

Methodology for the Puerto Rico Municipio Population Estimates by Age and Sex (Vintage 2007): April 1, 2000 to July 1, 2007

The U.S. Census Bureau produces annual estimates of the resident population for each state and county in the United States and for the Commonwealth of Puerto Rico and its municipios. The Puerto Rico municipio population estimates by age and sex were produced using the U.S. Census Bureau's *Rural-Urban Projection* (RUP) program, which employs a cohort-component method.¹ The following documentation outlines the methodology used to produce the age-sex estimates for the municipios of Puerto Rico.

Overview

The cohort-component population estimation method follows each birth cohort according to its exposure to fertility, mortality, and migration. The method is based on the traditional demographic accounting system; starting with a base population by age and sex, deaths are subtracted from the population and those surviving become older. Each cohort of children born is also followed through time by exposing it to mortality. Estimates of net migration are added to or subtracted from the population at each specific age-sex group.

Method

Base Population

The data by sex and single year of age for Census 2000 for the municipios with all Count Question Resolution and geographic program revisions were used as the base population for the July 1, 2007 Puerto Rico municipio age-sex estimates. The April 1, 2000 base population was moved to July 1, 2000 by applying the average intercensal growth rate between 1990 and 2000 for the municipio as a whole to each age.

Fertility

Total births of each sex by calendar year 2000 – 2006 for the municipios were taken from vital registration as received from the Puerto Rico Planning Board.² Age-specific fertility rates for 2007 for each municipio were obtained by linearly interpolating between a pattern of age-specific fertility rates for 2000 (derived from births by age of mother for the Commonwealth of Puerto Rico) and a pattern for 2050 based on historically observed age patterns in low fertility rate countries. Births for 2007 were obtained by multiplying the 2007 age-specific fertility rates by the midyear population for 2007.

Mortality

Total deaths of each sex by calendar year 2000 – 2006 for the municipios were taken from vital registration as received from the Puerto Rico Planning Board. Age-specific death rates for 2007 for each municipio were obtained by linearly interpolating between the logs of age-sex specific death rates from the 1998-2000 Commonwealth of Puerto Rico life table and those from a pattern for 2100 (based on the lowest death rates observed in low mortality countries through 1996). Deaths for 2007 were then estimated by multiplying the 2007 age-specific death rates by the estimated midyear population.

Net International Migration

We produced separate net migration rates by sex and 5-year age groups for each municipio. We estimated net migration rates for 1990-2000 using the forward survival method, which used municipio data on population from the 1990 census and Census 2000, intercensal births, intercensal deaths, and average intercensal life table survival rates for Puerto Rico. The average annualized 1990-2000 net migration rates for each municipio by age and sex are assumed constant throughout the post- Census 2000 period.

Resident Population Estimates by Age and Sex

The U.S. Census Bureau followed the above steps to produce initial annual estimates of the municipio resident population by single year of age and sex for July 1, 2001 to July 1, 2007. We derived the final municipio estimates by proportionately adjusting the annual estimates of each age-sex specific category so that the sum over all municipios was equal to the corresponding independently produced age-sex category estimate for the Puerto Rico Commonwealth. The total resident population estimate of each municipio was produced as the sum of its final age-sex population estimates.

Limitations

The most important limitation of the July 1, 2007 Puerto Rico municipio estimates is the absence of reliable administrative data about migration. First, the assumption that the migration in the post-Census 2000 period follows the 1990s pattern may not be valid. Second, the net migration estimates between 1990 and 2000 calculated with a residual technique include any differential coverage between the 1990 census and Census 2000 at the municipio level. The amount of differential coverage is not known and thus we were not able to adjust migration rates for the coverage differences. Third, in some cases, notably the Florida municipio, changes in legal boundaries between 1990 and 2000 occurred that had an impact on the change in population. We were not able to factor in these boundary changes.

Another potential limitation of the July 1, 2007 estimates is the quality of the birth and death data. For the purposes of these estimates, it is assumed that these data, received from the Department of Health in Puerto Rico, are complete and accurate. However, there is no direct measure of the completeness of coverage of these measures.

¹ For a more detailed description of the RUP program, see Eduardo E. Arriaga, 1994, Population Analysis with Microcomputers, Volume II: Software and Documentation, Washington, D.C.: U.S. Census Bureau.

² A relatively small number of births, whose municipios of residence was unknown, were distributed over all municipios in proportion to their reported number of births.