Estimating Citizenship Voting Age Population Data (CVAP)

Addendum to
Data for 2011 Redistricting in Texas

Texas Legislative Council
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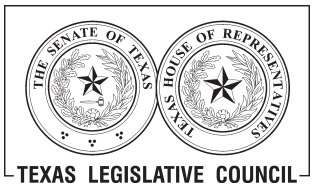

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Estimating Citizenship Voting Age Population Data (CVAP)

Beginning with the 2010 Census, the Census Bureau no longer requested detailed population and housing information, including citizenship, using the decennial census long-form. Instead, to obtain this type of data, the bureau uses the American Community Survey (ACS), an ongoing statistical survey that samples a small percentage of the population every year. To have a sufficient sample size to report the results at the census block group level, the bureau collects and reports the data for a five-year period. The bureau prepared a Special Tabulation of Citizen Voting Age Population (CVAP) from the 5-Year ACS that included voting age citizenship data for Hispanic or Latino (HCVAP) and for 10 race categories that are Not Hispanic or Latino. The 2006-2010 5-Year Special Tabulation was released on February 9, 2012, and the 2007-2011 5-Year Special Tabulation was released on January 28, 2013.[1]

To report citizenship data for redistricting proposals, the council had to:

(1) identify a methodology to aggregate citizenship data by district when block groups are split by districts; and
(2) calculate the margin of error for districts.

Aggregating Citizenship Data by District

The council aggregated the Special Tabulation block group data to estimate district level CVAP and CVAP for the Hispanic or Latino category and for 10 race categories that are Not Hispanic or Latino. Many block groups are wholly contained within a district, but a number of block groups are split by district boundaries. Because the ACS sample data are already estimated, it cannot be disaggregated below the block group level, so a method to address the population in the split block groups had to be determined.

Calculating District Estimates for CVAP and CVAP by Race/Ethnic Category

To generate district estimates of CVAP and of CVAP for the Hispanic or Latino category and for the 10 race categories that are Not Hispanic or Latino, the council includes all of the block groups wholly within a district and all of the block groups where more than 50 percent of the 2010 Census population was contained within the district. The data from these block groups are summed to generate the estimates. Using this method, some people who live outside the district are included in the district estimates, and some people who live in the district are not included in the district estimates. Two reports provide information about the district population included in the citizenship reports. The Block Group Population Used in ACS Reports (Red117) lists the individual block groups and their 2010 population by district and indicates whether the block group is included in the district estimates. The Population Coverage for Citizenship Analysis (Red118) shows the source of the population included in the district analysis, including (1) how much of the population is from block groups wholly within the district, (2) how much is derived from split block groups that are included in the district, and (3) how much is excluded from the district.

Calculating Margins of Error

All ACS block group estimates, including those in this Special Tabulation, are subject to sampling error, and the ACS publishes a margin of error (MOE) with a 90 percent confidence level, referred to as a 90 percent MOE, for each block group estimate. The MOE describes the precision of the estimate at a given level of confidence, or the difference between an estimate and its upper and lower confidence bounds. A 90 percent confidence interval can be interpreted roughly as providing a 90 percent probability that the range between the estimate plus the MOE and the estimate minus the MOE (the upper and lower confidence bounds) contains the true population value. Because the estimates from the block groups that compose a district estimate are aggregated, additional calculations are needed to produce the 90 percent MOEs for the district estimates.

Calculation Methodology

The council followed the Census Bureau's suggested methodology for calculating 90 percent margins of error for the district estimates as provided in Appendix 3 of *A Compass for Understanding and Using American Community Survey Data: What General Data Users Need to Know*.[2]

90 percent margins of error are calculated differently for aggregated counts (i.e., *cvap*) and for derived proportions (i.e., *hcvap / cvap*) as follows:

- Margins of error for aggregated counts (MOE_{agg}):
  To calculate the MOE, take the square root of the sum of squared margins of error for each block group in the district; or algebraically,

$$MOE_{agg} = \sqrt{\sum_{c} MOE_{c}^{2}}$$

  where c is the c^{th} block group.

- Margins of error for derived proportions (MOE_{pro}):
  To calculate the MOE,
  (1) obtain the derived proportion (*hcvap / cvap*);
  (2) obtain the MOE for the numerator (MOE_{hcvap}) and the MOE for the denominator of the proportion (MOE_{cvap});
  (3) square the derived proportion;
  (4) square the MOE of the numerator;
  (5) square the MOE of the denominator;
  (6) multiply the squared MOE of the denominator by the squared proportion;
  (7) subtract the result of (6) from the squared MOE of the numerator;
  (8) take the square root of the result of (7);
  (9) divide the result of (8) by the denominator of the proportion; or algebraically,

$$MOE_{pro} = \frac{\sqrt{MOE_{hcvap}^2 - \left(\frac{hcvap}{cvap}\right)^2 * MOE_{cvap}^2}}{cvap}$$

In rare instances, (6) is greater than (4) and, as a result, (7) is negative. In such instances, modify the formula by adding (6) to (4) rather than subtracting (6) from (4); or algebraically,

$$MOE_{pro} = \frac{\sqrt{MOE_{hcvap}^2 + \left(\frac{hcvap}{cvap}\right)^2 * MOE_{cvap}^2}}{cvap}$$

The same calculation methodology used for the Hispanic or Latino category is applied to each of the 10 race categories that are Not Hispanic or Latino.

Reporting the Redistricting Estimates and Margins of Error

The council's ACS Special Tabulation Using Census and ACS Data report (Red116) includes the following data for each district:

- From the 2010 Census: total population and voting age population (VAP)
- From the Special Tabulation: CVAP estimate with a 90 percent MOE
- From the Special Tabulation: Hispanic CVAP and Not Hispanic or Latino CVAP for Black Alone, Black plus White, Black plus American Indian, White Alone, American Indian Alone, Asian Alone, Native Hawaiian Alone, American Indian plus White, Asian plus White, and Remainder of Two or More Others as a percent of CVAP with a 90 percent MOE

The Hispanic Population Profile report (Red119) includes 2010 Census total population, VAP, and percent Hispanic VAP (HVAP); ACS CVAP and percent HCVAP, both with a 90 percent MOE; and total and non-suspense voter registration and percent Spanish surname voter registration data. Two additional reports, discussed above, include the Block Group Population Used in ACS Reports (Red117), which lists the block groups that are included in the districts, and the Population Coverage for Citizenship Analysis (Red118), which shows how much of the population by district is included in the report.

Notes

[1] http://www.census.gov/rdo/data/voting_age_population_by_citizenship_and_race_cvap.html
[2] http://www.census.gov/acs/www/guidance_for_data_users/handbooks/