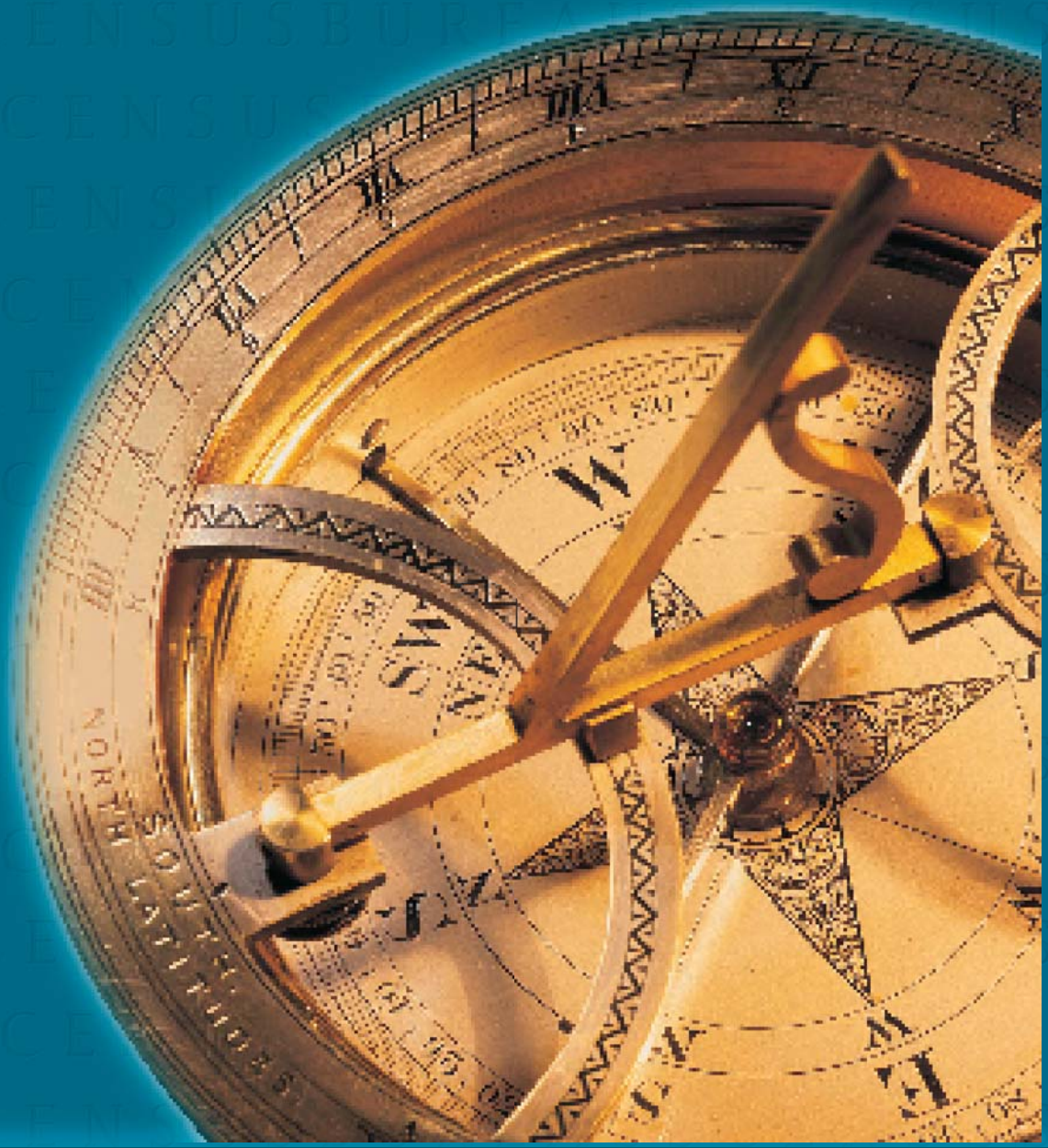
A Compass for Understanding and Using American Community Survey Data

What Congress Needs to Know

Issued
November 2008



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U.S. Department of Commerce
Economics and Statistics Administration
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United States Census 2010

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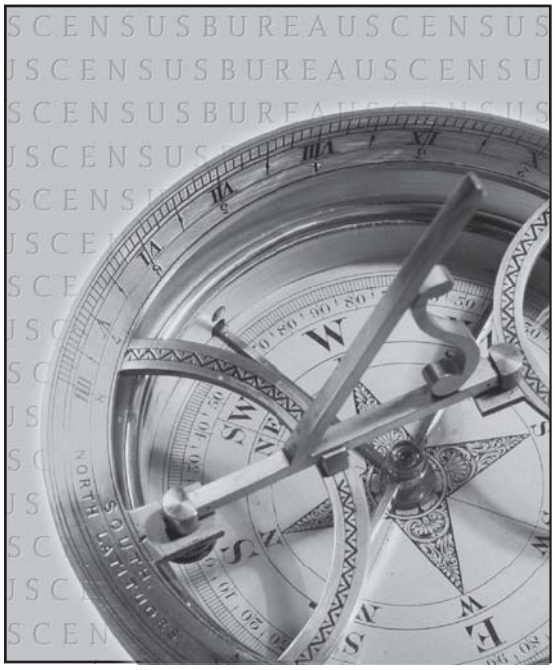

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Foreword

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	Congress
High school teachers	Puerto Rico Community Survey data users (in Spanish)
Business community	Public Use Microdata Sample (PUMS) data users
Researchers	Users of data for rural areas
Federal agencies	State and local governments
Media	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.

Overview

Introduction: Who Should Use This Handbook?

This handbook will help congressional staff who are unfamiliar with the American Community Survey (ACS) or who need a refresher on its many uses. The handbook can help staff use ACS data to:

- Respond to constituent inquiries.
- Draft floor and press statements.
- Conduct legislative research.
- Understand funding formulas.
- Compare data from the ACS with other federal statistics.
- Interpret ACS data.

Congressional staff members may have different levels of interest and technical expertise in using ACS data. The appendixes with this handbook include information that is more technical, and staff with greater expertise or more sophisticated project goals should find them useful. The Census Bureau has developed a series of handbooks that may be better suited to other staff members' needs. For example, members could refer to the handbook for federal agencies for additional guidance and information. The list of ACS handbooks appears in the text box on this page.

Census Bureau headquarters and Regional Office staff are available to answer questions about the ACS and your particular data needs. The contact information for headquarters and Regional Census Bureau Offices is included in the "Additional Resources" section of this handbook.

User Handbooks for the ACS

A Compass for Understanding and Using American Community Survey Data

- What Congress Needs to Know
- What High School Teachers Need to Know
- What State and Local Governments Need to Know
- What Federal Agencies Need to Know
- What the Media Need to Know
- What the Business Community Needs to Know
- What Researchers Need to Know
- What General Data Users Need to Know
- What Users of Data for Rural Areas Need to Know
- What Users of Data for American Indian and Alaska Native Populations Need to Know
- What Users of Data From the Puerto Rico Community Survey Need to Know (in Spanish)
- What Public Use Microdata Sample (PUMS) Data Users Need to Know

What Is the American Community Survey?

The American Community Survey (ACS), part of the 2010 Decennial Census Program, gathers demographic, social, economic, and housing information about the nation's people and communities on a continuous basis. As the largest survey in the United States, it is the only source of small-area data on a wide range of important social and economic characteristics for all communities in the country. In Puerto Rico the survey is called the Puerto Rico Community Survey (PRCS).

Research on the ACS began after the 1990 Census, starting with field-testing in several counties in 1996 that expanded to nationwide full implementation of the ACS in 2005, following congressional funding.

Who Receives the ACS?

The ACS is sent each month to a sample of roughly 250,000 addresses in the United States and Puerto Rico, or 3 million a year (about 2.5 percent of all residential addresses). The sample represents all housing units and group quarters in the United States and Puerto Rico. Group quarters include places such as college dormitories, prisons, military barracks, and nursing homes. The addresses are selected from the Census Bureau's Master Address File (MAF), which is also the basis for the decennial census.

The ACS sample is not spread evenly across all areas but includes a larger proportion of addresses in sparsely populated rural communities and American Indian reservations and a lower proportion in densely populated areas.

Over a 5-year period, the ACS will sample about 15 million addresses and complete interviews for about 11 million. This sample is sufficient to produce estimates for small geographic areas, such as neighborhoods and sparsely-populated rural counties. By comparison, the Census 2000 long-form sample was nearly 20 million addresses, resulting in about 18 million enumerations.

In a 5-year period no address will be selected for the ACS more than once, and many addresses will never be selected for the survey.

What Topics Are Covered in the ACS?

The ACS collects vital information about the nation's demographic, social, and economic characteristics, as well as physical and financial characteristics about the nation's housing stock. The subjects covered in the ACS (Table 1) provide Congress with a comprehensive portrait of the American people and communities that can be used to make policy and programmatic decisions.

Federal law (Title 13, U.S. Code, §141(f)) requires the Census Bureau to submit to Congress the proposed subjects to be covered in the decennial census 3 years before Census Day. The law also requires the Census Bureau to submit to Congress the actual questions it plans to include in the decennial census 2 years before Census Day. The ACS is part of the 2010 Decennial Census Program.

The subjects planned for the 2010 Census and the additional subjects covered on the ACS are included because federal law or regulation specifically mandates their inclusion in the census, the legal system requires that the data be collected, or federal law requires it for program implementation and the census is the only source for the information.

Administering the ACS

The ACS collects information using three methods—mail, telephone, and personal visits.

- **Mail.** Addresses selected for the ACS sample receive a questionnaire by mail. Residents are asked to complete the form and mail it back.
- **Telephone.** About 6 weeks after the ACS forms are mailed, the Census Bureau attempts to contact by telephone all addresses in the sample that did not mail back a questionnaire and for which the Census Bureau has a corresponding telephone number. This operation is known as computer assisted telephone interviewing or CATI.
- **Personal visits.** After the telephone phase, the Census Bureau selects a subsample of addresses from which information still has not been collected. Census field representatives visit these addresses and conduct interviews in person. This operation is called computer assisted personal interviewing or CAPI. A higher percentage of households in areas with the lowest mail response rates are chosen for CAPI to help ensure the quality of the ACS estimates in all neighborhoods.

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

Demographic Characteristics
Age
Sex
Hispanic Origin
Race
Relationship to Householder (e.g., spouse)

Economic Characteristics
Income
Food Stamps Benefit
Labor Force Status
Industry, Occupation, and Class of Worker
Place of Work and Journey to Work
Work Status Last Year
Vehicles Available
Health Insurance Coverage*

Social Characteristics
Marital Status and Marital History*
Fertility
Grandparents as Caregivers
Ancestry
Place of Birth, Citizenship, and Year of Entry
Language Spoken at Home
Educational Attainment and School Enrollment
Residence One Year Ago
Veteran Status, Period of Military Service, and VA Service-Connected Disability Rating*
Disability

Housing Characteristics
Year Structure Built
Units in Structure
Year Moved Into Unit
Rooms
Bedrooms
Kitchen Facilities
Plumbing Facilities
House Heating Fuel
Telephone Service Available
Farm Residence

Financial Characteristics
Tenure (Owner/Renter)
Housing Value
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.

The subsampling rates for CAPI range from 33 percent to 50 percent. Field representatives also visit all group quarters selected for ACS and interview a sample of their residents.

From the Long-Form Sample to the ACS: Collecting Characteristics Data in the Census

After years of planning, development, and a demonstration period, the ACS began nationwide full implementation in 2005. Before the ACS, the Census Bureau collected characteristics about the nation's people and communities once every 10 years during the decennial census.

Past decennial censuses have included two types of questionnaires:

- A *short form* on which most people were enumerated and that counted the population and asked only a few basic questions.
- A *long form* on which a sample of people, approximately 1 in 6 in Census 2000, were enumerated. The long form gathered a wide range of information about demographic, economic, social, and housing characteristics and also included all of the questions asked on the short form.

Evolution of the American Community Survey

1990: Congress expresses interest in more timely "long-form" data.

1996: Census Bureau begins testing a continuous survey in 4 counties, increasing to 36 counties by 1999.

2000: Census Bureau launches Census 2000 Supplementary Survey with a national sample to test the ACS concept on a large scale.

2005: ACS implemented nationwide, replacing census long form in 2010 and beyond.

2006: First ACS estimates (based on 2005 ACS) released for areas with populations of 65,000 and greater.

Together, the basic demographic information collected from everyone established the count of the population used primarily to apportion seats in the U.S. House of Representatives and to facilitate legislative redistricting.

After the 1990 Census, Congress raised concerns about falling census response rates and rising costs. Congress also expressed an interest in having more timely long-form sample data for policy purposes, noting that decennial census long-form data were out of date not long after their release and became less useful as the years went by. Congress asked the Census Bureau to explore alternatives to the long form, with the goals of simplifying the census, containing costs, and producing more timely information to inform policy debates and legislative actions.

In 1996, the Census Bureau began testing a continuous survey to collect the information previously gathered once every 10 years on the long form. Testing of the ACS concept began on a small scale, in four counties, and by 1999 had expanded to 36 counties around the country. Starting in 2000, the Census Bureau also fielded a national sample of about 800,000 households (called the Census 2000 Supplementary Survey) to evaluate ACS operations on a larger scale and to compare ACS estimates with information collected in Census 2000. These supplementary surveys continued through 2004.

The ACS, as part of the decennial census, is a mandatory survey. That is, response to the ACS is required by law. During the demonstration period, Congress directed the Census Bureau to test the effect that making the ACS a voluntary survey would have on survey costs. The results showed that a voluntary ACS would be considerably more expensive than a mandatory ACS. The next section discusses the mandatory nature of the ACS in greater detail.

In addition, all federal agencies documented that their respective questions on the ACS were required by law or regulation and were still needed to carry out their missions. Congress closely monitored development of the survey and provided funding for full implementation of the survey nationwide starting in 2005. Congress appropriated funds to include group quarters, such as college dormitories, military barracks, prisons, and nursing homes, starting in 2006.

The text box on this page summarizes the evolution of the American Community Survey.

Is the ACS Required by Law?

The ACS is part of the 2010 Decennial Census Program. The U.S. Constitution (Article I, Section 2) requires a census every 10 years. The census is authorized under Title 13, U.S. Code (the Census Act). Numerous federal laws also require information about the nation's population and housing to allocate formula grants and to establish eligibility for programs. The census is the primary source of data for many of these programmatic requirements.

In a 2002 opinion, the Government Accountability Office (GAO) found that Sections 141 and 193 of the Census Act authorized the Census Bureau to develop and administer the ACS and that no additional legal authority for the survey was required. (Legal Authority for American Community Survey, B-289852, April 4, 2002.) Therefore, you will not find a specific vote authorizing the ACS. See the text box below for the specific legal authority for the census and the ACS.

Legal Authority for the Census and the American Community Survey

Constitution of the United States, Article I, Sec. 2 (in relevant part). *Representatives and direct Taxes shall be apportioned among the several States which may be included within this Union, according to their respective Numbers . . . The actual Enumeration shall be made within three Years after the first Meeting of the Congress of the United States, and within every subsequent Term of ten Years, in such Manner as they shall by law direct.*

Title 13, U.S. Code, §141(a). *The Secretary shall, in the year 1980 and every 10 years thereafter, take a decennial census of population as of the first day of April of such year, which date shall be known as the "decennial census date", in such form and content as he may determine, including the use of sampling procedures and special surveys. In connection with any such census, the Secretary is authorized to obtain such other census information as necessary.*

Title 13, U.S. Code, §193. *In advance of, in conjunction with, or after the taking of each census provided for by this chapter, the Secretary may make surveys and collect such preliminary and supplementary statistics related to the main topic of the census as are necessary to the initiation, taking, and completion thereof.*

How Does Congress Use ACS Data?

The questions on the ACS supply the raw data needed for a range of programs affecting education, veterans, employment, housing and community development, public health care, commuting, services for the elderly and disabled, and assistance programs for low-income families and children. *About $400 billion in federal program funds are distributed each year based, in whole or in part, on census and ACS data.*

The ACS produces updated information every year, providing Congress with timely data for allocating formula grants and establishing eligibility for programs, evaluating community needs, and deciding how and where to invest funds in the future.

For example:

- Information on *veteran status* and *period of military service* is used to allocate funds to states and local areas for employment and job training programs for veterans.
- Information on *educational attainment* and *school enrollment* is used to allocate funds to provide classes in basic skills for adults who have not completed high school and who are not functionally literate. Employers also use the information to locate new jobs and stimulate economic growth.
- *Income* data from the ACS are used to determine poverty status, measure economic well-being, and assess the need for assistance. Many federal programs, including Low-Income Home Energy Assistance, Community Development Block Grant, Older Americans Act, WIC, Head Start, and No Child Left Behind Act, use income data to allocate formula grants.

Does the ACS Provide Official Population Counts?

No. The ACS is not designed to provide official counts of the nation's population. The decennial census of population, conducted once every 10 years (2000, 2010, etc.), is the official source of population counts for every jurisdiction in the United States. Between censuses, the Census Bureau provides updated official population estimates by race, Hispanic origin, age, and gender and estimates of total housing units for states, counties, and cities through its Population Estimates Program.

Data Products

Congressional staff can find ACS data in a wide variety of formats, including *tables, profiles, and maps,* through the Census Bureau's Web site and in written reports. Once the ACS completes collection of its first 5 years of data (2005–09), the Census Bureau will publish updated estimates for large and small geographic areas and population groups every year.

When Are ACS Estimates Available?

Annually, the ACS produces updated, single-year estimates of demographic, housing, social, and economic characteristics for all states, as well as for larger counties, cities, metropolitan and urban areas, and congressional districts. Geographic areas must have a minimum population of 65,000 to qualify for estimates based on a single year's sample. Every congressional district meets this threshold and therefore new single-year estimates are released each year for every congressional district. Some school districts, townships, and American Indian and Alaska Native areas also meet this population threshold.

For areas with populations of at least 20,000, the Census Bureau will produce estimates using data collected over 3 years. For rural areas and city neighborhoods (including census tracts and block groups) with fewer than 20,000 people, the Census Bureau plans to produce estimates using data collected over 5 years. The Census Bureau plans to update these multiyear estimates every year. Appendix 1 provides a more complete explanation of how the Census Bureau produces multiyear estimates and what they represent.

ACS data are released every year, about 8 months after the end of each calendar year of data collection. Table 2 shows release dates for 1-, 3-, and 5-year ACS estimates. In particular, Table 2 shows how the population size of an area defines when an area can expect to receive data from the ACS and the types of estimates those areas will receive.

For some geographic areas—including three-quarters of all counties, most school districts, and most cities, towns, and American Indian reservations—only 3-year or 5-year estimates will be available because of their population size. Because some federal grant programs allocate funds directly to these areas, Congress can use the 3- and 5-year estimates to evaluate needs at the relevant geographic level, compare characteristics between areas within and among states, and analyze how various formulas distribute funds. Many funding formulas are complex and, in addition to using census data, may include caps and 'hold harmless' provisions that also affect funding allocations. Table 3 summarizes the major types of geographic areas and the ACS estimates that will be published for these areas. The Census Bureau Web site posts definitions of these geographic areas at <http://www.census.gov/acs/www/UseData/geo.htm>. As the number of areas in column 1 makes clear, the vast majority of areas will receive only 5-year estimates.

In partnership with the states, the Census Bureau created *Public Use Microdata Areas (PUMAs)*, which are special, nonoverlapping areas within a state, each with a population of about 100,000.

Table 2. **Availability of ACS Estimates**

		Population of geographic area		
Year data available	**Type of estimates**	**65,000 or more** (receive 1-year, 3-year, and 5-year estimates)	**20,000–65,000** (receive only 3-year and 5-year estimates)	**Less than 20,000** (receive only 5-year estimates)
2006	1 year only	✔		
2007	1 year only	✔		
2008	1 year and 3 year	✔	✔	
2009	1 year and 3 year	✔	✔	
2010 & beyond	1 year, 3 year, and 5 year	✔	✔	✔

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

While designed specifically for the presentation of microdata, ACS data users in rural areas can use PUMA geography to obtain substate level 1-year ACS estimates that are not available for most other substate levels of geography. Because rural areas are sparsely populated, the ACS sample is not large enough to produce reliable single-year estimates for these communities. For example, in West Virginia, only 7 of its 55 counties have populations of at least 65,000, the size necessary to receive single-year ACS estimates. The counties with at least 20,000 population will receive 3-year estimates, and all areas will receive 5-year estimates. In the 2006 ACS, social, economic, housing, and demographic characteristics data were available for 2,068 PUMAs nationwide. The Census Bureau also will produce multiyear estimates for PUMAs.

What Data Products Are Available From the ACS?

The Census Bureau publishes a number of data products that will help Congress use ACS estimates for a range of important purposes.

- **Fast Facts for Congress** provides social, economic, and housing data on every congressional district.
- **Detailed tables** provide the most detailed data on all topics and geographic areas and are the foundation on which other ACS data products are built.
- **Data profiles** summarize key social, economic, housing, and demographic characteristics.

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.

- **Narrative profiles** provide information based on the data profiles in a user-friendly, text-and-graphic format that puts various topics into words for the general user.
- **Comparison profiles** make it easy to compare data for two sequential years. They are new in 2007 and will present 2006 ACS and 2007 ACS estimates and display the results of statistical testing to assess if the differences in these 2 years are statistically different.
- **Subject tables** provide more detail than the data profiles and present summarized topic-specific tables (for example on education, employment, income, and children).
- **Selected population profiles** provide population profiles for various race, Hispanic origin, ancestry, and place of birth groups. Selected population profiles are only released for geographic areas with populations of 500,000 or greater, including all congressional districts. More than 200 different population groups are represented in the selected population profiles.
- **State ranking tables** compare various characteristics for the United States, all states, the District of Columbia, and Puerto Rico.
- **Thematic maps** present information in the state ranking tables on a map to show geographic relationships for these population characteristics.
- **Geographic comparison tables** complement state ranking tables by showing key population characteristics for geographic areas beyond the state level.
- **Public Use Microdata Samples** provide data files of individual response records for a sample of all housing unit and group quarters residents who responded to the survey. All personally identifiable information is removed from these records to protect confidentiality. The only geographic codes available on these files are state and PUMA.
- **Summary files** contain the complete set of ACS detailed tables released each year in a computer file format.

Legislative Uses of the American Community Survey

This section covers two major areas:

1. Uses of ACS data to implement existing laws.
2. Uses of ACS data to carry out the daily responsibilities of congressional staff.

Use of ACS in Existing Laws

Many laws require census data as the basis for allocating funds, creating program and grant eligibility requirements, and establishing geographic designations (e.g., metropolitan areas, urban areas, nonurban areas). Census data are also used to monitor compliance with federal laws, such as the Age Discrimination and Employment Act.

The text box on this page gives an example of a well-known federal program that relies on data from the ACS to allocate funds.

Following are additional examples of significant federal laws and programs that rely on ACS data for implementation, along with a list of ACS questions that produce the needed data. The Census Bureau has prepared a report for Congress describing the history of each question on the ACS and showing specific legislative uses for the data. The full report is available at <http://www.census.gov/acs/www/Downloads/Final_2010_Census_and_American_Community_Survey_Subjects_Notebook.pdf>.

Low-Income Home Energy Assistance Program (LIHEAP)
[42 U.S. Code, 8629(a) & (b)(2), and 8622(11)]

Enacted as part of the Omnibus Budget Reconciliation Act of 1981, the Low Income Home Energy Assistance Program (LIHEAP) is a mandatory block grant program to the states. The mission of LIHEAP is to help low-income households pay their home energy bills.

Congress established the law's block grant distribution formula based on each state's weather and low-income population. The income question on the ACS is essential to determining the low-income population in each state. Implementation of the LIHEAP program also relies on data from other ACS questions, including age, gender, Hispanic origin, relationship, disability, units in structure, and occupants per room. LIHEAP program administrators also use data from the ACS question on selected monthly owner costs to analyze current residential energy supply and consumption and to forecast future energy needs.

Civil Rights Act
42 U.S. Code, 2000, 42 U.S. Code, 1975c

- Age
- Gender
- Hispanic origin
- Race
- Labor force status
- Work status last year

Community Services Block Grant Act
42 U.S. Code, 9902(2)

- Labor force status
- Income
- Year structure built
- Number of occupants per room
- Number of bedrooms
- Kitchen facilities
- Plumbing facilities
- Telephone service available
- Tenure
- Rent
- Selected monthly owner costs

Older Americans Act
42 U.S. Code, 3002(28)–(30)

- Age
- Gender
- Hispanic origin
- Race
- Relationship
- Marital status
- Ancestry
- Language spoken at home
- Educational attainment/school enrollment
- Residence one year ago
- Disability
- Income
- Work status last year
- Plumbing facilities
- Telephone services available
- Selected monthly owner costs
- Marital history
- VA service-connected disability rating

National Affordable Housing Act
42 U.S. Code, 12705 (b)(1); 24 CFR 91.205 (a) 42 U.S. Code 12747

- Gender
- Hispanic origin
- Race
- Relationship
- Units in structure
- Year moved into unit
- Kitchen facilities
- Plumbing facilities
- Tenure
- Rent
- Selected monthly owner costs

Congressional Uses of ACS Data

Data from the ACS and the decennial census are helpful to members of Congress and their staffs in many ways. ACS data can be used in drafting congressional testimony, press releases, statements, and constituent correspondence; conducting legislative research; and developing grant formulas for proposed programs. Census Bureau staff in the 12 regional offices and national headquarters are available to answer questions about the ACS and your particular data needs. See the "Additional Resources" section of this handbook for complete contact information for Census Bureau regional offices and headquarters. Figure 1 has some examples of how congressional staff can use ACS data to carry out their responsibilities.

Cosponsoring Legislation

Your member receives a *Dear Colleague* letter requesting that he or she cosponsor a bill to expand benefits for veterans. First, you want to know how many veterans live in your congressional district.

You can access information on the district's civilian veteran population based on the latest ACS data by using *Fast Facts for Congress* at <http://fastfacts.census.gov>. After entering any ZIP Code from the district on the *Fast Facts* home page, the database links you to a table of key demographic, social, housing, and economic data for the entire district. Information about the civilian veteran population appears in a table entitled "Social Characteristics." See Figure 1 for an example based on Congressional District 11 in Virginia.

Figure 1. **Example of Social Characteristics Data on *Fast Facts for Congress***

Social Characteristics - show more >>	Estimate	Percent	U.S.	Margin of Error
Average household size	2.91	(X)	2.61	+/-0.04
Average family size	3.37	(X)	3.20	+/-0.05
Population 25 years and over	487,664			+/-8,060
High school graduate or higher	(X)	91.9	84.1%	(X)
Bachelor's degree or higher	(X)	51.7	27.0%	(X)
Civilian veterans (civilian population 18 years and over)	73,034	13.5	10.4%	+/-3,216
Disability status (population 5 years and over)	56,817	8.3	15.1%	+/-4,446
Foreign born	185,946	24.9	12.5%	+/-8,896
Male, Now married, except separated (population 15 years and over)	171,931	59.1	52.4%	+/-4,935
Female, Now married, except separated (population 15 years and over)	168,642	57.0	48.4%	+/-5,567
Speak a language other than English at home (population 5 years and over)	218,849	31.5	19.7%	+/-10,556
Household population	740,261			+/-13,304
Group quarters population	(X)	(X)	(X)	(X)

Source: U.S. Census Bureau, *Fast Facts for Congress*, accessed at <http://fastfacts.census.gov>.

Drafting a Floor Statement

In less than an hour your member wants to make a speech about the economy. You need quick information on how many families in the district are living below the poverty level and how that figure compares with the poverty level for the nation as a whole.

A summary of key economic characteristics for all congressional districts is available through *Fast Facts for Congress* at <http://fastfacts.census.gov>. After entering any ZIP Code from the district on the *Fast Facts* home page, the database links you to a table of key demographic, social, housing, and economic data. The information, based on the latest ACS data, summarizes selected economic characteristics, including the number of families and individuals living below the poverty level, to the nation as a whole. These data are located in a table entitled "Economic Characteristics." Figure 2 displays the economic characteristics in the fact sheet for Congressional District 11 in Virginia.

Responding to a Constituent Inquiry

Your office receives a letter from a constituent who wants to know why he was selected to participate in the ACS. You need to understand how addresses are selected, how personal information is protected, what questions are asked on the ACS, and how Congress uses the responses to write legislation and assist constituents.

The Census Bureau publication *Questions and Answers: American Community Survey* at <http://www.census.gov/acs/www/Downloads/ACSQandA.pdf> can help you respond to your constituent's letter. *Subjects Planned for the 2010 Census and American Community Survey: Federal Legislative and Program Uses* at <http://www.census.gov/Press-Release/www/2007/subjects_notebook.pdf> includes detailed information on the subjects covered in the ACS.

Analyzing Legislative Proposals

During a meeting with an advocacy group, your member receives a proposal for reforming the social security system. Using the latest ACS data, you download information on labor force participation and disability to evaluate how many people would be affected by this proposal. You can access these data from the 2007 ACS data products home page at <http://www.census.gov/acs/www/Products/>.

Conducting Legislative Research

The Senator wants you to draft a housing assistance bill that targets people who are spending 30 percent or more of their income on housing and utilities. The bill would create a formula grant for the states to distribute funds authorized in the bill. Under "Demographic Links" on the *Fast Facts for Congress* home page, click on "Housing," then on "Financial Characteristics" to access tables and maps displaying data for all of the states on homeowners and renters who spend 30 percent or more of their income on housing and utilities. Data are available to download into a variety of formats. You then go to the *American FactFinder Guide to Data Products* at <http://www.census.gov/acs/www/Products/users_guide/> to access more detailed information about the characteristics of homeowners and renters within each state.

Figure 2. **Example of Economic Characteristics Data on *Fast Facts for Congress***

Economic Characteristics - show more >>	Estimate	Percent	U.S.	Margin of Error
In labor force (population 16 years and over)	417,760	72.7	65.0%	+/-8,952
Mean travel time to work in minutes (workers 16 years and over)	34.8	(X)	25.0	+/-0.7
Median household income (in 2006 inflation-adjusted dollars)	97,753	(X)	48,451	+/-2,632
Median family income (in 2006 inflation-adjusted dollars)	108,577	(X)	58,526	+/-2,520
Per capita income (in 2006 inflation-adjusted dollars)	40,476	(X)	25,267	+/-903
Families below poverty level	(X)	2.7	9.8%	(X)
Individuals below poverty level	(X)	4.2	13.3%	(X)

Source: U.S. Census Bureau, *Fast Facts for Congress*, accessed at <http://fastfacts.census.gov>.

Accessing ACS Data

The Census Bureau's Web site is the most accessible source of ACS data. The Census Bureau has developed several data dissemination tools to meet the needs of congressional staff. A description of these tools and examples of how congressional staffers can use them are provided on the following pages.

When deciding which product to use, you should consider how much data you need to accomplish your task. *Fast Facts for Congress* often will meet your needs if you are looking for quick socioeconomic and demographic information about a specific congressional district or state. *Fast Facts for Congress* also includes a Frequently Asked Questions and Answers page to answer the most common questions about the ACS and other census programs.

If you need a greater level of technical information about the data, the detailed tables and statistics in the *American FactFinder* often are more useful.

American FactFinder

The American FactFinder, at <http://factfinder.census.gov>, is an electronic system for disseminating Census Bureau data, including ACS estimates, on the Internet. To access the American FactFinder (AFF) from the Census Bureau home page:

- Go to <http://www.census.gov/>.
- Select "American FactFinder" from the left side bar. (See link circled in Figure 3.)

From the American FactFinder page you can access a variety of Census Bureau products. If, for example, you wanted to access information on commuting patterns within a congressional district, you could use the "Fast Access to Information" box, shown in Figure 4. Entering a ZIP Code will get you a fact sheet for that area. Scrolling down the fact sheet you will find information on the mean travel time to work. If you want additional details, click on "show more." Using the links in the left side bar you will also be able to access other summaries that may be available for your needs. For example, clicking on "People" and then "Employment" reaches a screen with a list of products including tables on "Commuting to Work."

Here are some uses of *American FactFinder* data:

- To access detailed tables of demographic, social, economic, and housing data for different geographic areas, including states, counties, school districts, and regions.
- To access narrative profiles (text and bar charts) highlighting data from specific geographic areas. You can use these charts to accompany congressional testimony or floor statements.

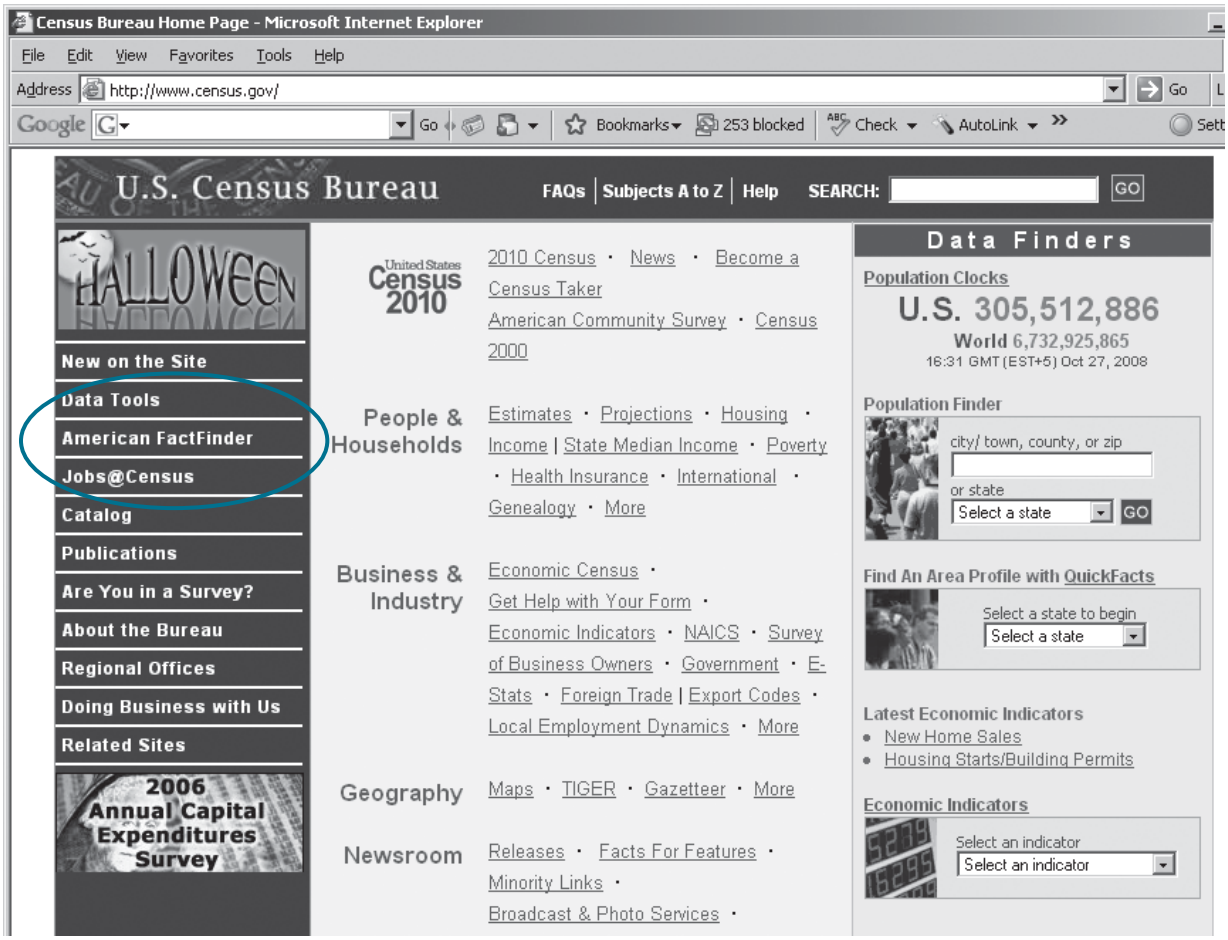
Fast Facts for Congress

Fast Facts for Congress is a Web-based dissemination system that provides demographic, social, economic, and housing data for congressional districts (see Figure 5). The site was specially designed to meet the needs of congressional staff members who need quick access to succinct data.

To obtain a quick profile of your congressional district:

- Go to <http://fastfacts.census.gov/home/cws/main.html>.

Figure 3. **How to Access the American FactFinder From the Census Bureau Home Page**



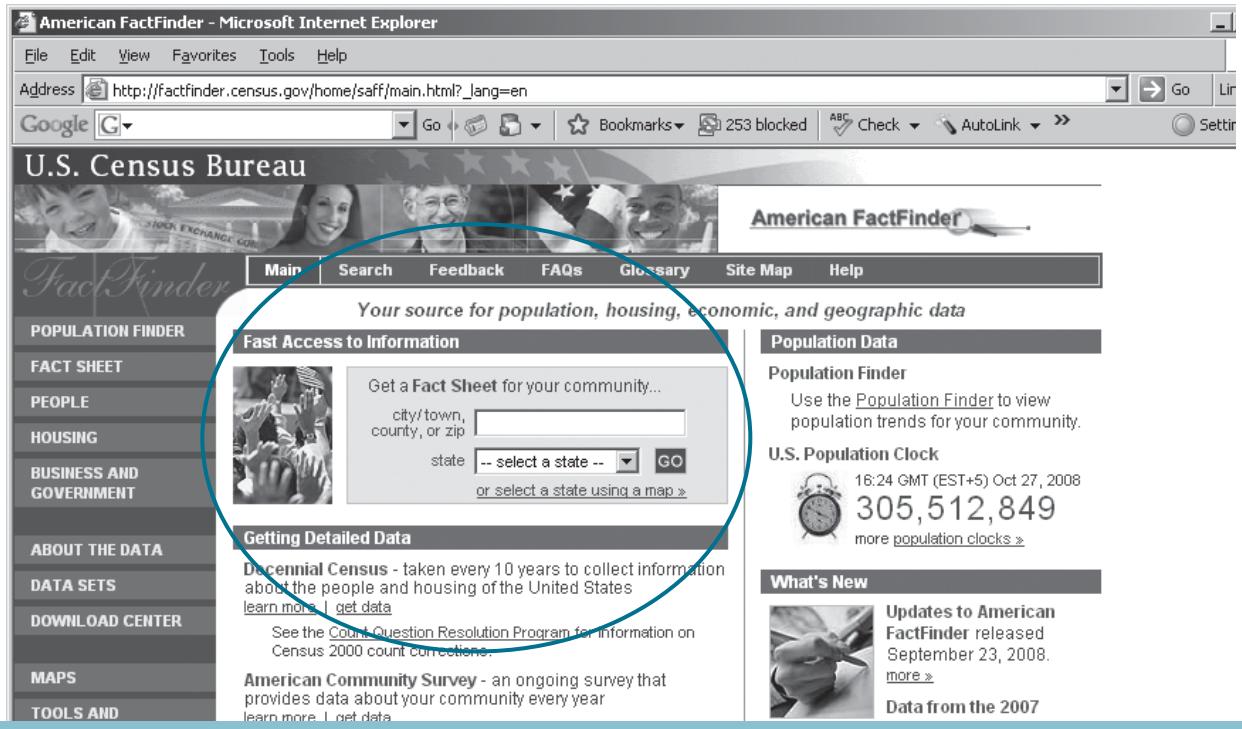
Source: U.S. Census Bureau, accessed at <http://www.census.gov>.

- Enter an address or ZIP Code, or select a state, county, or congressional district and select *GO*.
- A table will appear that includes social, economic, housing, and demographic estimates about the congressional district, using the most recent ACS data (see Figure 6).

Here are some ways to use data from *Fast Facts for Congress*:

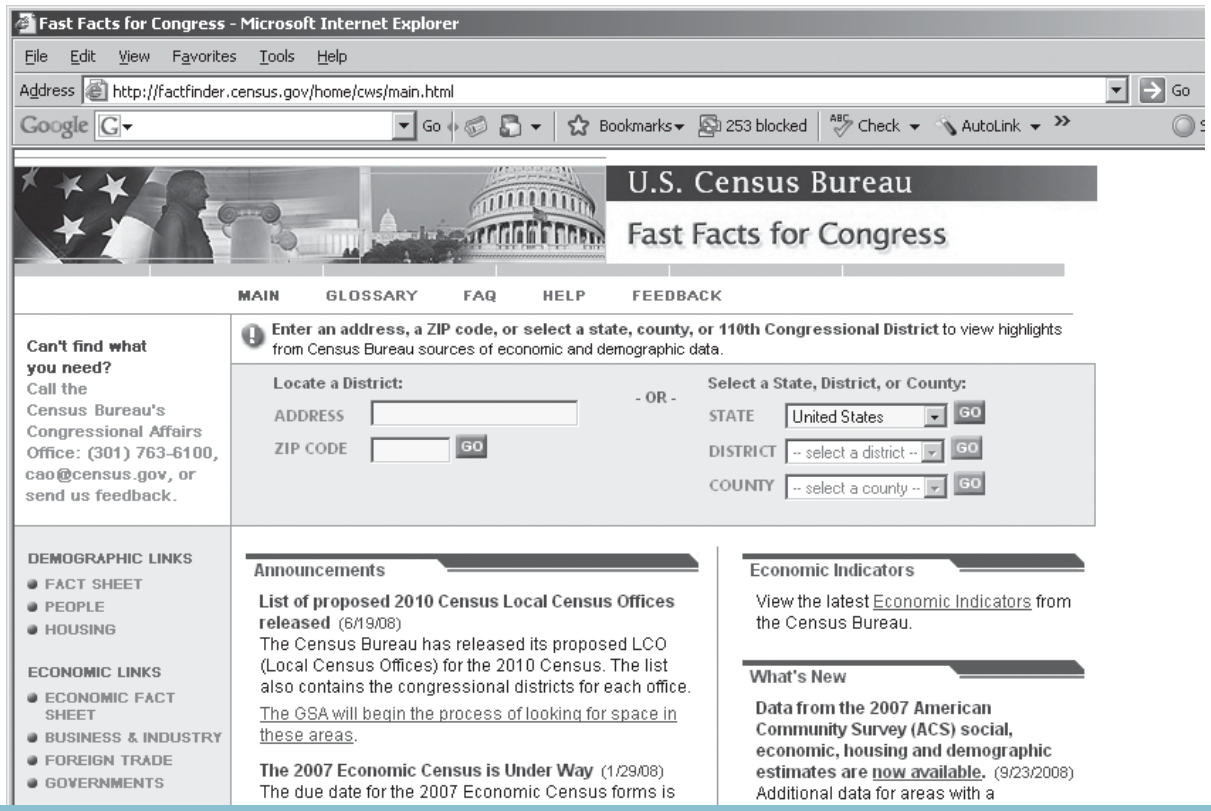
- To determine the percentage of college graduates in a congressional district compared with the rest of the United States.
- To determine the median age and racial composition of a congressional district.
- To determine the percentage of homeowners and renters in a congressional district.

Figure 4. **American FactFinder Web Site**



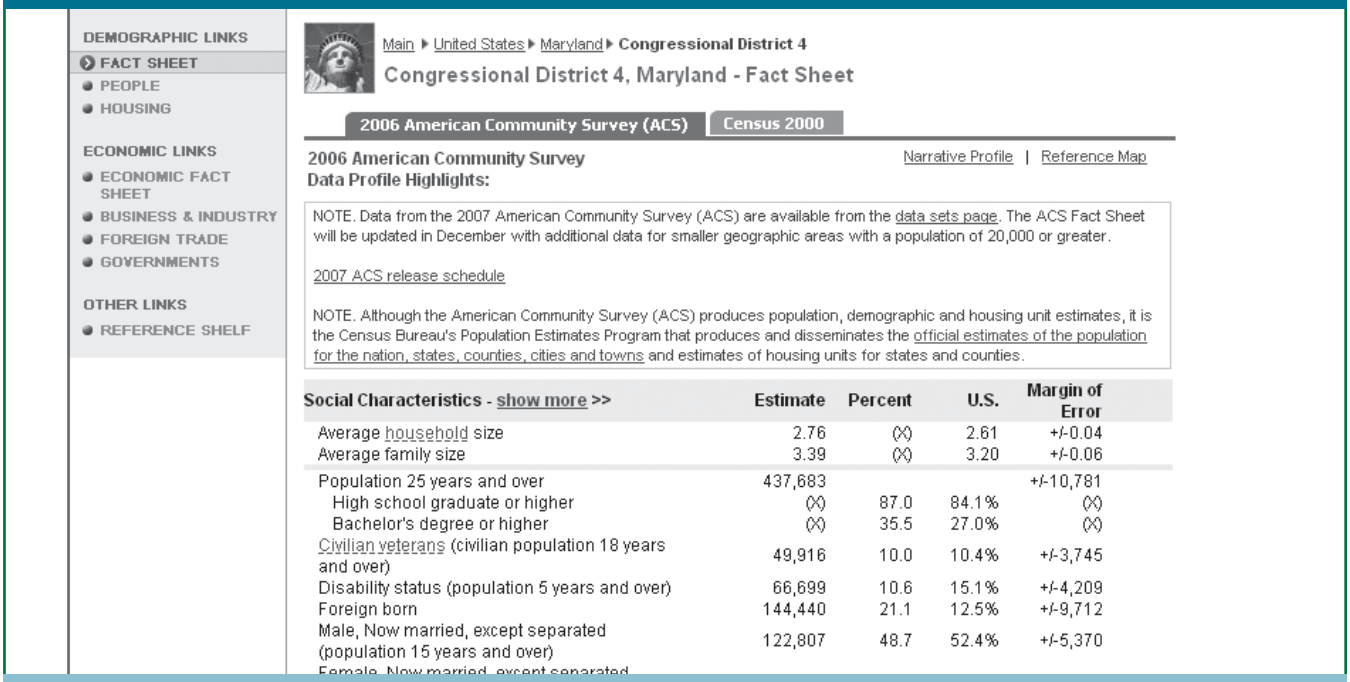
Source: U.S. Census Bureau, American FactFinder, accessed at <http://factfinder.census.gov>.

Figure 5. ***Fast Facts for Congress* Web Site**



Source: U.S. Census Bureau, *Fast Facts for Congress*, accessed at <http://fastfacts.census.gov>.

Figure 6. **Example of a Fact Sheet on *Fast Facts for Congress* Web Site**



DEMOGRAPHIC LINKS
- FACT SHEET
- PEOPLE
- HOUSING

ECONOMIC LINKS
- ECONOMIC FACT SHEET
- BUSINESS & INDUSTRY
- FOREIGN TRADE
- GOVERNMENTS

OTHER LINKS
- REFERENCE SHELF

Main ▸ United States ▸ Maryland ▸ Congressional District 4

Congressional District 4, Maryland - Fact Sheet

2006 American Community Survey (ACS) | Census 2000

2006 American Community Survey
Data Profile Highlights:

Narrative Profile | Reference Map

NOTE. Data from the 2007 American Community Survey (ACS) are available from the data sets page. The ACS Fact Sheet will be updated in December with additional data for smaller geographic areas with a population of 20,000 or greater.

2007 ACS release schedule

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.

Social Characteristics - show more >>	Estimate	Percent	U.S.	Margin of Error
Average household size	2.76	(X)	2.61	+/-0.04
Average family size	3.39	(X)	3.20	+/-0.06
Population 25 years and over	437,683			+/-10,781
High school graduate or higher	(X)	87.0	84.1%	(X)
Bachelor's degree or higher	(X)	35.5	27.0%	(X)
Civilian veterans (civilian population 18 years and over)	49,916	10.0	10.4%	+/-3,745
Disability status (population 5 years and over)	66,699	10.6	15.1%	+/-4,209
Foreign born	144,440	21.1	12.5%	+/-9,712
Male, Now married, except separated (population 15 years and over)	122,807	48.7	52.4%	+/-5,370
Female, Now married, except separated				

Source: U.S. Census Bureau, *Fast Facts for Congress*, accessed at <http://fastfacts.census.gov>.

Using ACS Data

ACS estimates offer Congress a rich resource for up-to-date information about population and housing characteristics in large and small communities across the country. Updated every year, ACS estimates are useful for legislators seeking to evaluate and address national and local needs in a timely way. Understanding how to use the data will help members of Congress and their staffs realize the full benefit of the ACS.

There is a notable difference between data from the ACS and data collected on the census long form in 2000 and previous decades. The ACS produces data that approximate conditions over specific periods of time consisting of 1, 3, or 5 calendar years. These types of estimates are called *period estimates*. The census long-form sample produced data that approximated characteristics as of a single day, Census Day. These types of estimate are called *point-in-time estimates*. For more information about differences between the ACS and the decennial census, see Appendix 2.

Understanding Survey Error

As with any survey results, ACS estimates reflect some level of error. When the primary sources of error are understood, ACS estimates can provide accurate information to assist Congress in carrying out its legislative and oversight functions.

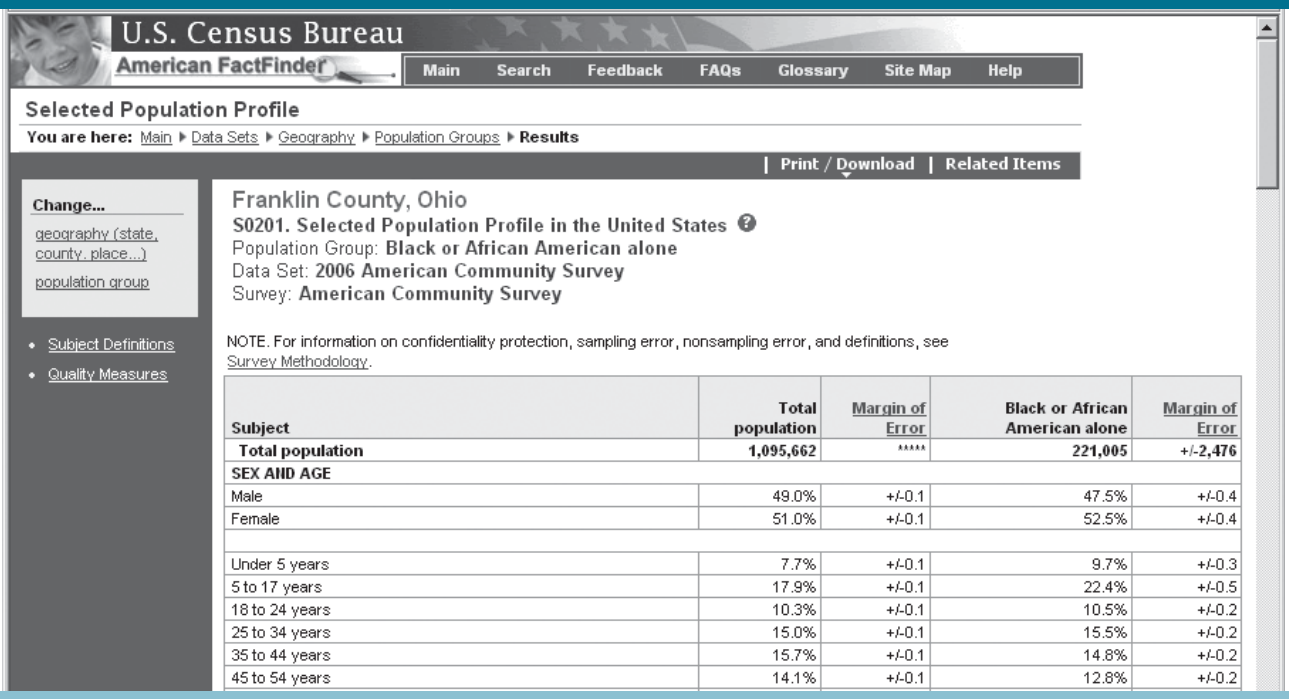
Sampling Error

The sample of addresses that receive the ACS is selected from the Census Bureau's Master Address File, also used for the decennial census. *Sampling error* occurs when information is collected from a subset of the people or addresses instead of from all units being measured. For a more detailed discussion of sampling error, see Appendix 3.

A larger sample increases the likelihood that an address or person will be included and lowers the uncertainty in the final data, because there is greater confidence that homes and people in the sample will represent all homes and people. This level of confidence is expressed in the *margins of error* that are published with all ACS estimates. These margins of error are based on a 90-percent level of confidence. Adding and subtracting the margin of error to the estimate produces a range around the estimate, called a confidence interval, which means that there is a 90 percent chance that the estimate for the population falls within the range.

Figure 7 shows how margins of error are presented in the Census Bureau's American FactFinder.

Figure 7. **Example of Margins of Error on the American FactFinder Web Site**



Subject	Total population	Margin of Error	Black or African American alone	Margin of Error
Total population	**1,095,662**	*****	**221,005**	**+/-2,476**
SEX AND AGE				
Male	49.0%	+/-0.1	47.5%	+/-0.4
Female	51.0%	+/-0.1	52.5%	+/-0.4
Under 5 years	7.7%	+/-0.1	9.7%	+/-0.3
5 to 17 years	17.9%	+/-0.1	22.4%	+/-0.5
18 to 24 years	10.3%	+/-0.1	10.5%	+/-0.2
25 to 34 years	15.0%	+/-0.1	15.5%	+/-0.2
35 to 44 years	15.7%	+/-0.1	14.8%	+/-0.2
45 to 54 years	14.1%	+/-0.1	12.8%	+/-0.2

Source: U.S. Census Bureau, 2006 American Community Survey, Table S0201 (Selected Population Profile in the United States), accessed at <http://factfinder.census.gov>.

Other Sources of Error

In addition to sampling error, the quality of ACS estimates can be affected by other factors related to difficulties in gathering or processing the data, collectively referred to as *nonsampling error.* Nonresponse is the most well-known source of nonsampling error. Some households refuse to answer the ACS (even though response is required by law); sometimes interviewers cannot find anyone at home, even after several tries; and sometimes a household will participate in the ACS but fail to answer all of the questions. Other factors may occur during the data collection and processing phases that affect the quality of the final estimates. See Appendix 6 for more information on nonsampling error.

Understanding Multiyear ACS Estimates

The ACS produces period estimates and is designed to provide estimates that describe characteristics over the full time period. In the case of multiyear ACS estimates, the period is either 3 or 5 calendar years (e.g., January 2005 through December 2007 or January 2006 through December 2010).

While one may think of these estimates as representing average characteristics over the 36 or 60 months of the reference period, it must be remembered that the estimates are not calculated as an average. Rather, the ACS collects survey information continuously nearly every day of every year and then aggregates the results over the entire time period.

Appendix 1 provides greater detail on interpretation of ACS single-year and multiyear estimates.

When Should I Use 1-Year, 3-Year, and 5-Year ACS Estimates?

Starting in 2010, there will be three sets of estimates available from the ACS. Refer to Table 2 for a summary of timing of the release of each set of estimates.

- For areas with populations below 20,000, each year the Census Bureau will produce a single set of multiyear estimates based on 5 years of data collection.
- For areas with populations between 20,000 and 65,000, each year the Census Bureau will produce two different sets of estimates. One will be based on data collected over a 3-year period; the other will be based on data collected over a 5-year period.
- For areas with populations of at least 65,000, the Census Bureau plans to release three different sets of estimates each year: single-year estimates (based on a single calendar year's data collection) and two sets of multiyear estimates (based on data collected over 3-year and 5-year periods).

TIP: *If you need the most current data, use the ACS estimates that are based on the fewest years of data collection.* For example:

If you are interested in tracking trends in language spoken at home for a county with a population of 250,000, the 1-year estimates for that county will provide the most current data from year to year. For areas of this size, the 1-year estimates should be sufficiently reliable for major language groups. For a relatively rare language, even in a very large county, the 3-year estimates may be a better source of reliable data.

If a county in your district has a population of only 30,000 and you are interested in analyzing county-level data on language spoken at home, then you must use 3-year estimates for that county, which will be available starting in 2008 and every year thereafter. Estimates based on 1 year of data collection will not be published for a county of this size.

TIP: *Do not compare data from different sets of estimates.* For example:

You want to compare the number of children living on New York City's Lower East Side whose primary household language is Spanish with Spanish-speaking children in the city as a whole and in New York State. Use 5-year ACS estimates for all three areas of comparison, even though 1-year estimates are available for the city and the state, because only 5-year estimates are available for census tracts that make up the Lower East Side.

TIP: *Educational materials developed by the Census Bureau can help you decide when to use 1-year, 3-year, or 5-year estimates.* For example:

Appendix 1 offers guidelines for making these decisions and provides examples. Appendix 4 provides a wealth of information about the mechanics of comparing ACS estimates from one year to the next. The ACS Web site provides links to other valuable references. The Congressional Affairs Office at the Census Bureau can direct you to the materials you need.

Comparing ACS Estimates Over Time

The key to making useful comparisons of ACS estimates over time is to focus on trends in the data. Because ACS estimates are derived from a sample survey, some level of uncertainty is associated with the data. The level of uncertainty is expressed by a *confidence interval,* which represents a range within which the true estimate lies. The margin of error, provided for each estimate that the ACS releases, is used to determine this range.

The estimates for a certain characteristic might appear to move up or down from year to year, but the data user should note whether the amount of change is greater than the margin of error associated with that estimate. Figure 8, showing school enrollment estimates for Dallas County, Texas, should help you understand the basic numbers in ACS tables.

ACS Case Study: Trends in School Enrollment

You are interested in knowing whether the number of children 3 years and over enrolled in school in Dallas County has changed from 2006 to 2007.

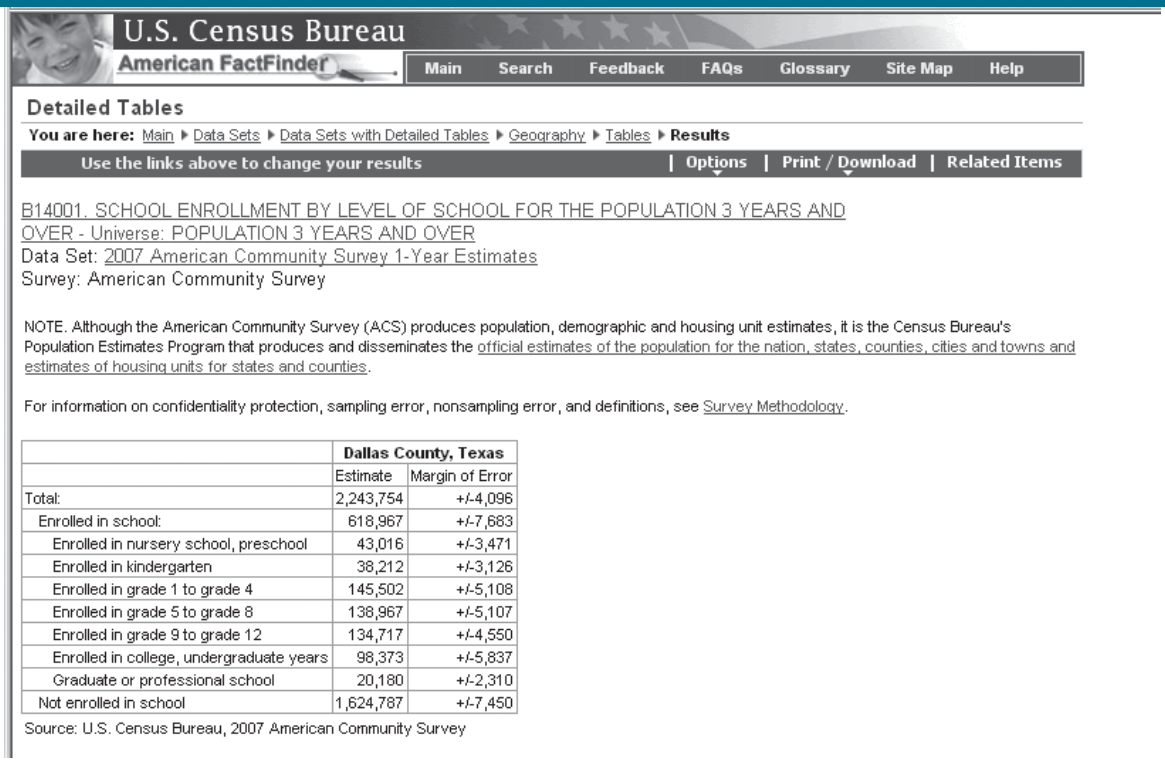
First, find the 2007 ACS school enrollment estimate for the county from the American FactFinder's detailed tables (see Figure 8). The point estimate for the county is 618,967 children, with a margin of error of +/-7,683. That means the number of children enrolled in school is likely to be (with 90-percent confidence) between 611,284 and 626,650.

Now find the 2006 ACS school enrollment estimate for the county from the American FactFinder's detailed tables (see Figure 9). In 2006, the point estimate for the county is 612,863 children, with a margin of error of +/-6,530. That means the number of children enrolled in school is likely to be (with 90-percent confidence) between 606,333 and 619,393. A quick look at the two intervals tells you that they overlap, which is a signal that these two estimates are not likely to be statistically different. But testing should be done to make a true determination.

To evaluate whether the enrollment figure has changed in a meaningful way, *calculate the difference between the point estimates for 2007 and 2006*. The difference is 6,104. Using the margins of error for these two estimates you can test to see if this is a statistically significant difference. Appendix 3 gives you step-by-step instructions. In this example we could not conclude that the estimates were statistically different and therefore could not conclude that school enrollment for this area has changed.

Because Congress generally is interested in trends over a longer period of time (for example, the 5-year period covered by a program authorization), instead of year-to-year conditions, the ACS offers a unique way to track whether school enrollment is going up or down. A more detailed analysis of ACS data would allow Congress to look at how any gains or losses affected the characteristics of the student population, such as median family income, language spoken at home, and race.

Figure 8. **2007 School Enrollment Data From the American FactFinder**



U.S. Census Bureau

American FactFinder

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B14001. SCHOOL ENROLLMENT BY LEVEL OF SCHOOL FOR THE POPULATION 3 YEARS AND OVER - Universe: POPULATION 3 YEARS AND OVER

Data Set: 2007 American Community Survey 1-Year Estimates

Survey: American Community Survey

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.

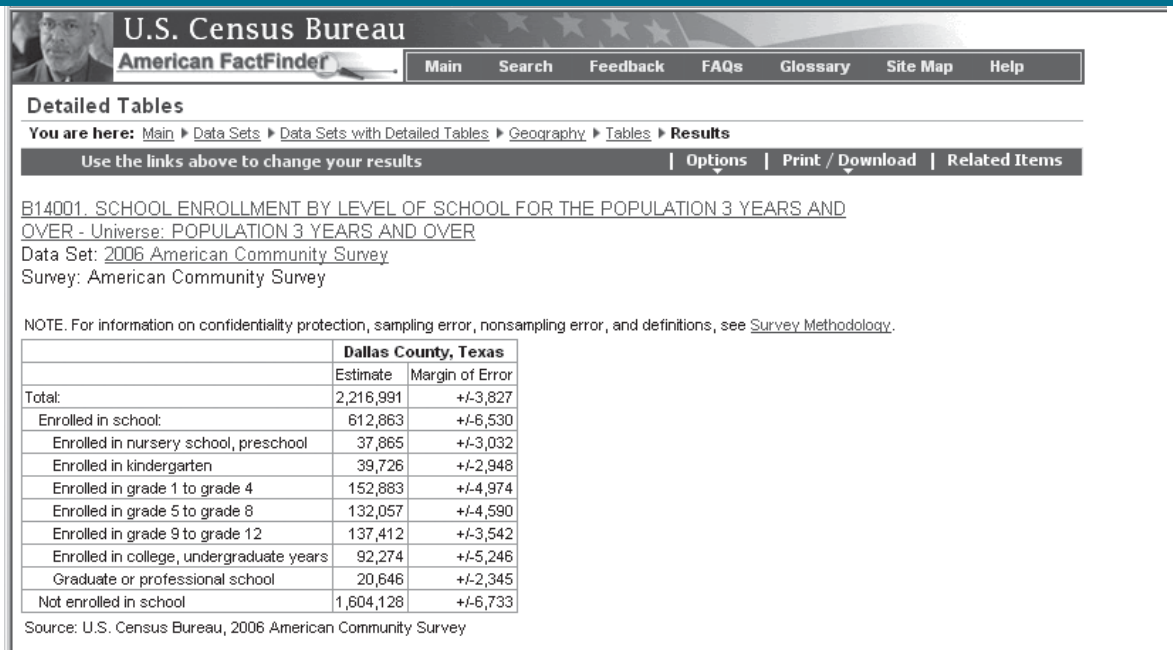
For information on confidentiality protection, sampling error, nonsampling error, and definitions, see Survey Methodology.

	Dallas County, Texas	
	Estimate	Margin of Error
Total:	2,243,754	+/-4,096
Enrolled in school:	618,967	+/-7,683
Enrolled in nursery school, preschool	43,016	+/-3,471
Enrolled in kindergarten	38,212	+/-3,126
Enrolled in grade 1 to grade 4	145,502	+/-5,108
Enrolled in grade 5 to grade 8	138,967	+/-5,107
Enrolled in grade 9 to grade 12	134,717	+/-4,550
Enrolled in college, undergraduate years	98,373	+/-5,837
Graduate or professional school	20,180	+/-2,310
Not enrolled in school	1,624,787	+/-7,450

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

Source: U.S. Census Bureau, 2007 American Community Survey, Table B14001 (SCHOOL ENROLLMENT BY LEVEL OF SCHOOL FOR THE POPULATION 3 YEARS AND OVER), accessed at <http://factfinder.census.gov>.

Figure 9. **2006 School Enrollment Data From the American FactFinder**



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B14001. SCHOOL ENROLLMENT BY LEVEL OF SCHOOL FOR THE POPULATION 3 YEARS AND OVER - Universe: POPULATION 3 YEARS AND OVER

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.

	Dallas County, Texas	
	Estimate	Margin of Error
Total:	2,216,991	+/-3,827
Enrolled in school:	612,863	+/-6,530
Enrolled in nursery school, preschool	37,865	+/-3,032
Enrolled in kindergarten	39,726	+/-2,948
Enrolled in grade 1 to grade 4	152,883	+/-4,974
Enrolled in grade 5 to grade 8	132,057	+/-4,590
Enrolled in grade 9 to grade 12	137,412	+/-3,542
Enrolled in college, undergraduate years	92,274	+/-5,246
Graduate or professional school	20,646	+/-2,345
Not enrolled in school	1,604,128	+/-6,733

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

Source: U.S. Census Bureau, 2006 American Community Survey, Table B14001 (SCHOOL ENROLLMENT BY LEVEL OF SCHOOL FOR THE POPULATION 3 YEARS AND OVER), accessed at <http://factfinder.census.gov>.

Comparing the ACS With Other Data Sources

The ACS is the largest household survey in the country, offering comprehensive data on demographic, social, economic, and housing characteristics, including poverty, income, race, and disability, for almost all U.S. geographic areas. By 2010, the survey will generate estimates for all areas, using 5-year averages, down to the community level: census tracts and block groups.

Because of its large representative sample (about 3 million addresses annually), the ACS is considered a major source of information on the nation's socioeconomic, housing, and demographic characteristics. However, other sources of data on these characteristics exist both inside and outside the Census Bureau. In some cases, other federal agencies contract with the Census Bureau to conduct surveys on their behalf.

Congress can compare data from the ACS with data from other federal sources, including the decennial census. In doing so, the user should understand how differences in design and methodology for collecting data affect the meaning and reliability of the data. Census Bureau staff can help you make appropriate comparisons.

Reference Periods

This section provides information on *reference periods* for selected ACS topics, such as employment, education, and income. A reference period helps you understand the period of time that the data reflect. The unique design and methodology of each census and survey the Census Bureau and other federal agencies conduct require some differences in definitions, reference periods, and other factors that bear on the interpretation and use of data. Appendix 2 discusses some of these factors in greater detail. Congressional staffers are encouraged to contact the Census Bureau's Congressional Affairs Office for more guidance on interpreting and using specific data sets.

Understanding the *reference period* for questions on the ACS will help congressional staff correctly interpret the characteristics of their congressional district, state, or other areas of interest. Questions on *income, education,* and *previous residence* are examples of topics that have rolling reference points, instead of reference points fixed in time, in order to produce information that reflects conditions in communities over a year's time.

Comparing the ACS and the Decennial Census

The Census Bureau provides detailed guidance on how best to compare estimates from the ACS and Census 2000. The guidance is divided into three major categories: *compare, compare with caution*, and *do not compare*. The complete table is located at <http://www.census.gov/acs/www/UseData/compACS.htm>. It is important to understand when it is appropriate to make comparisons between ACS and Census 2000 data.

Appendix 2 discusses differences between data from the ACS and Census 2000 that might affect interpretation of the estimates. Some key factors to bear in mind when comparing the ACS and the census include:

- Several topics included on the ACS were not included in Census 2000, although they may have been included on previous censuses.
- Some questions on the ACS that also were asked in Census 2000 have been modified to improve the quality of the data. An important example of a modified question is *disability.* The ACS asks a different series of questions than were asked in Census 2000 to better identify disabilities that affect a person's day-to-day activities. Several of the ACS questions related to housing characteristics have been modified from Census 2000, based on extensive research and testing.
- The ACS views communities over a period of time—instead of on a specific date, like the census. People come and go from households over time, of course, so how does the Census Bureau decide who should be considered a resident of a sample address? The answer is determined by a *residence rule.* The ACS uses a "*current" residence rule*, defined as anyone living or staying for more than 2 months in the residence at the time the data are collected. By contrast, the decennial census uses a "usual residence" rule, defined as the place where a person lives or stays most of the time as of Census Day (April 1).

Intercensal Population and Housing Estimates

While the ACS produces demographic and housing unit estimates between decennial censuses, the Population Estimates Program 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. These estimates are often referred to as annual population estimates or intercensal estimates. The Population Estimates Program also releases estimates of the population by age, sex, race, and Hispanic origin for the nation, states, and counties.

Congress uses intercensal population and housing estimates in formulas for allocating federal funds and

to monitor demographic changes and trends. Section 183 of the Census Act (Title 13, U.S. Code) requires federal agencies to use the most recent population estimates to determine funding allocations to states, counties, and localities, whenever population and basic population characteristics are called for in the funding formula, unless the law specifically requires the use of decennial census data.

Intercensal estimates are updated every year as of July 1. As new data become available, estimates are revised for years dating back to the most recent decennial census.

The official population estimates of sex, age, race, and Hispanic origin, along with total housing units are used in the final stage of weighting to improve data consistency. The ACS produces estimates of the population and housing for geographic areas (such as congressional districts) for which intercensal estimates are not available. For more information about the implications of population controls on ACS estimates, see Appendix 7.

Comparing the ACS and Other Census Bureau Surveys

Three of the best-known surveys the Census Bureau conducts are the Current Population Survey (CPS), the Survey of Income and Program Participation (SIPP), and the American Housing Survey (AHS). A review of factors that make these surveys unique and distinguish them from the ACS will help you to select the survey that best meets your data needs.

The **CPS** is conducted for the Labor Department's Bureau of Labor Statistics and is the *primary source of information on labor force characteristics*. The survey generates the nation's official monthly employment and unemployment rates, as well as annual poverty rates. Supplemental questions produce information on other useful topics such as income, employee benefits, school enrollment, and work schedules. Compared with the ACS, the CPS has a smaller sample that produces direct estimates for the nation as a whole and serves as part of model-based estimates for individual states and other geographic areas.

The **SIPP** is a *longitudinal survey*, meaning it follows the same respondents over a period of time. The survey, which the Census Bureau sponsors, is designed to track changes in income over time for the same households, regardless of employment status. The survey collects data on taxes, assets, liabilities, and participation in government transfer programs. SIPP data allow the government to evaluate the effectiveness of federal, state, and local programs; to estimate future costs and coverage for government programs such as food stamps; and to provide improved statistics on the distribution of income and measures of economic well-being in the country.

The **AHS** is conducted under contract with the Department of Housing and Urban Development. AHS collects *data on the nation's housing stock*, including apartments, single-family homes, mobile homes, vacant housing units, household characteristics, income, housing and neighborhood quality, housing costs, equipment and fuels, size of housing unit, and recent movers. A national survey of about 55,000 housing units is conducted every 2 years to produce reliable housing information for major metropolitan areas. A metropolitan area survey is conducted every 2 years with metropolitan areas in sample on a rotating basis. Each area is surveyed every 6 years.

Additional Resources About the American Community Survey

Several nonprofit organizations that use ACS data extensively in their research have prepared written and visual resources that can help congressional staff use ACS data effectively. We are pleased to recommend the following publications as additional resources for congressional data users.

Population Bulletin: The American Community Survey
<http://www.prb.org/pdf05/60.3The_American_Community.pdf>

Event: Tracking Who We Are and Where We Are Going: Using the American Community Survey (video)
<http://www.brookings.edu/events/2005/0628community-development.aspx>

Web Links for Additional Data Sources

Intercensal Population Estimates
<http://www.census.gov/popest/estimates.php>

Survey of Income and Program Participation
<http://www.sipp.census.gov/sipp/overview.html>

American Housing Survey
<http://www.census.gov/hhes/www/housing/ahs/ahs.html>

Economic Census
<http://www.census.gov/econ/census07/>

Current Population Survey
<http://www.census.gov/cps/>

Printed Publications

The Census Bureau publishes a number of resources to help people use ACS data effectively and appropriately. These documents can be downloaded from the Census Bureau's Web site and printed.

Questions and Answers: American Community Survey
<http://www.census.gov/acs/www/Downloads/ACSQandA.pdf>

Subjects Planned for the 2010 Census and American Community Survey: Federal Legislative and Program Uses (3/31/07)
<http://www.census.gov/acs/www/Downloads/Final_2010_Census_and_American_Community_Survey_Subjects_Notebook.pdf>

Questions Planned for the 2010 Census and American Community Survey
<http://www.census.gov/acs/www/Downloads/Questions_Planned_for_the_2010_Census_and_American_Community_Survey.pdf>

2006 ACS Data Users Handbook
<http://www.census.gov/acs/www/Downloads/Handbook2006.pdf>

Facts for Features: Collections of statistics from the Census Bureau's demographic and economic subject areas that commemorate anniversaries and observances (such as Women's History Month and St. Patrick's Day) or provide background information for topics in the news (such as a state holding a presidential primary)
<http://www.census.gov/Press-Release/www/releases/archives/facts_for_features_special_editions/index.html>

For a list of additional ACS resources, see Appendix 8.

Contacting Census Bureau Headquarters and Regional Census Offices

Census Bureau's Congressional Affairs Office

Phone: 301-763-6100
E-mail: <cao@census.gov>

American Community Survey

American Community Survey
U.S. Census Bureau
4600 Silver Hill Rd.
Room 3K276
Washington, DC 20233-7500

Phone: 301-763-INFO (4636)
E-mail: <cmo.acs@census.gov>
Internet: <www.census.gov/acs/www>

Atlanta, GA

U.S. Census Bureau
Atlanta Regional Office
101 Marietta St., Suite 3200
Atlanta, GA 30303-2700

Toll-free: 1-800-424-6974
Phone: 404-730-3832
Fax: 404-730-3835
TDD: 404-730-3963
E-mail: <atlanta.regional.office@census.gov>

Boston, MA

U.S. Census Bureau
Boston Regional Office
4 Copley Place, Suite 301
P.O. Box 9108
Boston, MA 02117-9108

Toll-free: 1-800-562-5721
Phone: 617-424-4501
Fax: 617-424-0547
TDD: 617-424-0565
E-mail: <boston.regional.office@census.gov>

Charlotte, NC

U.S. Census Bureau
Charlotte Regional Office
901 Center Park Drive, Suite 106
Charlotte, NC 28217-2935

Toll-free: 1-800-331-7360
Phone: 704-424-6400
Fax: 704-424-6944
TDD: 704-424-6963
E-mail: <charlotte_regional_office@census.gov>

Chicago, IL

U.S. Census Bureau
Chicago Regional Office
1111 W. 22nd Street, Suite 400
Oak Brook, IL 60523-1918

Toll-free: 1-800-865-6384
Phone: 630-288-9200
Fax: 630-288-9288
TDD: 708-562-1791
E-mail: <chicago.regional.office@census.gov>

Dallas, TX

U.S. Census Bureau
Dallas Regional Office
8585 N. Stemmons Freeway
Suite 800 S
Dallas, TX 75247-3836

Toll-free: 1-800-835-9752
Phone: 214-253-4400
Fax: 214-655-5362
TDD: 214-655-5363
E-mail: <daro.census@census.gov>

Denver, CO

U.S. Census Bureau
Denver Regional Office
6900 West Jefferson Avenue, Suite 100
Lakewood, CO 80235-2032

Toll-free: 1-800-852-6159
Phone: 303-264-0202
Fax: 303-969-6777
TDD: 303-969-6767
E-mail: <Denver_Regional_Office@census.gov>

Detroit, MI

U.S. Census Bureau
Detroit Regional Office
1395 Brewery Park Blvd.
Detroit, MI 48207

Toll-free: 1-800-432-1495
Phone: 313-259-1158
Fax: 313-259-5045
TDD: 313-259-5169
E-mail: <detroit.internet.mail@census.gov>

Kansas City, KS

U.S. Census Bureau
Kansas City Regional Office
1211 North 8th Street
Kansas City, KS 66101-2129

Kansas City, KS—Con.

Toll-free: 1-800-728-4748
Phone: 913-551-6728
Fax: 913-551-6789
TDD: 913-551-5839
E-mail: <KC.Regional.Office@census.gov>

Los Angeles, CA

U.S. Census Bureau
Los Angeles Regional Office
15350 Sherman Way, Suite 400
Van Nuys, CA 91406-4224

Toll-free: 1-800-992-3530
Phone: 818-267-1700
Fax: 818-267-1711
TDD: 818-904-6429
E-mail: <la.regional.office@census.gov>

New York, NY

U.S. Census Bureau
New York Regional Office
395 Hudson Street, Suite 800
New York, NY 10014

Toll-free: 1-800-991-2520
Phone: 212-584-3400
Fax: 212-478-4800
TDD: 212-478-4793
E-mail: <new.york.regional.office@census.gov>

Philadelphia, PA

U.S. Census Bureau
Philadelphia Regional Office
833 Chestnut Street
5th Floor, Suite 504
Philadelphia, PA 19107-4405

Toll-free: 1-800-262-4236
Phone: 215-717-1800
Fax: 215-717-0755
TDD: 215-717-0894
E-mail: <Philadelphia.Regional.Office@census. gov>

Seattle, WA

U.S. Census Bureau
Seattle Regional Office
601 Union Street, Suite 3800
Seattle, WA 98101-1074

Toll-free: 1-800-233-3308
Phone: 206-381-6200
Fax: 206-381-6310
TDD: 206-381-6318
E-mail: <seattle.regional.office@census.gov>

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 United States, 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, U.S. 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 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.

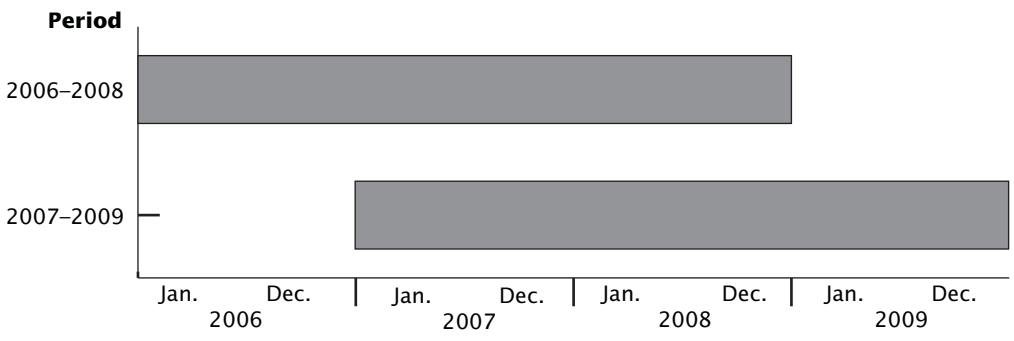
You certainly can compare characteristics for areas with populations of 30,000 to areas with populations of 100,000 but you should use the data set that they have in common. In this example you could use the 3-year or the 5-year estimates because they are available for areas of 30,000 and areas of 100,000.

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**

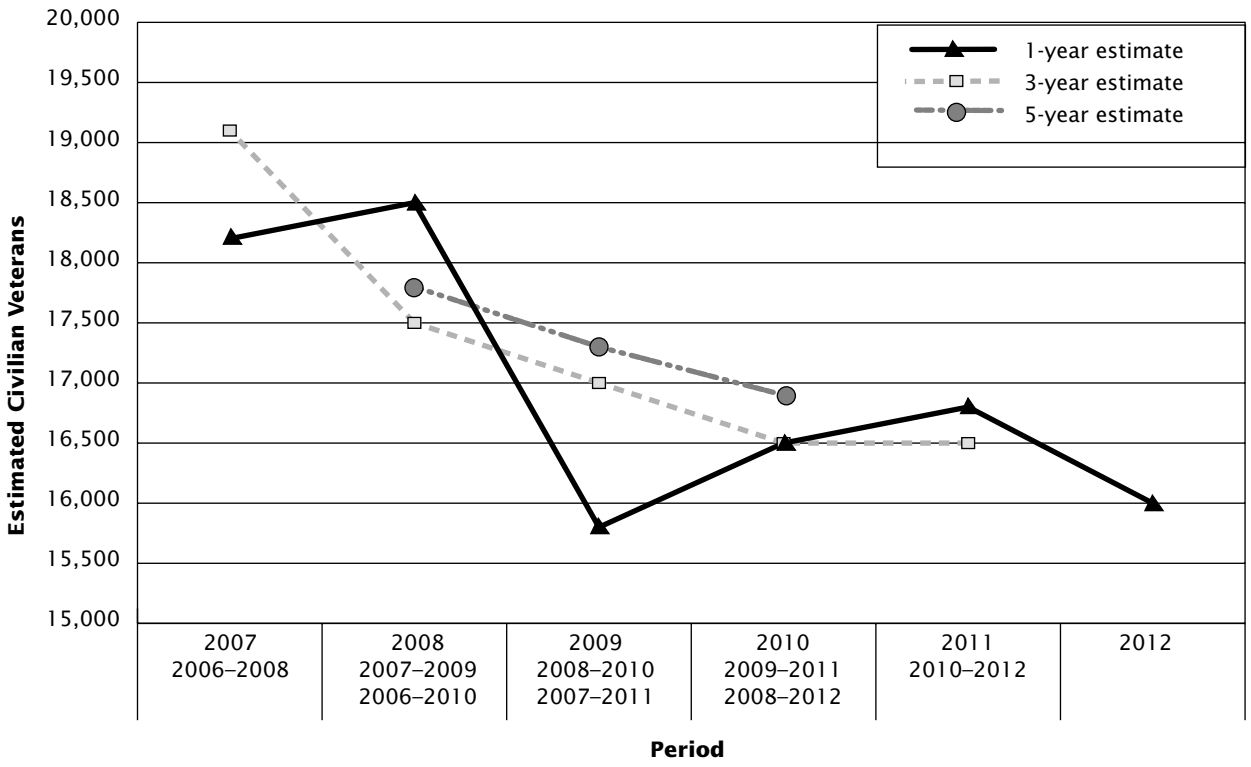


Source: U.S. Census Bureau.

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.

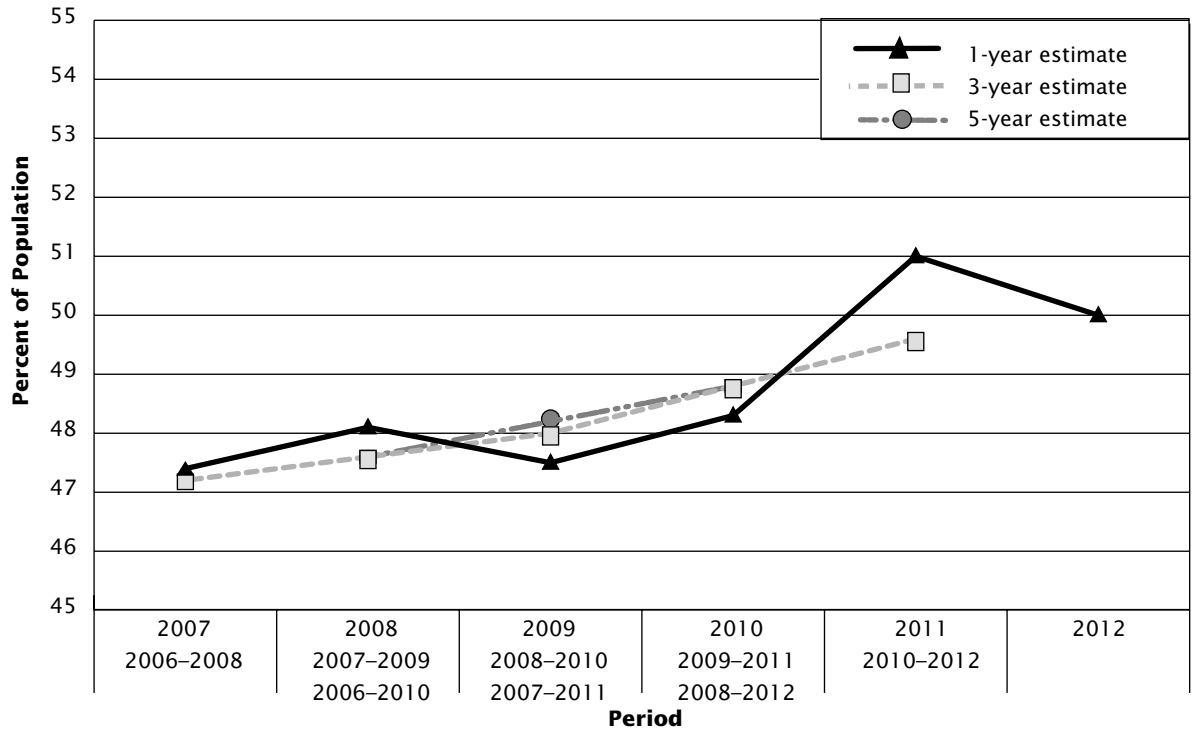
Local area variations may occur due to rapidly occurring changes. As discussed previously, multiyear estimates will tend to be insensitive to such changes when they first occur. Single-year estimates, if associated with sufficiently small CVs, can be very valuable in identifying and studying such phenomena. 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:

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

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

$$CI_{CL} = (L_{CL}, U_{CL}).$$[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).

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.

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

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.