Appendix 1d

A brief description of Metro's population forecast model

Forecast Method

Metro utilizes the cohort component method to project the total population size of the Portland-Vancouver-Hillsboro, OR-WA MSA (Portland MSA) as well as each 5-year age group for a future forecast horizon of at least 20 years. The cohort component technique uses the components of demographic change to project population growth. The technique projects the population by age groups, but unlike other standard population models the demographic attributes of sex and race are blended. This projection method is based on the components of demographic change including births, deaths, and migration. Recognizing that vital statistics differ significantly across race and sex, the Metro model uses weighted averages for the components of demographic change.

Implementation

The cohort component equation simply projects the total population size – in 5-year age groups – by estimating the number of residents who survive or are expected to be alive in the future. Add to this survived population number, the number births that take place and the number of net migrants in order to arrive at the total future population size.

Assumptions

When the cohort component method is used as a projection method, it assumes the components of demographic change for **mortality, fertility, and migration.** The Metro cohort population model arrays fertility rates in 5 year age groups for the population between ages 10 to 49. Age specific fertility rates are calculated from census of population and vital birth statistics for the Portland MSA. Similarly age specific mortality rates are calculated from the same sources for each 5-year age group.

The base year is pegged to the 2010 Census.

Future year annual estimates for mortality and fertility are assumed to change over time to reflect observed on-going demographic trends including improvements in life expectancy, delays in pregnancy in the age of the mother and overall lowering total fertility rate. The changes in the vital assumptions mirror the latest assumptions adopted in the 2012 U.S. Census national population projection. The Metro model implicitly considers differences in birth and death rates by race and sex in a blend of these vital rates for the forecast of future population. A blended rate – each for births and deaths – in which the weights are based on the 2010 share of Portland MSA population by race and sex.

The total fertility rate (TFR) assumed falls to 1.81 in 2040 as compared to the 2010 estimated TFR of 1.86, representing a modest decrease in fertility rates projected for the next 30 years. Life expectancies

are expected to improve; this is reflected in a modest decrease in the age specific mortality rates for each age group. The largest improvement in the survival rate is seen in retirement-age cohorts.

Net migration for the Portland MSA is calculated from Metro's in-house economic model. This model assumes regional net migration is tied into the relative economic performance between our region and neighboring economies and the U.S. For example, migration rates increase when Washington State employment grows faster and conversely, when California employment grows relatively slower, regional migration surges ahead. In contrast, the relationship between the region and the U.S. is found to be correlated with relative payroll wages. The estimated relationship predicts that when regional wages surge faster than the U.S., migration into the region increases. The Metro migration equation ties in the economic projections of employment and wages from Metro's economic model directly with the cohort population model.

Net migration from the Metro migration equation is split into age groups consistent with the cohort population model. The shares for splitting migration into 5-year age groups are assumed to remain constant through the projection period. The initial shares are derived from decennial Census data.

The cohort component approach produces a "baseline" projection of future population size. The demographic assumptions for each component of population is assumed to be based on values that will generate a growth scenario that represents the forecasters best guess using available information.

Probability model and the range population projection

Metro requires a population range forecast for its planning purposes. This is represented by 5 growth scenarios: high, medium-high, baseline, medium-low, and low. The basis for these alternatives is a monte carlo simulation approach that perturbs the population components for births, deaths and migration within the historical variance or a perceived standard forecast error of each population component.