

## Methodology

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Baseline census figures for North Dakota are presented in this report by age and gender for 1980, 1990, and 2000 along with projections for the years 2005, 2010, 2015 and 2020. This report updates the projections released in January 1999 (Rathge, et.al., 1999). The new projections were developed using a standard cohort-survival model. These new figures were based on census trends that reflect downward movement among most rural counties and upward growth among the counties with larger urban centers. Our assumptions reflect a weakening of the flow of North Dakota's population from the farmsteads and small rural communities into the metropolitan centers which will have a moderating effect on the state's population. In addition, the state's largest populated counties will continue to grow thus resulting in a modest growth pattern for North Dakota over the next two decades.

### Cohort-Survival Model

A cohort-survival model is one of the most commonly used projection techniques. In brief, a set of rates for births, deaths, and migration are applied to baseline population figures to determine the population at a later point in time. Generally, this technique assumes that these rates will continue unchanged, in a linear fashion, through the course of the projection period. Although complete stability in rates is unlikely, the model does provide a reasoned scenario for projecting the size and distribution of future populations. However, adjustments were made to the linear modeling, especially in the case of small counties, when such trends resulted in an unreasonable outcome. For example, it is unlikely that any age cohort would decline to zero, though this scenario would have been projected in several counties if the model was left uncorrected. The assumptions made about trends in births, deaths, and migration are described below.

#### *Birth Rates*

The number of births projected to occur in each county was derived from age-specific fertility rates. These rates were based on a three-year average of the total number of births to mothers by age cohort for the years 1998 through 2000. The three-year average was used to control for year-to-year variations. Fertility rates were calculated for mothers between 15 and 44 years of age. Births occurring to mothers outside these ages were averaged into the top and bottom age cohorts. County-specific fertility rates were used in the model. It was assumed that these rates would continue throughout the projection period.

#### *Death Rates*

Rates of death in North Dakota are very similar among counties. Therefore, a single statewide rate was used for all counties. The rates reflect age- and gender-specific mortality based on an average for the years 1998 through 2000. Once again, the three-year average controlled for year-to-year fluctuations in deaths. The actual rates were calculated using a standard life table (Hamm and Azam, 1991).

#### *Migration Rates*

Age- and gender-specific migration rates were calculated using a residual technique (Shryock and Siegel, 1976). The rates reflect the age-specific migration patterns from 1990 to 2000. In some cases, the migration rates for counties with small populations were modified to better reflect historical trends. For example, in some counties the number of residents in various age groups is extremely small. Slight changes in these age groups can result in sizeable migration rates which do not accurately reflect the migration experience. Therefore, migration rates were moderated in extreme cases.

### Limitations of Population Projections

Population projections are mathematical calculations that illustrate what the population will be in the future if specific assumptions persist throughout the projection period. Although information depicting North Dakota's resident population is relatively accurate, the ability to forecast substantial changes in any socio-economic or demographic process which may alter current population trends is tenuous at best. Therefore, it is wise to utilize these projections with caution. They should not be viewed as the sole element in planning or decision-making, rather as only one tool in the process.

## **Methodology (continued)**

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### **References**

- Hamm, Rita R. and Syed Azam. North Dakota Life Tables 1960, 1970, 1980, and 1990. North Dakota Census Data Center Report No. 17, Department of Agricultural Economics, North Dakota State University, Fargo, North Dakota, September 1991.
- Rathge, Richard W., Carrie Jacobsen, Andrea Huseeth, Abu Husain, Karen Olson, Kay Olson and Andrea Schuler. North Dakota Population Projections by Age and Gender, 2000-2015. North Dakota State Data Center, North Dakota State University, Fargo, North Dakota, January 1999.
- Shryock, Henry S. and Jacob S. Siegel. The Methods and Materials of Demography. Condensed edition by Edward G. Stockwell. New York: Academic Press, 1976.