Methodology for the Puerto Rico Commonwealth 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 Commonwealth 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. The following documentation outlines the methodology used to produce the age-sex estimates for the Commonwealth of Puerto Rico.

Overview

The cohort-component population estimation method follows each birth cohort according to its exposure to mortality, fertility, and migration. Starting with a Census 2000 base population tallied by age and sex, the population at each specific age is exposed to the chances of dying as determined by estimated or projected mortality levels and patterns by sex and age. Once deaths are estimated, they are subtracted from the population, and those surviving become older. Fertility rates are estimated or projected and applied to the female population in childbearing ages to estimate the number of births every year. Each cohort of children is also followed through time by exposing it to mortality. Finally, the component method takes into account any in-migrants who are incorporated into the population and out-migrants who leave the population. Migrants are added to or subtracted from the population at each specific age-sex group. The whole procedure is repeated for each year of the estimation period, resulting in the estimated population by age and sex.

Method

Base Population

The data by sex and single year of age (0-99 and 100+) for Census 2000 for Puerto Rico with all Count Question Resolution and geographic program revisions were used as the base population for the July 1, 2007 Puerto Rico Commonwealth 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 to each age.

Fertility

Births by age of mother for calendar years 2000-2006 were taken from vital registration as received from the Puerto Rico Planning Board. These data were aggregated into 5-year age groups (from 15-19 to 45-49), with births reported to mothers under the age of 15 added to the 15-19 category, those over the age of 49 added to the 45-49 category, and those to women of unknown age distributed proportionally among each age group. Age-specific fertility rates for 2007 were obtained by linearly interpolating between a pattern of age-specific fertility rates for 2000 (derived from births by age of mother) 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

Deaths by age and sex for calendar years 2000-2006 were taken from vital registration as received from the Puerto Rico Planning Board. These data were provided in 5-year age groups except for the population under age 5, which for selected years were provided either for single ages 0 through 4 or for ages 0 and 1-4. Age-specific death rates for 2007 were obtained by linearly interpolating between the logs of age-sex specific death rates from the 1998-2000 Puerto Rico Commonwealth 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 used net migration rates by sex and 5-year age groups. These estimates were calculated from residual differences between a hypothetical population for April 1, 2000 and the Census 2000 enumerated population. The residual technique starts with the 1990 Census population and projects a hypothetical population for 2000 by accounting for changes due to fertility and mortality. This approximates what the 2000 population would be without migration, assuming similar errors of coverage in 1990 and 2000. Net migration for the 10-year period is estimated by subtracting the hypothetical 2000 population from the Census 2000 population. The net migration for the decade is converted to annual rates. These average annual net migration rates are assumed constant throughout the post-Census 2000 period.

Limitations

The major limitation of the July 1, 2007 Puerto Rico Commonwealth estimates is the absence of reliable information about international migration. The assumption that the migration in the post-Census 2000 period follows the same pattern as that during the 1990s may be invalid. At this point, however, few additional sources of data are available that might shed some light on the migration to and from Puerto Rico.

Estimates of net migration between 1990 and 2000 calculated with the residual technique are affected by differential coverage between the two censuses. To the degree that there are large differences in the 1990 Census coverage and Census 2000 coverage for Puerto Rico as a whole or for segments of the Puerto Rican population, the estimated net migration rates will be inaccurate.

Another potential limitation of the July 1, 2007 Commonwealth 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.