

Methodology for the United States Resident Population Estimates by Age, Sex, Race, and Hispanic Origin (Vintage 2007): April 1, 2000 to July 1, 2007

The U.S. Census Bureau produces monthly estimates of resident population for the United States on an annual basis. We revise the estimates time series each year as final input data become available. These postcensal estimates from April 1, 2000 through July 1, 2007 supersede all previous estimates produced since Census 2000. The estimate for the total national resident population is obtained by summing the national resident population estimates across all age, sex, race, and Hispanic origin categories for each month in the time series. The following documentation describes the work that was carried out in the production of the July 1, 2007 resident population estimates at the national level.

Population Universe

Estimates of the U.S. resident population include persons resident in the 50 states and the District of Columbia. These estimates exclude residents of the Commonwealth of Puerto Rico and residents of the Island areas under U.S. sovereignty or jurisdiction (principally American Samoa, Guam, Virgin Islands of the United States, and the Commonwealth of the Northern Mariana Islands). The definition of residence conforms to the criterion used in Census 2000, which defines a resident of a specified area as a person "usually resident" in that area. Estimates of the resident population exclude the U.S. Armed Forces overseas, as well as civilian U.S. citizens whose usual place of residence is outside the United States.

While this document focuses on the method we use to produce the U.S. resident population, we also produce and publish estimates of three other population universes: the resident population plus Armed Forces overseas, the civilian population, and the civilian noninstitutionalized population. In general, we calculate each of these populations by adding another population to or subtracting a subpopulation from the official resident population estimates.

Estimates of the resident population plus Armed Forces overseas include U.S. residents and members of the Armed Forces on active duty stationed outside the United States, but do not include military dependents and other U.S. citizens living abroad.

Civilian population estimates include only those U.S. residents not in the active duty Armed Forces. The difference between the resident population and the civilian population is the Armed Forces population residing in the United States.

Estimates of the civilian noninstitutionalized population exclude persons residing in institutions, primarily nursing homes, prisons and jails, mental hospitals, and juvenile facilities as well as the Armed Forces population residing in the United States.

Overview

We produce quarterly estimates of the U.S. population by age, sex, race, and Hispanic origin by updating the modified Census 2000 base population with data on the components of population change. For each age, sex, race, and Hispanic origin group, we apply the following procedures:

- (1) updated 2000 enumeration of resident population,
- (2) + births to U.S. resident women,
- (3) - deaths to U.S. residents,
- (4) + net international migration,
- (5) + net movement of U.S. Armed Forces overseas

Method

Base Population

The enumerated resident population in Census 2000 is the starting point for the post-2000 population estimates. We modify the enumerated population in two ways to produce the April 1, 2000 population estimates base. First, we reconcile the Census 2000 race categories with the race categories that appear in our administrative records data by recoding the "Some other race" responses to one or more of the five 1997 Office of Management and Budget (OMB) race categories: White; Black or African American; American Indian and Alaska Native; Asian; Native Hawaiian and Other Pacific Islander.^{1, 2}

Second, we update the population estimates base to reflect changes to the Census 2000 population due to the Count Question Resolution program and geographic program revisions.

Components of Population Change

Births

We estimate births to U.S. resident women based on data collected by the National Center for Health Statistics (NCHS). NCHS provides final data on births by month of birth, sex of child, age of mother, and race and Hispanic origin of both mother and father through 2005. NCHS also provides preliminary data on total births for the calendar year of 2006.

NCHS provides the birth certificate data in the 1977 OMB race categories of White; Black; American Indian, Eskimo or Aleut; and Asian or Pacific Islander, under the "mark one race" scenario. To produce post-2000 population estimates in the 1997 OMB race categories, we model births by child's sex, race, and Hispanic origin in the full 31 possible single and multiple race combinations.

To model the NCHS births by month of birth, sex, and race and Hispanic origin of the mother and father from the file, we use information from Census 2000 on race and Hispanic origin reporting within households for the population under 1 year of age and their parent(s). First, we tabulate the NCHS births for each combination of parents' race and Hispanic origin. Then, we distribute these births according to the matching Census 2000 race and Hispanic origin distribution for the population under 1 year of age. We complete this race and Hispanic origin modeling separately for mother-only households and birth certificates and two-parent households and birth certificates.

To estimate the distribution of births for calendar year 2006, we distribute preliminary 2006 births received from NCHS according to the 2005 births by month of birth, sex, and modeled race and Hispanic origin.

To estimate the distribution of births by race and Hispanic origin of mother for the first half of 2007, we calculate calendar year, age-specific birth rates for women by race and Hispanic origin for 2005 (the last year of final data from NCHS). We apply these rates to the projected populations of resident women by age, race, and Hispanic origin for each of the first two quarters of 2007 and then proportionally adjust for the observed seasonality in births by quarter.

Deaths

We estimate deaths to U.S. residents based on data collected by NCHS. NCHS provides final data on deaths by month of death, age, sex, race, and Hispanic origin through 2005. NCHS also provides preliminary data on total deaths for the calendar year of 2006 by Hispanic origin.

As with the birth certificate data, NCHS provides death certificate data in the 1977 OMB race categories of White; Black; American Indian, Eskimo or Aleut; and Asian or Pacific Islander, under the "mark one race" scenario. Therefore, we model deaths by age, sex, race, and Hispanic origin in the full 31 possible single and multiple race combinations.

We calculate separate death rates for the NCHS race categories by age, sex, and Hispanic origin using the 1998 deaths and 1998 population estimates.³ We apply the deaths rates for the White, Black, and American Indian, Eskimo or Aleut groups to the corresponding White alone, Black alone, and American Indian and Alaska Native alone populations. In addition, we apply the Asian and Pacific Islander death rate to both the Asian alone population and the Native Hawaiian and Other Pacific Islander alone population. We estimate multiple race deaths as the difference between total 2005 deaths reported by NCHS and the sum of deaths estimated for the single race groups. Consequently, we apply a constant death rate to each of the 26 multiple race groups.

To estimate the distribution of deaths for calendar year 2006, we distribute preliminary 2006 deaths by Hispanic origin received from NCHS according to the 2005 deaths by month of death, age, sex, and modeled race.

To estimate the distribution of deaths by age, sex, race, and Hispanic origin for the first half of 2007, we calculate calendar year, age-specific mortality rates by sex, race, and Hispanic origin for 2005 (the last year of final data from NCHS). We apply these rates to the projected populations by age, sex, race, and Hispanic origin for each of the first two quarters of 2007 and then proportionally adjust for the observed seasonality in deaths by quarter.

Net International Migration

International migration, in its simplest form, is any change of residence across the borders of the United States (50 states and District of Columbia). The net international migration component of the population estimates combines four parts: (a) net international migration of the foreign born,

(b) net migration between the United States and Puerto Rico, (c) emigration of natives from the United States, and (d) net movement of the Armed Forces population.

The Vintage 2007 net international migration estimates for the first two parts (net international migration of the foreign born and net migration between the United States and Puerto Rico) are created using a combination of the Vintage 2006 estimate and a new method, which we anticipate using for Vintage 2008 and later years. The estimate of emigration of natives from the United States remains unchanged from Vintage 2006.

The Vintage 2007 net international migration estimate for the foreign-born population is created by averaging the Vintage 2006 estimate and the estimate generated using a new method for calculating foreign-born migration to and from the United States (50 states and District of Columbia). The Vintage 2006 estimate uses the change in the number of foreign born in two consecutive years of American Community Survey (ACS) data, with an adjustment for deaths to the foreign-born population. The new method utilizes information from the ACS on the reported residence of the foreign-born population in the prior year. Those who reported being abroad in the year prior to the survey are considered immigrants. We estimate the number of foreign-born emigrants separately using a residual method utilizing Census 2000 and ACS data. Subtracting the emigrants from the immigrants results in the new method's net international migration estimate for the foreign-born population. This estimate is then averaged with the Vintage 2006 estimate of the same population group to create the Vintage 2007 estimate. We apply the age-sex-race-Hispanic origin distribution of the noncitizen foreign-born population from Census 2000 who entered in 1995 or later to the national-level estimate of net migration of the foreign born.

The Vintage 2007 estimate of net migration between the United States and Puerto Rico is created by averaging the Vintage 2006 estimates and new estimates generated using American Community Survey (ACS) and Puerto Rico Community Survey (PRCS) data. For the 2000 to 2004 time periods, we estimate the net migration using levels observed during the 1990s.⁴ In Vintage 2006, this estimate was held constant and carried forward to the end of the estimate period. In Vintage 2007, we average these constant estimates with new estimates for the 2004 through 2006 time periods. The new estimates utilize ACS and PRCS data on residence one year ago, subtracting the estimate of emigration from the United States to Puerto Rico from the estimate of immigration from Puerto Rico to the United States. For the net movement between Puerto Rico and the United States, we base the distribution on the characteristics (age, sex, race, Hispanic origin) of the Census 2000 population born in Puerto Rico who entered the United States in 1995 or later.

For Vintage 2007, we estimate native emigration using levels observed during the 1990s.⁵ We assume these emigrants are likely to have the same geographic and characteristics distributions as natives who currently reside in the United States. Therefore, we apply the Census 2000 age, sex, race, and Hispanic origin distribution of natives residing in the 50 states and the District of Columbia to the native emigrant population.

We derive the estimate of the net overseas movement of the Armed Forces population from data collected by the Defense Manpower Data Center (DMDC). DMDC provides data by age, sex,

Hispanic origin, and branch of service in the Department of Defense. We apply the race distributions from the Census 2000 active military population to the Armed Forces movement overseas component.

Estimation of the Population by Quarter and Month

The calendar quarter is the basic time interval we employ for estimating the national population by age, sex, race, and Hispanic origin, but we are also required to produce national population estimates by age, sex, race, and Hispanic origin for each month of the time series. To do this, we need components of change (births, deaths, international migration, and Armed Forces data) by month.

NCHS and DMDC each supply their data by month. No seasonal information is available for net migration of the foreign-born, emigration of natives, and net movement between Puerto Rico and the United States, so we assume that each part of the international migration component occurs at the same level throughout the year.

Once we produce the quarterly population estimates as described above, we use the monthly components of change and the component method to produce population estimates for the intervening months.

Data Notes Concerning the Population Estimates

In our ongoing evaluation of these population estimates, research indicates that the coverage of vital statistics administrative record data and decennial census data differ, with Census 2000 enumerating a smaller young child population (including children under 1 year of age) than expected from the birth data collected by NCHS.

As stated in the method described above, we base our estimates in large part on these Census 2000 population counts. As the population ages over the time series and we use the administrative records to update the census population, the level of the young child population is increasingly based on birth records. Therefore, in the annual estimates by age, there is a discontinuity between the population based mainly on administrative record birth data and the population based mainly on census data.

In addition, our research shows that the administrative record data and decennial census data differ in coverage and consistency of race and Hispanic origin reporting. Consequently, the discontinuities described above are most pronounced in the estimates by race and Hispanic origin.

¹ Detailed information on the race modification is available at <http://www.census.gov/popest/archives/files/MRSE-01-US1.html>. The modified race data summary file is available at <http://www.census.gov/popest/archives/files/MR-CO.txt>.

² Office of Management and Budget, "Revisions to the Standards for the Classification of Federal Data on Race and Ethnicity," Notice, Vol. 62, No. 210, Thursday, October 30, 1997. <http://www.whitehouse.gov/omb/fedreg/1997standards.html>.

³ We use the race distribution for the 1998 deaths from the processing of the national estimates here because it adjusts for NCHS/Census race inconsistencies. In the production of national population estimates in the 1990s, we projected preliminary deaths to the American Indian, and Asian and Pacific Islander populations by sex using life tables, with proportional adjustment to sum to the other races total. We estimated Hispanic origin deaths by sex and race for all years using life tables applied to a distribution of the Hispanic population by age, sex, and race. We use the 1998 population estimate from the vintage 2000 population estimates.

⁴ For more information on the estimate of net movement from Puerto Rico see Christenson, M., 2002, "Evaluating Components of International Migration: Migration Between Puerto Rico and the United States," Population Division Technical Working Paper No. 64.

⁵ For information on estimates of native emigration, see Gibbs, J., G. Harper, M. Rubin, and H. Shin, 2003, "Evaluating Components of International Migration: Native-Born Emigrants," Population Division Technical Working Paper No. 63.