population requirement for publishing 1-year estimates. However, many subpopulations within this geographic area will be much smaller than 65,000. Table 5 shows an estimated 21,881 families in Sevier County based on the 2000–2004 multiyear estimate; but only 1,883 families with a female householder, no husband present, with related children under 18 years. Not surprisingly, the 2004 ACS estimate of the poverty rate (38.3 percent) for this subpopulation has a large standard error (SE) of 13.0 percentage points. Using this information we can determine that the CV is 33.9 percent (13.0/38.3).

For such small subpopulations, users obtain more precision using the 3-year or 5-year estimate. In this example, the 5-year estimate of 40.2 percent has an SE of 4.9 percentage points that yields a CV of 12.2 percent (4.9/40.2), and the 3-year estimate of 40.4 percent has an SE of 6.8 percentage points which yields a CV of 16.8 percent (6.8/40.4).

Users should think of the CV associated with an estimate as a way to assess "fitness for use." The CV threshold that an individual should use will vary based on the application. In practice there will be many estimates with CVs over desirable levels. A general guideline when working with ACS estimates is that, while data are available at low geographic levels, in situations where the CVs for these estimates are high, the reliability of the estimates will be improved by aggregating such estimates to a higher geographic level. Similarly, collapsing characteristic detail (for example, combining individual age categories into broader categories) can allow you to improve the reliability of the aggregate estimate, bringing the CVs to a more acceptable level.

Table 4. **Example of How to Assess the Reliability of Estimates—Percent of Population Who Speak Spanish at Home**

County	Estimate	Standard error	Coefficient of variation
Broward County, FL	19.9	0.2	1.0
Lake County, IL	15.9	0.2	1.3

Source: U.S. Census Bureau, Multiyear Estimates Study data.

Table 5. **Percent in Poverty by Family Type for Sevier County, TN**

	2000–2004	2000–2004		2002–2004		2004	
	Total family type	Pct. in poverty	SE	Pct. in poverty	SE	Pct. in poverty	SE
All families	21,881	9.5	0.8	9.7	1.3	10.0	2.3
With related children under 18 years	9,067	15.3	1.5	16.5	2.4	17.8	4.5
Married-couple families	17,320	5.8	0.7	5.4	0.9	7.9	2.0
With related children under 18 years	6,633	7.7	1.2	7.3	1.7	12.1	3.9
Families with female householder, no husband	3,433	27.2	3.0	26.7	4.8	19.0	7.2
With related children under 18 years	1,883	40.2	4.9	40.4	6.8	38.3	13.0

Source: U.S. Census Bureau, Multiyear Estimates Study data.

Making Comparisons

Often users want to compare the characteristics of one area to those of another area. These comparisons can be in the form of rankings or of specific pairs of comparisons. Whenever you want to make a comparison between two different geographic areas you need to take the type of estimate into account. It is important that comparisons be made within the same estimate type. That is, 1-year estimates should only be compared with other 1-year estimates, 3-year estimates should only be compared with other 3-year estimates, and 5-year estimates should only be compared with other 5-year estimates.

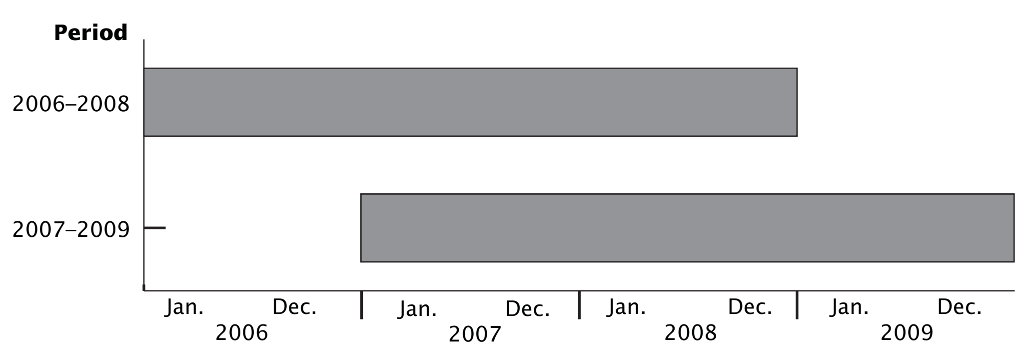
You certainly can compare characteristics for areas with populations of 30,000 to areas with populations of 100,000 but you should use the data set that they have in common. In this example you could use the 3-year or the 5-year estimates because they are available for areas of 30,000 and areas of 100,000.

Assessing Change

Users are encouraged to make comparisons between sequential single-year estimates. Specific guidance on making these comparisons and interpreting the results are provided in Appendix 4. Starting with the 2007 ACS, a new data product called the comparison profile will do much of the statistical work to identify statistically significant differences between the 2007 ACS and the 2006 ACS.

As noted earlier, caution is needed when using multiyear estimates for estimating year-to-year change in a particular characteristic. This is because roughly two-thirds of the data in a 3-year estimate overlap with the data in the next year's 3-year estimate (the overlap is roughly four-fifths for 5-year estimates). Thus, as shown in Figure 1, when comparing 2006–2008 3-year estimates with 2007–2009 3-year estimates, the differences in overlapping multiyear estimates are driven by differences in the nonoverlapping years. A data user interested in comparing 2009 with 2008 will not be able to isolate those differences using these two successive 3-year estimates. Figure 1 shows that the difference in these two estimates describes the difference between 2009 and 2006. While the interpretation of this difference is difficult, these comparisons can be made with caution. Users who are interested in comparing overlapping multiyear period estimates should refer to Appendix 4 for more information.

Figure 1. **Data Collection Periods for 3–Year Estimates**

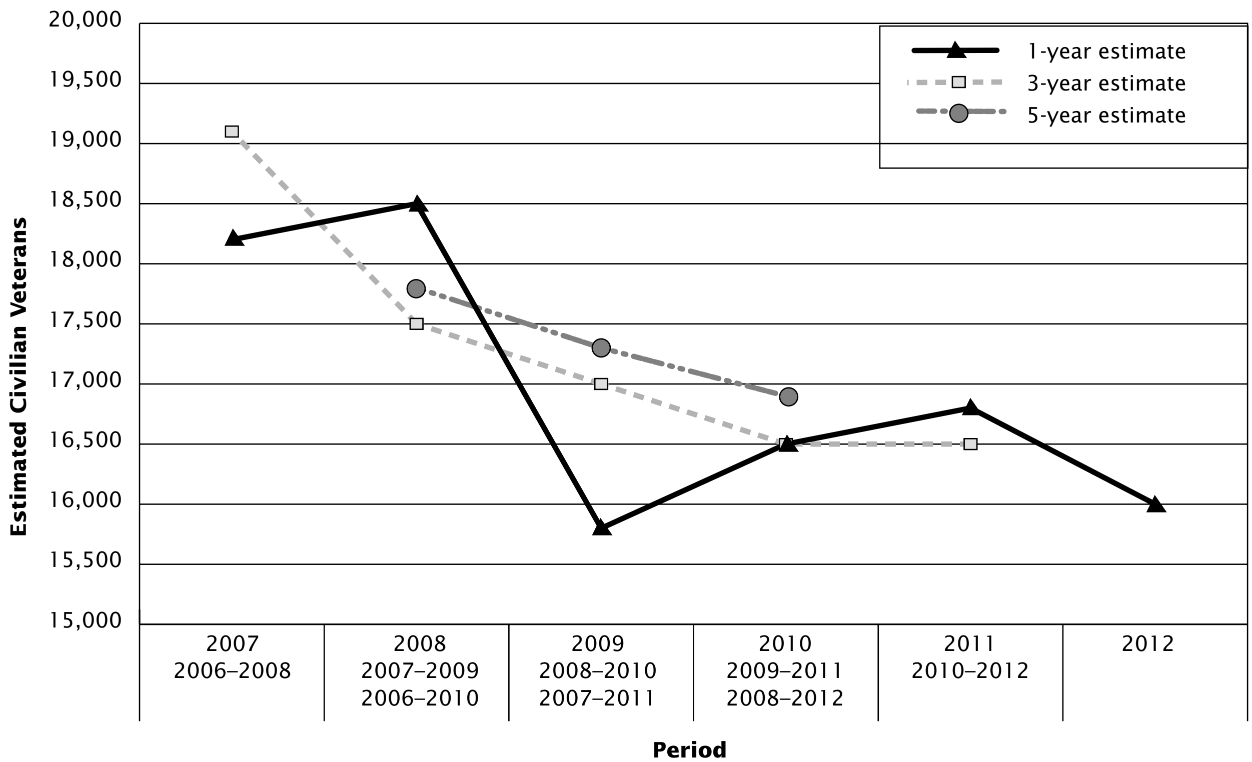


Source: U.S. Census Bureau.

Variability in single-year estimates for smaller areas (near the 65,000-publication threshold) and small subgroups within even large areas may limit the ability to examine trends. For example, single-year estimates for a characteristic with a high CV vary from year to year because of sampling variation obscuring an underlying trend. In this case, multiyear estimates may be useful for assessing an underlying, long-term trend. Here again, however, it must be recognized that because the multiyear estimates have an inherent smoothing, they will tend to mask rapidly developing changes. Plotting the multiyear estimates as representing the middle year is a useful tool to illustrate the smoothing effect of the multiyear weighting methodology. It also can be used to assess the "lagging effect" in the multiyear estimates. As a general rule, users should not consider a multiyear estimate as a proxy for the middle year of the period. However, this could be the case under some specific conditions, as is the case when an area is experiencing growth in a linear trend.

As Figure 2 shows, while the single-year estimates fluctuate from year to year without showing a smooth trend, the multiyear estimates, which incorporate data from multiple years, evidence a much smoother trend across time.

Figure 2. **Civilian Veterans, County X Single-Year, Multiyear Estimates**



Source: U.S. Census Bureau. Based on data from the Multiyear Estimates Study.

Summary of Guidelines

Multiyear estimates should, in general, be used when single-year estimates have large CVs or when the precision of the estimates is more important than the currency of the data. Multiyear estimates should also be used when analyzing data for smaller geographies and smaller populations in larger geographies. Multiyear estimates are also of value when examining change over nonoverlapping time periods and for smoothing data trends over time.

Single-year estimates should, in general, be used for larger geographies and populations when currency is more important than the precision of the estimates. Single-year estimates should be used to examine year-to-year change for estimates with small CVs. Given the availability of a single-year estimate, calculating the CV provides useful information to determine if the single-year estimate should be used. For areas believed to be experiencing rapid changes in a characteristic, single-year estimates should generally be used rather than multiyear estimates as long as the CV for the single-year estimate is reasonable for the specific usage.

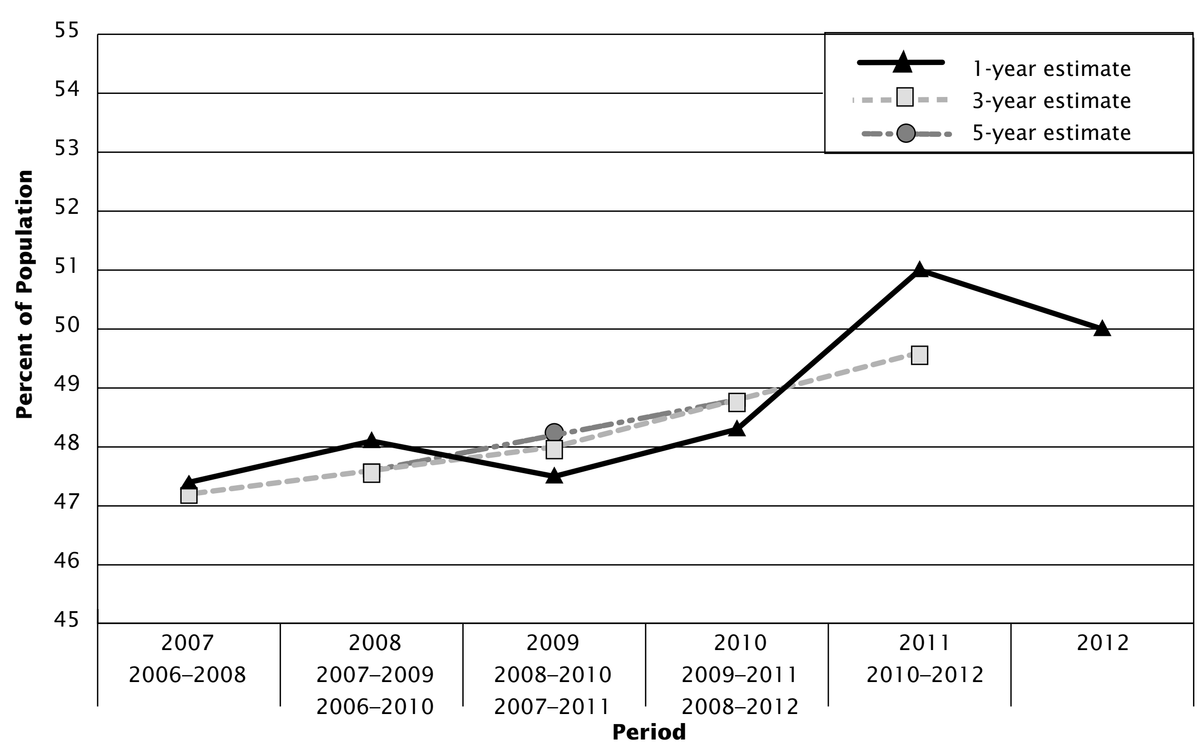
Local area variations may occur due to rapidly occurring changes. As discussed previously, multiyear estimates will tend to be insensitive to such changes when they first occur. Single-year estimates, if associated with sufficiently small CVs, can be very valuable in identifying and studying such phenomena. Graphing trends for such areas using single-year, 3-year, and 5-year estimates can take advantage of the strengths of each set of estimates while using other estimates to compensate for the limitations of each set.

Figure 3 provides an illustration of how the various ACS estimates could be graphed together to better understand local area variations.

The multiyear estimates provide a smoothing of the upward trend and likely provide a better portrayal of the change in proportion over time. Correspondingly, as the data used for single-year estimates will be used in the multiyear estimates, an observed change in the upward direction for consecutive single-year estimates could provide an early indicator of changes in the underlying trend that will be seen when the multiyear estimates encompassing the single years become available.

We hope that you will follow these guidelines to determine when to use single-year versus multiyear estimates, taking into account the intended use and CV associated with the estimate. The Census Bureau encourages you to include the MOE along with the estimate when producing reports, in order to provide the reader with information concerning the uncertainty associated with the estimate.

Figure 3. **Proportion of Population With Bachelor's Degree or Higher, City X Single-Year, Multiyear Estimates**



Source: U.S. Census Bureau. Based on data from the Multiyear Estimates Study.

Appendix 2.

Differences Between ACS and Decennial Census Sample Data

There are many similarities between the methods used in the decennial census sample and the ACS. Both the ACS and the decennial census sample data are based on information from a sample of the population. The data from the Census 2000 sample of about one-sixth of the population were collected using a "long-form" questionnaire, whose content was the model for the ACS. While some differences exist in the specific Census 2000 question wording and that of the ACS, most questions are identical or nearly identical. Differences in the design and implementation of the two surveys are noted below with references provided to a series of evaluation studies that assess the degree to which these differences are likely to impact the estimates. As noted in Appendix 1, the ACS produces period estimates and these estimates do not measure characteristics for the same time frame as the decennial census estimates, which are interpreted to be a snapshot of April 1 of the census year. Additional differences are described below.

Residence Rules, Reference Periods, and Definitions

The fundamentally different purposes of the ACS and the census, and their timing, led to important differences in the choice of data collection methods. For example, the residence rules for a census or survey determine the sample unit's occupancy status and household membership. Defining the rules in a dissimilar way can affect those two very important estimates. The Census 2000 residence rules, which determined where people should be counted, were based on the principle of "usual residence" on April 1, 2000, in keeping with the focus of the census on the requirements of congressional apportionment and state redistricting. To accomplish this the decennial census attempts to restrict and determine a principal place of residence on one specific date for everyone enumerated. The ACS residence rules are based on a "current residence" concept since data are collected continuously throughout the entire year with responses provided relative to the continuously changing survey interview dates. This method is consistent with the goal that the ACS produce estimates that reflect annual averages of the characteristics of all areas.

Estimates produced by the ACS are not measuring exactly what decennial samples have been measuring. The ACS yearly samples, spread over 12 months, collect information that is anchored to the day on which the sampled unit was interviewed, whether it is the day that a mail questionnaire is completed or the day that an interview is conducted by telephone or personal visit. Individual questions with time references such as "last week" or "the last 12 months" all begin the reference period as of this interview date. Even the information on types and amounts of income refers to the 12 months prior to the day the question is answered. ACS interviews are conducted just about every day of the year, and all of the estimates that the survey releases are considered to be averages for a specific time period. The 1-year estimates reflect the full calendar year; 3-year and 5-year estimates reflect the full 36- or 60-month period.

Most decennial census sample estimates are anchored in this same way to the date of enumeration. The most obvious difference between the ACS and the census is the overall time frame in which they are conducted. The census enumeration time period is less than half the time period used to collect data for each single-year ACS estimate. But a more important difference is that the distribution of census enumeration dates are highly clustered in March and April (when most census mail returns were received) with additional, smaller clusters seen in May and June (when nonresponse follow-up activities took place).

This means that the data from the decennial census tend to describe the characteristics of the population and housing in the March through June time period (with an overrepresentation of March/April) while the ACS characteristics describe the characteristics nearly every day over the full calendar year.

Census Bureau analysts have compared sample estimates from Census 2000 with 1-year ACS estimates based on data collected in 2000 and 3-year ACS estimates based on data collected in 1999–2001 in selected counties. A series of reports summarize their findings and can be found at <http://www.census.gov/acs/www/AdvMeth/Reports.htm>. In general, ACS estimates were found to be quite similar to those produced from decennial census data.

More on Residence Rules

Residence rules determine which individuals are considered to be residents of a particular housing unit or group quarters. While many people have definite ties to a single housing unit or group quarters, some people may stay in different places for significant periods of time over the course of the year. For example, migrant workers move with crop seasons and do not live in any one location for the entire year. Differences in treatment of these populations in the census and ACS can lead to differences in estimates of the characteristics of some areas.

For the past several censuses, decennial census residence rules were designed to produce an accurate count of the population as of Census Day, April 1, while the ACS residence rules were designed to collect representative information to produce annual average estimates of the characteristics of all kinds of areas. When interviewing the population living in housing units, the decennial census uses a "usual residence" rule to enumerate people at the place where they live or stay most of the time as of April 1. The ACS uses a "current residence" rule to interview people who are currently living or staying in the sample housing unit as long as their stay at that address will exceed 2 months. The residence rules governing the census enumerations of people in group quarters depend on the type of group quarter and where permitted, whether people claim a "usual residence" elsewhere. The ACS applies a straight de facto residence rule to every type of group quarter. Everyone living or staying in a group quarter on the day it is visited by an ACS interviewer is eligible to be sampled and interviewed for the survey. Further information on residence rules can be found at <http://www.census.gov/acs/www/AdvMeth/CollProc/CollProc1.htm>.

The differences in the ACS and census data as a consequence of the different residence rules are most likely minimal for most areas and most characteristics. However, for certain segments of the population the usual and current residence concepts could result in different residence decisions. Appreciable differences may occur in areas where large proportions of the total population spend several months of the year in what would not be considered their residence under decennial census rules. In particular, data for areas that include large beach, lake, or mountain vacation areas may differ appreciably between the census and the ACS if populations live there for more than 2 months.

More on Reference Periods

The decennial census centers its count and its age distributions on a reference date of April 1, the assumption being that the remaining basic demographic questions also reflect that date, regardless of whether the enumeration is conducted by mail in March or by a field follow-up in July. However, nearly all questions are anchored to the date the interview is provided. Questions with their own reference periods, such as "last week," are referring to the week prior to the interview date. The idea that all census data reflect the characteristics as of April 1 is a myth. Decennial census samples actually provide estimates based on aggregated data reflecting the entire period of decennial data collection, and are greatly influenced by delivery dates of mail questionnaires, success of mail response, and data collection schedules for nonresponse follow-up. The ACS reference periods are, in many ways, similar to those in the census in that they reflect the circumstances on the day the data are collected and the individual reference periods of questions relative to that date. However, the ACS estimates represent the average characteristics over a full year (or sets of years), a different time, and reference period than the census.

Some specific differences in reference periods between the ACS and the decennial census are described below. Users should consider the potential impact these different reference periods could have on distributions when comparing ACS estimates with Census 2000.

Those who are interested in more information about differences in reference periods should refer to the Census Bureau's guidance on comparisons that contrasts for each question the specific reference periods used in Census 2000 with those used in the ACS. See <http://www.census.gov/acs/www/UseData/compACS.htm>.

Income Data

To estimate annual income, the Census 2000 long-form sample used the calendar year prior to Census Day as the reference period, and the ACS uses the 12 months prior to the interview date as the reference period. Thus, while Census 2000 collected income information for calendar year 1999, the ACS collects income information for the 12 months preceding the interview date. The responses are a mixture of 12 reference periods ranging from, in the case of the 2006 ACS single-year estimates, the full calendar year 2005 through November 2006. The ACS income responses for each of these reference periods are individually inflation-adjusted to represent dollar values for the ACS collection year.

School Enrollment

The school enrollment question on the ACS asks if a person had "at any time in the last 3 months attended a school or college." A consistent 3-month reference period is used for all interviews. In contrast, Census 2000 asked if a person had "at any time since February 1 attended a school or college." Since Census 2000 data were collected from mid-March to late-August, the reference period could have been as short as about 6 weeks or as long as 7 months.

Utility Costs

The reference periods for two utility cost questions—gas and electricity—differ between Census 2000 and the ACS. The census asked for annual costs, while the ACS asks for the utility costs in the previous month.

Definitions

Some data items were collected by both the ACS and the Census 2000 long form with slightly different definitions that could affect the comparability of the estimates for these items. One example is annual costs for a mobile home. Census 2000 included installment loan costs in the total annual costs but the ACS does not. In this example, the ACS could be expected to yield smaller estimates than Census 2000.

Implementation

While differences discussed above were a part of the census and survey design objectives, other differences observed between ACS and census results were not by design, but due to nonsampling error—differences related to how well the surveys were conducted. Appendix 6 explains nonsampling error in more detail.

The ACS and the census experience different levels and types of coverage error, different levels and treatment of unit and item nonresponse, and different instances of measurement and processing error. Both Census 2000 and the ACS had similar high levels of survey coverage and low levels of unit nonresponse. Higher levels of unit nonresponse were found in the nonresponse follow-up stage of Census 2000. Higher item nonresponse rates were also found in Census 2000. Please see <http://www.census.gov/acs/www/AdvMeth/Reports.htm> for detailed comparisons of these measures of survey quality.

Appendix 3.
Measures of Sampling Error

All survey and census estimates include some amount of error. Estimates generated from sample survey data have uncertainty associated with them due to their being based on a sample of the population rather than the full population. This uncertainty, referred to as sampling error, means that the estimates derived from a sample survey will likely differ from the values that would have been obtained if the entire population had been included in the survey, as well as from values that would have been obtained had a different set of sample units been selected. All other forms of error are called nonsampling error and are discussed in greater detail in Appendix 6.

Sampling error can be expressed quantitatively in various ways, four of which are presented in this appendix—standard error, margin of error, confidence interval, and coefficient of variation. As the ACS estimates are based on a sample survey of the U.S. population, information about the sampling error associated with the estimates must be taken into account when analyzing individual estimates or comparing pairs of estimates across areas, population subgroups, or time periods. The information in this appendix describes each of these sampling error measures, explaining how they differ and how each should be used. It is intended to assist the user with analysis and interpretation of ACS estimates. Also included are instructions on how to compute margins of error for user-derived estimates.

Sampling Error Measures and Their Derivations

Standard Errors

A standard error (SE) measures the variability of an estimate due to sampling. Estimates derived from a sample (such as estimates from the ACS or the decennial census long form) will generally not equal the population value, as not all members of the population were measured in the survey. The SE provides a quantitative measure of the extent to which an estimate derived from the sample survey can be expected to deviate from this population value. It is the foundational measure from which other sampling error measures are derived. The SE is also used when comparing estimates to determine whether the differences between the estimates can be said to be statistically significant.

A very basic example of the standard error is a population of three units, with values of 1, 2, and 3. The average value for this population is 2. If a simple random sample of size two were selected from this population, the estimates of the average value would be 1.5 (units with values of 1 and 2 selected), 2 (units with values of 1 and 3 selected), or 2.5 (units with values of 2 and 3 selected). In this simple example, two of the three samples yield estimates that do not equal the population value (although the average of the estimates across all possible samples do equal the population value). The standard error would provide an indication of the extent of this variation.

The SE for an estimate depends upon the underlying variability in the population for the characteristic and the sample size used for the survey. In general, the larger the sample size, the smaller the standard error of the estimates produced from the sample. This relationship between sample size and SE is the reason ACS estimates for less populous areas are only published using multiple years of data: to take advantage of the larger sample size that results from aggregating data from more than one year.

Margins of Error

A margin of error (MOE) describes the precision of the estimate at a given level of confidence. The confidence level associated with the MOE indicates the likelihood that the sample estimate is within a certain distance (the MOE) from the population value. Confidence levels of 90 percent, 95 percent, and 99 percent are commonly used in practice to lessen the risk associated with an incorrect inference. The MOE provides a concise measure of the precision of the sample estimate in a table and is easily used to construct confidence intervals and test for statistical significance.

The Census Bureau statistical standard for published data is to use a 90-percent confidence level. Thus, the MOEs published with the ACS estimates correspond to a 90-percent confidence level. However, users may want to use other confidence levels, such as 95 percent or 99 percent. The choice of confidence level is usually a matter of preference, balancing risk for the specific application, as a 90-percent confidence level implies a 10 percent chance of an incorrect inference, in contrast with a 1 percent chance if using a 99-percent confidence level. Thus, if the impact of an incorrect conclusion is substantial, the user should consider increasing the confidence level.

One commonly experienced situation where use of a 95 percent or 99 percent MOE would be preferred is when conducting a number of tests to find differences between sample estimates. For example, if one were conducting comparisons between male and female incomes for each of 100 counties in a state, using a 90-percent confidence level would imply that 10 of the comparisons would be expected to be found significant even if no differences actually existed. Using a 99-percent confidence level would reduce the likelihood of this kind of false inference.

Calculating Margins of Error for Alternative Confidence Levels

If you want to use an MOE corresponding to a confidence level other than 90 percent, the published MOE can easily be converted by multiplying the published MOE by an adjustment factor. If the desired confidence level is 95 percent, then the factor is equal to 1.960/1.645.[1] If the desired confidence level is 99 percent, then the factor is equal to 2.576/1.645.

Conversion of the published ACS MOE to the MOE for a different confidence level can be expressed as

$$MOE_{95} = \frac{1.960}{1.645} MOE_{ACS}$$

$$MOE_{99} = \frac{2.576}{1.645} MOE_{ACS}$$

where MOE_{ACS} is the ACS published 90 percent MOE for the estimate.

Factors Associated With Margins of Error for Commonly Used Confidence Levels
90 Percent: 1.645 95 Percent: 1.960 99 Percent: 2.576
Census Bureau standard for published MOE is 90 percent.

For example, the ACS published MOE for the 2006 ACS estimated number of civilian veterans in the state of Virginia is ±12,357. The MOE corresponding to a 95-percent confidence level would be derived as follows:

$$MOE_{95} = \frac{1.960}{1.645}\left(\pm 12{,}357\right) = \pm 14{,}723$$

Deriving the Standard Error From the MOE

When conducting exact tests of significance (as discussed in Appendix 4) or calculating the CV for an estimate, the SEs of the estimates are needed. To derive the SE, simply divide the positive value of the published MOE by 1.645.[2]

Derivation of SEs can thus be expressed as

$$SE = \frac{MOE_{ACS}}{1.645}$$

where MOE_{ACS} is the positive value of the ACS published MOE for the estimate.

For example, the ACS published MOE for estimated number of civilian veterans in the state of Virginia from the 2006 ACS is ±12,357. The SE for the estimate would be derived as

$$SE = \frac{12{,}357}{1.645} = 7{,}512$$

Confidence Intervals

A confidence interval (CI) is a range that is expected to contain the average value of the characteristic that would result over all possible samples with a known probability. This probability is called the "level of confidence" or "confidence level." CIs are useful when graphing estimates to display their sampling variabilites. The sample estimate and its MOE are used to construct the CI.

Constructing a Confidence Interval From a Margin of Error

To construct a CI at the 90-percent confidence level, the published MOE is used. The CI boundaries are determined by adding to and subtracting from a sample estimate, the estimate's MOE.

For example, if an estimate of 20,000 had an MOE at the 90-percent confidence level of ±1,645, the CI would range from 18,355 (20,000 – 1,645) to 21,645 (20,000 + 1,645).

For CIs at the 95-percent or 99-percent confidence level, the appropriate MOE must first be derived as explained previously.

Construction of the lower and upper bounds for the CI can be expressed as

$$L_{CL} = \hat{X} - MOE_{CL}$$

$$U_{CL} = \hat{X} + MOE_{CL}$$

where $\hat{X}$ is the ACS estimate and

MOE_{CL} is the positive value of the MOE for the estimate at the desired confidence level.

The CI can thus be expressed as the range

$$CI_{CL} = \left(L_{CL}, U_{CL}\right).^{3}$$

[1] The value 1.65 must be used for ACS single-year estimates for 2005 or earlier, as that was the value used to derive the published margin of error from the standard error in those years.

[2] If working with ACS 1-year estimates for 2005 or earlier, use the value 1.65 rather than 1.645 in the adjustment factor.

[3] Users are cautioned to consider logical boundaries when creating confidence intervals from the margins of error. For example, a small population estimate may have a calculated lower bound less than zero. A negative number of persons doesn't make sense, so the lower bound should be set to zero instead.

For example, to construct a CI at the 95-percent confidence level for the number of civilian veterans in the state of Virginia in 2006, one would use the 2006 estimate (771,782) and the corresponding MOE at the 95-percent confidence level derived above (±14,723).

$$L_{95} = 771{,}782 - 14{,}723 = 757{,}059$$
$$U_{95} = 771{,}782 + 14{,}723 = 786{,}505$$

The 95-percent CI can thus be expressed as the range 757,059 to 786,505.

The CI is also useful when graphing estimates, to show the extent of sampling error present in the estimates, and for visually comparing estimates. For example, given the MOE at the 90-percent confidence level used in constructing the CI above, the user could be 90 percent certain that the value for the population was between 18,355 and 21,645. This CI can be represented visually as

Coefficients of Variation

A coefficient of variation (CV) provides a measure of the relative amount of sampling error that is associated with a sample estimate. The CV is calculated as the ratio of the SE for an estimate to the estimate itself and is usually expressed as a percent. It is a useful barometer of the stability, and thus the usability of a sample estimate. It can also help a user decide whether a single-year or multiyear estimate should be used for analysis. The method for obtaining the SE for an estimate was described earlier.

The CV is a function of the overall sample size and the size of the population of interest. In general, as the estimation period increases, the sample size increases and therefore the size of the CV decreases. A small CV indicates that the sampling error is small relative to the estimate, and thus the user can be more confident that the estimate is close to the population value. In some applications a small CV for an estimate is desirable and use of a multiyear estimate will therefore be preferable to the use of a 1-year estimate that doesn't meet this desired level of precision.

For example, if an estimate of 20,000 had an SE of 1,000, then the CV for the estimate would be 5 percent ([1,000 /20,000] x 100). In terms of usability, the estimate is very reliable. If the CV was noticeably larger, the usability of the estimate could be greatly diminished.

While it is true that estimates with high CVs have important limitations, they can still be valuable as building blocks to develop estimates for higher levels of aggregation. Combining estimates across geographic areas or collapsing characteristic detail can improve the reliability of those estimates as evidenced by reductions in the CVs.

Calculating Coefficients of Variation From Standard Errors

The CV can be expressed as

$$CV = \frac{SE}{\hat{X}} \times 100$$

where $\hat{X}$ is the ACS estimate and SE is the derived SE for the ACS estimate.

For example, to determine the CV for the estimated number of civilian veterans in the state of Virginia in 2006, one would use the 2006 estimate (771,782), and the SE derived previously (7,512).

$$CV = \frac{7{,}512}{771{,}782} \times 100 = 0.1\%$$

This means that the amount of sampling error present in the estimate is only one-tenth of 1 percent the size of the estimate.

The text box below summarizes the formulas used when deriving alternative sampling error measures from the margin or error published with ACS estimates.

Deriving Sampling Error Measures From Published MOE

Margin Error (MOE) for Alternate Confidence Levels

$$MOE_{95} = \frac{1.960}{1.645} MOE_{ACS}$$

$$MOE_{99} = \frac{2.576}{1.645} MOE_{ACS}$$

Standard Error (SE)

$$SE = \frac{MOE_{ACS}}{1.645}$$

Confidence Interval (CI)

$$CI_{CL} = \left(\hat{X} - MOE_{CL}, \hat{X} + MOE_{CL}\right)$$

Coefficient of Variation (CV)

$$CV = \frac{SE}{\hat{X}} \times 100$$

Calculating Margins of Error for Derived Estimates

One of the benefits of being familiar with ACS data is the ability to develop unique estimates called derived estimates. These derived estimates are usually based on aggregating estimates across geographic areas or population subgroups for which combined estimates are not published in American FactFinder (AFF) tables (e.g., aggregate estimates for a three-county area or for four age groups not collapsed).

ACS tabulations provided through AFF contain the associated confidence intervals (pre-2005) or margins of error (MOEs) (2005 and later) at the 90-percent confidence level. However, when derived estimates are generated (e.g., aggregated estimates, proportions, or ratios not available in AFF), the user must calculate the MOE for these derived estimates. The MOE helps protect against misinterpreting small or nonexistent differences as meaningful.

MOEs calculated based on information provided in AFF for the components of the derived estimates will be at the 90-percent confidence level. If an MOE with a confidence level other than 90 percent is desired, the user should first calculate the MOE as instructed below and then convert the results to an MOE for the desired confidence level as described earlier in this appendix.

Calculating MOEs for Aggregated Count Data

To calculate the MOE for aggregated count data:

1) Obtain the MOE of each component estimate.
2) Square the MOE of each component estimate.
3) Sum the squared MOEs.
4) Take the square root of the sum of the squared MOEs.

The result is the MOE for the aggregated count. Algebraically, the MOE for the aggregated count is calculated as:

$$MOE_{agg} = \pm\sqrt{\sum_c MOE_c^2}$$

where MOE_c is the MOE of the c^{th} component estimate.

The example below shows how to calculate the MOE for the estimated total number of females living alone in the three Virginia counties/independent cities that border Washington, DC (Fairfax and Arlington counties, Alexandria city) from the 2006 ACS.

Table 1. **Data for Example 1**

Characteristic	Estimate	MOE
Females living alone in Fairfax County (Component 1)	52,354	±3,303
Females living alone in Arlington County (Component 2)	19,464	±2,011
Females living alone in Alexandria city (Component 3)	17,190	±1,854

The aggregate estimate is:

$$\hat{X} = \hat{X}_{Fairfax} + \hat{X}_{Arlington} + \hat{X}_{Alexandria} =$$
$$52{,}354 + 19{,}464 + 17{,}190 = 89{,}008$$

Obtain MOEs of the component estimates:

$$MOE_{Fairfax} = \pm 3{,}303,$$
$$MOE_{Arlington} = \pm 2{,}011,$$
$$MOE_{Alexandria} = \pm 1{,}854$$

Calculate the MOE for the aggregate estimated as the square root of the sum of the squared MOEs.

$$MOE_{agg} = \pm\sqrt{(3{,}303)^2 + (2{,}011)^2 + (1{,}854)^2} =$$
$$\pm\sqrt{18{,}391{,}246} = \pm 4{,}289$$

Thus, the derived estimate of the number of females living alone in the three Virginia counties/independent cities that border Washington, DC, is 89,008, and the MOE for the estimate is ±4,289.

Calculating MOEs for Derived Proportions

The numerator of a proportion is a subset of the denominator (e.g., the proportion of single person households that are female). To calculate the MOE for derived proportions, do the following:

1) Obtain the MOE for the numerator and the MOE for the denominator of the proportion.
2) Square the derived proportion.
3) Square the MOE of the numerator.
4) Square the MOE of the denominator.
5) Multiply the squared MOE of the denominator by the squared proportion.
6) Subtract the result of (5) from the squared MOE of the numerator.
7) Take the square root of the result of (6).
8) Divide the result of (7) by the denominator of the proportion.

The result is the MOE for the derived proportion. Algebraically, the MOE for the derived proportion is calculated as:

$$MOE_p = \frac{\pm\sqrt{MOE_{num}^2 - (\hat{p}^2 * MOE_{den}^2)}}{\hat{X}_{den}}$$

where MOE_{num} is the MOE of the numerator.

MOE_{den} is the MOE of the denominator.

$\hat{p} = \frac{\hat{X}_{num}}{\hat{X}_{den}}$ is the derived proportion.

$\hat{X}_{num}$ is the estimate used as the numerator of the derived proportion.

$\hat{X}_{den}$ is the estimate used as the denominator of the derived proportion.

There are rare instances where this formula will fail—the value under the square root will be negative. If that happens, use the formula for derived ratios in the next section which will provide a conservative estimate of the MOE.

The example below shows how to derive the MOE for the estimated proportion of Black females 25 years of age and older in Fairfax County, Virginia, with a graduate degree based on the 2006 ACS.

Table 2. **Data for Example 2**

Characteristic	Estimate	MOE
Black females 25 years and older with a graduate degree (numerator)	4,634	±989
Black females 25 years and older (denominator)	31,713	±601

The estimated proportion is:

$$\hat{p} = \frac{\hat{X}_{gradBF}}{\hat{X}_{BF}} = \frac{4{,}634}{31{,}713} = 0.1461$$

where $\hat{X}_{gradBF}$ is the ACS estimate of Black females 25 years of age and older in Fairfax County with a graduate degree and $\hat{X}_{BF}$ is the ACS estimate of Black females 25 years of age and older in Fairfax County.

Obtain MOEs of the numerator (number of Black females 25 years of age and older in Fairfax County with a graduate degree) and denominator (number of Black females 25 years of age and older in Fairfax County).

$$MOE_{num} = \pm 989,\ MOE_{den} = \pm 601$$

Multiply the squared MOE of the denominator by the squared proportion and subtract the result from the squared MOE of the numerator.

$$MOE_{num}^2 - (\hat{p}^2 * MOE_{den}^2) =$$
$$(989)^2 - [(0.1461)^2 * (601)^2] =$$
$$978{,}121 - 7{,}712.3 = 970{,}408.7$$

Calculate the MOE by dividing the square root of the prior result by the denominator.

$$MOE_p = \frac{\pm\sqrt{970{,}408.7}}{31{,}373} = \frac{\pm 985.1}{31{,}373} = \pm 0.0311$$

Thus, the derived estimate of the proportion of Black females 25 years of age and older with a graduate degree in Fairfax County, Virginia, is 0.1461, and the MOE for the estimate is ±0.0311.

Calculating MOEs for Derived Ratios

The numerator of a ratio is not a subset (e.g., the ratio of females living alone to males living alone). To calculate the MOE for derived ratios:

1) Obtain the MOE for the numerator and the MOE for the denominator of the ratio.
2) Square the derived ratio.
3) Square the MOE of the numerator.
4) Square the MOE of the denominator.
5) Multiply the squared MOE of the denominator by the squared ratio.
6) Add the result of (5) to the squared MOE of the numerator.
7) Take the square root of the result of (6).
8) Divide the result of (7) by the denominator of the ratio.

The result is the MOE for the derived ratio. Algebraically, the MOE for the derived ratio is calculated as:

$$MOE_R = \frac{\pm\sqrt{MOE_{num}^2 + (\hat{R}^2 * MOE_{den}^2)}}{\hat{X}_{den}}$$

where MOE_{num} is the MOE of the numerator.

MOE_{den} is the MOE of the denominator.

$\hat{R} = \frac{\hat{X}_{num}}{\hat{X}_{den}}$ is the derived ratio.

$\hat{X}_{num}$ is the estimate used as the numerator of the derived ratio.

$\hat{X}_{den}$ is the estimate used as the denominator of the derived ratio.

The example below shows how to derive the MOE for the estimated ratio of Black females 25 years of age and older in Fairfax County, Virginia, with a graduate degree to Black males 25 years and older in Fairfax County with a graduate degree, based on the 2006 ACS.

Table 3. **Data for Example 3**

Characteristic	Estimate	MOE
Black females 25 years and older with a graduate degree (numerator)	4,634	±989
Black males 25 years and older with a graduate degree (denominator)	6,440	±1,328

The estimated ratio is:

$$\hat{R} = \frac{\hat{X}_{gradBF}}{\hat{X}_{gradBM}} = \frac{4{,}634}{6{,}440} = 0.7200$$

Obtain MOEs of the numerator (number of Black females 25 years of age and older with a graduate degree in Fairfax County) and denominator (number of Black males 25 years of age and older in Fairfax County with a graduate degree).

$$MOE_{num} = \pm 989,\ MOE_{den} = \pm 1{,}328$$

Multiply the squared MOE of the denominator by the squared proportion and add the result to the squared MOE of the numerator.

$$MOE_{num}^2 + (\hat{R}^2 * MOE_{den}^2) =$$

$$(989)^2 + [(0.7200)^2 * (1{,}328)^2] =$$

$$978{,}121 + 913{,}318.1 = 1{,}891{,}259.1$$

Calculate the MOE by dividing the square root of the prior result by the denominator.

$$MOE_R = \frac{\pm\sqrt{1{,}891{,}259.1}}{6{,}440} = \frac{\pm 1{,}375.2}{6{,}440} = \pm 0.2135$$

Thus, the derived estimate of the ratio of the number of Black females 25 years of age and older in Fairfax County, Virginia, with a graduate degree to the number of Black males 25 years of age and older in Fairfax County, Virginia, with a graduate degree is 0.7200, and the MOE for the estimate is ±0.2135.

Calculating MOEs for the Product of Two Estimates

To calculate the MOE for the product of two estimates, do the following:

1) Obtain the MOEs for the two estimates being multiplied together.
2) Square the estimates and their MOEs.
3) Multiply the first squared estimate by the second estimate's squared MOE.
4) Multiply the second squared estimate by the first estimate's squared MOE.
5) Add the results from (3) and (4).
6) Take the square root of (5).

The result is the MOE for the product. Algebraically, the MOE for the product is calculated as:

$$MOE_{A\times B} = \pm\sqrt{A^2 \times MOE_B^2 + B^2 \times MOE_A^2}$$

where *A* and *B* are the first and second estimates, respectively.

MOE_A is the MOE of the first estimate.

MOE_B is the MOE of the second estimate.

The example below shows how to derive the MOE for the estimated number of Black workers 16 years and over in Fairfax County, Virginia, who used public transportation to commute to work, based on the 2006 ACS.

Table 4. **Data for Example 4**

Characteristic	Estimate	MOE
Black workers 16 years and over (first estimate)	50,624	±2,423
Percent of Black workers 16 years and over who commute by public transportation (second estimate)	13.4%	±2.7%

To apply the method, the proportion (0.134) needs to be used instead of the percent (13.4). The estimated product is 50,624 × 0.134 = 6,784. The MOE is calculated by:

$$MOE_{A\times B} = \pm\sqrt{50{,}624^2 \times 0.027^2 + 0.134^2 \times 2{,}423^2}$$

$$= \pm 1{,}405$$

Thus, the derived estimate of Black workers 16 years and over who commute by public transportation is 6,784, and the MOE of the estimate is ±1,405.

Calculating MOEs for Estimates of "Percent Change" or "Percent Difference"

The "percent change" or "percent difference" between two estimates (for example, the same estimates in two different years) is commonly calculated as

$$Percent\ Change = 100\% * \frac{\hat{X}_2 - \hat{X}_1}{\hat{X}_1}$$

Because $\hat{X}_2$ is not a subset of $\hat{X}_1$, the procedure to calculate the MOE of a ratio discussed previously should be used here to obtain the MOE of the percent change.

The example below shows how to calculate the margin of error of the percent change using the 2006 and 2005 estimates of the number of persons in Maryland who lived in a different house in the U.S. 1 year ago.

Table 5. **Data for Example 5**

Characteristic	Estimate	MOE
Persons who lived in a different house in the U.S. 1 year ago, 2006	802,210	±22,866
Persons who lived in a different house in the U.S. 1 year ago, 2005	762,475	±22,666

The percent change is:

$$Percent\ Change = 100\% * \frac{\hat{X}_2 - \hat{X}_1}{\hat{X}_1} =$$

$$100\% * \left(\frac{802{,}210 - 762{,}475}{762{,}475}\right) = 5.21\%$$

For use in the ratio formula, the ratio of the two estimates is:

$$\hat{R} = \frac{\hat{X}_2}{\hat{X}_1} = \frac{802{,}210}{762{,}475} = 1.0521$$

The MOEs for the numerator ($\hat{X}_2$) and denominator ($\hat{X}_1$) are:

$$MOE_2 = +/-22{,}866,\ MOE_1 = +/-22{,}666$$

Add the squared MOE of the numerator (MOE_2) to the product of the squared ratio and the squared MOE of the denominator (MOE_1):

$$MOE_2^2 + (\hat{R}^2 * MOE_1^2) =$$

$$(22{,}866)^2 + [(1.0521)^2 * (22{,}666)^2] =$$

$$1{,}091{,}528{,}529$$

Calculate the MOE by dividing the square root of the prior result by the denominator ($\hat{X}_1$).

$$MOE_R = \frac{\pm\sqrt{1{,}091{,}528{,}529}}{762{,}475} = \frac{\pm 33{,}038.3}{762{,}475} = \pm 0.0433$$

Finally, the MOE of the percent change is the MOE of the ratio, multiplied by 100 percent, or 4.33 percent.

The text box below summarizes the formulas used to calculate the margin of error for several derived estimates.

Calculating Margins of Error for Derived Estimates

Aggregated Count Data

$$MOE_{agg} = \pm\sqrt{\sum_c MOE_c^2}$$

Derived Proportions

$$MOE_p = \frac{\pm\sqrt{MOE_{num}^2 - (\hat{p}^2 * MOE_{den}^2)}}{\hat{X}_{den}}$$

Derived Ratios

$$MOE_R = \frac{\pm\sqrt{MOE_{num}^2 + (\hat{R}^2 * MOE_{den}^2)}}{\hat{X}_{den}}$$

Appendix 4.
Making Comparisons

One of the most important uses of the ACS estimates is to make comparisons between estimates. Several key types of comparisons are of general interest to users: 1) comparisons of estimates from different geographic areas within the same time period (e.g., comparing the proportion of people below the poverty level in two counties); 2) comparisons of estimates for the same geographic area across time periods (e.g., comparing the proportion of people below the poverty level in a county for 2006 and 2007); and 3) comparisons of ACS estimates with the corresponding estimates from past decennial census samples (e.g., comparing the proportion of people below the poverty level in a county for 2006 and 2000).

A number of conditions must be met when comparing survey estimates. Of primary importance is that the comparison takes into account the sampling error associated with each estimate, thus determining whether the observed differences between estimates are statistically significant. Statistical significance means that there is statistical evidence that a true difference exists within the full population, and that the observed difference is unlikely to have occurred by chance due to sampling. A method for determining statistical significance when making comparisons is presented in the next section. Considerations associated with the various types of comparisons that could be made are also discussed.

Determining Statistical Significance

When comparing two estimates, one should use the test for significance described below. This approach will allow the user to ascertain whether the observed difference is likely due to chance (and thus is not statistically significant) or likely represents a true difference that exists in the population as a whole (and thus is statistically significant).

The test for significance can be carried out by making several computations using the estimates and their corresponding standard errors (SEs). When working with ACS data, these computations are simple given the data provided in tables in the American FactFinder.

1) Determine the SE for each estimate (for ACS data, SE is defined by the positive value of the margin of error (MOE) divided by 1.645).[4]
2) Square the resulting SE for each estimate.
3) Sum the squared SEs.
4) Calculate the square root of the sum of the squared SEs.
5) Calculate the difference between the two estimates.
6) Divide (5) by (4).
7) Compare the absolute value of the result of (6) with the critical value for the desired level of confidence (1.645 for 90 percent, 1.960 for 95 percent, 2.576 for 99 percent).
8) If the absolute value of the result of (6) is greater than the critical value, then the difference between the two estimates can be considered statistically significant at the level of confidence corresponding to the critical value used in (7).

[4] NOTE: If working with ACS single-year estimates for 2005 or earlier, use the value 1.65 rather than 1.645.

Algebraically, the significance test can be expressed as follows:

If $\left|\frac{\hat{X}_1 - \hat{X}_2}{\sqrt{SE_1^2 + SE_2^2}}\right| > Z_{CL}$, then the difference

between estimates $\hat{X}_1$ and $\hat{X}_2$ is statistically significant at the specified confidence level, CL

where $\hat{X}_i$ is estimate *i* (=1,2)

SE_i is the SE for the estimate *i* (=1,2)

Z_{CL} is the critical value for the desired confidence level (=1.645 for 90 percent, 1.960 for 95 percent, 2.576 for 99 percent).

The example below shows how to determine if the difference in the estimated percentage of households in 2006 with one or more people of age 65 and older between State A (estimated percentage =22.0, SE=0.12) and State B (estimated percentage =21.5, SE=0.12) is statistically significant. Using the formula above:

$$\left|\frac{\hat{X}_1 - \hat{X}_2}{\sqrt{SE_1^2 + SE_2^2}}\right| = \left|\frac{22.0 - 21.5}{\sqrt{(0.12)^2 + (0.12)^2}}\right| =$$

$$\left|\frac{0.5}{\sqrt{0.015 + 0.015}}\right| = \left|\frac{0.5}{\sqrt{0.03}}\right| = \left|\frac{0.5}{0.173}\right| = 2.90$$

Since the test value (2.90) is greater than the critical value for a confidence level of 99 percent (2.576), the difference in the percentages is statistically significant at a 99-percent confidence level. This is also referred to as statistically significant at the alpha = 0.01 level. A rough interpretation of the result is that the user can be 99 percent certain that a difference exists between the percentages of households with one or more people aged 65 and older between State A and State B.

By contrast, if the corresponding estimates for State C and State D were 22.1 and 22.5, respectively, with standard errors of 0.20 and 0.25, respectively, the formula would yield

$$\left|\frac{\hat{X}_1 - \hat{X}_2}{\sqrt{SE_1^2 + SE_2^2}}\right| = \left|\frac{22.5 - 22.1}{\sqrt{(0.20)^2 + (0.25)^2}}\right| =$$

$$\left|\frac{0.4}{\sqrt{0.04 + 0.0625}}\right| = \left|\frac{0.4}{\sqrt{0.1025}}\right| = \left|\frac{0.4}{0.320}\right| = 1.25$$

Since the test value (1.25) is less than the critical value for a confidence level of 90 percent (1.645), the difference in percentages is not statistically significant. A rough interpretation of the result is that the user cannot be certain to any sufficient degree that the observed difference in the estimates was not due to chance.

Comparisons Within the Same Time Period

Comparisons involving two estimates from the same time period (e.g., from the same year or the same 3-year period) are straightforward and can be carried out as described in the previous section. There is, however, one statistical aspect related to the test for statistical significance that users should be aware of. When comparing estimates within the same time period, the areas or groups will generally be nonoverlapping (e.g., comparing estimates for two different counties). In this case, the two estimates are independent, and the formula for testing differences is statistically correct.

In some cases, the comparison may involve a large area or group and a subset of the area or group (e.g., comparing an estimate for a state with the corresponding estimate for a county within the state or comparing an estimate for all females with the corresponding estimate for Black females). In these cases, the two estimates are not independent. The estimate for the large area is partially dependent on the estimate for the subset and, strictly speaking, the formula for testing differences should account for this partial dependence. However, unless the user has reason to believe that the two estimates are strongly correlated, it is acceptable to ignore the partial dependence and use the formula for testing differences as provided in the previous section. However, if the two estimates are positively correlated, a finding of statistical significance will still be correct, but a finding of a lack of statistical significance based on the formula may be incorrect. If it is important to obtain a more exact test of significance, the user should consult with a statistician about approaches for accounting for the correlation in performing the statistical test of significance.

Comparisons Across Time Periods

Comparisons of estimates from different time periods may involve different single-year periods or different multiyear periods of the same length within the same area. Comparisons across time periods should be made only with comparable time period estimates. Users are advised against comparing single-year estimates with multiyear estimates (e.g., comparing 2006 with 2007–2009) and against comparing multiyear estimates of differing lengths (e.g., comparing 2006–2008 with 2009–2014), as they are measuring the characteristics of the population in two different ways, so differences between such estimates are difficult to interpret. When carrying out any of these types of comparisons, users should take several other issues into consideration.

When comparing estimates from two different single-year periods, one prior to 2006 and the other 2006 or later (e.g., comparing estimates from 2005 and 2007), the user should recognize that from 2006 on the ACS sample includes the population living in group quarters (GQ) as well as the population living in housing units. Many types of GQ populations have demographic, social, or economic characteristics that are very different from the household population. As a result, comparisons between 2005 and 2006 and later ACS estimates could be affected. This is particularly true for areas with a substantial GQ population. For most population characteristics, the Census Bureau suggests users make comparisons across these time periods only if the geographic area of interest does not include a substantial GQ population. For housing characteristics or characteristics published only for the household population, this is obviously not an issue.

Comparisons Based on Overlapping Periods

When comparing estimates from two multiyear periods, ideally comparisons should be based on nonoverlapping periods (e.g., comparing estimates from 2006–2008 with estimates from 2009–2011). The comparison of two estimates for different, but overlapping periods is challenging since the difference is driven by the nonoverlapping years. For example, when comparing the 2005–2007 ACS with the 2006–2008 ACS, data for 2006 and 2007 are included in both estimates. Their contribution is subtracted out when the estimate of differences is calculated. While the interpretation of this difference is difficult, these comparisons can be made with caution. Under most circumstances, the estimate of difference should not be interpreted as a reflection of change between the last 2 years.

The use of MOEs for assessing the reliability of change over time is complicated when change is being evaluated using multiyear estimates. From a technical standpoint, change over time is best evaluated with multiyear estimates that do not overlap. At the same time, many areas whose only source of data will be 5-year estimates will not want to wait until 2015 to evaluate change (i.e., comparing 2005–2009 with 2010–2014).

When comparing two 3-year estimates or two 5-year estimates of the same geography that overlap in sample years one must account for this sample overlap. Thus to calculate the standard error of this difference use the following approximation to the standard error:

$$SE(\hat{X}_1 - \hat{X}_2) \cong \sqrt{(1-C)}\sqrt{SE_1^{\ 2} + SE_2^{\ 2}}$$

where C is the fraction of overlapping years. For example, the periods 2005–2009 and 2007–2011 overlap for 3 out of 5 years, so C=3/5=0.6. If the periods do not overlap, such as 2005–2007 and 2008–2010, then C=0.

With this SE one can test for the statistical significance of the difference between the two estimates using the method outlined in the previous section with one modification; substitute $\sqrt{(1-C)}\sqrt{SE_1^{\ 2} + SE_2^{\ 2}}$ for $\sqrt{SE_1^{\ 2} + SE_2^{\ 2}}$ in the denominator of the formula for the significance test.

Comparisons With Census 2000 Data

In Appendix 2, major differences between ACS data and decennial census sample data are discussed. Factors such as differences in residence rules, universes, and reference periods, while not discussed in detail in this appendix, should be considered when comparing ACS estimates with decennial census estimates. For example, given the reference period differences, seasonality may affect comparisons between decennial census and ACS estimates when looking at data for areas such as college towns and resort areas.

The Census Bureau subject matter specialists have reviewed the factors that could affect differences between ACS and decennial census estimates and they have determined that ACS estimates are similar to those obtained from past decennial census sample data for most areas and characteristics. The user should consider whether a particular analysis involves an area or characteristic that might be affected by these differences.[5]

When comparing ACS and decennial census sample estimates, the user must remember that the decennial census sample estimates have sampling error associated with them and that the standard errors for both ACS and census estimates must be incorporated when performing tests of statistical significance. Appendix 3 provides the calculations necessary for determining statistical significance of a difference between two estimates. To derive the SEs of census sample estimates, use the method described in Chapter 8 of either the Census 2000 Summary File 3 Technical Documentation <http://www.census.gov/prod/cen2000/doc/sf3.pdf> or the Census 2000 Summary File 4 Technical Documentation <http://www.census.gov/prod/cen2000/doc/sf4.pdf>.

A conservative approach to testing for statistical significance when comparing ACS and Census 2000 estimates that avoids deriving the SE for the Census 2000 estimate would be to assume the SE for the Census 2000 estimate is the same as that determined for the ACS estimate. The result of this approach would be that a finding of statistical significance can be assumed to be accurate (as the SE for the Census 2000 estimate would be expected to be less than that for the ACS estimate), but a finding of no statistical significance could be incorrect. In this case the user should calculate the census long-form standard error and follow the steps to conduct the statistical test.

Comparisons With 2010 Census Data

Looking ahead to the 2010 decennial census, data users need to remember that the socioeconomic data previously collected on the long form during the census will not be available for comparison with ACS estimates. The only common variables for the ACS and 2010 Census are sex, age, race, ethnicity, household relationship, housing tenure, and vacancy status.

The critical factor that must be considered when comparing ACS estimates encompassing 2010 with the 2010 Census is the potential impact of housing and population controls used for the ACS. As the housing and population controls used for 2010 ACS data will be based on the Population Estimates Program where the estimates are benchmarked on the Census 2000 counts, they will not agree with the 2010 Census population counts for that year. The 2010 population estimates may differ from the 2010 Census counts for two major reasons—the true change from 2000 to 2010 is not accurately captured by the estimates and the completeness of coverage in the 2010 Census is different than coverage of Census 2000. The impact of this difference will likely affect most areas and states, and be most notable for smaller geographic areas where the potential for large differences between the population controls and the 2010 Census population counts is greater.

Comparisons With Other Surveys

Comparisons of ACS estimates with estimates from other national surveys, such as the Current Population Survey, may be of interest to some users. A major consideration in making such comparisons will be that ACS

[5] Further information concerning areas and characteristics that do not fit the general pattern of comparability can be found on the ACS Web site at <http://www.census.gov/acs/www/UseData/compACS.htm>.

estimates include data for populations in both institutional and noninstitutional group quarters, and estimates from most national surveys do not include institutional populations. Another potential for large effects when comparing data from the ACS with data from other national surveys is the use of different questions for measuring the same or similar information.

Sampling error and its impact on the estimates from the other survey should be considered if comparisons and statements of statistical difference are to be made, as described in Appendix 3. The standard errors on estimates from other surveys should be derived according to technical documentation provided for those individual surveys.

Finally, the user wishing to compare ACS estimates with estimates from other national surveys should consider the potential impact of other factors, such as target population, sample design and size, survey period, reference period, residence rules, and interview modes on estimates from the two sources.

Appendix 5.

Using Dollar-Denominated Data

Dollar-denominated data refer to any characteristics for which inflation adjustments are used when producing annual estimates. For example, income, rent, home value, and energy costs are all dollar-denominated data.

Inflation will affect the comparability of dollar-denominated data across time periods. When ACS multiyear estimates for dollar-denominated data are generated, amounts are adjusted using inflation factors based on the Consumer Price Index (CPI).

Given the potential impact of inflation on observed differences of dollar-denominated data across time periods, users should adjust for the effects of inflation. Such an adjustment will provide comparable estimates accounting for inflation. In making adjustments, the Census Bureau recommends using factors based on the All Items CPI-U-RS (CPI research series). The Bureau of Labor Statistics CPI indexes through 2006 are found at <http://www.bls.gov/cpi/cpiurs1978_2006.pdf>. Explanations follow.

Creating Single-Year Income Values

ACS income values are reported based on the amount of income received during the 12 months preceding the interview month. This is the income reference period. Since there are 12 different income reference periods throughout an interview year, 12 different income inflation adjustments are made. Monthly CPI-U-RSs are used to inflation-adjust the 12 reference period incomes to a single reference period of January through December of the interview year. Note that there are no inflation adjustments for single-year estimates of rent, home value, or energy cost values.

Adjusting Single-Year Estimates Over Time

When comparing single-year income, rent, home value, and energy cost value estimates from two different years, adjustment should be made as follows:

1) Obtain the All Items CPI-U-RS Annual Averages for the 2 years being compared.

2) Calculate the inflation adjustment factor as the ratio of the CPI-U-RS from the more recent year to the CPI-U-RS from the earlier year.

3) Multiply the dollar-denominated data estimated for the earlier year by the inflation adjustment factor.

The inflation-adjusted estimate for the earlier year can be expressed as:

$$\hat{X}_{Y1,Adj} = \frac{CPI_{Y2}}{CPI_{Y1}} \hat{X}_{Y1}$$

where CPI_{Y1} is the All Items CPI-U-RS Annual Average for the earlier year (Y1).

CPI_{Y2} is the All Items CPI-U-RS Annual Average for the more recent year (Y2).

$\hat{X}_{Y1}$ is the published ACS estimate for the earlier year (Y1).

The example below compares the national median value for owner-occupied mobile homes in 2005 ($37,700) and 2006 ($41,000). First adjust the 2005 median value using the 2005 All Items CPI-U-RS Annual Average (286.7) and the 2006 All Items CPI-U-RS Annual Average (296.1) as follows:

$$\hat{X}_{2005,Adj} = \frac{296.1}{286.7} \times \$37{,}700 = \$38{,}936$$

Thus, the comparison of the national median value for owner-occupied mobile homes in 2005 and 2006, in 2006 dollars, would be $38,936 (2005 inflation-adjusted to 2006 dollars) versus $41,000 (2006 dollars).

Creating Values Used in Multiyear Estimates

Multiyear income, rent, home value, and energy cost values are created with inflation adjustments. The Census Bureau uses the All Items CPI-U-RS Annual Averages for each year in the multiyear time period to calculate a set of inflation adjustment factors. Adjustment factors for a time period are calculated as ratios of the CPI-U-RS Annual Average from its most recent year to the CPI-U-RS Annual Averages from each of its earlier years. The ACS values for each of the earlier years in the multiyear period are multiplied by the appropriate inflation adjustment factors to produce the inflation-adjusted values. These values are then used to create the multiyear estimates.

As an illustration, consider the time period 2004–2006, which consisted of individual reference-year income values of $30,000 for 2006, $20,000 for 2005, and $10,000 for 2004. The multiyear income components are created from inflation-adjusted reference period income values using factors based on the All Items CPI-U-RS Annual Averages of 277.4 (for 2004), 286.7 (for 2005), and 296.1 (for 2006). The adjusted 2005 value is the ratio of 296.1 to 286.7 applied to $20,000, which equals $20,656. Similarly, the 2004 value is the ratio of 296.1 to 277.4 applied to $10,000, which equals $10,674.

Adjusting Multiyear Estimates Over Time

When comparing multiyear estimates from two different time periods, adjustments should be made as follows:

1) Obtain the All Items CPI-U-RS Annual Average for the most current year in each of the time periods being compared.
2) Calculate the inflation adjustment factor as the ratio of the CPI-U-RS Annual Average in (1) from the most recent year to the CPI-U-RS in (1) from the earlier years.
3) Multiply the dollar-denominated estimate for the earlier time period by the inflation adjustment factor.

The inflation-adjusted estimate for the earlier years can be expressed as:

$$\hat{X}_{P1,Adj} = \frac{CPI_{P2}}{CPI_{P1}} \hat{X}_{P1}$$

where CPI_{P1} is the All Items CPI-U-RS Annual Average for the last year in the earlier time period (P1).

CPI_{P2} is the All Items CPI-U-RS Annual Average for the last year in the most recent time period (P2).

$\hat{X}_{P1}$ is the published ACS estimate for the earlier time period (P1).

As an illustration, consider ACS multiyear estimates for the two time periods of 2001–2003 and 2004–2006. To compare the national median value for owner-occupied mobile homes in 2001–2003 ($32,000) and 2004–2006 ($39,000), first adjust the 2001–2003 median value using the 2003 All Items CPI-U-RS Annual Averages (270.1) and the 2006 All Items CPI-U-RS Annual Averages (296.1) as follows:

$$\hat{X}_{2001-2003,Adj} = \frac{296.1}{270.1} \times \$32{,}000 = \$35{,}080$$

Thus, the comparison of the national median value for owner-occupied mobile homes in 2001–2003 and 2004–2006, in 2006 dollars, would be $35,080 (2001–2003 inflation-adjusted to 2006 dollars) versus $39,000 (2004–2006, already in 2006 dollars).

Issues Associated With Inflation Adjustment

The recommended inflation adjustment uses a national level CPI and thus will not reflect inflation differences that may exist across geographies. In addition, since the inflation adjustment uses the All Items CPI, it will not reflect differences that may exist across characteristics such as energy and housing costs.

Appendix 6.

Measures of Nonsampling Error

All survey estimates are subject to both sampling and nonsampling error. In Appendix 3, the topic of sampling error and the various measures available for understanding the uncertainty in the estimates due to their being derived from a sample, rather than from an entire population, are discussed. The margins of error published with ACS estimates measure only the effect of sampling error. Other errors that affect the overall accuracy of the survey estimates may occur in the course of collecting and processing the ACS, and are referred to collectively as nonsampling errors.

Broadly speaking, nonsampling error refers to any error affecting a survey estimate outside of sampling error. Nonsampling error can occur in complete censuses as well as in sample surveys, and is commonly recognized as including coverage error, unit nonresponse, item nonresponse, response error, and processing error.

Types of Nonsampling Errors

Coverage error occurs when a housing unit or person does not have a chance of selection in the sample (undercoverage), or when a housing unit or person has more than one chance of selection in the sample, or is included in the sample when they should not have been (overcoverage). For example, if the frame used for the ACS did not allow the selection of newly constructed housing units, the estimates would suffer from errors due to housing undercoverage.

The final ACS estimates are adjusted for under- and overcoverage by controlling county-level estimates to independent total housing unit controls and to independent population controls by sex, age, race, and Hispanic origin (more information is provided on the coverage error definition page of the "ACS Quality Measures" Web site at <http://www.census.gov/acs/www/UseData/sse/cov/cov_def.htm>). However, it is important to measure the extent of coverage adjustment by comparing the precontrolled ACS estimates to the final controlled estimates. If the extent of coverage adjustments is large, there is a greater chance that differences in characteristics of undercovered or overcovered housing units or individuals differ from those eligible to be selected. When this occurs, the ACS may not provide an accurate picture of the population prior to the coverage adjustment, and the population controls may not eliminate or minimize that coverage error.

Unit nonresponse is the failure to obtain the minimum required information from a housing unit or a resident of a group quarter in order for it to be considered a completed interview. Unit nonresponse means that no survey data are available for a particular sampled unit or person. For example, if no one in a sampled housing unit is available to be interviewed during the time frame for data collection, unit nonresponse will result.

It is important to measure unit nonresponse because it has a direct effect on the quality of the data. If the unit nonresponse rate is high, it increases the chance that the final survey estimates may contain bias, even though the ACS estimation methodology includes a nonresponse adjustment intended to control potential unit nonresponse bias. This will happen if the characteristics of nonresponding units differ from the characteristics of responding units.

Item nonresponse occurs when a respondent fails to provide an answer to a required question or when the answer given is inconsistent with other information. With item nonresponse, while some responses to the survey questionnaire for the unit are provided, responses to other questions are not obtained. For example, a respondent may be unwilling to respond to a question about income, resulting in item nonresponse for that question. Another reason for item nonresponse may be a lack of understanding of a particular question by a respondent.

Information on item nonresponse allows users to judge the completeness of the data on which the survey estimates are based. Final estimates can be adversely impacted when item nonresponse is high, because bias can be introduced if the actual characteristics of the people who do not respond to a question differ from those of people who do respond to it. The ACS estimation methodology includes imputations for item nonresponse, intended to reduce the potential for item nonresponse bias.

Response error occurs when data are reported or recorded incorrectly. Response errors may be due to the respondent, the interviewer, the questionnaire, or the survey process itself. For example, if an interviewer conducting a telephone interview incorrectly records a respondent's answer, response error results. In the same way, if the respondent fails to provide a correct response to a question, response error results. Another potential source of response error is a survey process that allows proxy responses to be obtained, wherein a knowledgeable person within the household provides responses for another person within the household who is unavailable for the interview. Even more error prone is allowing neighbors to respond.

Processing error can occur during the preparation of the final data files. For example, errors may occur if data entry of questionnaire information is incomplete or inaccurate. Coding of responses incorrectly also results in processing error. Critical reviews of edits and tabulations by subject matter experts are conducted to keep errors of this kind to a minimum.

Nonsampling error can result in random errors and systematic errors. Of greatest concern are systematic errors. Random errors are less critical since they tend to cancel out at higher geographic levels in large samples such as the ACS.

On the other hand, systematic errors tend to accumulate over the entire sample. For example, if there is an error in the questionnaire design that negatively affects the accurate capture of respondents' answers, processing errors are created. Systematic errors often lead to a bias in the final results. Unlike sampling error and random error resulting from nonsampling error, bias caused by systematic errors cannot be reduced by increasing the sample size.

ACS Quality Measures

Nonsampling error is extremely difficult, if not impossible, to measure directly. However, the Census Bureau has developed a number of indirect measures of nonsampling error to help inform users of the quality of the ACS estimates: sample size, coverage rates, unit response rates and nonresponse rates by reason, and item allocation rates. Starting with the 2007 ACS, these measures are available in the B98 series of detailed tables on AFF. Quality measures for previous years are available on the "ACS Quality Measures" Web site at <http:/www.census.gov/acs/www/UseData/sse/>.

Sample size measures for the ACS summarize information for the housing unit and GQ samples. The measures available at the state level are:[6]

- Housing units
  - Number of initial addresses selected
  - Number of final survey interviews
- Group quarters people (beginning with the 2006 ACS)
  - Number of initial persons selected
  - Number of final survey interviews

Sample size measures may be useful in special circumstances when determining whether to use single-year or multiyear estimates in conjunction with estimates of the population of interest. While the coefficient of variation (CV) should typically be used to determine usability, as explained in Appendix 3, there may be some situations where the CV is small but the user has reason to believe the sample size for a subgroup is very small and the robustness of the estimate is in question.

For example, the Asian-alone population makes up roughly 1 percent (8,418/656,700) of the population in Jefferson County, Alabama. Given that the number of successful housing unit interviews in Jefferson County for the 2006 ACS were 4,072 and assuming roughly 2.5 persons per household (or roughly 12,500 completed person interviews), one could estimate that the 2006 ACS data for Asians in Jefferson County are based on roughly 150 completed person interviews.

Coverage rates are available for housing units, and total population by sex at both the state and national level. Coverage rates for total population by six race/ethnicity categories and the GQ population are also available at the national level. These coverage rates are a measure of the extent of adjustment to the survey weights required during the component of the estimation methodology that adjusts to population controls. Low coverage rates are an indication of greater potential for coverage error in the estimates.

Unit response and nonresponse rates for housing units are available at the county, state, and national level by reason for nonresponse: refusal, unable to locate, no one home, temporarily absent, language problem, other, and data insufficient to be considered an interview. Rates are also provided separately for persons in group quarters at the national and state levels.

A low unit response rate is an indication that there is potential for bias in the survey estimates. For example, the 2006 housing unit response rates are at least 94 percent for all states. The response rate for the District of Columbia in 2006 was 91 percent.

Item allocation rates are determined by the content edits performed on the individual raw responses and closely correspond to item nonresponse rates. Overall housing unit and person characteristic allocation rates are available at the state and national levels, which combine many different characteristics. Allocation rates for individual items may be calculated from the B99 series of imputation detailed tables available in AFF.

Item allocation rates do vary by state, so users are advised to examine the allocation rates for characteristics of interest before drawing conclusions from the published estimates.

[6] The sample size measures for housing units (number of initial addresses selected and number of final survey interviews) and for group quarters people cannot be used to calculate response rates. For the housing unit sample, the number of initial addresses selected includes addresses that were determined not to identify housing units, as well as initial addresses that are subsequently subsampled out in preparation for personal visit nonresponse follow-up. Similarly, the initial sample of people in group quarters represents the expected sample size within selected group quarters prior to visiting and sampling of residents.

Appendix 7.

Implications of Population Controls on ACS Estimates

As with most household surveys, the American Community Survey data are controlled so that the numbers of housing units and people in categories defined by age, sex, race, and Hispanic origin agree with the Census Bureau's official estimates. The American Community Survey (ACS) measures the characteristics of the population, but the official count of the population comes from the previous census, updated by the Population Estimates Program.

In the case of the ACS, the total housing unit estimates and the total population estimates by age, sex, race and Hispanic origin are controlled at the county (or groups of counties) level. The group quarters total population is controlled at the state level by major type of group quarters. Such adjustments are important to correct the survey data for nonsampling and sampling errors. An important source of nonsampling error is the potential under-representation of hard-to-enumerate demographic groups. The use of the population controls results in ACS estimates that more closely reflect the level of coverage achieved for those groups in the preceding census. The use of the population estimates as controls partially corrects demographically implausible results from the ACS due to the ACS data being based on a sample of the population rather than a full count. For example, the use of the population controls "smooths out" demographic irregularities in the age structure of the population that result from random sampling variability in the ACS.

When the controls are applied to a group of counties rather than a single county, the ACS estimates and the official population estimates for the individual counties may not agree. There also may not be agreement between the ACS estimates and the population estimates for levels of geography such as subcounty areas where the population controls are not applied.

The use of population and housing unit controls also reduces random variability in the estimates from year to year. Without the controls, the sampling variability in the ACS could cause the population estimates to increase in one year and decrease in the next (especially for smaller areas or demographic groups), when the underlying trend is more stable. This reduction in variability on a time series basis is important since results from the ACS may be used to monitor trends over time. As more current data become available, the time series of estimates from the Population Estimates Program are revised back to the preceding census while the ACS estimates in previous years are not. Therefore, some differences in the ACS estimates across time may be due to changes in the population estimates.

For single-year ACS estimates, the population and total housing unit estimates for July 1 of the survey year are used as controls. For multiyear ACS estimates, the controls are the average of the individual year population estimates.

Appendix 8.
Other ACS Resources

Background and Overview Information

American Community Survey Web Page Site Map: <http://www.census.gov/acs/www/Site_Map.html> This link is the site map for the ACS Web page. It provides an overview of the links and materials that are available online, including numerous reference documents.

What Is the ACS? <http://www.census.gov/acs/www/SBasics/What/What1.htm> This Web page includes basic information about the ACS and has links to additional information including background materials.

ACS Design, Methodology, Operations

American Community Survey Design and Methodology Technical Paper: <http://www.census.gov/acs/www/Downloads/tp67.pdf> This document describes the basic design of the 2005 ACS and details the full set of methods and procedures that were used in 2005. Please watch our Web site as a revised version will be released in the fall of 2008, detailing methods and procedures used in 2006 and 2007.

About the Data (Methodology: <http://www.census.gov/acs/www/AdvMeth/> This Web page contains links to information on ACS data collection and processing, evaluation reports, multiyear estimates study, and related topics.

ACS Quality

Accuracy of the Data (2007): <http://www.census.gov/acs/www/Downloads/ACS/accuracy2007.pdf> This document provides data users with a basic understanding of the sample design, estimation methodology, and accuracy of the 2007 ACS data.

ACS Sample Size: <http://www.census.gov/acs/www/SBasics/SSizes/SSizes06.htm> This link provides sample size information for the counties that were published in the 2006 ACS. The initial sample size and the final completed interviews are provided. The sample sizes for all published counties and county equivalents starting with the 2007 ACS will only be available in the B98 series of detailed tables on American FactFinder.

ACS Quality Measures: <http://www.census.gov/acs/www/UseData/sse/> This Web page includes information about the steps taken by the Census Bureau to improve the accuracy of ACS data. Four indicators of survey quality are described and measures are provided at the national and state level.

Guidance on Data Products and Using the Data

How to Use the Data: <http://www.census.gov/acs/www/UseData/> This Web page includes links to many documents and materials that explain the ACS data products.

Comparing ACS Data to other sources: <http://www.census.gov/acs/www/UseData/compACS.htm> Tables are provided with guidance on comparing the 2007 ACS data products to 2006 ACS data and Census 2000 data.

Fact Sheet on Using Different Sources of Data for Income and Poverty: <http://www.census.gov/hhes/www/income/factsheet.html> This fact sheet highlights the sources that should be used for data on income and poverty, focusing on comparing the ACS and the Current Population Survey (CPS).

Public Use Microdata Sample (PUMS): <http://www.census.gov/acs/www/Products/PUMS/> This Web page provides guidance in accessing ACS microdata.