Vermont Legislative Joint Fiscal Office

The Challenges of Projecting Vermont's Population

Projecting Vermont's population over the next couple of decades is both important and highly challenging. Population projections for the State of Vermont, and projections of the size of different age groups, are critical to planning for vital governmental services such as education, health care, and transportation. They also affect expectations of future State revenues from taxes and fees. State population projections influence business decisions to expand the production of goods and services or to relocate in search of workers. Nonprofit organizations gauge the need for their services by looking ahead at the size and characteristics of different age groups.

The U.S. Census Bureau issued interim projections for Vermont in 2005 but has no plans to update them. Two current projections from different parts of State government forecast similar population totals for 2020 and 2030 but somewhat different views of how the size of different age groups will evolve over time. Other projections are done under contract for specific areas such as health care. A working group has started to grapple with developing a unified approach that will serve the needs of the various users of population projections.

Historical swings in the State's population growth rates suggest no straightforward way to project how total population or the age distribution will look going forward. Vermont's population grew 14 percent in the 1960s and 15 percent in the 1970s. But the rate of growth slowed to 9 percent in the 1990s and 2 percent in the 2000s. The Census Bureau tells us that Vermont's population fell ever so slightly in 2012 and again in 2014. Vermont fertility rates are below the national average. The number of school-age children has fallen substantially and the number of people ages 65 and older is climbing. What is the best way to make projections of the State's population for the next couple of decades?
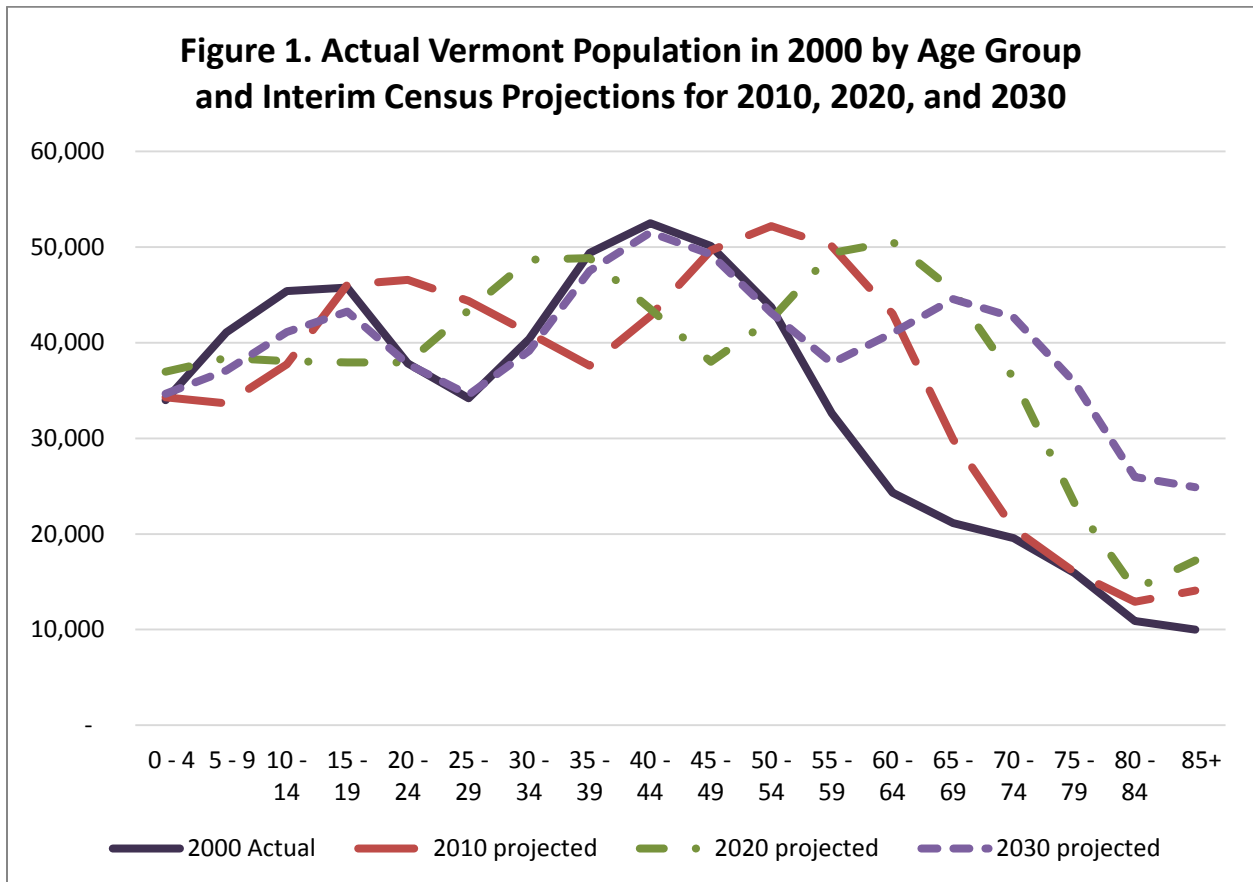
Census Bureau Interim Projections

In 2005, the Census Bureau issued "interim" population projections for Vermont for the years 2010, 2020, and 2030.[1] The interim projections were produced for each of the 50 states and the District of Columbia by age and sex and reflect the population on July 1st of each year. The

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[1] The interim projections for Vermont in 2010, 2020, and 2030 are available at https://www.census.gov/population/projections/data/statepyramid.html. Additional information is available at https://www.census.gov/population/projections/data/state/projectionsagesex.html.

starting point for those state-specific projections was the interim population projection for the entire United States issued in 2004. The Decennial Census conducted in 2000 was the basis for the interim projections using the general assumption that then-recent trends in fertility, mortality, domestic migration, and international migration would continue. The Census Bureau has not issued updates to the interim population projections for Vermont and has no plans to do so.

The interim projections suggested strong growth in Vermont's population through 2030. The overall population was projected to increase about 16 percent from 608,827 to 711,867. That growth was not evenly distributed across age groups, however. The baby boom that took place in the United States between 1946 and 1964 continues to dominate the distribution of people by age groups for the next few decades (see Figure 1). Almost all of the population growth between 2000 and 2030 in the interim projections was for ages 55 and above. The number of people age 65 or older was expected to more than double. Over the same period, the number of young adults in the age group 25 to 44 was expected to drop about 2 percent, and the number of school-age children was projected to decline about 8 percent.

Figure 1. Actual Vermont Population in 2000 by Age Group and Interim Census Projections for 2010, 2020, and 2030

Much has happened since those projections were published in 2005. Actual rates of fertility, mortality, and migration have turned out to be different than projected, and demographers have revised their projections of fertility and mortality rates going forward. The U.S. economy suffered the worst economic downturn since the Great Recession in the late 2000s and is still

struggling to recover from it. That economic downturn affected not only birth rates and perhaps death rates but also migration into and out of Vermont. It is unclear if those rates will return to pre-downturn levels or remain permanently changed.

To get an idea of the challenges associated with using the 2005 Census projections for Vermont's population in 2015 and beyond, we look at Vermont's actual population in 2010 as reflected in the 2010 Decennial Census compared to the interim projection for Vermont's population in 2010. The actual population was 625,792 or about 4 percent lower than the interim projection of 652,512. In addition, the discrepancies vary considerably across different 5-year age groups (see Figure 2). The greatest discrepancies occur in the age groups 25-29 and 30-34 where the actual populations are 19 percent lower and 25 percent lower, respectively, than was projected. Those misses are especially important because they encompass the age cohorts of young women who are most likely to have children.[2] Fewer potential new moms will lead to fewer young children. Indeed, we see that the number of children ages 0 to 4 was about 8 percent lower than was projected in the interim projections. Another age group where significant differences arise is the oldest old, or those who are age 85 or older. The actual population in that group was about 9 percent lower than projected.

Figure 2. Vermont Population in 2010: Interim Census Projection vs. Actual

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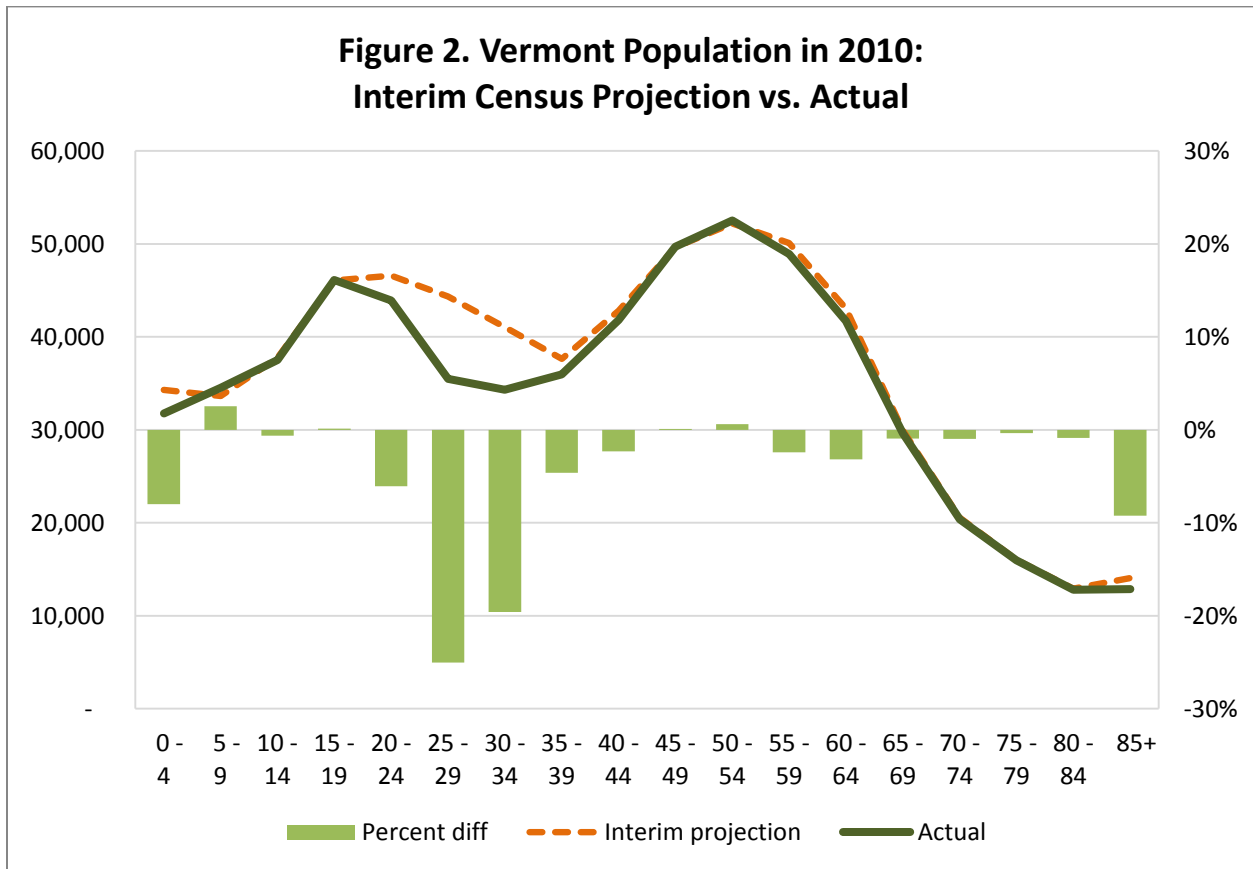
[2] Martin, J.A., Hamilton, B.E., Osterman, M.J.K., Curtin, S.C., and Mathews. T.J. (2014). Births: Final Data for 2013. National Vital Statistics Reports, 64(1). Hyattsville, MD: National Center for Health Statistics. http://www.childtrends.org/wp-content/uploads/2014/07/79_fig2.jpg

Two Existing Projections of Vermont's Population

Given the outdated Census Bureau interim projections, two more recent efforts using different methods offer different views of Vermont's population going forward (see Figure 3). The Consensus-Joint Fiscal Office-Administration projections, known as the CJFA projections, use the growth rates by single year of age from the interim projections together with the most recent historical population estimates from the Census Bureau. Projections from the Agency of Commerce and Community Development, known as the ACCD projections, use the 2010 Decennial Census numbers together with birth rates, death rates, and net migration rates by 5-year age groups from recent history to make projections for 2020 and 2030.

Figure 3. Vermont Population Totals: 2010, 2020, 2030
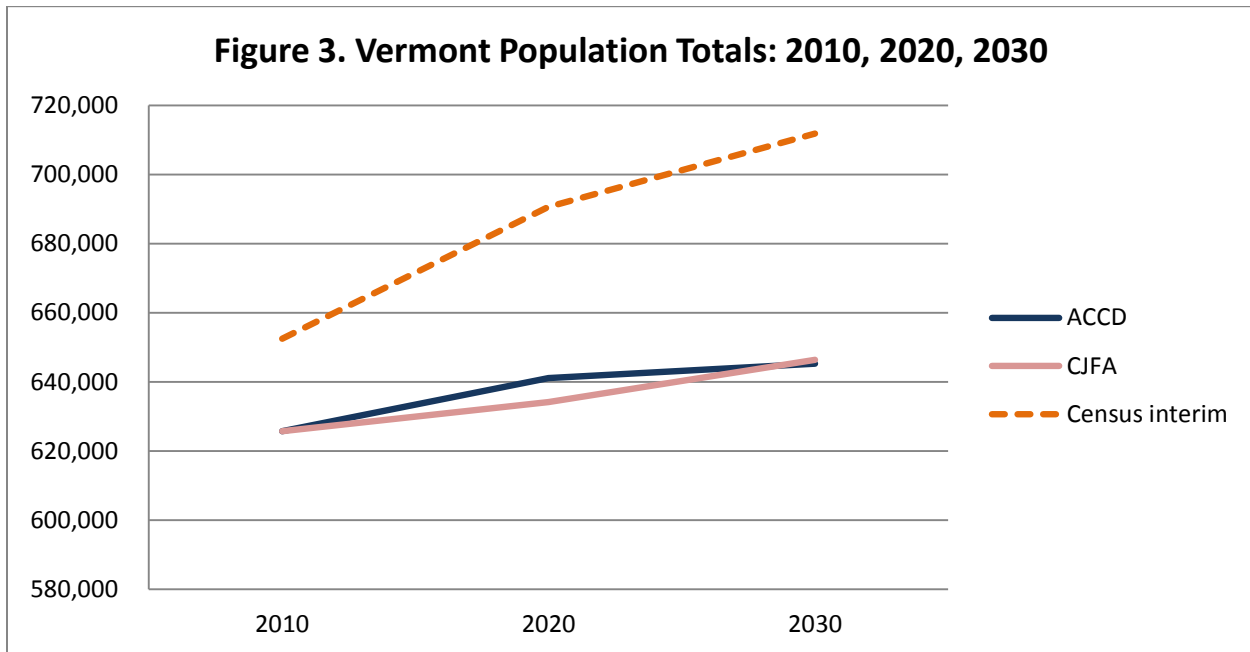
Each of the different approaches results in a different distribution of the population by age group (see Figures 4 and 5). The CJFA projections show more children and fewer older people than the ACCD projections in 2020 and 2030. The age distribution can be important when forecasting demand for educational services, the supply of working-age people, or the demand for health care and other services among older people, for example. Projecting future tax revenues in the State will also depend on the age distribution of the population.

Figure 4. Population Projections for 6 Age Groups: 2020
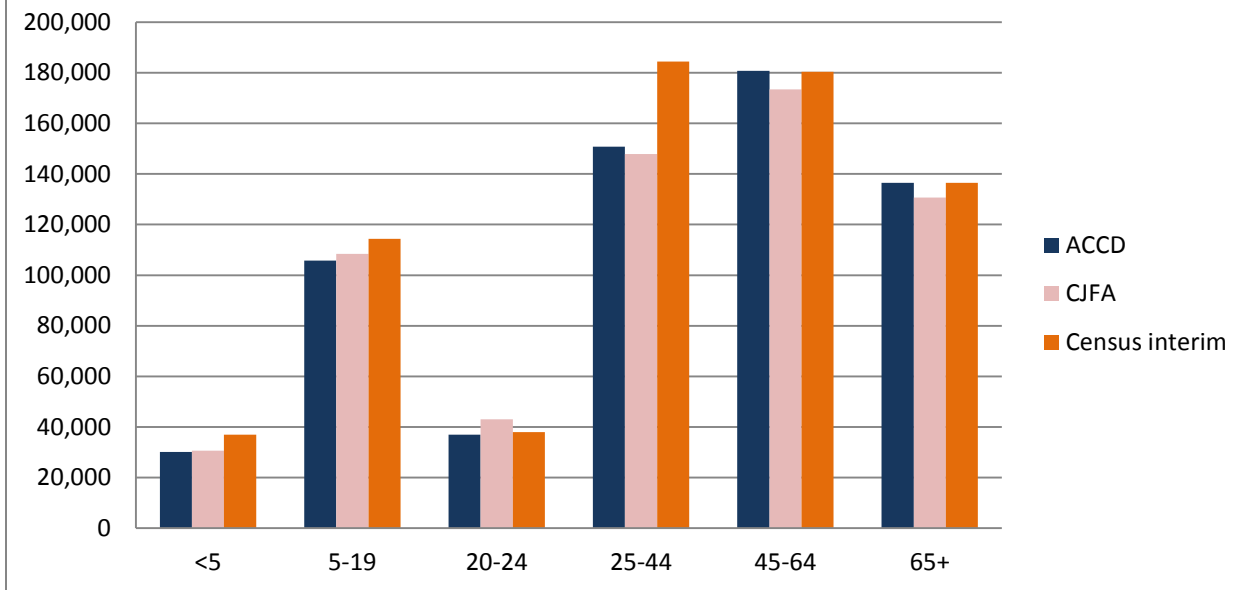
Figure 5. Population Projections, by 6 Age Groups: 2030
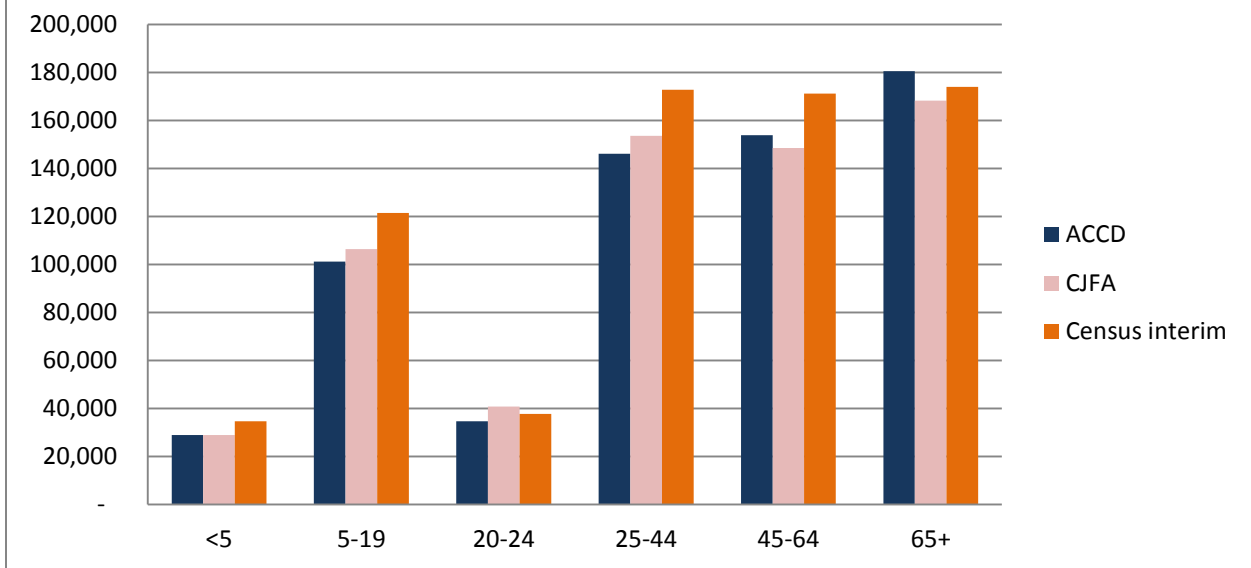
The CFJA Approach. The CFJA approach uses survival rates to move the number of people in each single year of age and sex group into the following year for ages 1 to 85 plus. If there were 100 people age 50 in year t and we observe 99 people age 51 in year t+1, the survival rate is 99 percent. That survival rate reflects the net result of the death rate, the in-migration rate, and the out-migration rate and reflects national trends in fertility, mortality, and migration rates as projected in the early 2000s. Starting levels of survival rates differ across states; trends do not.

The historical fertility rate of women of child-bearing age and the net migration rate for newborns determines the number of newborns (age 0) in each year.

A potential problem with the survival rate approach is that unpacking the components of the rate is not possible if we believe that one component has changed in a particular way. If we believe that death rates have declined since the projection was made, for example, it is not possible to know how much to adjust the survival rate without knowing the other components of the survival rate.

The CJFA approach recognizes that the survival rates embedded in the interim Census projections out to 2030 are now outdated, so the most recent historical population by single year of age (2013) becomes the base-year starting point. In each projection year, the previous year's population by single year of age is multiplied by the interim Census survival rates for the relevant age. Population totals in the projection years are scaled to match those of Moody's forecasting service for Vermont with some additional adjustments to reflect local demographic trends. As time marches forward, the outdated survival rates will drive the age distribution of the population farther from the trends suggested by recent evidence on fertility, mortality, and migration.

The primary purpose of the CJFA population forecasts has been to make projections associated with State revenue and budgetary analyses and forecasts, which have relatively short horizons of not more than 5 years. The implications of differences in the survival rate will be less pronounced in the short term. The CJFA projections have also been used as inputs for various legislative inquiries and studies with longer time horizons, but rarely beyond 2030.

The ACCD Approach. Population projections from the ACCD look at 5-year age groups and use mortality rates, birth rates, and net migration rates from 1990 to 2010 and trends in those rates to make two sets of projections.[3] Starting with the 2010 Decennial Census population, it forecasts Vermont's population in total and for 5-year age groups in 2020 and 2030 using two scenarios. Scenario A incorporates the higher rates of in-migration in the 1990s, and Scenario B reflects the lower rates of in-migration in the 2000s. The ACCD projections shown in figures here are an average of those two scenarios.

Mortality rates and birth rates in the ACCD projections reflect recent trends. For example, the ACCD model assumes mortality rates for people age 50 and older will continue to decrease over the next couple of decades as they have done in recent decades. The model assumes that birth rates for women in their 20s and early 30s will be stable, but birth rates for women in their late 30s and 40s are expected to increase as they did in the 1990s and 2000s. The ACCD projections

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[3] Ken Jones and Lilly Schwarz, "Vermont Population Projections, 2010 – 2030," Vermont Agency of Commerce and Community Development, August 2013. http://dail.vermont.gov/dail-publications/publications-general-reports/vt-population-projections-2010-2030

are available for individual counties in Vermont and use county-specific birth rates based on historical differences. Unfortunately, the ACCD projections use the 2010 population as the starting point rather than the most recent year, are available only for 5-year age groups, and offer projections for just two points in time: 2020 and 2030.

The ACCD population forecasts were developed with the support of several State agencies to produce a publicly accessible set of population projections. Documentation as well as the forecasts are readily available on the web. In addition, the Agency of Commerce and Commercial Development provides them to the Vermont Regional Planning Commissions.

The Working Group

During the last few months, a small group of analysts has met to discuss the current projection methods and begin discussing an approach that would produce a single set of population projections for the State. To move forward, we will talk with the Vermont Department of Health to obtain any available data on birth and mortality rates by county and will investigate trends in migration rates into and out of Vermont.

The working group has discovered some notable differences between CJFA and ACCD projections in specific age groups in 2020 and 2030. For example, the ACCD projections for 2020 show 26 percent or about 30,000 more people in the 50-64 age group than the CJFA projections, and 24 percent or about 18,000 fewer people age 75 or older. In 2030, the biggest discrepancies appear in different age groups. The ACCD projections for 2030 show 13 percent or 20,000 fewer young people in the 15-34 age group, and 11 percent or 13,000 more people in the 65-79 age group. Which projection will be more accurate is difficult to judge.

The Challenge

Ideally, the State of Vermont would have a single set of population projections by single year of age and sex that would serve the needs of most users and form the basis of more detailed projections such as those needed for school enrollments at the county or town level. The approach used would be fully documented and available on the web. Assumptions regarding birth rates, death rates, and net migration rates would be explained and any trends in those rates would be transparent. It is possible that the base case projection would be augmented with alternative scenarios, such as "high" and "low" scenarios.

The immediate challenge will be to obtain usable historical data on births and deaths by county and perhaps by town from the Vermont Department of Health. We will then need to agree on Vermont's birth rates, mortality rates, and net migration rates going forward as well as future trends in those rates over time given known divergences from national rates and swings in patterns over the years. We anticipate that our working group will make progress on those goals in the coming months.