

Michigan Statewide Population Projections through 2050: Methodology

The Michigan Center for Data and Analytics (MCDA) 2024 vintage projections were produced using the cohort-component model. The cohort component method advances the population forward in time, while preserving the structural characteristics of its age and sex distribution at each timestep. The “component” aspect of the model refers to the three components of demographic change: births, deaths, and migration. The 2024 vintage population projection assumes that the rates underlying these three components will vary over time, rather than remaining constant through 2050.

Births

The number of births were projected using dynamic total fertility rates (TFR).

The first step was to calculate baseline average age-specific fertility rates using data from 2020 to 2022. This baseline was adjusted in each year of projection using the slope of a regression line of TFR from 1996 to 2022. Extending that regression trend forward resulted in a projected decline in TFR to 1.39 by 2050. A linear interpolation was then applied so that a uniform annual decline in each age-specific fertility could be applied to each projection year.

Deaths

The number of deaths were projected using dynamic survival rates and life expectancy trends.

Baseline age-specific survival rates were calculated using death and population data from 2015 to 2019. The decision to use 2015 to 2019 rather than a more recent time interval was due to the large annual increase in deaths during the COVID-19 pandemic and the corresponding decrease in survival rates. Since survival rates will likely increase from 2020 to 2021 levels, using the relatively low survival rates during

the pandemic to project deaths would result in unrealistically low survival rates throughout the projections series.

Dynamic survival rates were projected using life expectancy changes from 1996 to 2019 calculated from a regression slope. The life expectancy change over the historical period was used to establish the life expectancies for each sex in 2050. Based on long-term trends, total life expectancy is projected to increase by about three years to 81.5 by 2050. A linear interpolation was then applied so that a uniform annual increase in life expectancy could be calculated for each projection year. Finally, life expectancies were translated to age-specific survival probabilities.

Migration

Migration was projected using the historical relationship between Michigan's 25- to 64-year-old population and net migrants.

Migration is a challenging component in population projections. In Michigan, these challenges are compounded by the state's migration dynamics in recent years.

First, Michigan has had substantial variation in the direction and volume of net migration the past three decades. Since 1990, Michigan's annual net migration has ranged from gaining 32,000 to losing 93,000 net migrants annually during and after the Great Recession. Since the end of the recession, the number of net migrants has recovered and recently become positive. Even though Michigan's total net migration has recently been positive, a method that averages net migration from the past several years could result in projecting negative migration. Similarly, a method that uses recent rates of increase to project net migration might lead to unrealistic population growth, because the rate of increase in Michigan's net migration over the last decade is unlikely to continue.

Second, unprecedented, and ongoing changes to the age structure of Michigan's population presents a challenge. A large portion of Michigan's population, the baby boomers, will likely continue to retire into the 2030s. This may lead to downward pressure on the size of the state's workforce. This increased demand for labor may require migration for sufficient replacement.

The number of net migrants was projected by first applying linear regression to historical data. The linear regression equation modeled the relationship between annual changes in Michigan's population ages 25 to 64 and total net migration from 1996 to 2019. Based on the regression model, a substantial amount of the past variation in Michigan's net migrants is associated with the number of working-age people in the state (adjusted $R^2 = 0.586$). The following equation provides a predicted number of migrants on an annual basis:

$$\text{net migrants year}_t = 1957672.2 - (0.38178 * \text{pop2564}_{t-1})$$

Since migration rates vary by age, the next step was determining how to allocate migrants by single year age group. For example, even though Michigan experienced an average annual domestic net migration of -9,419 people between 2015 and 2019, there were still age groups that Michigan experienced net positive migration for during this time. To address variation in net migration across age groups, baseline age-specific migrants were calculated using data from 2015 to 2019. To adjust this baseline for the first year of projections, the average annual net migrants in 2015–2019 was subtracted from the number of net migrants projected for 2022 (14,464) to establish the estimated change in migration between periods.

$$\text{change in net migrants between 2019, 2022} = 14,464 - (-9,419) = 23,883$$

Once the difference in net migrants was calculated, the change in net migration was distributed based on age-specific migration flow rates. College students were not included in flow calculations since the theory behind calculating the predicted number of net migrants was related to people moving for employment. Using the five-year 2019 American Community Survey, age-specific flow rates were calculated by summing the total in- and out-migration for each one-year age class from ages one to 85+ and dividing these values by the total in and outflow for all ages. Finally, the age-specific change in net migrants between years was added to the appropriate age-specific net migrants from the previous year and the sum was used to project age-specific migrants during the current year.

Accessing MCDA's 2019 Vintage

The 2050 state population projections represent an update to MCDA's first state projection vintage produced in 2019 (Michigan Population Projections by County Through 2045). Michigan's population growth projections have been revised down from the 2019 estimates due to modifications in methodology and changes to the state's underlying vital rates. The 2019 projection vintage report and data are available upon request.