

Documentation for Arkansas' Single-Age Cohort
Population Projections by Race 2011-2020

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This note documents the methodology used to project the single-age cohorts by race for Arkansas' Counties over the 2011-2020 period. The population projections are available at the Institute for Economic Advancement's website under the heading:

- Vintage 2010 (based on Census 2010)
 - Arkansas' Single Age-Cohorts by Race and Hispanic Origin Population Projections by County and Planning and Development District 2011-2020.¹

The model that was used to project the Arkansas population was based on a constant rate of geometric change over a period of time. The population modeling assumed that each age-cohort's population would change by the same percentage rate in the future as it had over the 2000-2010 period. The populations were then assumed to grow at a geometric rate during the 2000-2010 period, and that the rates of growth would remain constant over the 2010-2020 period. Monthly geometric growth rate was computed using the following general formula:

$$r = (\text{Pop}_{10}/\text{Pop}_{00})^{(1/120)} - 1$$

where r is the monthly geometric growth rate, Pop_{00} is the 2000 Census population enumeration, Pop_{10} is the 2010 Census population enumeration, and 120 is the number of months between the two censuses.

Monthly geometric growth rates were computed for each age-cohort by county and by race. These geometric rates were then used to compute a one year projection of a county's population by single age-cohort and by selected races. The selected races included the white and the black populations as well as the number of people of Hispanic origin. The general formula used to project a year forward population was:

$$\text{Pop}_{t+1} = \text{Pop}_t(1 + r)^{12}$$

where Pop_t is the launch year population or population at time t and Pop_{t+1} is the population projection one year forward (12 months).

The actual projections were computed in the following steps:

1. The population for July 2011 was projected using the April 2010 Census enumeration by age-cohort and selected races.
2. Balancing the sum of the row sums and the sum of the column sums: In the projection computations, county population totals were also projected by race. There is no mathematical

¹ <http://iea.ualr.edu/population-estimates-a-projections.html>

reason for the county population projection to be equal to the sum of single age-cohort projections. Hence, it was necessary to balance the two projections. In this case, the sum of the cohort projects was balanced to the county total population projections. An iterative proportional adjustment process was applied to the single-age projections by county to ensure that the sum of the age-cohorts projections across all counties equaled the sum of the county projections of by age-cohort across all age-cohorts.²

3. Using the balanced 2011 projection (July 2011), the 2012 population projection (July 2012) was computed by single age-cohort. In the process each age-cohort was advanced one year in a chronological order and that year's geometric growth rate was applied to compute the one year forward population projection. In the final age-cohort (110 and over), survivors were accumulated.
4. The balanced 2012 age-cohorts projections became the launch year for the 2013 age-cohort's projection which were then balanced using the iterative proportional adjustment.
5. These population projection computations continued incrementally throughout the 2013-2020 period for each race and county.
6. In addition to the aforementioned race projections, the Arkansas single-age cohort population was also projected using this method outlined above. Since the race population projections were independent of each other, there was no reason to expect that the sum of the race projection would be the same as the total projection. The population projections for "other races" were used to balance the total population projections with the sum of the race population projections using the iterative proportional adjustment process.

The population projections are displayed in accordance with each county's membership in a Planning and Development District. Each county's FIPS code is also displayed to enable the sorting of the projections in some other manner. For each spreadsheet, the count column would be in an ascending order if the counties were arranged in an alphabetical order.

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² Siegel, Jacob and David Swanson, *The Methods and Materials of Demography*, Elsevier Academic Press, 2nd Ed, 2004.