

Estimating Net International Migration for 2010 Demographic Analysis: An Overview of Methods and Results

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Table of Contents

Introduction.....	1
Net International Migration: 1945 to 2000	2
Net International Migration: 2000 to 2010	4
Foreign-Born Immigration	4
Foreign-Born Emigration	6
Native Migration	8
Migration between the United States and Puerto Rico	10
Results.....	10
Conclusion	14
References.....	17

Introduction

Demographic analysis (DA) is a term that refers to a set of methods that have been used to develop estimates of the population for comparison with the decennial census counts. The Census Bureau has been developing DA estimates as a tool for evaluating results from decennial censuses since the 1950 Census (Robinson 2011). DA estimates are developed primarily from historical vital statistics, estimates of international migration, and information on Medicare enrollment that are independent from the Census being evaluated. For DA in 2010, we developed a set of national-level estimates by age, sex, and race (Black/non-Black) for the total population and by Hispanic origin for the population under age 20.¹ Upon completion, the DA estimates were compared with census counts; we plan to evaluate the differences by demographic characteristics.

One component of the DA estimates is net international migration (NIM), which represents the movement across the borders of the United States of people who change their residence. Although the NIM component in 2010 DA comprises approximately twelve percent of the total DA resident population under age 65, it represents a large portion of the uncertainty in the DA estimates. As with all components of the DA estimate, there were many assumptions and data limitations included in the calculation of NIM estimates that must be considered.

For DA in 2010, the population under age 65 was estimated using information on births, deaths, and international migration (cohort-component method) while the population 65 years and older was estimated using information on Medicare enrollment adjusted for under enrollment (Demographic Analysis Research Team 2010b). This paper will discuss the estimates of international migration for the population below age 65 on April 1, 2010 that were used as inputs to the five series of DA estimates that were publicly released on December 6, 2010. It will describe the different methods used to measure NIM for 2010 DA, focusing on estimates for the 2000 to 2010 time period.

One important aspect of the 2010 DA methodology is the calculation of multiple estimates of the resident population in the United States on April 1, 2010. The DA research team produced multiple estimates of births and estimates of net international migration which were combined to develop five series of estimates of the resident population. By calculating multiple estimates, we were able to understand how using different assumptions to compute subcomponents of NIM affects the total NIM estimate, and in turn the total DA estimate. In December 2010 we released the five series of DA estimates (low, low middle, middle, high middle, and high).

The NIM estimates for 2010 DA were built from the 2000 DA estimates. Estimates of migration flows from 2000 to 2010 were added to the base of pre-April 2000 NIM from 2000 DA. We

¹ For more information on the development of the total DA estimate and the sensitivity analyses that were completed to produce a series of estimates of the total resident population, see: Devine et. al 2012 and Demographic Analysis Research Team 2010a.

estimated NIM from 2000 to 2010 as four subcomponents: foreign-born immigration, foreign-born emigration, net native migration, and net migration between the United States and Puerto Rico.² This paper will provide an overview of the data and methods used to develop these four components of international migration. Additional working papers will be released that describe each component in more detail.

Net International Migration: 1945 to 2000

Estimates of NIM for April 1945 through March 2000 are based on prior DA estimates. For April 2000 through March 2010, we used different methodologies to estimate NIM which incorporate new data sources that were unavailable for prior DA estimates. In 2000 DA, we estimated net international migration in six components: legal immigration, legal emigration, net civilian citizen migration, net migration from Puerto Rico, temporary migration, and the residual foreign born (for more information on the 2000 DA components, see Cassidy and Pearson 2002; Christenson 2001; Costanzo, Davis, and Malone 2002; Deardorff and Blumerman 2001; Gibbs et al. 2003; Mulder, Guzman, and Brittingham 2002; and Perry et al. 2002). The 2010 DA estimates of NIM reflect the NIM from the 2000 DA base plus the accumulation of change from April 1, 2000 to March 31, 2010 based on the annual estimates of the NIM components. The estimates were produced by age, sex, and race for the population under age 65 and by Hispanic origin for the population under age 20.³

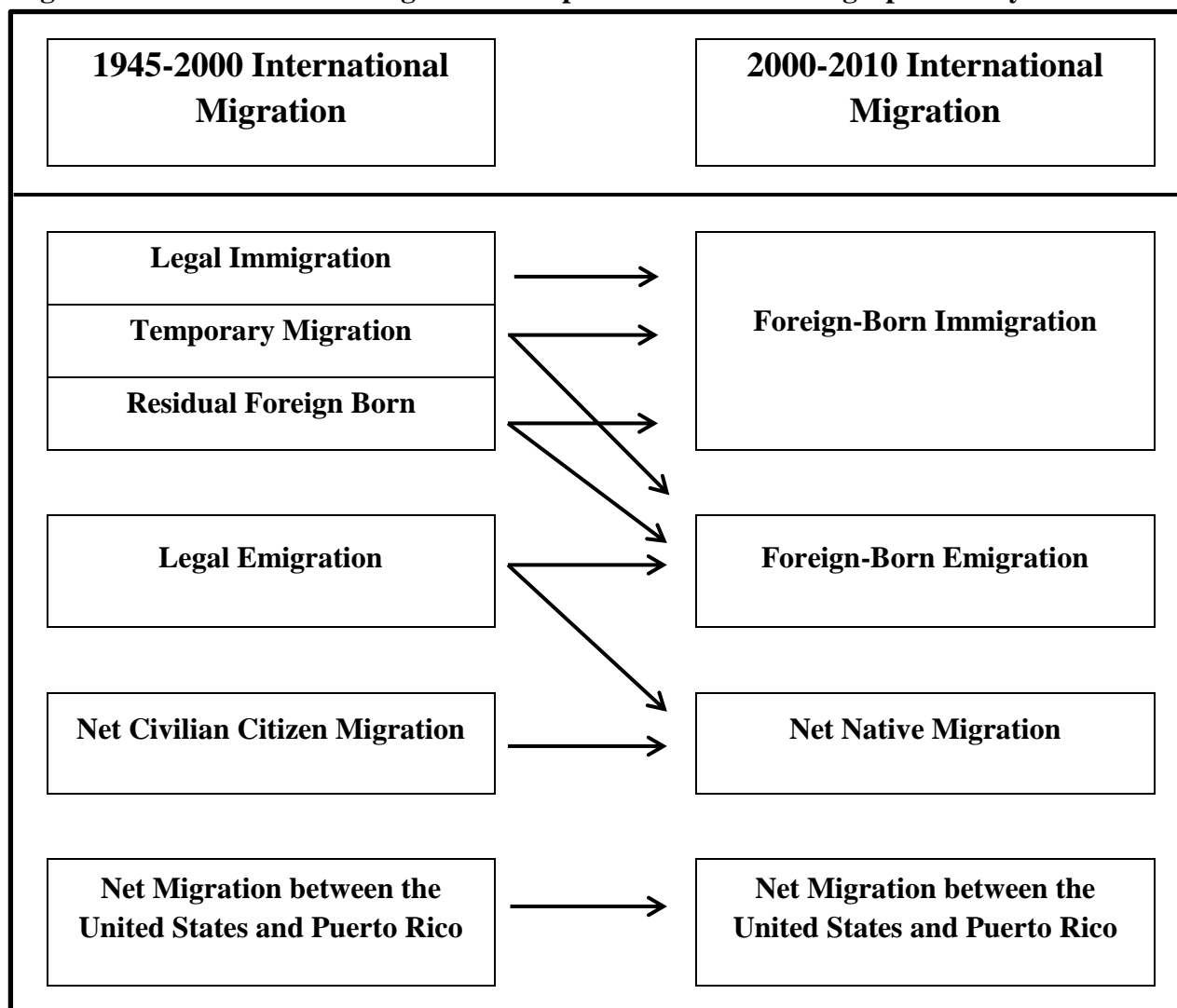
Figure 1 shows the NIM components in 2010 DA. The left side of the figure displays the components representing international migration from 1945 to 2000 and the right side of the figure displays the components used to measure migration from 2000 to 2010. The arrows demonstrate how the components of migration that we estimated for the 1945 to 2000 time period relate to those measured for the 2000 to 2010 time period. The differences in data availability resulted in changes in the calculation of 2010 DA as compared to 2000 DA.

Legal immigration was estimated as a separate component from 1945 to 2000. Immigration of legal migrants from 2000 to 2010 was incorporated in the foreign-born immigration estimate. The 2000 DA series contained an estimate of the stock of temporary migrants and the residual foreign-born living in the United States on April 1, 2000. This stock estimate was included in 2010 DA and the immigration and emigration of this population from 2000 to 2010 was included in the foreign-born immigration and emigration components. The emigration of legal migrants was reflected in both the foreign-born emigration and net native migration components, while the migration of civilian citizens was part of the native migration component. Movement between

² An estimate of the stock of the Armed Forces population overseas on April 1, 2010 was also included in the 2010 DA estimates but is not discussed in this paper.

³ Demographic Analysis estimates were produced for the population under age 65 by age, sex, and for two race groups: Black and non-Black. An additional series of estimates was produced for the population under age 20 by age, sex, and Hispanic origin (Hispanic and non-Hispanic).

Figure 1. Net International Migration Components in 2010 Demographic Analysis



Note: The components from 1945-2000 are from the 2000 DA estimate.

the United States and Puerto Rico from 2000 to 2010 was reflected in the Puerto Rico component.

With one exception, estimates of international migration from 1945 to 2000 were not revised for 2010 DA. The low series in 2010 DA included a revision to the estimate of the residual foreign born component. The residual component in the 2000 DA base represented the stock of the migrant population that was not estimated in the other international migration components. It includes people who were in the United States legally but not yet included in the official estimates of legal migrants and refugees, people who were awaiting action on their legal migration request, and unauthorized migrants (Costanzo, Davis, and Malone 2002). Estimation

of the residual migration component included an assumption of 85 percent coverage of the residual population in Census 2000.

For the 2010 DA Low Series this assumption was replaced with a coverage profile based on expert opinion and information from the Accuracy and Coverage Evaluation (A.C.E.) Revision II, such as overall patterns in the data and Current Population Survey (CPS) coverage rates. Specifically, we compared the Dual System Estimates (DSE) from the A.C.E. Revision II with estimates from Census 2000 to identify patterns in coverage by age, sex, and Hispanic origin. We also evaluated coverage patterns in the CPS by age, sex, and Hispanic origin. This revision resulted in a reduction to the 2000 DA residual population by about one million people (Demographic Analysis Research Team 2010c). The remainder of this paper focuses on the estimation of migration from 2000 to 2010 and on the cumulative estimates of NIM from 1945 to 2010 in the five DA series released on December 6, 2010.

Net International Migration: 2000 to 2010

Multiple sources of data were used to produce the 2010 DA estimates of NIM for the period from 2000 to 2010 including: the American Community Survey (ACS), the Puerto Rico Community Survey (PRCS), Census 2000, life tables from the National Center for Health Statistics (NCHS), and census data from non-U.S. countries.⁴ Using a combination of methods and data sources, a range of NIM estimates by age, sex, race (Black/non-Black), and—for the population under age 20—by Hispanic origin were produced and were included in the five 2010 DA series.

Over the past decade, the Census Bureau has undertaken a major initiative to improve its ability to measure net international migration. The implementation of the ACS provided us with critical demographic information between decennial censuses that was not available in previous decades. The NIM estimates were developed using data from the ACS on citizenship, residence one year ago, and year of entry. Information from the ACS was used in part in the estimation and the age, sex, race, and Hispanic origin distribution of all the 2000 to 2010 NIM components.

Foreign-Born Immigration

Foreign-born immigration, which represents the migration of naturalized U.S. citizens and non-citizens to the United States, was the largest component of the 2000 to 2010 NIM estimates. Due to uncertainty in the size of the foreign-born population entering the United States, the DA series contain four different measures of foreign-born immigration (Demographic Analysis Research Team 2010a). Two of the measures use information from the ACS question on residence one

⁴ Information on the American Community Survey and Puerto Rico Community Survey can be obtained from <http://www.census.gov/acs/www/>.

year ago (ROYA)—this question asks “Where did this person live 1 year ago?” Using information from the 2000 to 2009 single-year ACS, foreign-born immigration is estimated by tabulating the household population whose residence one year prior was outside of the United States (referred to as the ROYA method).⁵

Questions on ROYA are only asked of those one year of age and older, therefore we made an additional assumption for foreign-born immigrants under the age of one. We assumed that the number of foreign-born immigrants under age one was equal to half of the number of one year-old foreign-born immigrants. We also smoothed estimates from 2000 to 2004 because during these years the ACS was not fully implemented. This is similar to methods used in the U.S. Census Bureau’s post-censal population estimates program.

The second set of measures uses information from the ACS on the respondent’s year of entry (YOE). The YOE question asks, “When did this person come to live in the United States?” The resulting estimate is based on the foreign-born population living in households whose YOE was the year before the survey year using annual ACS data from 2000 to 2009 (YOE method).

The ROYA and YOE estimates are based on data from the ACS which is a sample and therefore subject to sampling variability. The degree of uncertainty in the estimates arising from sampling variability can be represented through the use of the 90-percent confidence interval. As part of our research we evaluated the upper and lower bounds on both the ROYA and YOE estimates of immigration. The ROYA method produced lower estimates of foreign-born immigration than the YOE method. To take into account the sampling variability, the lowest foreign-born immigration estimate included in DA was based on the lower-bound of the ROYA estimate using the 90-percent confidence interval.

An additional assumption of using data from the ACS to estimate foreign-born immigration (ROYA and YOE methods) is that the survey weighting process fully accounts for any potential underrepresentation of foreign-born immigrants. The ACS is controlled to population estimates produced by the Population Estimates Program so that the number of housing units and number of people by age, sex, race, and Hispanic origin are consistent with the Census Bureau’s official population estimates (U.S. Census Bureau 2009). Differential coverage of those who have immigrated in the last year within these control categories or imprecision in the population controls may result in variation in the survey-based estimates of foreign-born immigration. To evaluate the potential impact of error resulting from possible differential coverage, we altered this assumption by producing estimates of foreign-born immigration for the high DA series that included an alternative set of coverage factors applied to the YOE-based estimates (Demographic Analysis Research Team 2010d; Jensen, Scopilliti, and Bhaskar 2011). This produced the highest estimate of foreign-born immigration and was included in the 2010 DA high series.

⁵ The population with a residence one year ago in Puerto Rico was included in the Puerto Rico component.

Each of these four estimates of foreign-born immigration was produced by single year of age, sex, and two broad race groups (Black and non-Black) for the population under the age of 65. Additionally, estimates were produced by Hispanic origin for the population under the age of 20. The characteristics of age, sex, race, and Hispanic origin of foreign-born immigrants were based on data on recent foreign-born immigrants from Census 2000 and the 2005-2007 ACS. Foreign-born immigrants were assigned the demographic characteristic distribution of the foreign-born population who entered the United States within five years of the Census/survey year. Age was adjusted to represent age at arrival into the United States instead of age at the time of the survey using a probability distribution and information on age, year of entry, and the Census/survey year. Estimates for the year 2000 used information from Census 2000, while 2005 and later years used information from the 2005-2007 ACS. The incorporation of ACS data was phased in through linear interpolation between estimate years 2000 and 2005.

The values of foreign-born immigration range from a low estimate of 11.0 million using the lower-bound ROYA method and a high estimate of 13.8 million for the YOE with coverage factors method, a difference of 2.8 million. Figure 2 shows the four estimates of foreign-born immigration from 2000 to 2010 by age on April 1, 2010. Estimates of foreign-born immigrants are lower at the youngest and oldest ages, as compared to estimates of immigrants between the ages of 20 and 40.

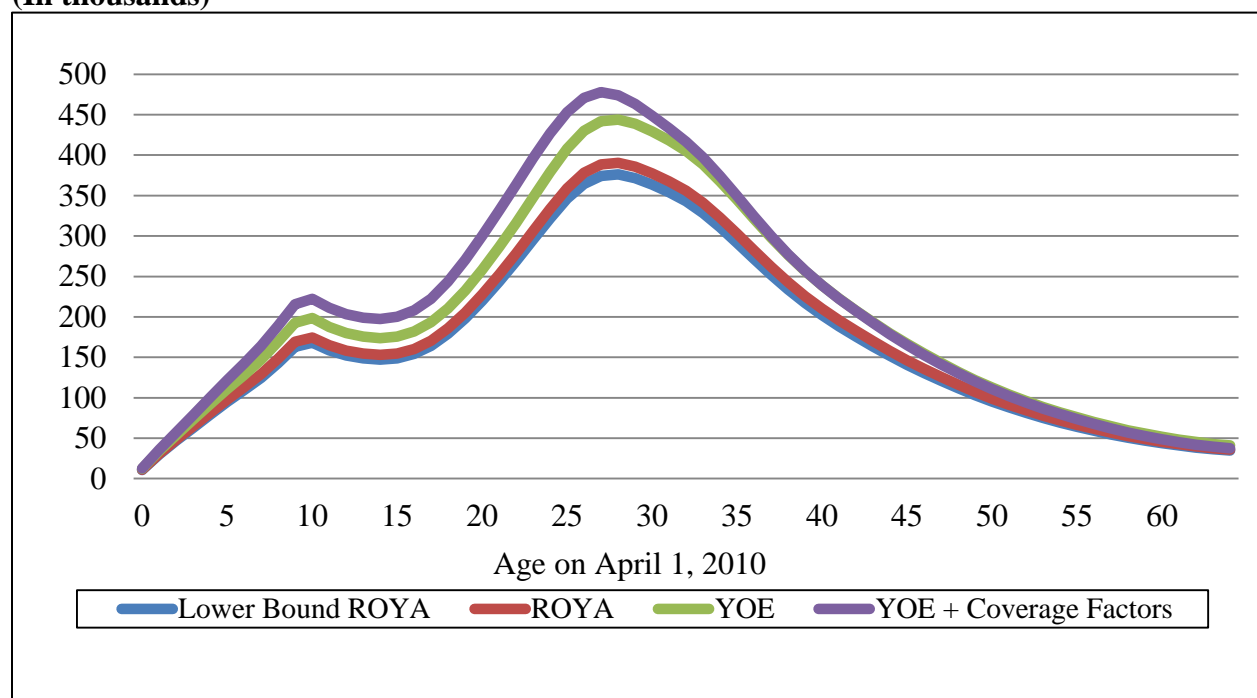
Foreign-Born Emigration

Foreign-born emigration is the migration of naturalized U.S. citizens and non-citizens from the United States. Emigration is a particularly difficult component of migration to measure due to a lack of reliable data. Three foreign-born emigration estimates were developed using a residual method and data from Census 2000, the single year ACS, and life tables from the NCHS.

In the residual method, the Census 2000 foreign-born population by broad period of entry groups was survived forward and compared to the foreign-born population estimated in the ACS to estimate emigration over the time period which was then used to develop annual rates of emigration. This calculation was performed for two period-of-entry groups: the foreign-born population who entered the United States between 1990 and 1999; and the foreign-born population who entered before 1990. We applied these rates to the population at risk of emigrating (the foreign-born household population) in each year of the ACS by period of entry. We assumed that the foreign-born population in the ACS who entered in the prior ten years had the same emigration rates as the foreign born who entered between 1990 to 1999; and that those who entered ten years prior to the survey had emigration rates similar to those who entered prior to 1990.

To evaluate the range of possible foreign-born emigration rates and estimates during the 2000 to 2010 time period, the margins of error around the ACS were used to produce a low and a high estimate. The 90-percent confidence intervals were applied to the ACS estimates in the residual

**Figure 2. Foreign-Born Immigration by Age: 2000 to 2010
(In thousands)**



Note: Data shown are for the population under age 65 on April 1, 2010.

Source: U.S. Census Bureau, Population Division, 2010 Demographic Analysis, December 2010 release, special tabulation.

calculation to produce a range of emigration rates, and were also used to produce a low and high estimate of the population at risk of emigrating. For the low estimate of foreign-born emigration (included in the high DA series), the upper-bound of the ACS estimate was used in the residual calculation to develop a low rate of emigration. These rates were then applied to the lower-bound estimate of the population at risk of emigrating in each year of the ACS to produce a low series of foreign-born emigration.

To develop the high estimate of foreign-born emigration, the lower-bound of the ACS was used in the residual calculation to develop a high rate of foreign-born emigration. These rates were then applied to the upper bound estimates of the population at risk of emigrating in each year of the ACS to produce a high estimate of foreign-born emigration. This estimate was used in the low and low-middle DA series.

Table 1 shows foreign-born emigration rates. The rates range from 12.8 to 15.5 per 1,000 population for the foreign-born who entered the United States less than ten years before the survey year, and from 1.7 to 3.5 per 1,000 population for the foreign born who entered more than ten years before the survey year. The application of the rates to the foreign-born population in

Table 1. Foreign-Born Emigration Rates: 2000 to 2010
(Rates expressed per 1,000 population)

Period of Entry to the United States	Low	Middle	High
Entered 10 or fewer years before the survey year	12.8 to 13.5	13.8 to 14.3	14.7 to 15.5
Entered more than 10 years before the survey year	1.7 to 2.5	2.4 to 3.0	3.0 to 3.5

Note: Data shown are for the population under age 65 on April 1, 2010.

Source: U.S. Census Bureau, Population Division, 2010 Demographic Analysis, December 2010 release, special tabulation.

the ACS results in a range of foreign-born emigration of 1.8 million to 2.3 million for the 2000 to 2010 time period.

As with the estimates of immigration, foreign-born emigration estimates were produced by single year of age, sex, and two broad race groups (Black and non-Black) for the population below age 65. Estimates were also produced by Hispanic origin for the population under the age of 20. The age, sex, race, and Hispanic origin distribution of each of the estimates of foreign-born emigration is based on data from Census 2000 and 2005-2007 ACS. Again, estimates for the year 2000 used information from Census 2000, while 2005 and later years used information from the 2005-2007 ACS. The incorporation of ACS data was phased in through linear interpolation between estimate years 2000 and 2005. Characteristics were applied to the estimates of foreign-born emigration by period of entry. The age, sex, race, and Hispanic origin distribution of the foreign born who entered the United States within ten years of the Census/survey year were applied to the estimate of emigrants who entered within ten years of the estimate year. The age, sex, race, and Hispanic origin of the foreign-born who entered the United States more than ten years before the Census/survey year were applied to the estimate of emigrants who entered the United States more than ten years before the estimate year.

Native Migration

Native migration is the net migration of people born in the United States, U.S. Island Areas, and abroad of U.S. citizen parents.⁶ For DA in 2010, estimates of native migration were based in part on the research of Schachter (2008) who used a residual method and census data from non-U.S. countries to estimate the net migration of U.S. natives. He estimated an annual net loss of about 45,000 persons for the total population. This estimate was restricted to the population under age 65 and was used in the low NIM series (low and low-middle DA series). The resulting low estimate of net native migration from 2000 to 2010 was -376,000 people.

⁶ The Island Areas of the United States are American Samoa, Guam, the Commonwealth of the Northern Mariana Islands (Northern Mariana Islands), and the Virgin Islands of the United States (Virgin Islands).

Additional estimates of native migration were produced by altering the assumption of coverage of the population born abroad of American parents in Schachter's (2008) estimate. This research made adjustments to account for differences in the collection of information on place of birth and citizenship across countries. For example, some countries collect information on place of birth while others collect information on citizenship status. People born abroad of American parents were U.S. natives but would not be identifiable in other countries' censuses if only information on place of birth was collected. The three measures of net native migration—low, middle, and high—differ in their assumption of the coverage of the population born abroad of American parents in Schachter's (2008) estimates.

The low estimate of net native migration discussed above was based on research by Schachter (2008) without any additional adjustment to account for those U.S. citizens who were born abroad of U.S. citizen parents. Therefore, the low estimate assumed that the Schachter estimate included all those people who were born abroad of U.S. citizen parents. To produce a high estimate of net native migration, we added an estimate of the migration of the population born abroad of U.S. citizen parents using data from Census 2000 and the ACS, assuming that the migration of those born abroad of U.S. citizen parents was completely excluded from Schachter's estimate. To develop this estimate, we survived forward an estimate of the population born abroad of U.S. citizen parents from Census 2000 (using NCHS death rates) to 2009, and compared the resulting estimate to the population born abroad of U.S. citizen parents in the 2009 ACS. The difference, after projecting to April 1, 2010, resulted in an estimate of the net flow of natives over the decade of approximately 243 thousand and was included in the high DA series.

The middle estimate of net native migration assumed that a portion of the population born abroad of U.S. citizen parents was included in Schachter's (2008) estimate for those countries that collected information on citizenship status. We included an estimate of the population born abroad of U.S. citizen parents for countries not included in Schachter's estimate and for countries where place of birth was used to define U.S. natives. The net flow of this population was estimated at approximately 18 thousand over the decade. This middle estimate was included in the middle and high-middle estimates of total NIM for 2010 DA.

The age, sex, race, and Hispanic origin distribution of the estimates of net native migration are determined in a similar process as the estimates of foreign-born immigration and emigration, using data from Census 2000 and 2005-2007 ACS. We apply characteristics separately for the estimate based on foreign census data and the estimate of migration of those born abroad of U.S. citizen parents that was developed using U.S. Census and ACS data. The estimate of migration derived from foreign census data is assigned the characteristics distribution of the native household population in Census 2000 and 2005-2007 ACS, whereas the migration of those born abroad of U.S. citizen parents component is assigned characteristics based on the born abroad of U.S. citizen parents population who entered within ten years of the Census/survey.

Migration between the United States and Puerto Rico

The estimate of net migration between the United States and Puerto Rico was developed for the total population, regardless of citizenship status. Only one DA estimate of the net migration between the United States and Puerto Rico was included in the NIM estimates.

The PRCS was first implemented in 2005. For the years 2005 and later, information from the ACS and PRCS was used to estimate migration flows between the United States and Puerto Rico. The population in the ACS who lived in Puerto Rico one year ago were considered immigrants into the United States. The population in the PRCS who lived in the United States one year ago were considered emigrants from the United States. Since the residence one year ago question is asked of persons aged one and older, we assumed that the number of migrants under age one was equal to half of the number of one year-old migrants. For years 2000 to 2004 we used prior research (Christenson 2001) to establish a base estimate of net migration between the United States and Puerto Rico for 2000 and linearly interpolated between the 2000 net estimate and the 2005 net estimate to generate the estimates for 2001 to 2004. The DA estimate for net migration between the United States and Puerto Rico from 2000 to 2010 was an inflow to the United States of about 192,000 people, a small portion of the total NIM estimate.

Results

Table 2 shows how the various estimates of foreign-born immigration, foreign-born emigration, net native migration, and net migration between the United States and Puerto Rico were combined to develop a low, low-middle, middle, high-middle, and high series of NIM for 2010 DA. Estimates of NIM for 2000 to 2010 ranged from 8.5 million in the low series to 12.4 million in the high series.

These estimates were combined with estimates of migration prior to 2000 to develop five estimates of NIM from 1945 to 2010. As noted earlier, the 2010 DA low series of estimates contained a modification to the residual foreign-born component in the 2000 base. Figure 3 shows the NIM estimates for the population under age 65 from 1945 to 2010 in the five DA series. The series range from 31.7 million people in the low series to 36.7 million in the high series. This is a difference between the low and high series of about 5 million people, or about 14 percent of the high estimate. The range in the NIM estimates comprises over seventy percent of the overall range of DA for the total resident population.

Figure 4 shows the NIM estimates from 1945 to 2010 by age on April 1, 2010. The five estimates show similar numbers for the youngest and oldest ages; showing less variation in the

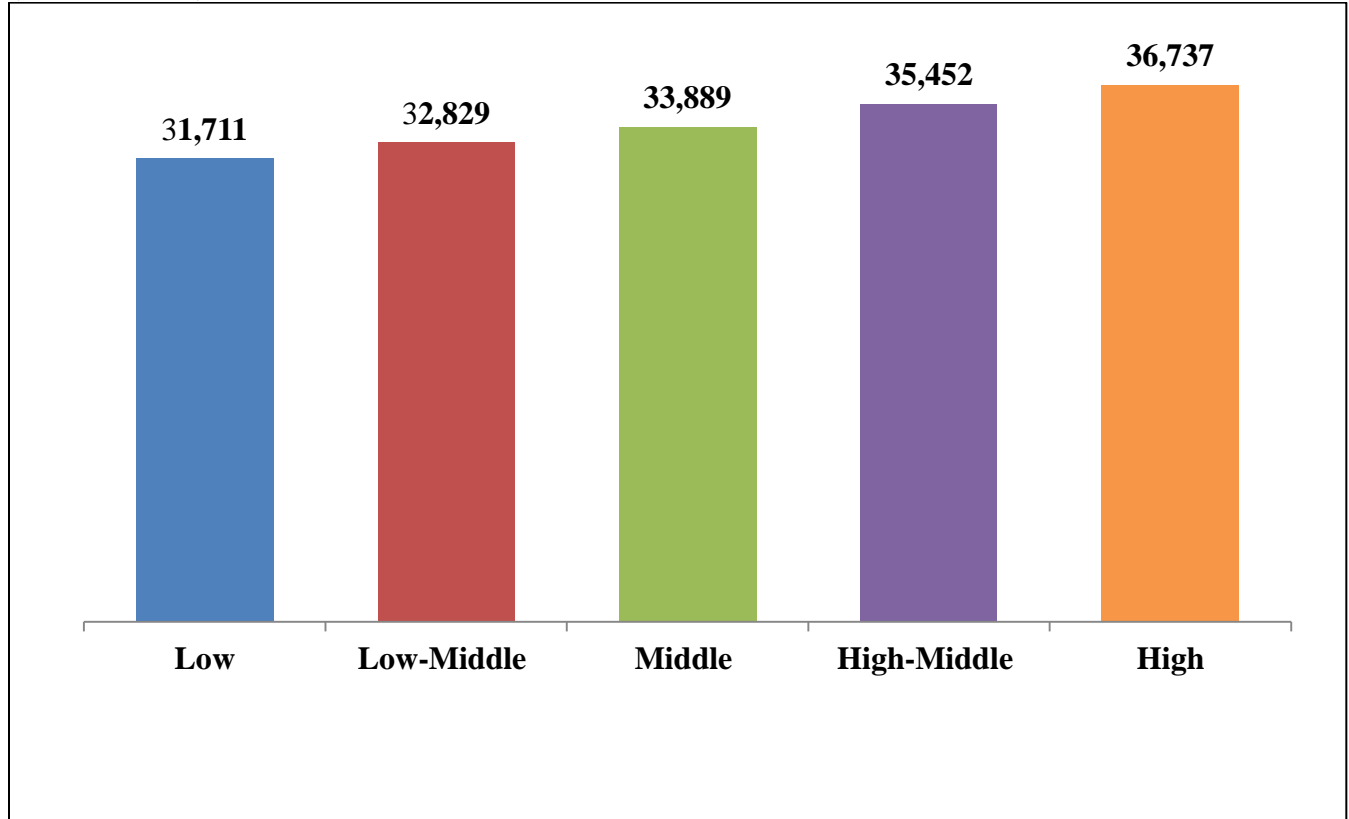
Table 2. Net International Migration Components in the Five DA Series: 2000 to 2010
(In thousands)

DA Series	Foreign-Born Immigration	Foreign-Born Emigration	Net Native Migration	Net Migration Between the United States and Puerto Rico	Total Net International Migration
Low	Lower-Bound Residence One Year Ago 11,000	High -2,330	Low -376	192	8,485
Low-Middle					
Middle	Residence One Year Ago 11,417	Middle -2,081	Middle 18		9,546
High-Middle	Year of Entry 12,980				
High	Year of Entry + Coverage Factors 13,780	Low -1,822	High 243		12,393

Note: Data shown are for the population under age 65 on April 1, 2010.

Source: U.S. Census Bureau, Population Division, 2010 Demographic Analysis, December 2010 release, special tabulation.

**Figure 3. Net International Migration: 1945 to 2010
(In thousands)**



Note: Data shown are for the population under age 65 on April 1, 2010.

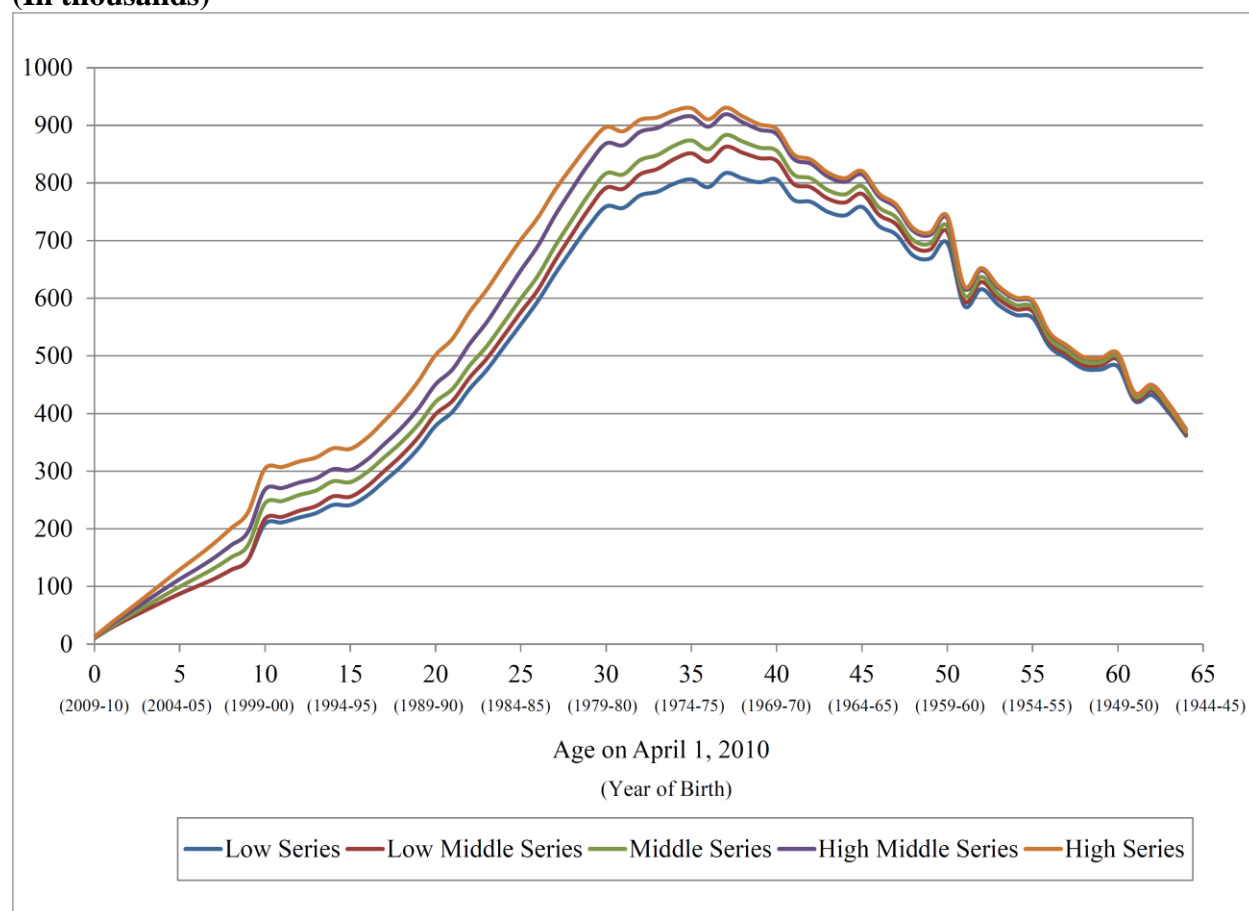
Source: U.S. Census Bureau, Population Division, 2010 Demographic Analysis, December 2010 release, special tabulation.

estimates of NIM at these ages. These five estimates begin to diverge around age 10, converging again around age 50.⁷

As noted earlier, the DA NIM estimates were produced at the national level by single year of age, sex, and two race groups (Black and non-Black). An additional series of estimates were produced for the population under age 20 by single year of age, sex, and Hispanic origin (Hispanic and non-Hispanic). Estimates were produced by limited race groups due to the availability of data on historical vital statistics records. Table 3 shows the NIM estimates by race; we can see that non-Blacks comprise the majority of the NIM estimate (ranging from 27.9 million in the low estimate to 32.5 million in the high estimate); the estimate of Black net

⁷ The NIM estimates represent the migrant population. Deaths to migrants for most components have not been subtracted from the NIM estimates, but are represented in the mortality component of DA (which is separate from the NIM component of DA). Therefore, some of the international migrants in the 2010 DA estimates were not alive on April 1, 2010.

**Figure 4. Net International Migration by Age: 1945 to 2010
(In thousands)**



Note: Data shown are for the population under age 65 on April 1, 2010.

Source: U.S. Census Bureau, Population Division, 2010 Demographic Analysis, December 2010 release, special tabulation.

international migration ranges from 3.0 million in the low estimate to 3.3 million in the high estimate.

The estimates were also produced at the national level by Hispanic origin for the population under age 20. Table 4 shows the NIM estimates by Hispanic origin; we can see that Hispanics comprise the majority of the NIM estimates (ranging from 1.7 million in the low estimate to about 2.4 million in the high estimate). The estimate of non-Hispanic net international migration under age 20 ranges from about 1.5 million in the low estimate to 1.9 million in the high estimate.

Figure 5 shows the sex ratios from the cumulative 1945-2010 NIM estimates for DA by age. Sex ratios are expressed as the number of males per 100 females. At age zero we see that the sex ratio for the high series is higher than the sex ratio for the other series (about 95 compared to about 93,

Table 3. Net International Migration by Race: 2000 to 2010
(In thousands)

	Low	Low-Middle	Middle	High-Middle	High
Black	2,956	3,042	3,149	3,289	3,340
Non-Black	27,855	28,887	29,840	31,262	32,496

Note: Data shown are for the population under age 65 on April 1, 2010.

Source: U.S. Census Bureau, Population Division, 2010 Demographic Analysis, December 2010 release, special tabulation.

Table 4. Net International Migration by Hispanic Origin for the Population Under Age 20: 2000 to 2010
(In thousands)

	Low	Low-Middle	Middle	High-Middle	High
Hispanic	1,730	1,806	1,867	2,052	2,357
Non-Hispanic	1,526	1,593	1,648	1,810	1,903

Note: Data shown are for the population under age 65 on April 1, 2010.

Source: U.S. Census Bureau, Population Division, 2010 Demographic Analysis, December 2010 release, special tabulation.

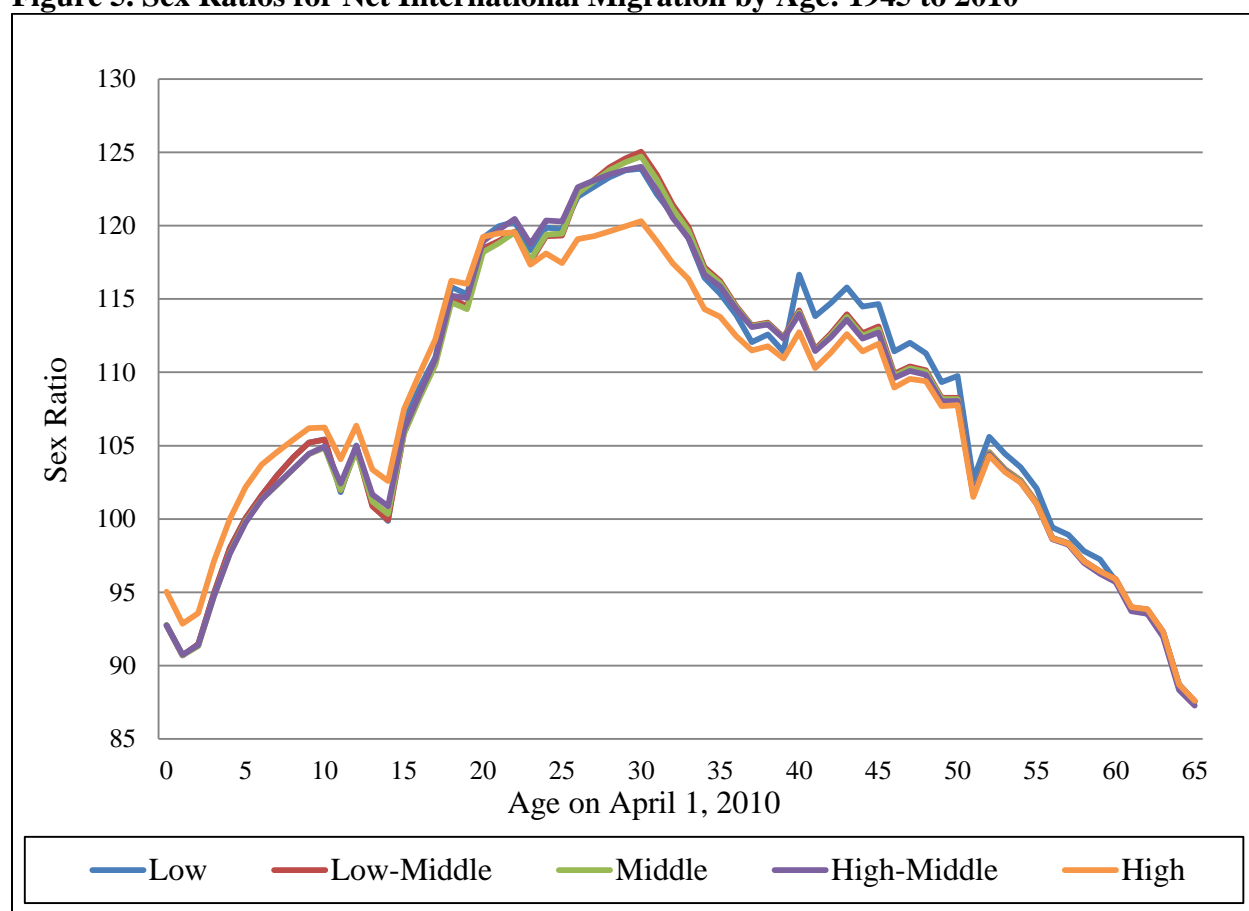
respectively). The sex ratio for all series then dips at around age one, then increases for all series. Between ages 25 and 35, the high series shows a lower sex ratio than the other series. This is because of the application of coverage factors by age, sex and Hispanic origin in the high series (Jensen, Scopilliti, and Bhaskar 2011). At age 65, the sex ratios for all series converge at about 87.

Conclusion

This paper provided an overview of the data and methods used to estimate net international migration from 2000 to 2010 for DA in 2010. Foreign-born immigration, foreign-born emigration, net native migration, and net migration between the United States and Puerto Rico represent the four components of 2000 to 2010 net migration to the United States in the 2010 DA estimates. Each component was measured using available and applicable data from the ACS, the PRCS, the decennial census, life tables, independent research on the topic of migration, and census data from other countries.

International migration of the foreign born represents the largest subcomponent of NIM, accounting for over 90 percent of the total 2000 to 2010 NIM estimate. DA estimates of foreign-born immigration yield four separate estimates which were included in the five NIM estimates.

Figure 5. Sex Ratios for Net International Migration by Age: 1945 to 2010



Note: Y axis begins at 85; Data shown are for the population under age 65 on April 1, 2010.
Source: U.S. Census Bureau, Population Division, 2010 Demographic Analysis, December 2010 release, special tabulation.

Three separate measures of foreign-born emigration were used in the total NIM estimates. There was only one estimate of net movement between the United States and Puerto Rico, which was used in all five estimates of total NIM for DA. Lastly, we calculated three separate measures of net native migration. The four components of migration were then used to create five estimates of NIM for the DA estimates.

The five series of NIM range from about 31.7 million to about 36.7 million. This range represents a plausible set of estimates of the NIM component of DA. Once these five series were developed, they were combined with estimates of births, deaths, the Armed Forces population living overseas, and Medicare-based estimates of the population aged 65 and over to produce five series of estimates of the resident population living in the United States on April 1, 2010.

The DA estimates of the resident population (all ages) were as follows: 305.7 million (low), 307.4 million (low-middle), 308.5 million (middle), 310.0 million (high-middle), and 312.7

million (high).⁸ These estimates were released on December 6, 2010 before the actual decennial census counts were released and were produced without knowledge of the 2010 Census results. The resident population enumerated in the 2010 Census was released on December 21, 2010. The 2010 Census count of the resident population, 308,745,538, fell within the range of 2010 DA estimates and was closest to the middle 2010 DA estimate.⁹

In addition to comparing estimates of the total population, we will be performing additional analyses comparing 2010 Census counts by age, sex, race, and Hispanic origin with the 2010 DA estimates. Differences will be evaluated and used to inform us on the strengths and weakness of both the decennial census and the demographic analysis estimates.

⁸ For more information on the 2010 DA resident population data release, see http://www.census.gov/newsroom/releases/pdf/20101206_da_table_3.pdf.

⁹ For more information on the 2010 Census resident population counts, see <http://2010.census.gov/news/releases/operations/cb10-cn93.html>.

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