



## Update from the American Community Survey

### ACS Estimates and Sources of Error

Before 2010, detailed social, housing and economic data about the population were collected as part of the decennial Census. The Census short form was sent to all U.S. residents and collected basic count and demographic data and the Census long form was sent to a sample of U.S. residents and included questions about a wide-ranging set of population and housing characteristics. These detailed characteristics were tabulated and released for a hierarchy of geographic entities, including local counties and cities, every 10 years following the decennial Census data collection period.

The most recent Census conducted in 2010 did not include a long form questionnaire. Rather, the 2010 Census included only a count of people and housing units and a very small set of demographic data (i.e. age, sex, race, Hispanic origin, and housing occupancy/vacancy). The decennial Census long form has been replaced by the American Community Survey (ACS). The ACS collects essentially the same information that was collected on the Census long form. However, the ACS is an on-going survey and collects detailed population and housing characteristics every year. As a result, local communities do not have to wait 10 years for detailed characteristics. Now, these data are available every year from the ACS.

The ACS does differ from the decennial Census in a couple of important ways. First, instead of providing data about the population at one point in the year, like the decennial Census (i.e. on April 1), the ACS collects data continuously. Thus, while the decennial Census characteristics are point-in-time estimates or a “snapshot” of the characteristics of the population, the ACS data are period estimates, describing the population over a particular period, such as a year.

Second, ACS data are released for different time periods depending on the size of the geographic area. For large jurisdictions with 65,000 people or more (e.g. Fairfax County, City of Alexandria, Calvert County), ACS data are released every year. For somewhat smaller jurisdictions with between 20,000 and 64,999 people (e.g. cities of Fairfax, Fredericksburg and Manassas), ACS data are released for three-year periods. In other words, instead of getting data on population characteristics for 2009, these jurisdictions get detailed data for the 2007 through 2009 period. Finally, the smallest geographic areas with fewer than 20,000 people

**Table 1. ACS Period Estimates Available for Local Jurisdictions**

<b>1-Year, 3-Year and 5-Year Estimates</b>	State of Maryland State of Virginia District of Columbia Washington DC Metro Area Arlington County Fairfax County Fauquier County Loudoun County Prince William County Spotsylvania County Stafford County City of Alexandria Calvert County Charles County Frederick County Montgomery County Prince George’s County
<b>3-Year and 5-Year Estimates Only</b>	Warren County City of Fairfax City of Fredericksburg City of Manassas Jefferson County
<b>5-Year Estimates Only</b>	Clarke County City of Falls Church City of Manassas Park

(e.g. Clarke County and the cities of Falls Church and Manassas Park) will receive ACS data for five-year periods, such as 2005-2009, which describe the characteristics of the localities' populations over that period.

Because the ACS data are collected from a sample rather than the entire U.S. population, there is some uncertainty about how close the sample estimates are to the "true" population characteristics. This uncertainty is called sampling error. The U.S. Census Bureau publishes the margin of error with each of the ACS estimates which is a measure of the uncertainty in the estimates. The Census Bureau's margins of error are calculated at the 90-percent confidence level.

#### **Margin of Error – Example**

*According to the 2009 American Community Survey 1-Year Estimates, 22.6% of people age 25 or older in the Washington DC Metropolitan Area has a graduate or professional degree. There is a margin of error of +/- 0.3% associated with this estimates. The margin of error is subtracted from and added to the point estimate to calculate a 90-percent confidence interval. Thus, the 90-percent confidence interval is 22.3% to 22.9%. The interpretation is that there is a 90 percent chance that the true percentage of people with a graduate or professional degree is between 22.3% and 22.9%.*

If ACS data are being used to get a general sense of the population characteristics for a local community, then the uncertainty about the estimates and the reported margins of error may not be important. When using ACS data, it is most appropriate to use percentages, means and medians, rather than actual numbers of people with particular characteristics. For population and housing unit counts, the 2010 Census provides the most reliable data.

If ACS data are being used to examine trends over time or to compare geographic areas, rather than to describe generally the characteristics of a population, the margins of error of estimates can be critical. There are two main attributes that affect the margins of error from the ACS: 1) the period of the estimate and 2) the population of the geographic area.

**In general, estimates from the ACS will be more precise (i.e. will have smaller margins of error) for longer periods.** In other words, the margin of error associated with a 1-year estimate will be larger than the margin of error associated with a 3-year estimate.

Table 2 below shows the percent of the population age 25 or older with a graduate or professional degree for the Washington DC metropolitan area and for each of the 22 jurisdictions that comprise the region. The 2009 1-year estimate for Frederick County, Maryland is 13.6% with a margin of error of +/- 1.4%. The 3-year estimate that covers the period from 2007 through 2009 is 13.1% with a margin of error of +/- 0.8%. The 5-year estimate is 13.3% with a margin of error of +/- 0.6%. Thus, there is a smaller margin of error—and greater precision—in the multi-period estimates.

**ACS estimates are more precise for jurisdictions with larger populations.** Table 2 shows the 2005-2009 estimate of the percentage of the District of Columbia population with a graduate or professional degree is 26.4% with a margin of error of +/- 0.4%. In the City of Fairfax, with a population of only 22,565 compared to the District's population of over 600,000, the estimate is 23.0% with a margin of error of +/- 2.3%. The margins of error associated with estimates generally will be larger for smaller places, meaning it is more difficult to be confident of the "true" value of the characteristics for places with smaller populations. The ACS data are released for sub-County areas, such as Census tracts and block groups, and the margins of error for these estimates are even larger, which means there is even more uncertainty about ACS estimates at very small levels of geography.

When using ACS data to examine changes over time or to compare characteristics of two or more jurisdictions, it is very important to take into account the margins of error associated with the ACS estimates. For example, in 2008 in Arlington County it was estimated that 36.2% of residents age 25 or older had a graduate or professional degree, with a margin of error of +/- 2.2% (Table 2). In 2009, the estimate was 34.9% with a margin of error of +/- 2.2%. If only the point estimates were considered, it would appear as though the percentage of Arlington County residents with a graduate or professional degree dropped from 36.2% in 2008 to 34.9% in 2009. However, the margins of error indicate there is some uncertainty about each of the estimates. The 90-percent confidence interval for the 2008 estimate is 34.0% to 38.4%. Thus, there is a 90 percent chance that the true value for Arlington County in 2008 is between 34.0% and 38.4%. In 2009, the 90-percent confidence interval is 32.7% to 37.1%. Because the confidence intervals overlap, it is impossible to say that there has been a significant change in the percentage of the Arlington County population with a graduate or professional degree between 2008 and 2009.

Margins of error and confidence intervals should also be used when making statements about how the characteristics of two jurisdictions differ. According to the 2007-2009 ACS estimates, 9.3% of Warren County residents age 25 or older have a graduate or professional degree, with a margin of error of +/- 1.8%. In Fauquier County, the estimate is 12.3% with a margin of error of +/- 1.5%. The point estimates alone suggest that Fauquier County has a more highly educated population, with a greater share having a graduate or professional degree. However, the 90-percent confidence interval is 7.5% to 11.1% for Warren County and 10.8% to 13.8% for Fauquier County. These overlapping confidence intervals indicate that it is possible that there is no real difference in the percentages for the two counties.

In summary, detailed population and housing characteristics are now available on an annual basis from the ACS and will not be reported from the 2010 Census. ACS data are period estimates and are released for 1-year, 3-year and 5-year periods depending on the size of the population the geographic area. ACS data are useful for describing characteristics of the population; however, there is uncertainty associated with the ACS estimates. When using the ACS data to examine trends over time or to compare the characteristics of two or more areas, it is important to take into account the margins of error published by the Census Bureau.

## **GMU Center for Regional Analysis**

The principal mission of the Center for Regional Analysis is to provide research and analytical services to local governments, businesses and other stakeholders in the Washington region focusing on economic, demographic, transportation, housing and fiscal trends and forecasts.

The Center for Regional Analysis has become the “go-to” organization for economic, demographic and housing data and analysis within the Washington and Baltimore regions and is cited locally and nationally as the source of information for the media, research scholars, and investors interested in understanding the Washington area’s economy. The Center posts research reports, presentations, data and other information its website ([policy-cra.gmu.edu](http://policy-cra.gmu.edu))

### **Updates from the 2010 Census and the American Community Survey**

The Center for Regional Analysis will issue periodic reports on demographic and economic topics based on newly released data from the 2010 Census and the American Community Survey. The American Community Survey (ACS) is an ongoing survey that provides detailed data every year about states, metropolitan areas, counties and cities. More information about the 2010 Census and the ACS can be found at [www.census.gov](http://www.census.gov).

**Table 2. Percent of the Population Age 25 or Older With a Graduate or Professional Degree**

Period	Wash. Metro	DC	Arlington	Clarke	Fairfax	Fauquier	Loudoun	Prince William	Spotsylvania	Stafford	Warren	Alexandria City
2006	21.5	25.4	34.3	n/a	28.1	9.0	18.5	14.0	8.3	12.9	n/a	28.5
2007	22.2	26.0	38.3	n/a	27.8	10.8	21.1	14.5	11.3	15.3	n/a	30.4
2008	21.9	26.7	36.6	n/a	27.8	11.5	21.8	13.8	9.3	12.2	n/a	29.2
2009	22.6	28.0	34.9	n/a	28.1	13.7	23.2	15.7	11.7	15.9	n/a	27.2
2009 MOE	0.3	1.0	2.2	n/a	0.9	2.8	1.7	1.3	2.2	1.9	n/a	2.6
2006-2008	21.9	26.0	36.4	n/a	28.0	10.1	20.7	14.0	10.2	13.5	7.2	29.2
2007-2009	22.1	27.0	36.1	n/a	27.6	12.3	22.3	14.9	11.0	14.8	9.3	27.9
2007-2009 MOE	0.2	0.6	1.4	n/a	0.5	1.5	0.9	0.7	1.0	1.0	1.8	1.2
2005-2009	21.9	26.4	35.2	10.4	27.6	11.1	21.0	14.6	10.7	14.0	8.1	28.1
2005-2009 MOE	0.2	0.4	0.9	2.8	0.3	1.3	0.7	0.5	0.9	0.8	1.4	0.9
2010 Population	5,582,170	601,723	207,627	14,034	1,081,726	65,203	312,311	402,002	122,397	128,961	37,575	139,966

Period	Fairfax City	Falls Church City	Fredericks- burg City	Manassas City	Manassas Park City	Charles	Calvert	Montgomery	Prince George's	Frederick	Jefferson County
2006	n/a	n/a	n/a	n/a	n/a	8.1	10.0	29.5	12.2	13.3	n/a
2007	n/a	n/a	n/a	n/a	n/a	9.6	11.8	29.6	12.4	13.0	n/a
2008	n/a	n/a	n/a	n/a	n/a	8.8	9.1	29.0	11.8	13.3	n/a
2009	n/a	n/a	n/a	n/a	n/a	10.0	13.5	30.1	11.8	13.6	n/a
2009 MOE	n/a	n/a	n/a	n/a	n/a	1.6	2.3	0.9	0.7	1.4	n/a
2006-2008	22.3	n/a	11.7	9.1	n/a	8.7	10.4	29.2	12.2	13.1	14.2
2007-2009	22.4	n/a	11.3	9.5	n/a	9.7	11.5	29.3	11.9	13.3	11.7
2007-2009 MOE	2.7	n/a	2.4	2.0	n/a	0.8	1.1	0.6	0.4	0.7	1.5
2005-2009	23.0	38.5	12.7	9.1	10.3	9.1	11.2	29.2	12.2	13.3	11.7
2005-2009 MOE	2.3	3.4	2.1	1.3	2.1	0.6	0.7	0.4	0.3	0.6	1.2
2010 Population	22,565	12,332	24,286	37,821	14,273	146,551	88,737	971,777	863,420	233,385	53,498

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

n/a indicates estimate not available for that period

MOE = margin of error