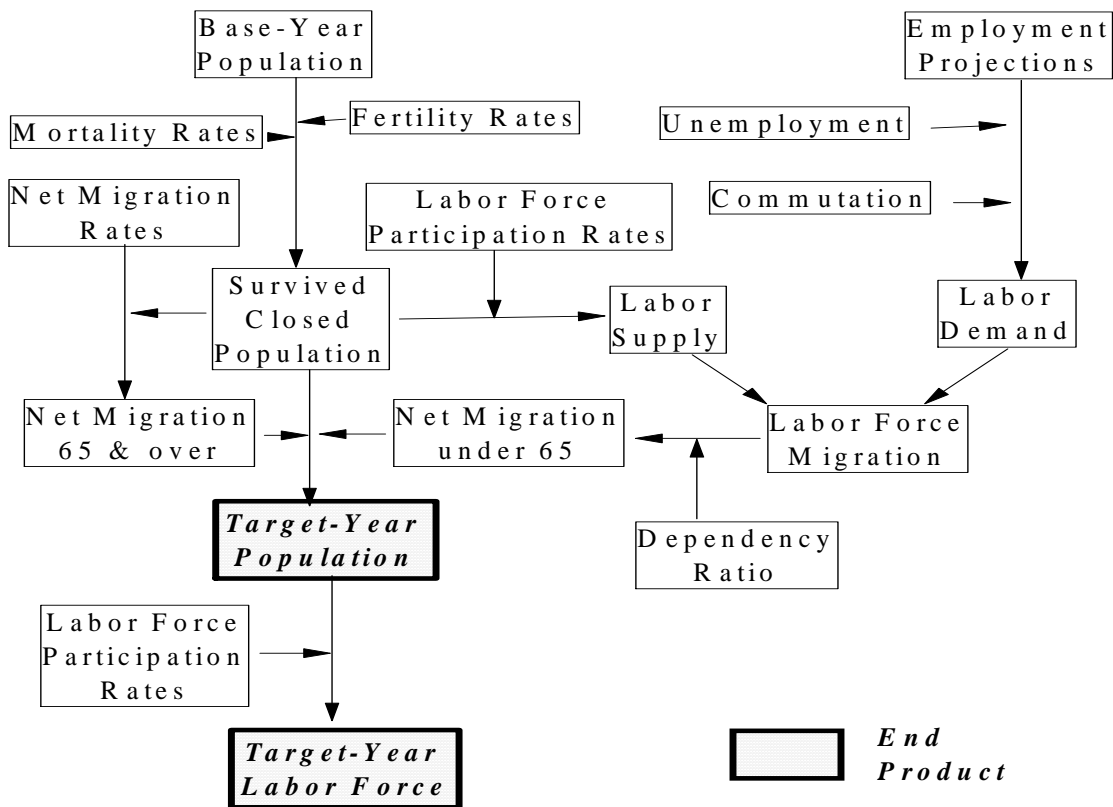


METHODOLOGY - THE PROJECTION MODELS

Four projection models were used in preparing population projections for the state. The *Economic-Demographic Model* used both economic and demographic inputs. The *Historical Migration Model* is a pure demographic projection that applies the migration trend of the 1990-2004 period to the future years. The *Zero Migration Model*, or Cohort Survival Model, assumes no net migration at the state level. The *Linear Regression Model* is a linear extrapolation of the state's total population from 1900 to 2002. The *Economic-Demographic Model* is designated "preferred" because of its greater scope of the input information and its consistency with the employment projections, which were developed as a part of this Department's *Projections 2014 Series*. The labor force projections and all county projections are prepared based on the *Economic-Demographic Model* only.

THE ECONOMIC-DEMOGRAPHIC MODEL

Population and Labor Force Projections Economic-Demographic Model



The *Economic-Demographic Model* is based on standard demographic projection procedures, but assumes employment growth to be the major determinant of migration in and out of the state for persons under 65 years of age. The model is, therefore, driven primarily by labor demand, which is estimated based on the employment projections prepared by this department.

The Cohort-Component Method

The basic projection procedure used in this model is known as the *cohort-component method*. For each five-year cycle of the projection, a base population distribution by age, race, sex and Hispanic origin is "aged" five years. Each five-year age group is reduced through a survival ratio to account for mortality during the five years. Births are computed by applying five-year age-race-sex-specific fertility rates to the female age groups from 14 to 45. After adjustment for mortality through a survival ratio, the five years of births become the projected group 0 to 4 years of age. Net migrants derived primarily from labor demand and supply are added to the resulting projected population by age, race, sex and Hispanic origin. This procedure is repeated for each five-year interval in the projection period. Specific inputs and their methods of development are discussed separately below.

Base Population

The base population used in the projection is the July 1, 2004 estimates by age, race, sex and Hispanic origin. Age is defined by five-year groups from age 0 to age 84, with an open category for age 85 and over.

According to the US Bureau of the Census, 450,972 persons in New Jersey were enumerated as "some *other (not specified) races*" in the 2000 census. These people were not included in any racial categories listed on the census form but were included in all race-related tabulations. In order to be consistent with the race classification guidelines defined by the Office of Management and Budget's Directive No. 15 and other administrative data, the census race statistics were modified to include only specified race categories (white alone, black alone, American Indian & Alaska Native alone, Asian alone, Native Hawaiian & other Pacific Islander alone, and persons reported more than one races). The "modified" census 2000 data also include a redistribution of certain multiracial persons, whose races include "*some other races*", to a single race category.

The age-race-sex and Hispanic origin distribution of the 2004 population estimates prepared by the Census Bureau is consistent with the 2000 census *Modified Race* data and includes estimated changes from 2000 to 2004. Thus, the base population of this projection reflects the demographic characteristics of the latest decennial census and the recent trend.

Fertility and Mortality

Age-specific fertility rates by race and Hispanic origin were used to compute births to women in each five-year interval. The fertility trend was determined from the national "middle series" projections of fertility by age, race and Hispanic origin of mother. Rates for New Jersey were adjusted to reflect the relationship of the state rates to the national rates in 1990-2000. In the national projections, little change from the recent fertility level is projected. Based on the national trend, New Jersey's race-specific fertility rates are projected to change gradually from 1.8 births, 2.0 births and 2.5 births per white, black and Hispanic woman in 2004 to 1.9 births, 2.1 births and 2.4 births per white, black and Hispanic woman, respectively, in 2014.

Similar reasoning was used in the projection of mortality. State survival ratios by age, race, sex

and Hispanic origin were projected on the basis of the US Census Bureau's "middle mortality assumption" for the nation, and incorporating the recent mortality differences between New Jersey and the nation. Mortality rates for both the nation and the state are projected to decline gradually. (The annual births and deaths data for the state are provided by the New Jersey Department of Health and Senior Services.)

Migration of Persons Under 65 Years of Age

Projected migration for persons of working age and their children is based on the projected civilian labor market and constitutes the assumption that distinguishes this model from pure demographic models. In simple terms, an over-supply of labor relative to demand for workers results in a net out-flow of persons from the state while higher demand relative to supply results in a net in-flow of migrants. Net migration is, therefore, based on the size of the civilian labor force needed to balance the labor market.

Labor supply is estimated by applying projected labor force participation rates to civilian non-institutionalized persons 16 years of age and over in the population projected without migration (i.e., the "survived closed population"). These rates are based on national labor force projections by age, race, sex and Hispanic origin produced by the US Bureau of Labor Statistics until 2014¹. The increase/decrease pattern for each age-race-sex group projected between 2004 and 2014 is assumed to continue to 2025, but at a slower pace. The differences in participation rates between the nation and the state are carried over throughout the projection period.

Labor demand is determined by employment projections adjusted to a residence basis and the projections of unemployment rates. Employment projections reflect the historical growth of industries in the state and the projected growth by industry at the national level (published by the US Bureau of Labor Statistics). Population from the *Zero-Migration* projections was, in turn, input to the 2014 employment projections for selected industries. The state's employment is projected to grow at 1.0 percent per year during the 2004-2014 period. Between 2014 and 2025, the state's employment is assumed to continue to grow but at a relatively slower pace. Adjustment of employment to a residence basis is necessary due to commutation across state boundaries, self-employment and multiple-job holdings.

Finally, net migration of the labor force is determined by the balance of demand and supply, allowing a level of unemployment projected for the state. The resulting labor force net migrants are inflated to include children and adults under 65 years old who are not in the labor force and are distributed by age, race, sex and Hispanic origin according to the projected labor force participation rates and migration patterns observed in the 1995-2004 period.

Migration of Persons 65 Years of Age and Older

Migration patterns of persons 65 years of age and over are assumed to follow their migration patterns estimate based on the 1990-2004 data. Rates by age, race, sex and Hispanic origin were inferred from the five-year change in birth cohorts, and by an adjustment to the 1990-2004 annual estimates of the population 65 and over by race, sex and Hispanic origin. Differences in net migration rates among races are further assumed to converge gradually in the 21st century.

ALTERNATIVE PROJECTION MODELS

Three additional projection models were attempted for the purpose of presenting population

¹ The national labor force projections, 2004 to 2014 prepared by the US Bureau of Labor Statistics were published on the November 2005 issue of the *Monthly Labor Review*.

growth scenarios that could occur under different input assumptions. The *Historical Migration Model* is also based on established demographic techniques (i.e., the cohort-component method). The only difference between the *Historical Migration Model* and the *Economic-Demographic Model* is the migration assumptions. The projected population from these two models may be used as a range for possible population change in the future. The *Zero Migration Model* and the *Linear Regression Model* projections were prepared primarily for illustrative purposes and are intended only for comparison to other models.

The Historical Migration Model

The assumptions of the *Historical Migration Model* projection regarding base population, fertility and mortality are the same as those of the *Economic-Demographic model* discussed above. Net migrants by age, race and sex are inferred from 1990 to 2004 based on the census data, population estimates and annual vital statistics; and are then converted to net migration rates.

Rather than inferring migration under age 65 by economic factors, the *Historical Migration Model* applies the past net migration rates directly to the population distributed at each projection interval. Migration rates are assumed to gradually converge by race and sex, which implies that the rate differences among races and sexes will diminish while the effect of age on net migration will rise. Thus, the model is purely demographic which assumes that future components of population change are an outgrowth of past components of population change.

The Zero Migration Model

The *Zero Migration Model* is presented as an illustrative projection of the population change that would occur in New Jersey in the total absence of net migration. As migration tends to be the major distinguishing factor in sub-national projection models, a model that eliminates it altogether can provide a useful analytical tool. Comparing the *Zero Migration Model* with either the *Economic-Demographic* or *Historical Migration Models* reveals the impact of migration on population growth according to each of the two models.

Like the two models previously discussed, the *Zero Migration Model* is also a cohort-component projection. The base population, as well as projected fertility and mortality are the same as that assumed in the previous two models. Age-race-sex-specific migration rates are all set to **zero** for the state.

Linear Regression Model

The *Linear Regression Model* is presented primarily for comparison to the *Economic-Demographic* and *Historical Migration Models*. It hypothesizes that the population growth observed in New Jersey from 1900 to 2004 will continue until 2025. Unlike the three other models, it is *not* a cohort component projection but a simple extrapolation of past total population trends. The main feature of the model is the extensive history of population change on which it is based. The method employs ordinary least squares regression on a time series for the state. Total population measured by decennial censuses from 1900 to 2000 and the 2000-2004 estimates were regressed on time, the predicted coefficients are applied to years 2009, 2014, 2020 and 2025.

CIVILIAN LABOR FORCE PROJECTIONS

Projected civilian labor force is obtained by applying the projected age-race-sex-Hispanic origin specific labor force participation rates to the civilian non-institutionalized population aged 16 and over derived from the *Economic-Demographic Model*. The military personnel and institutionalized population in New Jersey are assumed to be constant at its 2004 level through the projection period. The projections of total population and labor force participation rates were discussed in the previous sections of this document. Definitions of labor force and participation rates in this projection follow that of the decennial census, which differ slightly from those used in the US Bureau of Labor Statistics' (BLS) publications. Numbers published by BLS are based on annual averages computed from monthly sample surveys (i.e., Current Population Survey), which were taken by trained interviewers while census data were reported by individual respondents on the census date and cover all civilian population.²

² Beginning in January 1996, the state labor force estimates are generated from BLS-developed statistical models due to a sample reduction in the Current Population Survey (CPS). However, the CPS survey result still is a major input to the statistical model.