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Producing migration data using household surveys and other sources

The U.S. Census Bureau's 2010 Demographic Analysis Estimates: Incorporation of Data from the 2010 Mexico Census

Note by the United States Census Bureau¹

Demographic Analysis (DA) is a technique that uses administrative and survey data to create estimates of the population by demographic characteristics. Historically, in the United States, DA estimates have been used in conjunction with results from a post-enumeration survey as benchmarks for evaluating coverage of the decennial census. For DA in 2010, the U.S. Census Bureau produced five series of national-level estimates of the population by age, sex, race (Black/non-Black), and, for the population under age 20, by Hispanic origin. The estimates were produced independently from the 2010 Census and were released to the public on December 6, 2010, prior to the release of 2010 Census counts.

DA estimates for the population aged 0-64 on April 1, 2010 (Census Day) were produced using the cohort-component method, where:

$$\text{Population}_{\text{Aged 0-64}} = \text{Births}_{1945-2010} - \text{Deaths}_{1945-2010} + \text{Net International Migration}_{1945-2010}$$

The population aged 0-64 on April 1, 2010 is equal to births from April 1, 1945 through March 31, 2010 minus deaths from April 1, 1945 through March 31, 2010 plus net international migration (NIM) over the time period. A Medicare-data-based methodology was used to produce estimates for the population aged 65 and older in the original DA

¹ Prepared by Melissa Scopilliti and Eric B. Jensen. This paper is released to inform interested parties of ongoing research and to encourage discussion of work in progress. Any views expressed are those of the authors and not necessarily those of the U.S. Census Bureau.

series and did not include an international migration component. Of the components of population change in DA—births, deaths, and international migration—estimates of international migration have the most uncertainty and variation across the series.

For 2010 DA, the Population Division of the Census Bureau focused substantial effort on estimating the subcomponents of net international migration (NIM) from 2000 to 2010, which included foreign-born immigration, foreign-born emigration, migration between the United States and Puerto Rico, and the net international migration of U.S. natives.² The international migration estimates from 1945 to 2000 incorporated results from prior Census Bureau research as part of the 2000 Demographic Analysis-Population Estimates (DAPE) project (Robinson 2011). Five series of international migration estimates were developed by altering the data or methods used to estimate the different subcomponents (Bhaskar et al. 2011, Cortés et al. 2011, Demographic Analysis Research Team 2010, Devine et al. 2012).

Analysis of the 2010 DA estimates revealed a pattern in the age-specific sex ratios for the resident population that was not present in the 1990 and 2000 DA estimates.³ The sex ratio that peaked around age 20 in 2000 aged forward ten years to peak around age 30 in 2010 (Figure 1). Subsequent research showed that this shift in the peak of the sex ratios was largely caused by estimates of international migration.

U.S. Census Bureau research focused primarily on evaluating two theories behind the aging forward of the sex ratios: migration momentum and the spurious cohort effect (Jensen 2012). The term “migration momentum” is used to describe the process whereby predominantly male immigrants who entered the United States in the late 1980s and 1990s were still present in the United States in 2010, and the subsequent flow of female immigrants from the same birth cohorts were not sufficiently high to offset the high sex ratios of these flows. An alternative explanation for the aging forward of the sex ratios could be due a spurious cohort effect, or the improper aging forward of a large number of males. This could occur if DA underestimated the level of emigration for males, or if we emigrated out too many females relative to males.

As part of the research effort, we collaborated with a colleague from the Instituto Nacional de Estadística y Geografía (INEGI) and analyzed results from the 2010 Mexico Census (Censo de Población y Vivienda).⁴ The data indicated a substantial level of return migration of the Mexico-born population from the United States to Mexico during the 2005 to 2010 period. In May 2012, we released a revised DA middle-series of estimates by age, sex, and race (Black/non-Black) that incorporated several data and method changes including the use of information from the 2010 Mexico Census to update the foreign-born emigration component.⁵ The revised series had a noticeable impact on the sex ratios (Figure 2).

The revised series also included updates to assumptions of international migration to group quarters, implemented more recent data into the characteristics distribution of international migration, and included small revisions to the foreign-born immigration component. In addition to these changes in net international migration, several improvements were implemented to the birth, death, and Medicare-based estimates (Devine and Scopilliti

² Net international migration also included a component for the Armed Forces overseas on April 1, 2010. This component is a stock estimate that was removed from the resident population estimate, and will not be discussed in this paper.

³ Age-specific sex ratios specify the number of males per 100 females of a specific age. A sex ratio of 100 indicates an equal number of males and females, whereas numbers above 100 indicate more males, and numbers below 100 indicate more females.

⁴ Data from the 2010 Mexico Census is available online at < <http://www.censo2010.org.mx/> > (accessed September 17, 2012).

⁵ Results from the 2010 Demographic Analysis series are available at <<http://www.census.gov/popest/research/demo-analysis.html>> (accessed September 17, 2012)

2012).⁶ For example, a substantial method change was implemented that impacted estimates for the population aged 65-74. The original series used the Medicare-based method to estimate the population aged 65-74, whereas the revised series used the cohort-component method to estimate the population aged 65-74 and the Medicare-based method to estimate the population aged 75 and older.

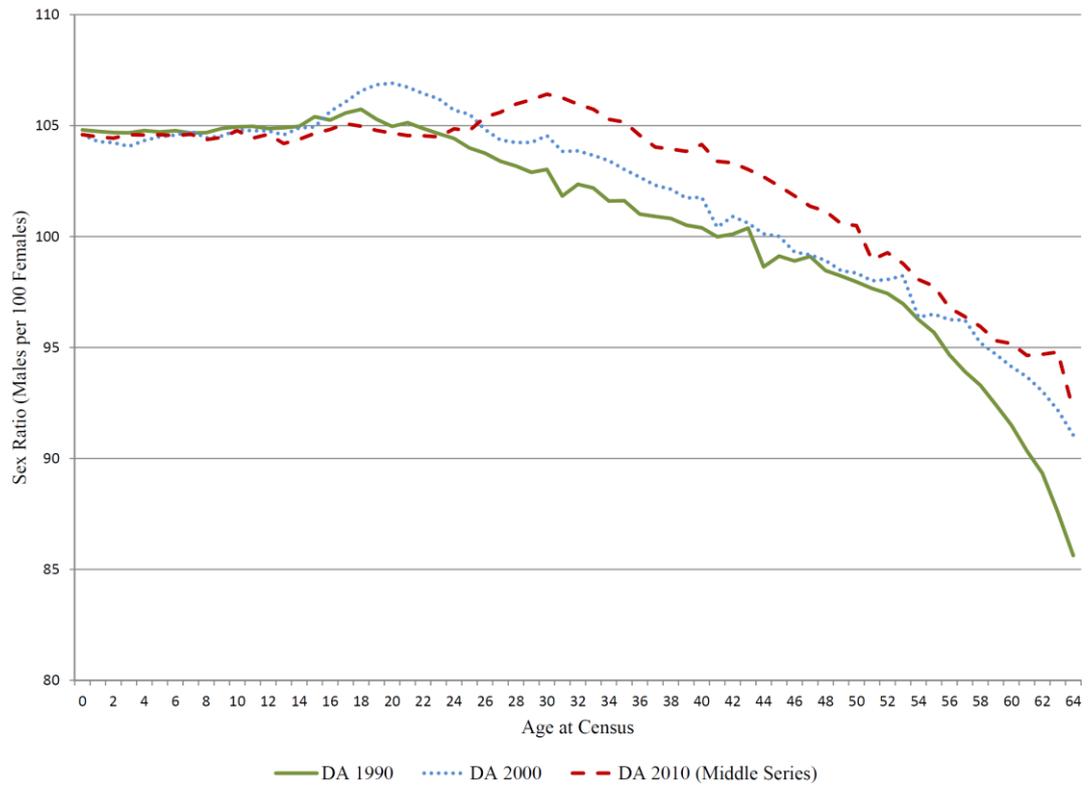
The 2010 DA estimates will serve as a base for demographic analysis in 2020. Future research includes continual evaluation of the data and methods for estimating international migration. In addition, we plan to produce a revised series of DA estimates by Hispanic origin for the population under age 20 that incorporates the adjustment using the 2010 Mexico Census.

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⁶ Summary-level information on these improvements is available in the methodology statement that accompanied the release (<http://www.census.gov/popest/research/DA_Methodology.pdf> (accessed September 17, 2012).

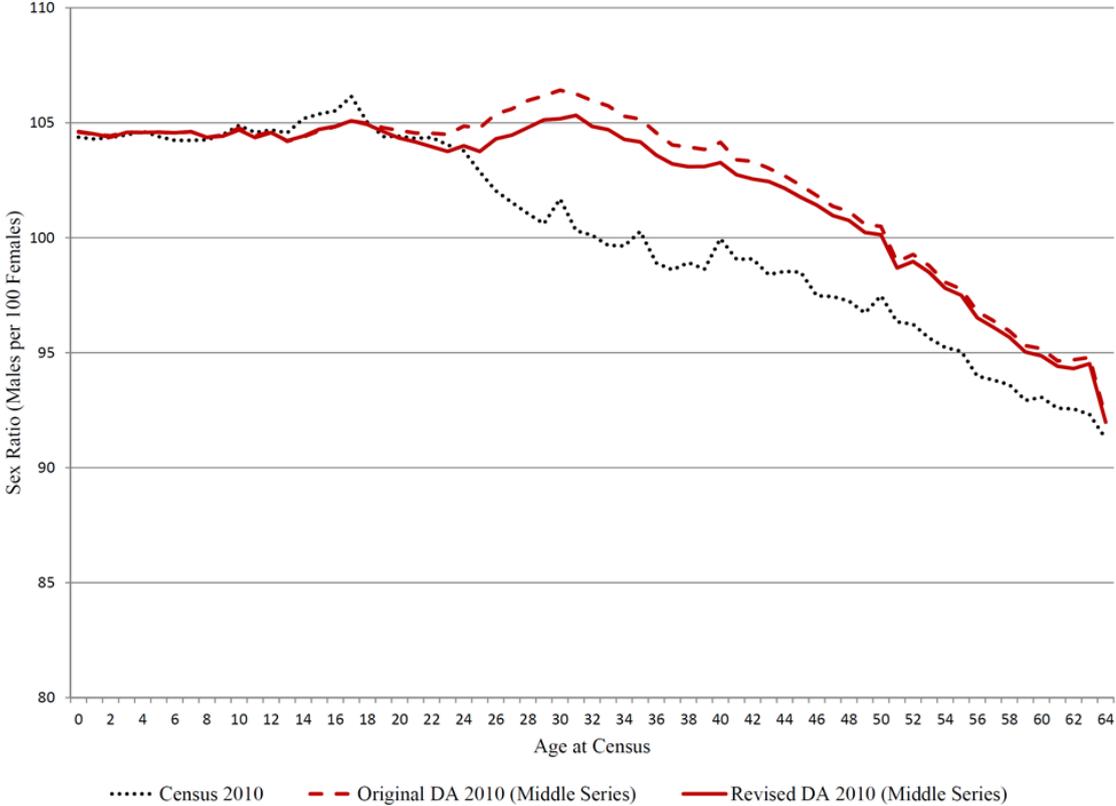
Figure 1. Sex Ratios: 1990, 2000, and 2010 Demographic Analysis



Note: The sex ratios for 2010 represent the middle series. There is little variation in sex ratios across the five 2010 Demographic Analysis series.

Source: U.S. Census Bureau, Population Division, 1990, 2000, and 2010 Demographic Analysis Estimates.

Figure 2. Sex Ratios from the Original Demographic Analysis Middle Series, Revised Demographic Analysis Middle Series, and Census 2010



Source: U.S. Census Bureau, Population Division, 2010 Demographic Analysis and 2010 Decennial Census.