

SPECIAL REPORT

A Practical Guide to the American Community Survey (5-Year Estimates)

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Historically, most demographic data for states and substate areas were collected from the long version of the decennial census questionnaire. A “snapshot” of the characteristics of the population on the April 1 census date was available once every 10 years. The long form of the decennial census has been replaced by the American Community Survey (ACS) that has been conducted on an ongoing basis for the entire country since 2005. Instead of a snapshot in which all of the data are gathered at one time, the ACS aggregates data collected over time, making the results more difficult to interpret. However, the ACS data are updated annually.

ACS results by calendar year are released annually for areas with a population of at least 65,000; the first nationwide data were for 2005 (though people living in group quarters such as prisons and nursing homes were not surveyed until 2006). Combined estimates for three years of data are available for areas with a population of at least 20,000; the first data were produced for the 2005-through-2007 period. Combined figures for five years of data are provided for the full range of geographic areas, down to census tracts (areas of roughly 5,000 people).

The results for areas of moderate population size are not available by year, and the estimates for less populous areas are available only as five-year averages, because of the substantial sampling error present in the ACS. Even the combined data for five years have larger sampling error than was present from the long form of the decennial census.

Just because the Census Bureau releases ACS data for an area does not mean that the sampling error is small enough to be of little consequence. In fact, the opposite is true: most of the data released have a sampling error that is too large to make the estimates usable for most purposes.

The Census Bureau provides the sampling error in the form of the margin of error, which is published with every estimate. The Census Bureau calculates the margin of error at the 90 percent confidence level. The following is an example:

The estimate of the poverty rate in Maricopa County in 2009 is 15.2 percent, with a margin of error of + or - 0.6 percentage points. The interpretation is that there is a 90 percent likelihood that the actual poverty rate is within the confidence interval of 14.6 percent to 15.8 percent. A one-in-ten chance exists that the real rate is outside this range.

Most surveys, such as public opinion polls, express error at 95 percent confidence. This widens the confidence interval (in the above example it becomes + or - 0.7 percentage points), but reduces the chances that the actual figure is outside the confidence interval to only one in 20.

If the purpose of obtaining the poverty rate for Maricopa County is simply to get a rough idea of its value, then the stated margin of error may not be a significant issue. However, if the goal is to compare the poverty rate from one year to the next, or to compare the rate to other geographic areas, then a margin of error of this magnitude becomes a prohibitive problem.

For an example of comparing results across geographic areas, the poverty rate in 2009 was reported at 19.3 percent in Pima County and at 18.3 percent in Coconino County. Yet one should not conclude that the rate in Pima County was higher than that in Coconino County. The confidence interval for the former was a wide 17.8-to-20.8 percent; for the latter, it was a very wide 15.1-to-21.5 percent.



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Arizona Indicators is an online information resource and analysis tool that centralizes data about the state and its communities. Arizona Indicators presents interactive visualizations, clear data descriptions, and public opinion data in a broad range of content areas.

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For an example of comparing the poverty rate from one year to the next, the reported poverty rate in Maricopa County from 2006 through 2008 was 12.5, 13.1 and 13.4 percent. It is impossible to state with confidence that the poverty rate rose in either 2007 or 2008. Given the magnitude of the increase in the reported poverty rate between 2008 and 2009 (from 13.4-to-15.2 percent), one can conclude with 90 percent confidence that the poverty rate rose, but not by how much. The confidence interval in 2008 was 12.8-to-14.0 percent; the interval in 2009 was 14.6-to-15.8 percent.

For those interested in a time series of data—that is, how a value changes from year to year—then a rough rule of thumb is that a margin of error that is greater than the likely annual change in the value is too large to be useful. For example, the percentage of the population age 25 or older who has earned a graduate degree (such as a master’s degree or doctorate) has gradually been climbing nationally by an average of about 0.1 percentage point a year. The change is largely predictable—on average, a higher percentage of those aging into this age group have earned a graduate degree than those who have died. (Advanced degrees were rare among those born before World War II.) The migration of people into and out of an area also can affect the value, as can those who earn an advanced degree after the age of 25, but such factors rarely have more than a minor effect in any year.

The following table presents the ACS estimates, and margins of error, of the percentage of the population age 25 or older who has earned a graduate degree. For estimates specific to a single year, the margin of error is small for the most populous areas, such as the nation and regions. The margin of error is higher than desirable for Arizona and becomes prohibitively large for less populous areas.

Percentage of the Population Age 25 or Older With a Graduate Degree						
	United States	Western Region	Arizona	Maricopa County	Pima County	Coconino County
2005	10.0%	10.2%	9.3%	9.5%	12.2%	12.3%
2006	9.9	10.1	9.2	9.8	11.4	12.4
2007	10.1	10.3	9.2	9.5	12.2	16.1
2008	10.2	10.4	9.2	9.7	11.7	11.9
2009	10.3	10.4	9.3	10.0	11.1	12.0
Margin of Error, 2009	+/-0.1	+/-0.1	+/-0.2	+/-0.3	+/-0.7	+/-1.6
2005-07	9.9	10.1	9.2	9.5	11.8	13.6
2006-08	10.1	10.3	9.2	9.7	11.6	13.5
2007-09	10.2	10.4	9.3	9.8	11.5	13.1
Margin of Error, 2007-09	+/-0.1	+/-0.1	+/-0.1	+/-0.2	+/-0.4	+/-1.4
2005-09	10.1	10.3	9.3	9.9	11.4	12.7
Margin of Error, 2005-09	+/-0.1	+/-0.1	+/-0.1	+/-0.1	+/-0.3	+/-0.9
Population in millions (2009)	307	71.6	6.6	4.0	1.0	0.13

Source: U.S. Department of Commerce, Census Bureau, American Community Survey, extracted with American FactFinder (Data Profiles)

The volatility and margin of error of the annual estimates increases with decreasing population size. Even for Maricopa County, annual ups and downs that likely are due to sampling error rather than a real change can be seen. The 2007 estimate for Coconino County appears to be one of the one-in-ten chances that the actual value is not within the confidence interval.

Sampling error is smaller when three years of data are combined, but still is too large for users to have much confidence in the results for areas less populous than Maricopa County. If an estimate for one year is far enough off the mark, as appears to be the case in Coconino County in 2007, then the three-year estimates could be substantially different from the actual value. Four of the five single-year estimates for Coconino County are from 11.9-to-12.4 percent yet all of the three-year estimates exceed 13 percent. The sampling error falls further when five years of data are combined, but remains a significant issue for areas of even 1 million residents, such as Pima County. Because of the one extreme annual value, even the five-year average for Coconino County likely overstates the actual percentage.

While overall population size is a good first indicator of sampling error, the magnitude of the error also depends on other factors, such as the size of the estimate. For example, an area with a small percentage of its residents holding an advanced degree has a smaller margin of error than an area of comparable size that has a higher proportion of its residents with a graduate degree.

The margin of error within any geographic area varies widely by the size of the population being analyzed. For example, the estimate of the percentage of advanced degrees in the total population age 25 or older is much more accurate than the estimate for 25-to-29-year-old females. Thus, for example, for an area of Pima County's size (1 million residents), broad measures of the entire population may have an acceptable sampling error even when using annual data, while more specific measures (such as the roughly one-in-ten adults age 25 or older who have earned an advanced degree) may not have an acceptable sampling error even when using three-year or five-year averages.

In conclusion, the published margin of error should be taken into consideration when deciding whether to use a result from the ACS. Whether the reported sampling error is too large depends on the user's purpose for accessing the data and on the volatility of the measure over time and across geographic areas. In general, considerable caution is urged in using the ACS data.

For more information on the accuracy of the ACS, see <http://www.census.gov/acs/www/UseData/Accuracy/Accuracy1.htm>. ACS results can be accessed from <http://factfinder.census.gov/home/saff/main.html>.