

**Methodology, Assumptions, and Inputs for the
2014 National Projections**

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Introduction

The U.S. Census Bureau produces projections of the resident population using a cohort-component method and assumptions about demographic components of change (future trends in births, deaths and net international migration). Projections are updated periodically to incorporate revised assumptions about anticipated trends for these components. This can result in differences between series in the projected population, both in terms of number and in distribution across characteristics. This document describes the methodology, assumptions, and inputs used to produce the 2014 National Projections.

Methods

The projections were produced using a cohort-component method beginning with an estimated base population for July 1, 2013.¹ In this method, the components of population change are projected separately for each birth cohort (persons born in a given year) based on past trends. For each year, 2014 to 2060, the population is advanced one year of age using the projected age-specific survival rates and levels of net international migration for that year. A new birth cohort is added to the population by applying the projected age-specific fertility rates to the female population. Births, adjusted for infant mortality and net international migration, form the new population under one year of age. In its simplest form, the cohort component method is expressed as:

$$P_t = P_{t-1} + B_{t-1,t} - D_{t-1,t} + M_{t-1,t} \quad [1]$$

where:

P_t = population at time t;

P_{t-1} = population at time t-1;

$B_{t-1,t}$ = births in the interval from time t-1 to time t;

$D_{t-1,t}$ = deaths in the interval from time t-1 to time t; and

$M_{t-1,t}$ = net migration in the interval from time t-1 to time t

Projections produced through the cohort component method are driven by assumptions regarding each of the components of change. In order to project a population forward in this manner, separate projections of fertility, mortality, and net international migration are required to serve as inputs into the cohort component model, as is an original base population to project forward. The assumptions and methodologies used to create each input for the 2014 National Projections are described in detail in the sections that follow.

Base Population

The 2014 National Projections are of the resident population by age, sex, race, Hispanic origin and nativity. Producing population projections by nativity requires a base population that is distributed across this characteristic. Additionally, rates of emigration for the foreign-born in this projection series are assumed to vary depending on the length of time that has passed since arrival in the

¹ The base population derives from the Census Bureau's Vintage 2013 Population Estimates, which are based on the 2010 Census (U.S. Census Bureau, 2013).

United States. For this reason, the foreign born in the base population must also be divided by year-of-entry cohort.

The base population for the 2014 National Projections derives from the Census Bureau's Vintage 2013 Estimates of the resident population on July 1, 2013. These estimates are by age (0 to 99, 100+), sex, race (31 groups), and Hispanic origin, but do not include any detail on nativity. The 2013 American Community Survey (ACS) was used to add nativity by calculating the proportion native born for each age, sex, race, and Hispanic origin group and applying those proportions to the Vintage 2013 estimates. Rounded values were used to create the native-born population, which was then subtracted from the Vintage 2013 estimate to create the foreign-born population.

Duration was also added to the foreign-born population using data from the 2013 ACS. A year-of-entry distribution by age, sex, race and Hispanic origin ranging from 0 to 10+ years was calculated and applied to the foreign-born base population. The results were then rounded within each age, sex, race, and Hispanic origin cohort so that the previous totals were maintained.

A final adjustment was made to extend the open-ended age category of 100+ out to 115 by single year of age. The projections were processed to age 115, with survivorship ratios at 115 set to zero to ensure that the 100+ cohort was not artificially inflated. Distributing the 100+ cohort across ages 100 to 115 was accomplished using 2010 Census data. Age distributions from 100 to 115 by sex were calculated and applied to the 100+ population. The values were then rounded so that, when aggregated at 100, they matched the original values.

Fertility

Age-specific fertility rates were estimated and projected for women aged 14 to 54 in five nativity, race and Hispanic origin groups. These rates are based on birth registration data compiled by the National Center for Health Statistics (NCHS) in conjunction with data from the Census Bureau's Intercensal Estimates, Decennial Censuses, and the ACS.

Final birth registration data from NCHS for the years 1990 to 2011 were used as the numerators in our fertility rates. These data contain demographic information about the mother, including her race, age at the time of delivery, Hispanic origin, and country of birth.

Because our assumptions are based on historical trends, some adjustments were made to ensure uniformity in race reporting across the years. In particular, single-race categories consistent with the 1977 Office of Management and Budget (OMB) standards for data on race and ethnicity were used, including the superseded category of Asian or Pacific Islander (API). These data were categorized into four groups of race for the mother – White, Black, American Indian or Alaska Native (AIAN), and API – and two categories for Hispanic origin – Hispanic and Not Hispanic.

For this series of projections, fertility rates were also assumed to differ depending on the mother's country of birth. A dichotomous variable was used to differentiate native mothers, those born in the United States or in U.S. territories, from those born elsewhere. Births to non-residents were excluded from the series.²

For 2012 and 2013, final birth data from NCHS were not available at the time of production, however, a preliminary total number of births for each year was available. In order to incorporate the most recent trends in fertility in the time series for the 2014 National Projections, a short-term

² Non-residents are defined as persons whose reported state of residence is *not* one of the 50 states or the District of Columbia.

projection method was used for 2012 and 2013, where the total births for these years were distributed by maternal age, race, Hispanic origin, and nativity based on the distribution of these characteristics in the 2011 birth data.

The denominators used to calculate the fertility rates were derived from the intercensal estimates for the years 1990 to 2009 and the Vintage 2013 population estimates for 2010 to 2013. Population estimates for women aged 14 to 54 were coded in the same race and Hispanic origin groupings used for the births. Intercensal estimates were available only by the four races prior to 2000. For the period from 2000 to 2013, estimates were produced for a total of 31 race groups consistent with the revised OMB standards for data on race and ethnicity (Office of Management and Budget, 1997), however, to maintain continuity of the estimates across the time series, bridged race estimates were used for 2000 to 2013.³

Because the Census Bureau's estimates do not distribute the population on the basis of nativity, proportions of native and foreign-born women within age, race, and Hispanic origin groups from the 1990 and 2000 Decennial Censuses and the 2001 to 2012 single-year ACS files were applied to the estimates for those years.⁴ Annual estimates of the resident population by nativity were not available for the period from 1991 to 1999. A linear interpolation of the proportion of native-born women between the 1990 and 2000 censuses was used to create proportions of native-born women in the years for which no data were available. Computed proportions were then applied to the population estimates in these years to create a time series of women aged 14 to 54 by race, Hispanic origin, and nativity.

Groups displaying similar fertility rates and trends throughout the time series were aggregated. For the purposes of these projections, rates were produced for three foreign-born groups: (1) Hispanic, (2) non-Hispanic API, and (3) non-Hispanic other; and two native-born groups: (1) API (includes both Hispanic and non-Hispanic) and (2) all others.

Fertility Projections

For the 2014 National Projections, total fertility rates were projected to 2060 by assuming linear convergence in the year 2100 of the total fertility rates of all five nativity, race, and Hispanic origin groups to the average total fertility rates of the native-born population for the years 1990 to 2013 (a value of 1.86). The average proportional age distributions of the rates (Age-Specific Fertility Rate (ASFR)/Total Fertility Rate (TFR)) for the native population in 1990 to 2013 was set as a second convergence point for all of the groups in 2100. Projected proportions by age were applied to the projected TFRs to create age-specific fertility rates.

Fertility Rates

Table 1 presents total fertility rates by race and Hispanic origin for 2014 to 2060.⁵ Foreign-born Hispanics are projected to have the highest fertility levels in all years. The TFR for this group in 2014 is projected to be 3.11, and that is expected to decline to 2.44 by 2060. Of the five groups for

³ Bridged race estimates are those where multiple-race responses are converted back to the single-race categories consistent with the 1977 Office of Management and Budget standards for data on race and ethnicity.

⁴ The universe represented by the ACS varies across years. For instance, in the years 2000 to 2004, data are available only for areas with populations greater than 250,000, whereas in the years 2005 and beyond, data are available for populations in excess of 65,000. For detailed descriptions of the ACS data, see <http://www.census.gov/acs/www/>.

⁵ The projected age-specific fertility rates by the five nativity, race and Hispanic origin groupings are provided in Technical Appendix 1: <http://www.census.gov/population/projections/data/national/2014/2014methodology.html>.

which fertility rates were projected, only two, the foreign-born Hispanics and foreign-born non-Hispanic others are projected to have fertility levels that exceed replacement at any point throughout the time series.⁶ Rates for the foreign-born non-Hispanic API group, as well as those for both native-born groups were below replacement in 2011,⁷ and they are projected to remain below replacement through 2060. The projected TFR in 2014 is lowest for the native-born API group (1.19). Consistent with the convergence approach used in our projections, the TFR for the native-born API population is projected to increase to 1.55 in 2060 as this group moves closer to the average native-born rate. This is still well below replacement and is lower than the projected rates for any of the other groups. Rates for the native-born all other group are projected to increase slightly, from 1.75 in 2014 to 1.81 in 2060. Rates for the foreign-born non-Hispanic API group are also projected to increase, reaching 1.84 in 2060 from 1.82 in 2014.

Figure 1 shows the age-specific fertility rates for each of the five nativity, race, and Hispanic origin groups in 2014. In that year, foreign-born Hispanics had higher rates in the young adult ages compared with the other groups, while foreign-born non-Hispanic other women had the highest rates in the older ages. API women had the lowest age-specific fertility rates in ages less than 20 in 2014.

Figure 2 shows the age-specific fertility rates for 2060. As expected, there is less variation in the age distribution of the fertility rates across the groups in 2060. In the younger ages, rates for foreign-born Hispanics remain slightly higher, and rates for API women slightly lower, than the other groups. However, for ages 35 and beyond, rates are similar across all of the groups.

Assigning Race, Hispanic Origin, Sex, and Nativity to Projected Births

The number of births each year by race and Hispanic origin are determined by applying projected fertility rates to each year's projected female population. Race and Hispanic origin were assigned to projected births based on the race of the mother, the racial composition of men in the projected population, and the racial and ethnic distribution of women and men with children less than 18 years of age in the household from the 2010 Census.

Distributions of race reported by parents of children aged 0 to 17 in the census data were used to assign race and Hispanic origin to each birth. This method and the underlying data have been described in previous work in population estimates and projections (e.g., Guarneri and Dick 2012, Hollmann and Kingkade 2005, Smith and Jones 2003, U.S. Census Bureau 2010). The current application of this method is referred to as the "Kid Link Method."

The Kid Link Method utilizes information on the relationship to the householder to define children as natural-born sons and daughters of the householder, and parents as persons who are the householder, spouse of the householder, or unmarried partner of the householder. Distributions of race and Hispanic origin for children aged 0 to 17 are derived from a series of cross-tabulations of the reported race of the child for every race and Hispanic origin combination of parents. The result is a series of child race and Hispanic origin proportions for every combination of parents' race and Hispanic origin. These are referred to as Kid Link Proportions. Race and Hispanic origin are assigned to births by multiplying the births by the respective child race proportions for that parental race-origin combination.

Records where there is only one parent in the household are included, while records with same-sex parents are not. In the case of a single parent household, the parent is assumed to be a biological

⁶ Replacement fertility is considered to be about 2.1 births per woman.

⁷ 2011 is the last year for which full birth data were available from NCHS.

parent. Since the intent is to provide a comparable measure to the parents' records on the birth certificate that can be used to examine the relationship between biological parents' race and Hispanic origin with the race and Hispanic origin reported for children, the same assumption cannot be true for both partners in a same-sex household.

In this application, the method for allocating births by race and Hispanic origin must be modified somewhat because births are projected by the race and Hispanic origin of the mother, but do not include information on the race and Hispanic origin of the father. To address this limitation, a pool of potential fathers was created from the projected male population based on the race and Hispanic origin composition of fathers relative to that of the entire male population in the 2010 Census.

The potential fathers were linked to mothers by age – each age of mother category has a specified age range for potential fathers based on 2010 Census data. The age range was generated by calculating the mean age of fathers for mothers from the census data, then adding and subtracting one standard deviation from the mean age to create the age range for each age of mother category. Once prospective fathers were linked to the mothers, race and Hispanic origin were assigned to each projected birth using the Kid Link proportions. Since the Kid Link proportions remain constant for all projected years, changes in the racial and Hispanic origin composition of the mothers and fathers drive changes in the racial and Hispanic origin composition of births over time.

Sex was assigned to projected births within each race and Hispanic origin group. The sex ratios (males per 100 females) of future births were set to equal the average of the sex ratios of births for the period from 1989 to 2011, within each of five race and Hispanic origin groups: (1) non-Hispanic White, (2) non-Hispanic Black, (3) non-Hispanic AIAN, (4) non-Hispanic API, and (5) Hispanic. All projected births are considered native born.

Mortality

Mortality rates were calculated from NCHS-compiled death registration data for 1989 to 2012. In conjunction with the Population Estimates Program's Intercensal Estimates for the years 1989 to 2009 and Vintage 2013 Postcensal Estimates for 2010 to 2012, death data were used to produce a series of mortality rates by age and sex for three race and Hispanic origin groupings (U.S. Census Bureau, 2013). Death data include four categories of race – White, Black, AIAN, and API – and two categories for Hispanic origin – Hispanic and non-Hispanic. Prior to 2000, the intercensal estimates are available by these four races. For the period from 2000 to 2012, the estimates were produced for a total of 31 race groups consistent with the revised OMB standards for data on race and ethnicity (Office of Management and Budget, 1997). To maintain continuity of the estimates across the time series, bridged race intercensal estimates were used for 2000 to 2012. Deaths to non-residents were excluded from the series.⁸

Due to concerns about the quality of race reporting in the death data over the time series, non-Hispanic race groups with similar mortality patterns were collapsed into two categories. As a result, mortality rates were produced for three race and Hispanic origin groups: (1) non-Hispanic White and API, (2) non-Hispanic Black and AIAN, and (3) Hispanic (of any race). We did not draw distinctions between the mortality of the foreign and native-born populations. All mortality assumptions apply to the total population for a particular group, regardless of nativity.

⁸ Non-residents are defined as persons whose reported state of residence is *not* one of the 50 states or the District of Columbia.

Mortality Projections

Mortality was projected based on projections of the life expectancy at birth (e_0) by sex. Changes in life expectancy by sex were modeled assuming that the complement of the life expectancy (difference between an upper bound value, A , and life expectancy values) would decline exponentially.

Thus,

$$C(t) = A - e_0(t) \quad [2]$$

Where: $C(t)$ = The observed complement of life expectancy at birth at time t

A = The upper asymptote of life expectancy

$e_0(t)$ = The life expectancy at birth at time t

The complement of life expectancy was then projected for future dates as:

$$\hat{C}(t) = \hat{C}(t_0)e^{r(t-t_0)} \quad [3]$$

Where: $\hat{C}(t)$ = The observed complement of life expectancy at birth at time t

r = The rate of change in the complement of life expectancy at birth

$\hat{C}(t_0)$ = The model complement of life expectancy at time t_0

The parameters r , $\hat{C}(t_0)$, and A were estimated simultaneously by minimizing the sum of squared errors (SSE) between the model and the observed values of life expectancy, by sex, for the years 1999 through 2012.⁹

The sex-specific life expectancies for each of the three races and Hispanic origin groups were assumed to track those for the total country by setting the exponential growth rates of the complements for the three groups equal to that of the country from 2013 through 2060.¹⁰

Mortality rates by age were then produced using the most recent observed rates by sex and race-origin group, the trajectory of life expectancy values, and an ultimate life table. To get an ultimate age pattern of mortality by sex, the United Nations' single age versions of the extended Coale and Demeny model life tables were used (United Nations 2010, United Nations 2012). The West model mortality rates with life expectancy values of 87 for males and 91 for females were selected.

Using the Coale-Demeny West model, age-specific central death rates were projected for each of the three race-origin groups by sex using the Census Bureau's Rural-Urban Projection (RUP) program. The RUP algorithm creates life tables for years that have intermediate life expectancy estimates by finding the interpolation factors for the most recent and next death rate inputs that would result in the desired life expectancy at birth value (U.S. Census Bureau, 2013c). The linear interpolation is done on the logarithms of the death rate values.

While the difference in life expectancy between Hispanics and non-Hispanics is projected to grow smaller over time, the projected life expectancy at birth for Hispanic males and females remains

⁹ These calculations were performed using Microsoft Excel's "Solver" add-in tool.

¹⁰ The calculation was made using the Census Bureau's Subnational Projections Toolkit's PROJe032 (U.S. Census Bureau, 2013b).

higher in all years than for the other two groups. We question whether the differential in life expectancy for the observed years is real or an artifact produced by issues in the underlying mortality and population data used to produce the measure. This issue will lead to further research in subsequent years, but for the purposes of producing the 2014 National Projections, the projections of life expectancy for the Hispanic population were modified by assuming they would converge to the life expectancy of the non-Hispanic White and API group in 2035. From 2035 through 2060, the Hispanic group is given the same projected life expectancy as the non-Hispanic White and API group.

An adjustment was made to the projected mortality rates for the 100 years and older population to account for potential age misreporting in the death data, as this could inflate the population at the oldest ages. Projected mortality rates were used to create life tables, including survival ratios, by sex, group, and year. The survival ratios from these life tables for ages 0-99 were applied to the population in the projections to calculate deaths (deaths for ages 1 and over are equal to the difference between the population alive at the start of a given interval and survivors to the end of that interval). The survival ratio representing the population 100 years and older was split into single years of age and extended out to age 115. Survivorship rates were linearly interpolated from age 100 to age 115, where the survivorship for age 115 was set to 0 under the assumption that no individuals in the projection survive beyond that age.

Life Expectancies and Mortality Rates

Estimates and projections of life expectancy are shown in Table 2 by sex and group. For males and females, life expectancy both at birth and at age 65 is lowest for the non-Hispanic Black and AIAN category. Although this is true for the years 2014 through 2060, this group is projected to experience a larger increase in life expectancy during this time than any of the other groups.¹¹ Between 2014 and 2060, life expectancy at birth for the non-Hispanic Black and AIAN category is anticipated to increase by 8.8 years for males, from 72.4 years in 2014 to 81.2 years in 2060. For females, the projected increase is 6.6 years, from 78.6 years in 2014 to 85.2 years in 2060. Hispanics had the highest life expectancy at birth in 2014, 79.6 years for males and 84.2 years for females. Hispanics also had the highest remaining life expectancy at age 65 in 2014, 20.0 years for males and 22.4 years for females. Consistent with our methodology, life expectancy for the Hispanic and the non-Hispanic White and API groups are the same from 2040 to 2060. In 2060, the life expectancy at birth for these groups is projected to be 84.6 for males and 87.5 for females. At age 65, males in these groups are expected to live an average of 21.9 additional years and females an additional 24.4 years.

Figure 3 shows male mortality rates by age for the three race and Hispanic origin groups in 2014 and 2060. In both years, rates at the younger ages are higher among non-Hispanic Black and AIAN males relative to the other groups, however, for the oldest ages, this pattern shifts and the highest rates are observed in the non-Hispanic White and API group. Mortality rates are generally projected to decline for all groups between 2014 and 2060, with some ages and groups experiencing more improvement than others. A similar pattern of change is shown in Figure 4 for females.

¹¹ The projected input life expectancies at birth, mortality rates, and survival ratios by the three race and Hispanic origin groupings are provided in Technical Appendices 2 through 4: <http://www.census.gov/population/projections/data/national/2014/2014methodology.html>.

Net International Migration

One series of net international migration (NIM) projections was produced for the 2014 National Projections. The projections of net international migration for the 2014 National Projections consist of three components:

1. Foreign-born immigration
2. Foreign-born emigration
3. Net native-born migration

Foreign-Born Immigration

Projections of foreign-born immigration were based on rates of emigration from sending countries. This approach shifts the perspective from the receiving nation to the source countries by incorporating information on the trends in population in sending countries. Sending countries were organized into regions and rates of emigration were calculated from annual estimates of foreign-born immigration and population estimates for the regions. Both sets of estimates are described below.

Estimates and Projections of Population in Sending Countries: 1980-2060

The Census Bureau produces estimates and projections of populations in other countries, which are compiled in the Census Bureau's International Data Base (IDB) and are available to the public via the Census Bureau's Web site (www.census.gov). The IDB projections are available through 2050. To extend the series to 2060, we extrapolated the populations from 2050 to 2060 by assuming that the growth rates for that period would decline at the same rate as in the 2040 to 2050 period. The extrapolation was performed within country-of-birth groupings, which are described in the next section.

Country of Birth Groupings

The foreign-born immigration estimates and sending country population estimates and projections were categorized into six country-of-birth regions to maximize the diversity between regions and minimize the heterogeneity within region, while maintaining large enough aggregations to remain viable. These regions are:

1. Mexico
2. Latin America/Caribbean/South America
3. Asia
4. Sub-Saharan Africa
5. Near East/North Africa
6. Europe/Canada/Oceania

Estimates of the population for each region from 1980 to 2011 are presented in Figure 5. The populations of all regions grew between 1980 and 2011, though Asia and Africa grew substantially faster than the other regions. Asia had the largest population with just over 4 billion in 2011.

Estimates of Foreign-Born Immigration: 1980-2011

Estimates of foreign-born immigration were developed using data from the 1990 and 2000 censuses and the 2001-2012 single-year ACS data files. Using ACS data, foreign-born immigration is

measured as the foreign-born population who reported their year of entry to the United States as one year prior to the survey year. For example, if foreign-born respondents in the 2009 ACS reported their year of entry as 2008 then they would be counted in the 2008 estimate of foreign-born immigration.

Estimating immigration using decennial census data requires additional adjustments to account for death and emigration occurring within the decade. Because these data represent two time points that are ten years apart, and do not include information on immigrants who emigrate or die before the census date, there is an increased risk of excluding those who emigrate before the census date. For instance, immigrants who entered the United States in 1994 and then emigrated in 1998 would not be included in the 2000 Census. Omitting cases like this would produce downwardly biased estimates of immigration.

To account for emigration between censuses, the year-of-entry estimates for each year were adjusted using emigration rates. First, foreign-born immigration was estimated for the years 1991 to 2000 using the foreign-born population in the 2000 Census who reported a year of entry between 1990 and 1999 by sex, race, and Hispanic origin. Next, each annual estimate was adjusted for emigration by applying an emigration rate of 1.44 per thousand population to each year.¹² The same method was applied to 1990 Census data to develop estimates of foreign-born immigration between 1980 and 1989. Deaths that occurred to the foreign born each year were estimated using the 1989 to 2000 survivorship ratios that were created to produce the mortality input. A substantial amount of the death records prior to 1989 do not include information regarding Hispanic origin. This led to the decision to use data from 1989 forward to produce the time series of death estimates. For the same reason, survivorship ratios for 1989, based on more complete reporting of Hispanic origin in death records, were used to generate immigration estimates for 1980 through 1989. For all other years, 1990 through 2000, the survivorship ratios for that year are used.

Figure 6 shows the immigration estimates from 1980 to 2011 by region. Asia, the Near East and North Africa, and Sub-Saharan Africa show increasing levels of immigration to 2011, while Latin America/Caribbean/South America and Europe/Canada/Oceania show downturns after 2000. Mexico shows a marked downturn in the 2000's, dropping from about 450 thousand in 2005 to about 130 thousand in 2011.

Emigration Rates from Sending Countries (to the United States)

Emigration rates for each of the six regions were calculated by dividing the number of immigrants to the United States by the estimated population in that region for the years 1980 through 2011. The emigration rates were projected into the future using a power function, a linear model that uses the natural log of the dependent variable (emigration rate) and the natural log of the independent variable (year) to estimate the intercept and coefficient.

¹² The emigration rate of 1.44 is the emigration rate for recent arrivals (e.g., those entering within the past 10 years) used for the Vintage 2013 estimates of foreign-born emigration. Emigration rates for the 1980s were calculated by Ahmed and Robinson (1994), but they were calculated only for arrivals before 1980. Earlier arrival cohorts are expected to have a lower rate of emigration than the more recent arrivals for which we are producing estimates, so we chose to use more current data on the emigration of recent immigrants.

$$\text{Log}_n(er) = a + b\text{Log}_n(n) \quad [4]$$

Where: er = the emigration rate for year n
 n = the year
 a = the model intercept
 b = the model coefficient

Estimated and projected rates of emigration for each sending region are presented in Figure 7. The rate patterns are very similar to the immigration patterns. Mexico's emigration rates were the highest, ranging from 7 per thousand population in 1990 to about 1 per thousand in 2011 with the model projecting a relatively flat trajectory that stays near 3.5 per thousand.

The rates for Latin America/Caribbean/South America range from 1.4 per thousand population in 1980 to about 0.4 per thousand in 2011. The model projects rates to decline from about .58 per thousand in 2014 to about .51 in 2060.

Rates in the other regions were generally under 0.2 per thousand population, though Europe/Canada/Oceania jumped to about 0.4 per thousand in 1999. Europe's rates are projected to increase from .27 per thousand population in 2014 to .33 per thousand in 2060. The other three groups (Asia, Sub-Saharan Africa, and Near East/North Africa) are projected to have very stable rates between 0.1 and 0.14 per thousand population.

Foreign-Born Immigration Projections

Projected immigrants to the United States were calculated for each year by multiplying the projected emigration rate from the sending countries by the projected population in the sending countries within each region. Figure 8 presents the projections of foreign-born immigration within each of the six regions.

The total number of foreign-born immigrants is projected to be 1.9 million in 2060. Both Mexico and Asia are projected to be sending just over 500 thousand immigrants in 2060. Latin America/Caribbean/South America is projected to be sending more than 300 thousand in 2060 and Europe/Canada/Oceania is projected to be sending about 250 thousand in 2060. Sub-Saharan Africa is projected to increase the most, rising from 83 thousand in 2014 to just over 250 thousand in 2060. The Near East/North Africa is projected to increase to 76 thousand in 2060.

The foreign-born immigration projections were distributed by age, sex, race, and Hispanic origin using the distributions of characteristics of immigrants within each of the six country of birth groupings from the 2008-2012 ACS. These distributions were held constant in all years of the projections, meaning that the projections of foreign-born immigration do not account for potential variations in the composition of the population within the sending countries. Because of this, any

changes in the demographic characteristics of foreign-born immigrants to the United States over time are the result of shifts in the sending countries from which the immigrants originate. For instance, a projected increase in the share of immigrants arriving from Asia would be associated with a rise in foreign-born immigrants in the Asian race group.

Figure 9 shows the race/Hispanic origin distribution of projected foreign-born immigrants. Hispanics are projected to remain the largest immigrant group, though their share of the population drops from 42 percent in 2014 to less than 39 percent in 2060. The proportion that is Non-Hispanic Asian is also projected to decrease slightly from almost 28 percent in 2014 to just over 25 percent in 2060. Non-Hispanic White is also projected to decline by about 0.5 percent to just over 19 percent in 2060. Non-Hispanic Other is expected to remain relatively constant at more than 1 percent while the percentage Non-Hispanic Black is projected to increase substantially from 9 percent in 2014 to more than 15 percent in 2060.

Foreign-Born Emigration Rates

Calculating projections of foreign-born emigration was accomplished in two steps, the first being the calculation of emigration rates using ACS data, and the second being the application of these rates to the foreign-born population annually.

Foreign-born emigration rates were calculated by Hispanic origin, sex, and tenure in the United States using the residual method. Tenure is defined from Time 1 as ‘Recent Arrivals’ (0 to 10 years) and ‘Earlier Arrivals’ (more than 10 years ago). The residual method assumes that a decline in the foreign-born population between two given years, the residual difference after accounting for mortality, is due to emigration. The general formula for a residual estimate is:

$$E_{t1-t2} = (\sum_0^{99+} P_{t1,m} * S_{t1+1,m+1} * \dots * S_{t2,m+(t2-t1)}) - P_{t2} \quad [5]$$

Where:

- E_{t1-t2} = foreign-born emigration residual between year $t1$ and year $t2$, the difference between the sum of sex and age-specific expected populations, after accounting for annual survival in the residual period, and the estimated population in year $t2$,
- $P_{t1,m}$ = estimate of foreign-born population, age m , residing in the United States in year $t1$,
- $S_{t1+1,m+1}$ = annual survivorship ratio for population that will turn age $m+1$ between July 1 of year $t1$ and July 1 of year $t1+1$,
- $S_{t2,m+(t2-t1)}$ = annual survivorship ratio for population that will turn age $m+(t2-t1)$, where $t2-t1$ is the number of years in the residual period, between July 1 of year $t2-1$ and July 1 of year $t2$, and
- P_{t2} = estimate of foreign-born population in year $t2$ that arrived in the United States prior to year $t1$.

For each foreign-born subgroup, six emigration rates are calculated using five years of annual data derived from the 2007-2011 ACS 5-year file. Three of the rates are based on two year residual periods; 2007-2009, 2008-2010 and 2009-2011. Two have three year periods: 2007-2010 and

2008-2011 and the sixth has a four year period; 2007-2011. The mean of the six rates is applied to all ages of the annual foreign-born populations projected to be at risk of emigrating during the projection period. The population at risk is distributed by tenure in the United States, age, sex, race, and Hispanic origin. Rates are applied to the population by Hispanic origin, sex, and tenure, with the demographic characteristics of the population at risk determining the racial composition of the foreign-born emigrants.

Table 3 presents the foreign-born emigration rates by tenure, Hispanic origin, and sex. Recently arrived Hispanic males have the highest emigration rate at 2.5, followed by recently arrived Non-Hispanic males at 1.7. The recently arrived non-Hispanic females had rates a little less than 1 and Hispanic females had rates of about 0.5. All earlier arriving groups had rates less than 0.5.

Net Native-Born Migration

The net international migration of the native-born population includes natives emigrating out of the United States and those migrating between the United States and Puerto Rico. The estimates of native-born net migration from the Vintage 2013 estimates by age, sex, race, and Hispanic origin were held constant for all years in the projections.

Puerto Rico net migration by age and sex was obtained from IDB projections for 2014 through 2050. This series was extended to 2060 by holding the 2050 values constant for 2051 to 2060. Race and Hispanic origin were assigned to migrants using the distribution of these characteristics from the Vintage 2013 estimates of Puerto Rico. The Vintage 2013 values for Puerto Rico were not used because Puerto Rico is currently experiencing extremely high rates of emigration that are unlikely to be sustained over the projection horizon. Net migration from Puerto Rico, as modeled in the IDB, was devised by interpolating between current levels and levels created by rates based on 2000/2010 census residuals starting in 2021.

Native net migration for the 2014 to 2060 projection period was negative 45 thousand. Puerto Rico net migration drops sharply from about 32 thousand in 2014 to 11 thousand in 2021 after which it gradually declines to 7 thousand in 2050 where it stays constant until 2060. Puerto Rico net migration is assumed to represent solely native movement, therefore, the net international migration for natives is the sum of Puerto Rico net migration and native net migration. This total changes from -13 thousand in 2014 to -34 thousand in 2021 and -38 thousand in 2060.

Net International Migration

Net international migration was calculated by summing the native and foreign-born net migration components by age, sex, race, and Hispanic origin. Figure 10 shows net international migration by race and Hispanic origin. Hispanic levels are the highest, running in the mid 500 thousands across the projection period. Non-Hispanic Asian levels are the next highest, rising to 400 thousand in 2043 and holding steady after. Non-Hispanic White levels are also projected to increase, rising from 224 thousand in 2014 to 277 thousand in 2060. The projected increase in Non-Hispanic Black levels is the sharpest. They rise from 109 thousand in 2014 to 246 thousand in 2060. Finally, levels for Non-Hispanic Other are projected to rise slightly to 20 thousand in 2060.

Table 4 shows the distribution and sex ratios of the net international migrants by race and Hispanic origin from 2014 to 2060. The percent of net international migrants that are projected to be non-

Hispanic White increases by about 0.3 percent to 18.5 percent in 2060. The percent non-Hispanic Black is projected to increase from 8.9 percent in 2014 to 16.5 percent in 2060, while the percent non-Hispanic Asian is projected to decrease from 28.5 percent in 2014 to 26.9 percent in 2060. Hispanics are projected to decrease from 43.3 percent of net international migrants in 2014 to 36.8 percent in 2060.

The sex ratios indicate that Hispanic net international migrants are projected to be predominantly male, while there are slightly more females than males for all of the non-Hispanic groups.

Population Projections

The projected fertility rates, mortality rates, and international migration components described in this document and presented in the tables and figures were used to generate projections of the U.S. resident population for the years 2014 to 2060 by nativity, age, sex, race and Hispanic origin. Projections of the resident population and components of change from the 2014 National Projections are available on the Census Bureau Web site at <http://www.census.gov/population/projections/data/national/>.

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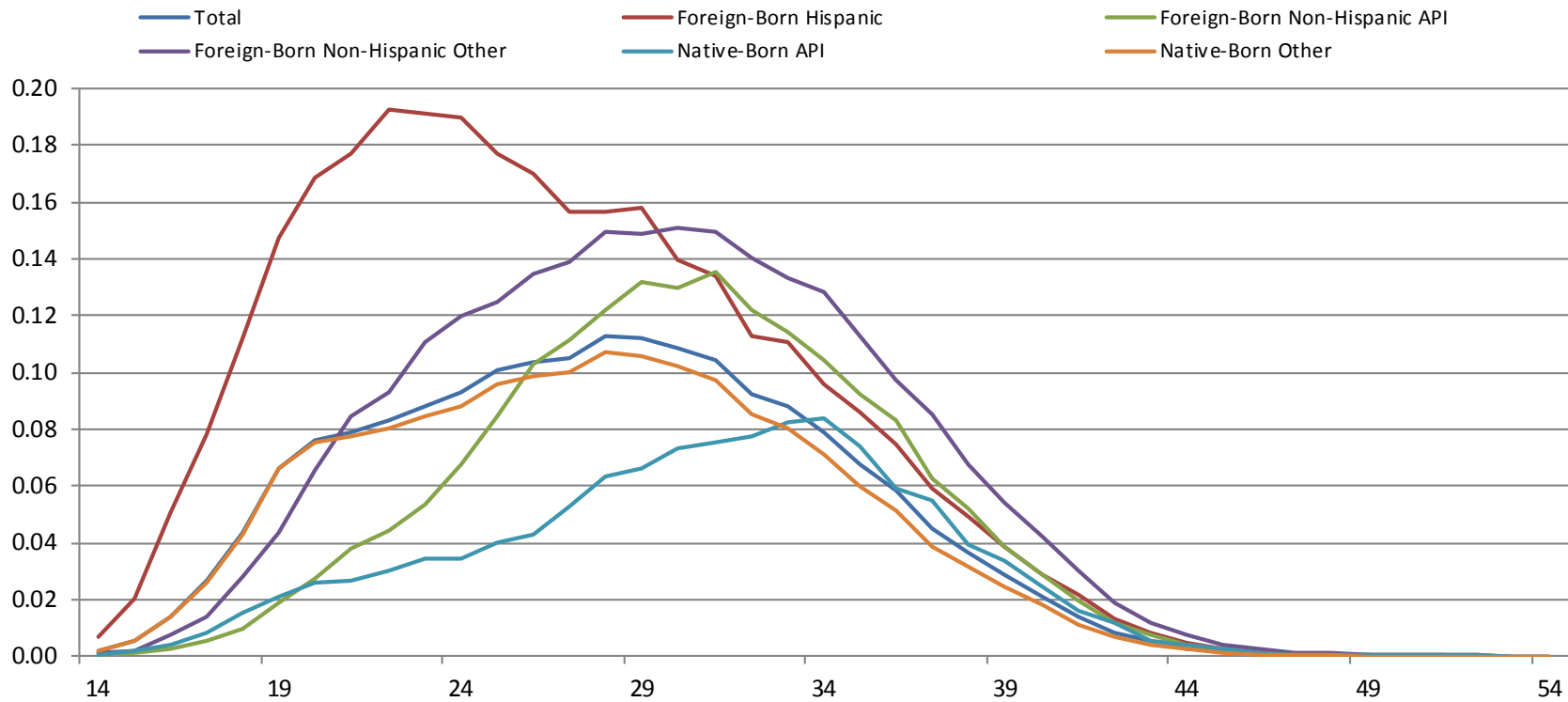
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Tables and Figures

| Table 1. Total Fertility Rates by Race and Hispanic Origin: 2014 to 2060 | | | | | | |
|--|-------|--------------|---------------------|-----------------------------|-------------|-------|
| Year | Total | Foreign Born | | | Native Born | |
| | | Hispanic | Non-Hispanic API | Non-Hispanic Other Races | API | Other |
| 2014 | 1.87 | 3.11 | 1.82 | 2.48 | 1.19 | 1.75 |
| 2015 | 1.87 | 3.09 | 1.82 | 2.48 | 1.20 | 1.75 |
| 2016 | 1.87 | 3.08 | 1.82 | 2.47 | 1.20 | 1.75 |
| 2017 | 1.87 | 3.06 | 1.82 | 2.46 | 1.21 | 1.75 |
| 2018 | 1.87 | 3.05 | 1.82 | 2.45 | 1.22 | 1.75 |
| 2019 | 1.87 | 3.04 | 1.82 | 2.45 | 1.23 | 1.75 |
| 2020 | 1.87 | 3.02 | 1.82 | 2.44 | 1.24 | 1.76 |
| 2021 | 1.87 | 3.01 | 1.82 | 2.43 | 1.24 | 1.76 |
| 2022 | 1.87 | 2.99 | 1.82 | 2.43 | 1.25 | 1.76 |
| 2023 | 1.87 | 2.98 | 1.82 | 2.42 | 1.26 | 1.76 |
| 2024 | 1.87 | 2.96 | 1.82 | 2.41 | 1.27 | 1.76 |
| 2025 | 1.87 | 2.95 | 1.82 | 2.40 | 1.27 | 1.76 |
| 2026 | 1.87 | 2.93 | 1.83 | 2.40 | 1.28 | 1.76 |
| 2027 | 1.87 | 2.92 | 1.83 | 2.39 | 1.29 | 1.77 |
| 2028 | 1.87 | 2.90 | 1.83 | 2.38 | 1.30 | 1.77 |
| 2029 | 1.87 | 2.89 | 1.83 | 2.37 | 1.31 | 1.77 |
| 2030 | 1.87 | 2.88 | 1.83 | 2.37 | 1.31 | 1.77 |
| 2031 | 1.86 | 2.86 | 1.83 | 2.36 | 1.32 | 1.77 |
| 2032 | 1.86 | 2.85 | 1.83 | 2.35 | 1.33 | 1.77 |
| 2033 | 1.86 | 2.83 | 1.83 | 2.35 | 1.34 | 1.77 |
| 2034 | 1.86 | 2.82 | 1.83 | 2.34 | 1.34 | 1.77 |
| 2035 | 1.86 | 2.80 | 1.83 | 2.33 | 1.35 | 1.78 |
| 2036 | 1.86 | 2.79 | 1.83 | 2.32 | 1.36 | 1.78 |
| 2037 | 1.86 | 2.77 | 1.83 | 2.32 | 1.37 | 1.78 |
| 2038 | 1.86 | 2.76 | 1.83 | 2.31 | 1.38 | 1.78 |
| 2039 | 1.86 | 2.74 | 1.83 | 2.30 | 1.38 | 1.78 |
| 2040 | 1.86 | 2.73 | 1.83 | 2.29 | 1.39 | 1.78 |
| 2041 | 1.86 | 2.72 | 1.83 | 2.29 | 1.40 | 1.78 |
| 2042 | 1.86 | 2.70 | 1.83 | 2.28 | 1.41 | 1.78 |
| 2043 | 1.86 | 2.69 | 1.83 | 2.27 | 1.41 | 1.79 |
| 2044 | 1.86 | 2.67 | 1.83 | 2.27 | 1.42 | 1.79 |
| 2045 | 1.86 | 2.66 | 1.83 | 2.26 | 1.43 | 1.79 |
| 2046 | 1.86 | 2.64 | 1.83 | 2.25 | 1.44 | 1.79 |
| 2047 | 1.86 | 2.63 | 1.83 | 2.24 | 1.45 | 1.79 |
| 2048 | 1.86 | 2.61 | 1.84 | 2.24 | 1.45 | 1.79 |
| 2049 | 1.86 | 2.60 | 1.84 | 2.23 | 1.46 | 1.79 |
| 2050 | 1.86 | 2.59 | 1.84 | 2.22 | 1.47 | 1.79 |
| 2051 | 1.86 | 2.57 | 1.84 | 2.22 | 1.48 | 1.80 |
| 2052 | 1.86 | 2.56 | 1.84 | 2.21 | 1.48 | 1.80 |
| 2053 | 1.86 | 2.54 | 1.84 | 2.20 | 1.49 | 1.80 |
| 2054 | 1.86 | 2.53 | 1.84 | 2.19 | 1.50 | 1.80 |
| 2055 | 1.86 | 2.51 | 1.84 | 2.19 | 1.51 | 1.80 |
| 2056 | 1.86 | 2.50 | 1.84 | 2.18 | 1.52 | 1.80 |
| 2057 | 1.86 | 2.48 | 1.84 | 2.17 | 1.52 | 1.80 |
| 2058 | 1.86 | 2.47 | 1.84 | 2.16 | 1.53 | 1.80 |
| 2059 | 1.86 | 2.45 | 1.84 | 2.16 | 1.54 | 1.81 |
| 2060 | 1.86 | 2.44 | 1.84 | 2.15 | 1.55 | 1.81 |

Note: API=Asian and Pacific Islander
Source: U.S. Census Bureau, 2014 National Projections.

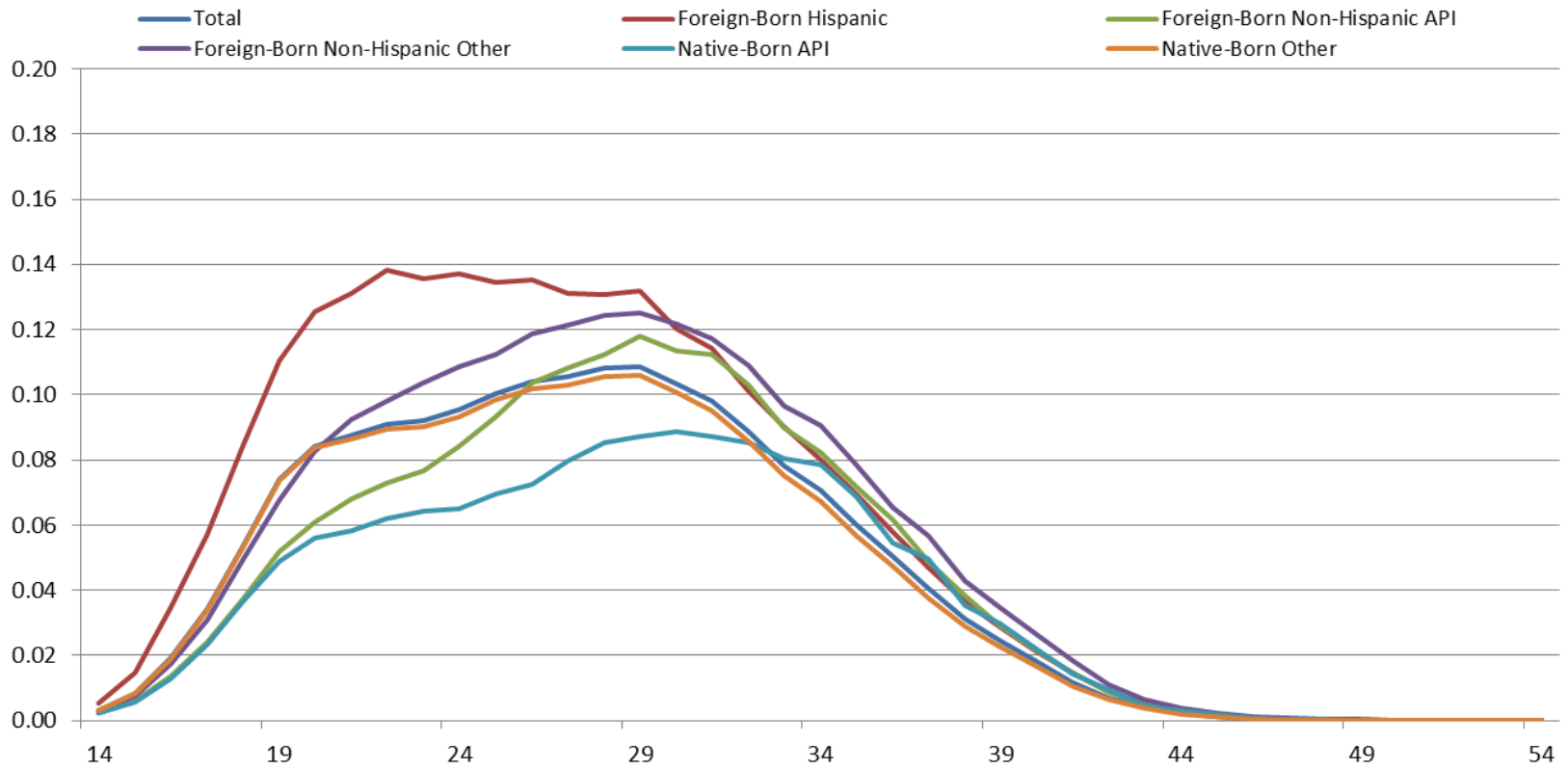
Figure 1. Age-Specific Fertility Rates by Race and Hispanic Origin: 2014



API = Asian and Pacific Islander

Source: U.S. Census Bureau, 2014 National Projections.

Figure 2. Age-Specific Fertility Rates by Race and Hispanic Origin: 2060



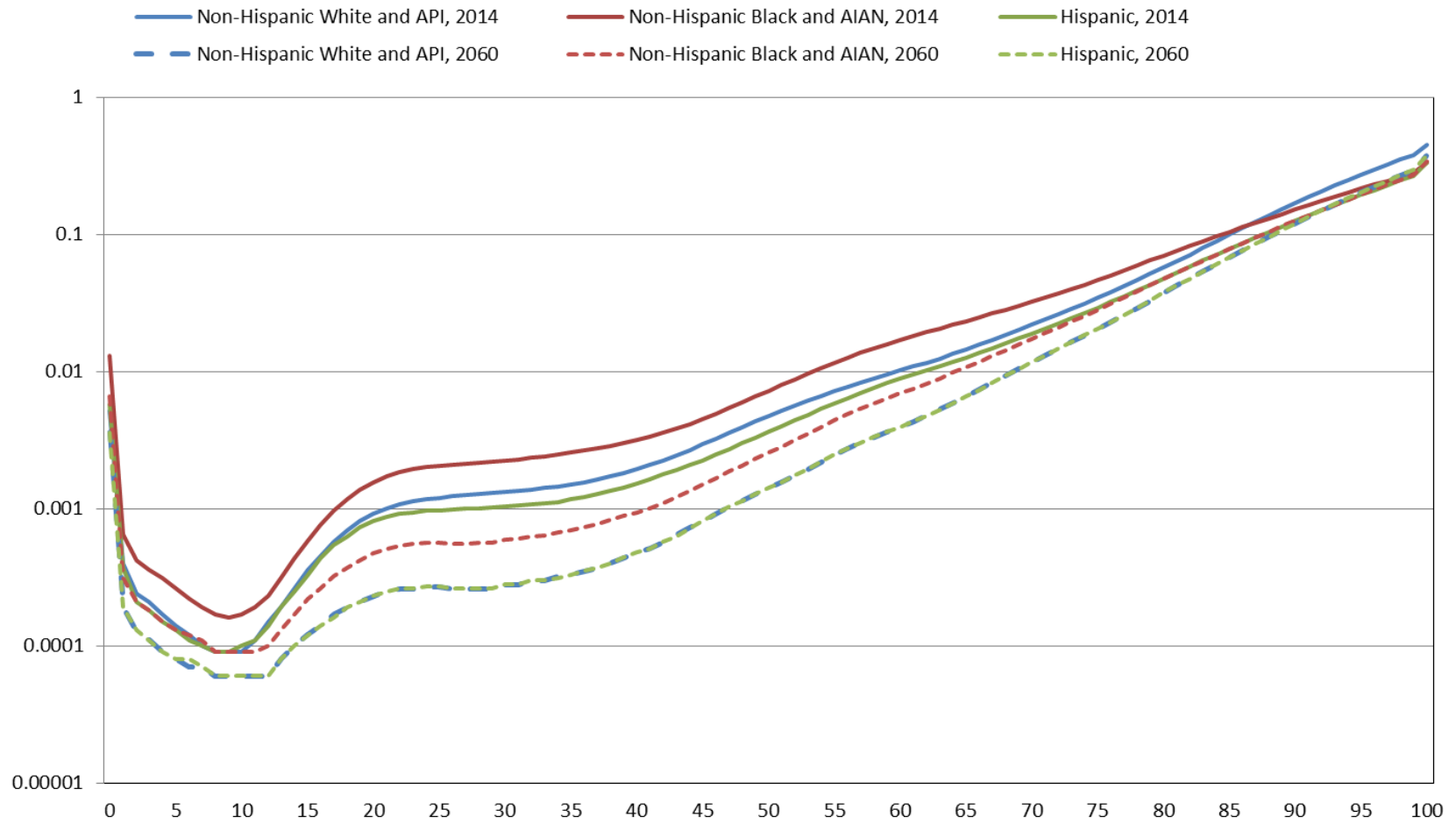
API = Asian and Pacific Islander

Source: U.S. Census Bureau, 2014 National Projections.

| Year | Life Expectancy at Birth | | | | | | Life Expectancy at Age 65 | | | | | |
|-------------|----------------------------|-----------------------------|----------|----------------------------|-----------------------------|----------|----------------------------|-----------------------------|----------|----------------------------|-----------------------------|----------|
| | Male | | | Female | | | Male | | | Female | | |
| | Non-Hispanic White and API | Non-Hispanic Black and AIAN | Hispanic | Non-Hispanic White and API | Non-Hispanic Black and AIAN | Hispanic | Non-Hispanic White and API | Non-Hispanic Black and AIAN | Hispanic | Non-Hispanic White and API | Non-Hispanic Black and AIAN | Hispanic |
| 2014 | 77.4 | 72.4 | 79.6 | 81.8 | 78.6 | 84.2 | 18.4 | 16.6 | 20.0 | 20.8 | 19.8 | 22.4 |
| 2020 | 78.4 | 73.7 | 80.0 | 82.7 | 79.6 | 84.3 | 18.8 | 17.1 | 20.0 | 21.3 | 20.3 | 22.4 |
| 2030 | 80.2 | 75.8 | 80.6 | 84.0 | 81.2 | 84.5 | 19.6 | 17.9 | 20.0 | 22.1 | 21.1 | 22.5 |
| 2040 | 81.7 | 77.8 | 81.7 | 85.3 | 82.6 | 85.3 | 20.4 | 18.7 | 20.4 | 22.9 | 21.8 | 22.9 |
| 2050 | 83.2 | 79.5 | 83.2 | 86.4 | 84.0 | 86.4 | 21.2 | 19.5 | 21.2 | 23.7 | 22.6 | 23.7 |
| 2060 | 84.6 | 81.2 | 84.6 | 87.5 | 85.2 | 87.5 | 21.9 | 20.2 | 21.9 | 24.4 | 23.3 | 24.4 |

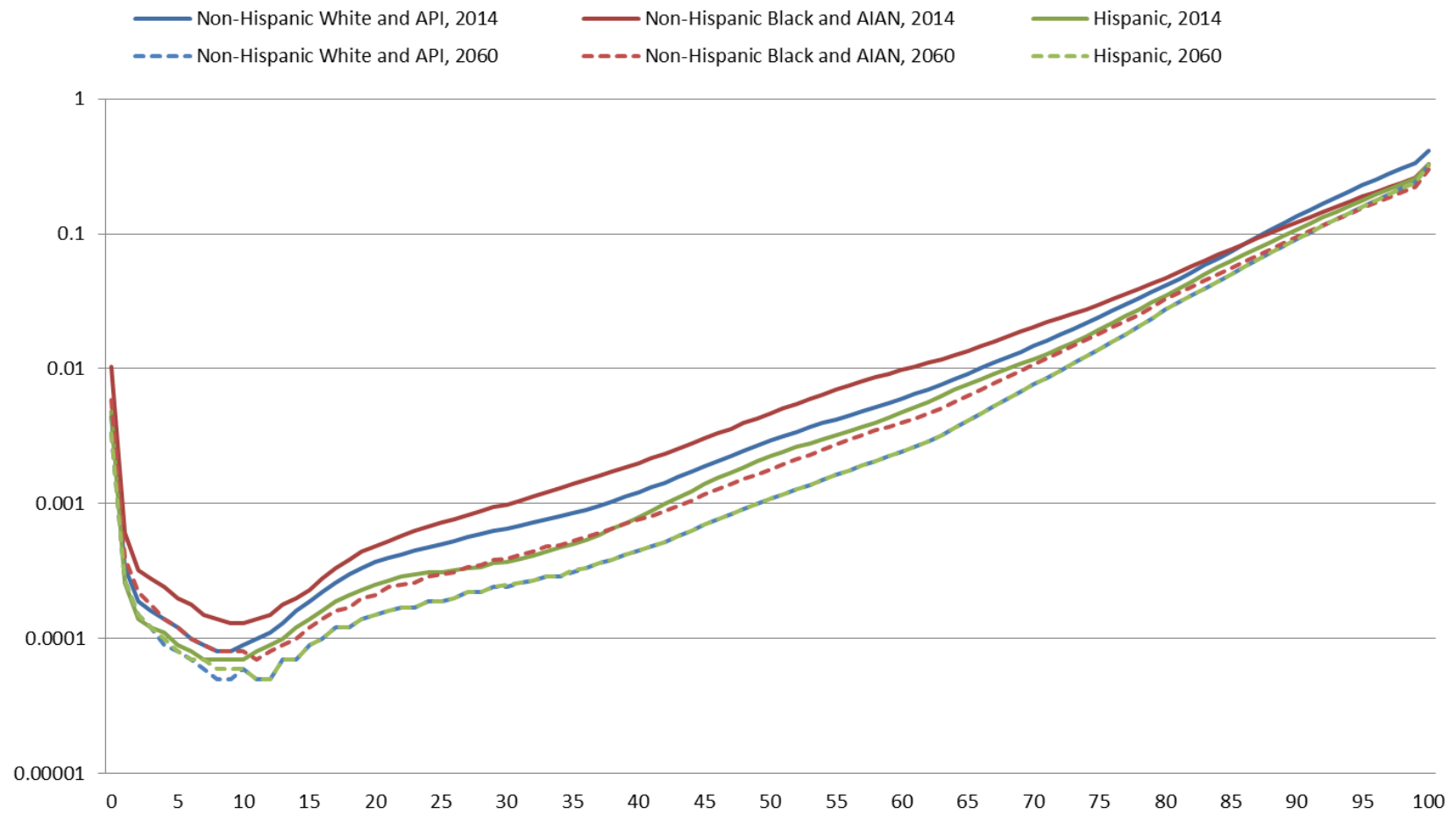
AIAN=American Indian and Alaska Native; API=Asian and Pacific Islander
Source: U.S. Census Bureau, 2014 National Projections.

Figure 3. Male Mortality Rates by Age, Race, and Hispanic Origin: 2014 and 2060



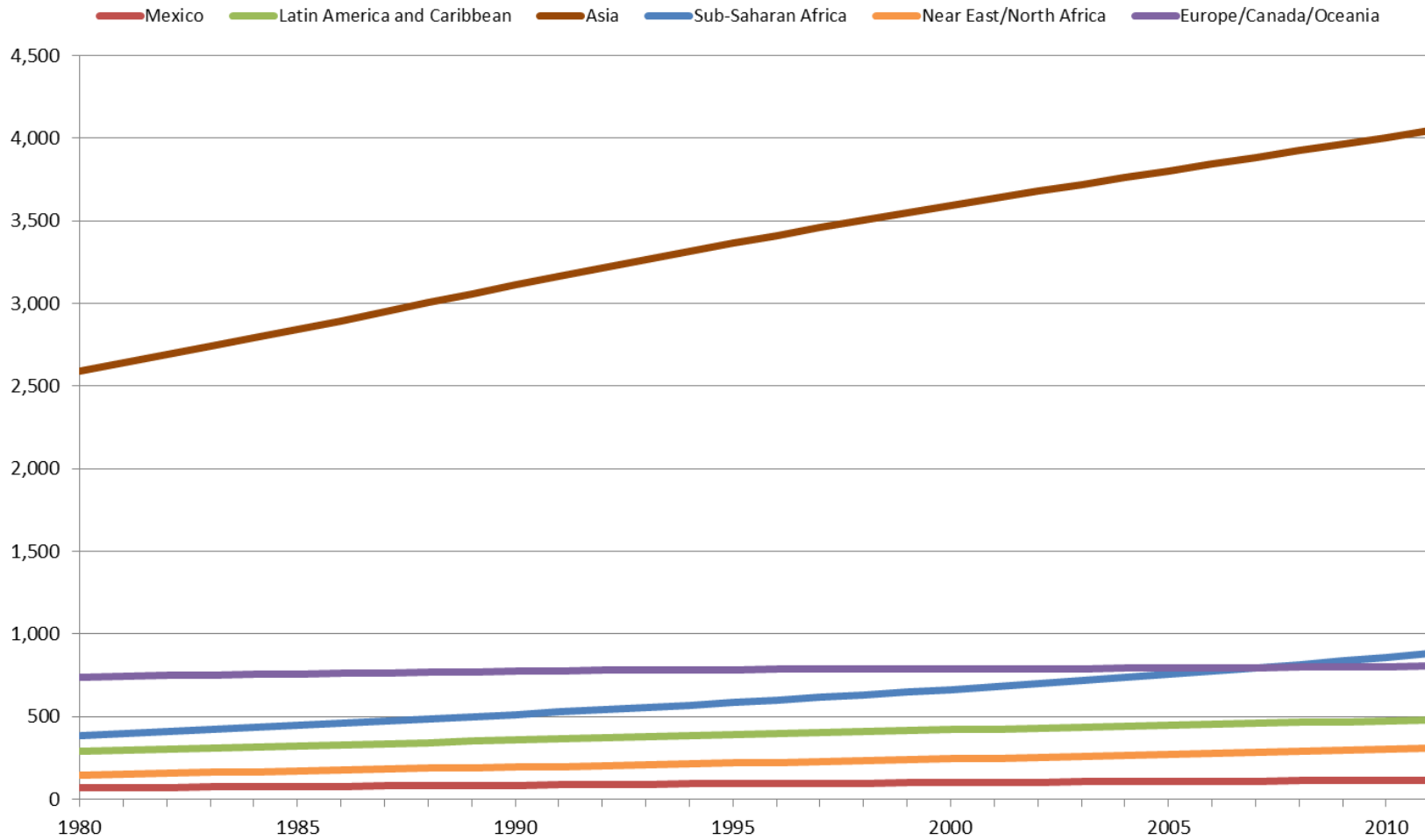
API=Asian and Pacific Islander, AIAN=American Indian and Alaska Native
 Source: U.S. Census Bureau, 2014 National Projections.

Figure 4. Female Mortality Rates by Age, Race and Hispanic Origin: 2014 and 2060



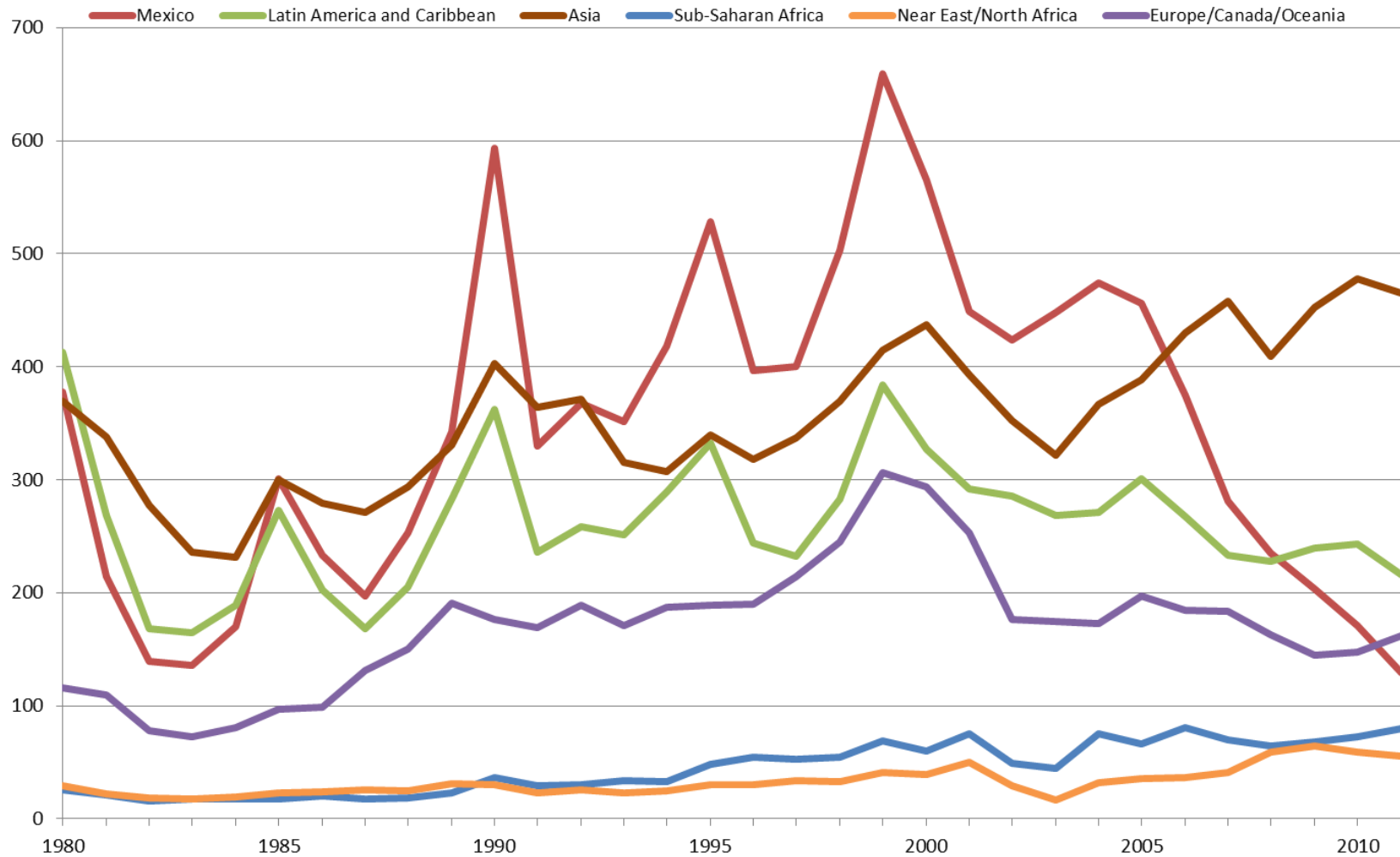
API=Asian and Pacific Islander, AIAN=American Indian and Alaska Native
 Source: U.S. Census Bureau, 2014 National Projections.

Figure 5. Population Estimates for Sending Regions: 1980 to 2011
(In millions)



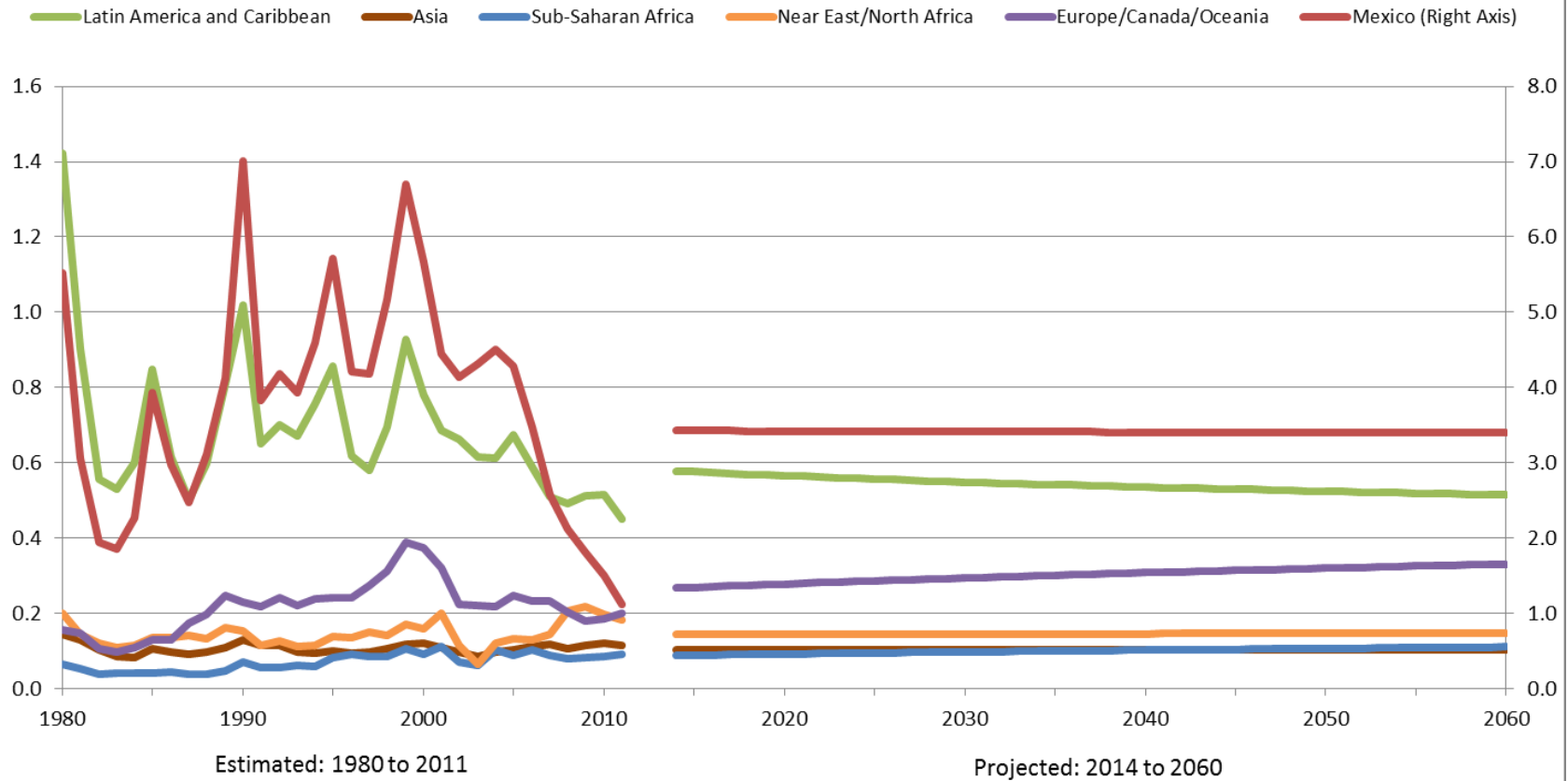
Source: U.S. Census Bureau, Population Division, International Data Base (2013b).

Figure 6. Immigration Estimates by Sending Region: 1980 to 2011
(In thousands)



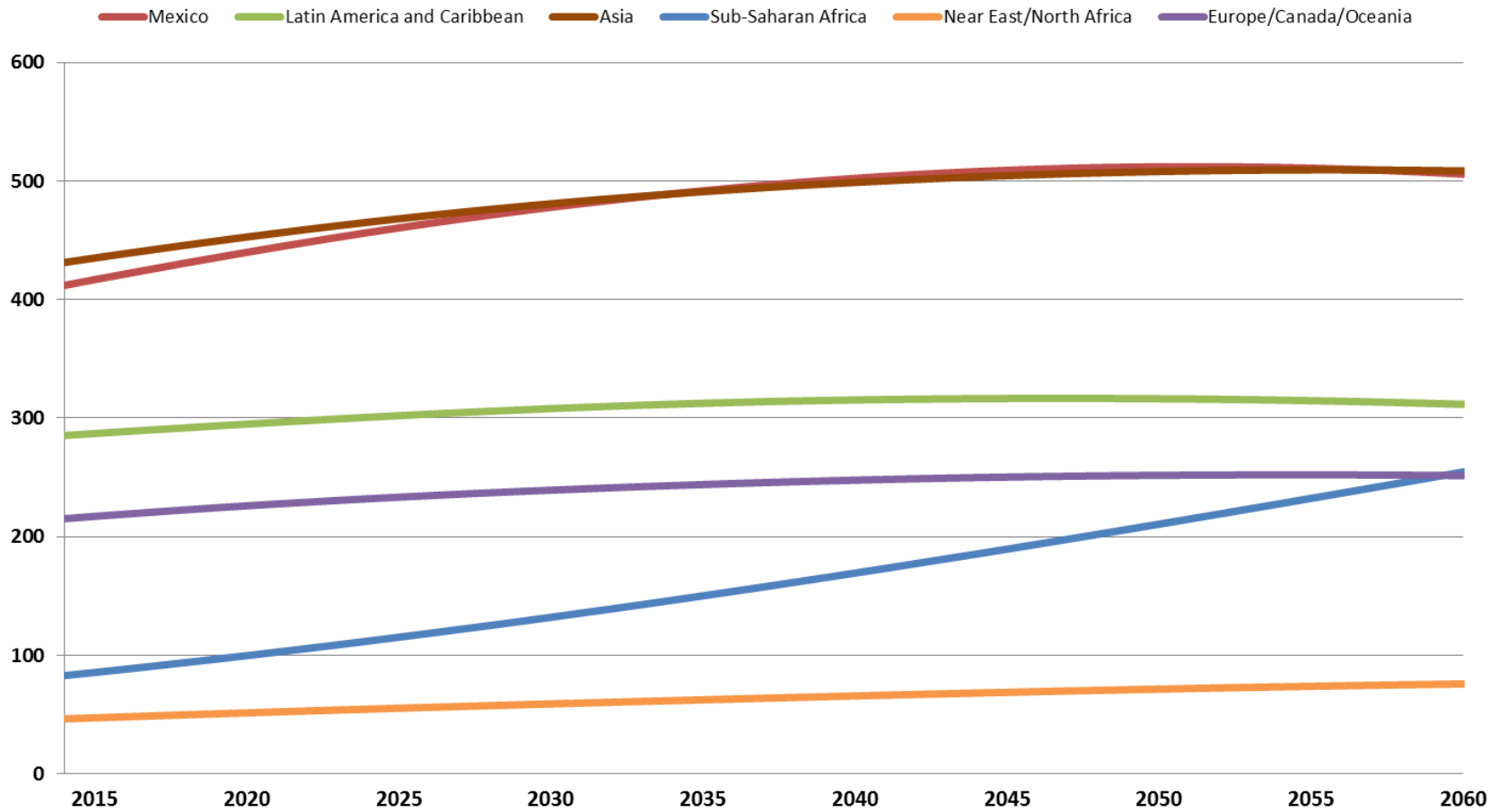
Source: U.S. Census Bureau, 1990 and 2000 Decennial Censuses and 2001 to 2012 American Community Survey 1-year estimates.

**Figure 7. Emigration Rates from Sending Regions to the United States:
1980 to 2060**
(Emigrants per 1,000 population)



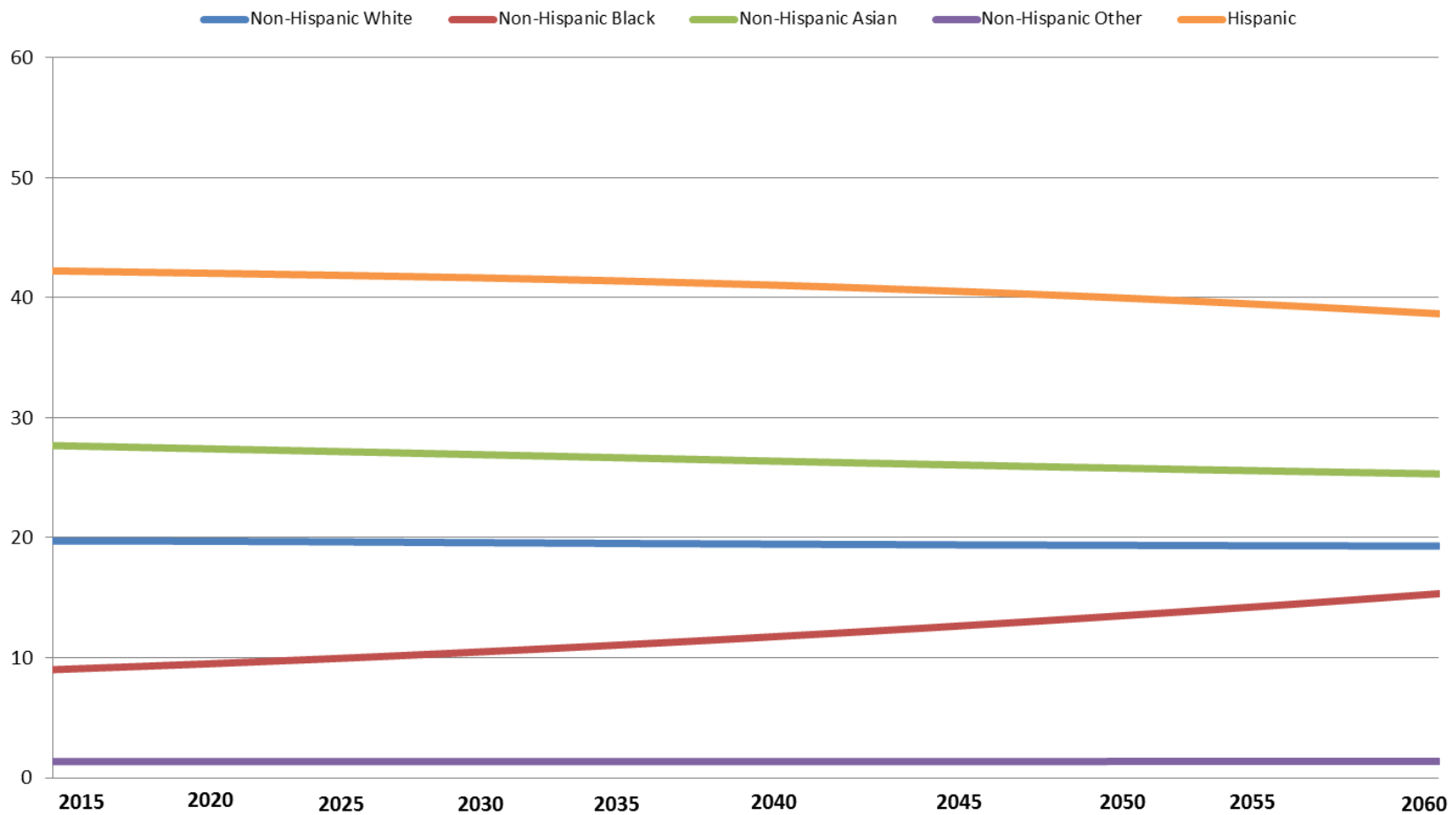
Note: Emigration rates from Mexico are much larger than those from other sending regions. A secondary scale shown, on the right of the figure, applies to rates from Mexico, while all other rates use the scale from the primary axis .
Source: U.S. Census Bureau, 2014 National Projections.

Figure 8. Projections of Foreign-Born Immigration to the United States by Sending Region: 2014 to 2060
(In thousands)



Source: U.S. Census Bureau, 2014 National Projections.

Figure 9. Distribution of Projected Foreign-Born Immigrants to the United States by Race and Hispanic Origin: 2014 to 2060 (Percent of total)

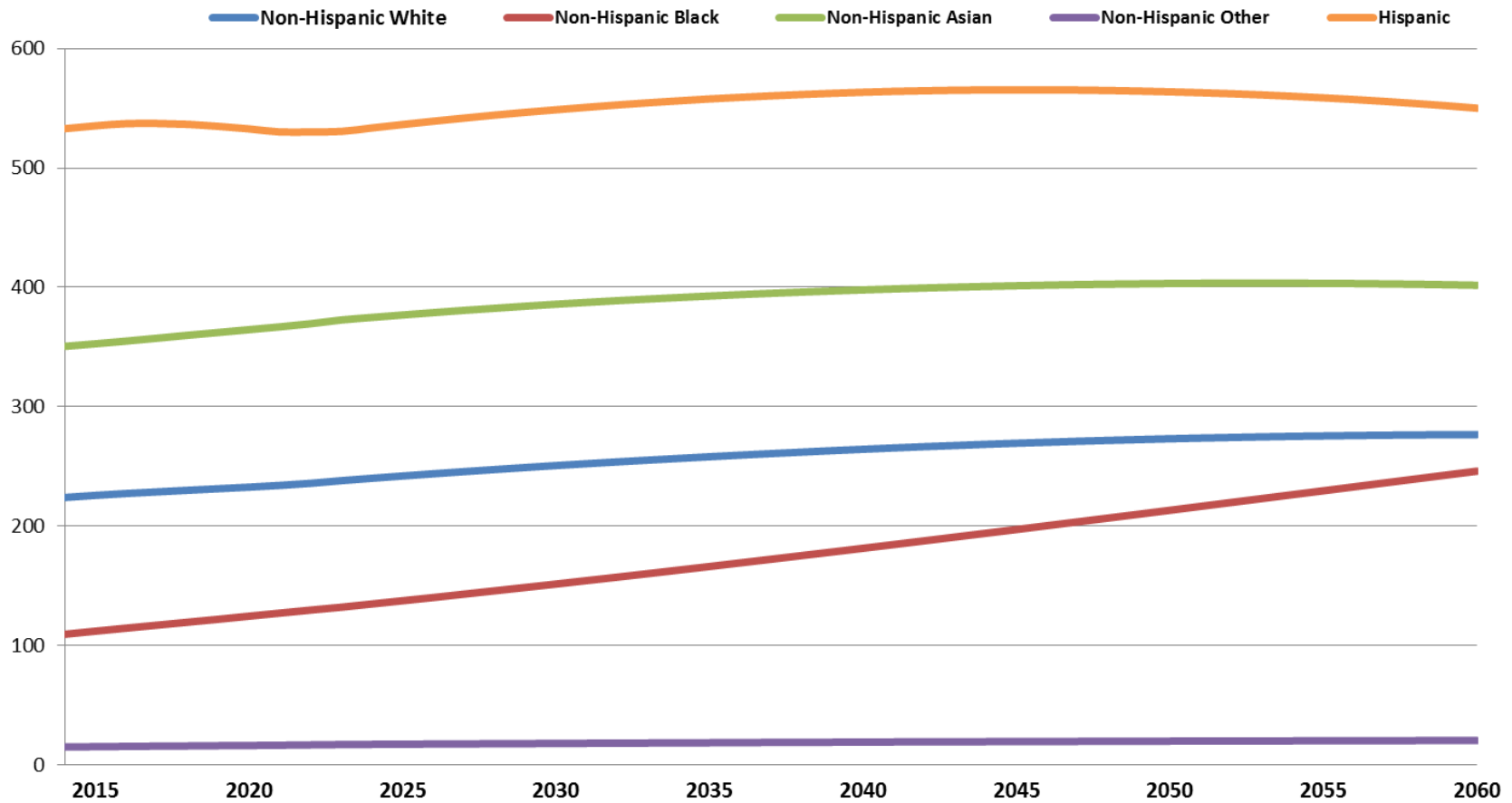


Source: U.S. Census Bureau, 2014 National Projections.

| Table 3. Foreign-Born Emigration Rates by Arrival Cohort, Hispanic Origin, and Sex | | | |
|---|------------------------|------------|---|
| Arrival Cohort | Hispanic Origin | Sex | Emigration Rate (per 1,000 population) |
| Recent Arrivals (0 to 9 years) | Non-Hispanic | Male | 1.719 |
| | | Female | 0.948 |
| | Hispanic | Male | 2.496 |
| | | Female | 0.542 |
| Earlier Arrivals (10 or more years) | Non-Hispanic | Male | 0.067 |
| | | Female | 0.222 |
| | Hispanic | Male | 0.411 |
| | | Female | 0.232 |

Source: U.S. Census Bureau, 2014 National Projections.

Figure 10. Projections of Net International Migration by Race and Hispanic Origin: 2014 to 2060
(In thousands)



Source: U.S. Census Bureau, 2014 National Projections.

| Year | Total | Non-Hispanic White | | | Non-Hispanic Black | | | Non-Hispanic Asian | | | Non-Hispanic Other | | | Hispanic | | |
|------|-------|--------------------|---------|-----------|--------------------|---------|-----------|--------------------|---------|-----------|--------------------|---------|-----------|----------|---------|-----------|
| | | Number | Percent | Sex Ratio | Number | Percent | Sex Ratio | Number | Percent | Sex Ratio | Number | Percent | Sex Ratio | Number | Percent | Sex Ratio |
| 2014 | 1,232 | 224 | 18.2 | 91.0 | 109 | 8.9 | 85.1 | 351 | 28.5 | 86.7 | 15 | 1.2 | 91.8 | 533 | 43.3 | 114.1 |
| 2020 | 1,271 | 233 | 18.3 | 89.6 | 125 | 9.8 | 86.4 | 365 | 28.7 | 86.6 | 16 | 1.3 | 92.0 | 533 | 41.9 | 112.4 |
| 2030 | 1,355 | 251 | 18.5 | 90.1 | 152 | 11.2 | 87.2 | 386 | 28.5 | 87.4 | 18 | 1.3 | 93.2 | 549 | 40.5 | 108.4 |
| 2040 | 1,426 | 264 | 18.5 | 90.5 | 182 | 12.7 | 87.9 | 398 | 27.9 | 87.9 | 19 | 1.3 | 95.4 | 564 | 39.5 | 107.5 |
| 2050 | 1,473 | 273 | 18.5 | 91.0 | 213 | 14.5 | 88.6 | 403 | 27.4 | 88.4 | 20 | 1.3 | 96.6 | 564 | 38.3 | 106.5 |
| 2060 | 1,495 | 277 | 18.5 | 91.6 | 246 | 16.5 | 89.1 | 402 | 26.9 | 88.8 | 20 | 1.4 | 97.8 | 550 | 36.8 | 105.3 |

Note: Numbers are in thousands. Non-Hispanic Other includes Non-Hispanic American Indian and Alaska Native, Non-Hispanic Native Hawaiian and Other Pacific Islander, and Non-Hispanic Two or More Races.

Source: U.S. Census Bureau, 2014 National Projections.