Race Projection Technical Notes

Population projections by race and ethnicity are developed with cohort-component methods. The model produces the births, deaths and migration separately based on historical trends and assumptions that link the Washington specific trends with national projections produced by the Census Bureau.

Base population

Population by age, sex and single year of age are downloaded from the Census Bureau's population estimate site as of April 2010. Race groups are based on OMB 1997 categories---White, Black, American Indian and Alaska Native (AIAN), Asian, Native Hawaiian and Other Pacific Islander (NHOPI), and Multiracial. Those are further categorized as Hispanic by race and Non-Hispanic by race. Altogether, the projection has 12 race and ethnic categories.

Fertility

The Fertility component is broken into two parts. For years from 2000 to 2018 actual Births are used directly in the projections as controls. Those data come from Center for Health Statistics, Washington Department of Health (DOH). OFM screened the race of both parents to determine the race of the child. The multiracial births include those whose mother and father are multiracial themselves, or they are of different races.

The model requires age specific fertility rates to compute the initial future births. The 2010 ASFR are computed for Hispanic, non-Hispanic White, non-Hispanic Asian and non-Hispanic other. This "other" group contains non-Hispanic Black, AIAN and NHOPI. Births used in this calculation are for April, and the denominator is 2010 census counts for woman 15-49. ASFRs are kept constant through the projection horizon as no significant change is expected.

From 2019 onwards, the model-projected births are controlled to the total fertility rates. For each race, we have run simulations to obtain the 2010 to 2018 TFRs that produced births at the same level as observed. Then we establish the 2040 TFR targets by comparing the race specific historical changes, as well as the trended relationship between the Washington TFR and the TFR for the United States.

Additional adjustments are made to the TFR for multiracial and AIAN categories.   It is difficult to calculate the TFR for the multiracial category because it is impossible to obtain the denominator, women aged 15-49 at risk of having a multiracial child, therefore, we did not update these assumptions in 2019. To estimate this rate in 2016, we trended the growth rate between 2000 and 2015 to set up the 2040 target of 16,000, adjusting the TFR to meet that target. For the AIAN projections, the race of mother is used to identify AIAN births and these births are used to trend the AIAN births. This decision is based on comparison of the TFR driven births against the population age 0 in 2010. The observed AIAN births using both parents' race results in far fewer 0 year olds than are found in the 2010 Census. Using the race of the mother brings the 2010 AIAN births much closer to the 2010 Census counts for the 0 year old population. Finally, births are adjusted proportionally so that total births across all race/ethnicity groups total the forecasted births in the 2018 November State Forecast.

Mortality

To project mortality, the cohort-component model needs single year of age, sex and race specific survival rates and life expectancies (also referred to as E_0) by sex and race as inputs. The 2019 update of

the 2016 Race Projections did not change the life expectancy expectations developed in 2016. The below methods were used to develop the expectations in 2016.

The initial age and sex specific survival rates for Hispanics, Non-Hispanic Whites, and Non-Hispanic Blacks used in the model are from the National Center for Health Statistics for 2010. When the model generated deaths by race, they are compared to actual deaths for 2010-2015. The difference are between the projected and observed is used to create an adjustment factor. This factor is used to set up Washington age, sex, and race specific E_0 target for 2040. The final survival rates between 2015 and 2040 are determined from a calibration routine that adjusts all the postcensal survival rates to the 2040 E_0 target.

To produce Washington specific life expectancy by sex and race for 2017 to 2040, we use three data items: (1) U.S life expectancy by sex; (2) U.S life expectancy by race from Census Bureau 2014 projection; and (3) Washington life expectancies by sex from OFM 2016 state forecast. We first develop a ratio between US total by sex and by race/ethnicity specific life expectancies in formula (1); then apply that ratio to Washington's total life expectancy by sex to develop Washington's sex and race/ethnicity specific E_0 in formula (2):

(1) $R_{sex*race} = (U.S.\ E_{0\ sex*race})/(U.S.\ E_{0\ sex})$

(2) $(WA\ E_{0\ sex*race}) = (WA\ E_{0\ sex})*R_{sex*race}$

As we did with survival rates, those initial E_0 values for 2010 to 2015 period are compared to E_0 calculated with the actual data. Further adjustments are made so that the observed and expected agree with each other.

Once the survival rates and life expectancies are both developed and tested to satisfaction, the survival rates are applied to the beginning year population by age, sex and race to produce the initial projected deaths. The model then uses those deaths to calculate projected E_0, which are compared to the expected E_0 and adjusted again until they converge. Final adjustments are made so that total deaths across all race/ethnicity groups sum to the forecasted deaths in the 2018 November State Forecast.

Net migration

Migration is developed for two separate periods: 2010-2018 and 2019-2040.

The 2010-2018 migration numbers are estimated based on 2000-2010 race and ethnicity specific migration patterns developed by University of Wisconsin-Madison, as well as racial distribution of migrants reflected in the Census Bureau's population estimates for Washington State.

For the projection period between 2019 and 2040, American Community Survey (ACS) migration data are incorporated in developing the racial distribution for net migration. We used the 2017 ACS 5 year data to get interstate net migration and immigration by race and ethnicity. We estimated emigration by applying emigration rates developed for the Census Bureau's 2014 Population Projections to OFM's SADE estimates by race, ethnicity, and sex.

From mid-2000's, the U.S and Washington have been receiving a fairly significant increase of immigrants from African and South American countries. Since the trend is relatively short, it is difficult to make an assumption about what the future trend might be. Therefore, we assume that it will increase at the

current rate until 2020, and then start to decline. The distribution will be adjusted when we see a clear change in the future trend of this group.

As a final step, we calculated the proportion of net migration by race and controlled to the total migration from the November State Forecast.

References:
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