Executive Summary

The state of Ohio is in the initial stage of gradual, sustained population loss because of an aging population, declining fertility, and stagnant migration patterns. The population decline began in the fall of 2020 because of a sharp increase in mortality. However, the declining fertility rate and the aging of the population have occurred over the longer term, so the record number of Ohio resident deaths in 2020 and in 2021 have simply accelerated the timetable – and likely the magnitude – of expected population losses.

- Population change: Ohio's population is projected to decline by approximately 675,000 (5.7%) by 2050 if current rates of fertility, mortality, and migration remain unchanged.
    - Ohio is the seventh most populous state. Georgia and North Carolina will likely surpass Ohio in total population by 2030 or shortly thereafter. Ohio is expected to remain the ninth most populous state for many years beyond the scope of these projections.
- Fertility: Ohio's total fertility rate (TFR) has fallen during the past decade, as it has in the United States. Ohio's 2020 TFR was approximately 1715 (about 1.7 total births per female), a 10% decline from a decade earlier. Ohio's TFR is slightly higher than the national rate, which has declined by about 15% from a decade earlier. In Ohio and in the United States, women are delaying childbirth and having fewer children overall.
- Mortality: Current data trends in mortality are highly unstable. From 2019 to 2020, Ohio's age-adjusted mortality rate increased by approximately 15% and was also 15% higher than the national rate. Ohio currently ranks 38th of all states in life expectancy.[1]
    - In 2020, approximately 143,600 Ohioans died, which was the highest number of annual deaths in state history. In 2021, that figure increased again to approximately 147,500. These population projections assume that mortality rates will return somewhat to levels more consistent with historic norms, rather than those associated with the presumed height of the COVID-19 pandemic in 2020 and 2021.
- Natural change: The difference between resident births and deaths is the "natural change" of the population. In 2020, Ohio deaths outnumbered births by about 14,000. This was the first annual "natural decline" of state population on record. Ohio may briefly return to a natural increase because of short-term fluctuations, but the natural decline will continue through at least 2050 because of low fertility and Ohio's 2.6 million baby boomers, all of whom will be reaching the end of their life cycle in the decades to come. The natural decline of Ohio's population, rather than out-migration, will be the driver of overall population loss.
- Migration: Between 2010 and 2020, Ohio is assumed to have gained approximately 60,000 (net) new residents through a combination of domestic and international migration. This was the first decade since the 1950s that Ohio experienced net positive migration. Modest in-migration to Ohio is projected to partially offset losses from negative natural change. If migration does not meet these expectations, overall population loss may exceed figures presented here.

- The Oldest Cohorts: As the baby boomers complete their journey through the age structure, the youngest senior cohorts will decline while the population of the very oldest Ohioans will increase. The 85+ cohort will increase by nearly 25% (see Table 1).

Table 1. Summary of Projected Changes for Various Ohio Age Cohorts, 2020 to 2050

| Age Cohort | 2020 | 2050 | # Change | % Change | % of 2020 Pop | % of 2050 Pop |
|---|---|---|---|---|---|---|
| 0-to-14 | 2,170,245 | 1,987,475 | -182,770 | -8.4% | 18.4% | 17.9% |
| 15-to-24 | 1,515,496 | 1,384,137 | -131,359 | -8.7% | 12.8% | 12.4% |
| 25-to-64 | 6,065,987 | 5,792,462 | -273,525 | -4.5% | 51.4% | 52.1% |
| 65-to-74 | 1,228,376 | 1,030,175 | -198,201 | -16.1% | 10.4% | 9.3% |
| 75-to-84 | 586,511 | 641,020 | 54,509 | 9.3% | 5.0% | 5.8% |
| 85+ | 232,833 | 288,627 | 55,794 | 24.0% | 2.0% | 2.6% |
| Total Population | 11,799,448 | 11,123,896 | -675,552 | -5.7% | X | X |

Because of overall population loss during the next 30 years, most Ohio age cohorts will decline in absolute terms. However, Ohio's 2050 population structure will not be fundamentally different from today. In contrast to earlier decades when the baby boomer generation was a dynamic factor on the overall population structure, today there are no other cohorts that exert such an influence.

The remainder of this document discusses the projections methodology and these demographic trends in greater detail.

Projections Methodology

This report and the accompanying data file contain population projections from 2020 to 2050, in five-year increments and for five-year age / sex cohorts, for Ohio and its 88 counties. These projections supersede those that were published by the Ohio Department of Development Research Office in 2013 and that were updated in 2018.

Population projections are not speculative, nor do they attempt to "predict" what will happen in the future. The only way a population grows is if a baby is born or if someone moves into the area. Conversely, the only way a population declines is if someone dies or if someone moves out of the area. Therefore, population projections are based on applying the most recent observed data and rates of demographic change – fertility, mortality, and migration – to an existing group, or "base population."[2] Specifically, rates of mortality and migration are calculated for and applied to each five-year age / sex cohort. Rates of fertility are calculated for and applied to female cohorts from 15-to-19 through 40-to-44 in order to create a new 0-to-4 cohort for each projection year.[3] The rates used in the projections are the average of the annual observed rates from 2016 to 2020. This projection technique is known as the "cohort component method" and is widely used by other states and by the U.S. Census Bureau to develop reliable expectations of the future population.

The rates of demographic change used in these projections are derived from various publicly available data sources. Birth and death data, which are used to construct the "numerator" of the fertility and mortality rates, are from the Ohio Department of Health Public Health Information Warehouse.[4] The relevant midyear population estimates published by the U.S. Census Bureau are the "denominator" of the rate calculations.

Migration rates are calculated differently. Because there is no single comprehensive source for migration data in the United States, several different sources are consulted. At the state level, migration is first calculated as a residual category based upon intercensal population change and the natural change. For example, if overall population growth exceeded the natural increase between the two censuses, net in-migration must also have occurred. Or, if population growth was less than the natural increase, out-migration must have occurred. Expressed as a formula:

Base Population + Resident Births - Resident Deaths + / - Migration = Future Population

After establishing a residual net migration figure for the decade, a more complex model is used to determine which age / sex cohorts migrated. Specifically, birth and death data are collected from April 1, 2010, to March 30, 2020, for the household population (not including the group quarters population).[5] After subtracting the deaths and adding the births for the relevant age / sex cohorts and then aging the cohorts by 10 years, age / sex net migration totals may be assumed as the difference between the expected and observed age / sex population on April 1, 2020.[6] It should be noted that even with overall net migratory gains, some age / sex cohorts may have experienced net out-migration, and vice versa. This procedure is done for the state and for each individual county. These net migration figures are then triangulated with migration data from the Census Bureau and from the Internal Revenue Service to ensure their reliability.[7] If necessary, adjustments are made on a county basis to the totals and to the various cohort rates in order to align the data across these sources.

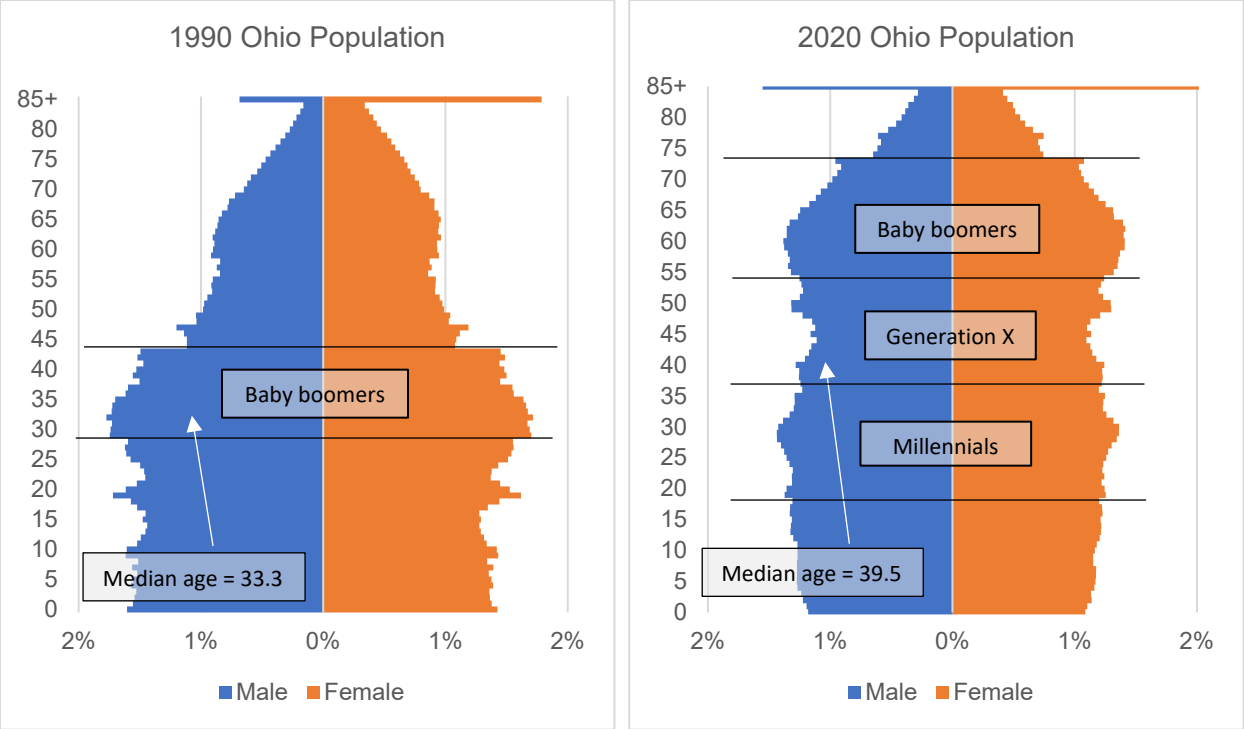
Because of the greater reliability of data and the relative stability of their demographic trends, projections for larger, more populous areas are generally more accurate than those for smaller, less populous areas. For this reason, Ohio's population projections follow a "top-down" method. In other words, projections are first made for the state as a whole, and then each individual country is projected separately. Following this initial round of projections, county total populations are controlled to the overall state total for each of the six projection years (2025, 2030, etc., to 2050). Adjustments are then made to the projected county age / sex cohorts to maintain their same proportional values relative to the adjusted county totals, such that the various cohorts sum to state totals in each projection year.

Special consideration is given to individuals living in group quarters facilities such as college dorms, prisons, and nursing homes. As of the 2020 census, there were 299,628 people whose primary place of residence was in such facilities (about 2.5% of the state population). Group quarters populations are independent from the rates of demographic change, and they are not aged into older cohorts over time. For example, in Athens County, where Ohio University is located, group quarters residents compose 12.8% of the county population. Those individuals (the majority of whom reside in college dorms) will be replaced in time by individuals of similar age / sex composition. In other words, for example, it is assumed that the 2040 population of college dorm residents in Athens County will not be 20 years older than those living there in 2020.[8]

As a final introductory note, there are infinite scenarios for Ohio's demographic future. It is unrealistic to assume the accompanying data will perfectly match Ohio's census population totals in 2030, 2040, and 2050. There are countless variables – economic, political, and sociological – that will influence how many children Ohioans will have, whether those Ohioans will remain in Ohio, and whether residents of other states – and citizens of other countries – will move to Ohio. Those variables and scenarios are not part of the modeling that has been used to create these projections. After examining different scenarios, it can be asserted that these projections do not represent the "best case" or the "worst case" for overall population change in Ohio during the next 30 years. The most reliable and the most recent available data indicates that gradual population loss at the state level is all but assured, and it is the opinion of the state's demographer that the figures accompanying this report represent a "middle ground" of likely outcomes.

## Ohio's Aging Population

Chart 1. Ohio Population Structure, 1990 and 2020




As Chart 1 illustrates, [9] the baby boomer generation (those born between 1946 and 1964) has played a leading role in driving larger population trends. Since 1990, Ohio's median age has increased by about six years, to 39.5. Although the baby boomers are still the most populous cohort in Ohio,[10] they no longer exert the demographic force they once did. The increase of the state median age has slowed and is projected to reach 40.4 by 2050. In the decades to come, the structure of Ohio's population will increasingly resemble a column with a narrowing base, rather than a pyramid.

## Fertility

Approximately 129,300 babies were born to Ohio mothers in 2020. This is the lowest number on record (since at least 1950) and a 4% decline from 2019. Although there are short-term factors that influence individuals' fertility decisions, in Ohio and in the United States, there has been a steady longer-term decline in fertility rates and in the total number of births.

There are two widely used measures of fertility. Age-specific fertility rates (ASFRs) reflect the annual number of babies born to women in various age cohorts. ASFRs reflect the annual number of babies born to a group of 1,000 "typical" women of a given age. For example, the 2020 ASFR for 25-to-29-year-old Ohioans is 99.7 (see table below). In other words, about 1 in 10 women (99.7 out of 1,000) in that age cohort gave birth in 2020.

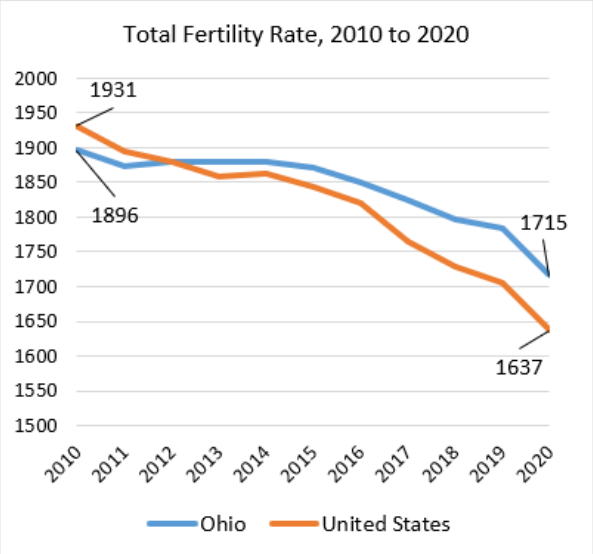
The total fertility rate (TFR) is a more general and longer-term measure for all women between the ages of 15 and 45. The TFR is the number of children a group of 1,000 women will have (on average) over their lifetimes if current ASFRs remain unchanged. The 2020 TFR for Ohio is about 1715. In other words, on average, 1,000 Ohioans will give birth to 1,715 children (about 1.7 children per woman) during their lifetimes. The "replacement rate" – the TFR required to maintain population growth (assuming zero net migration) – is about 2100.

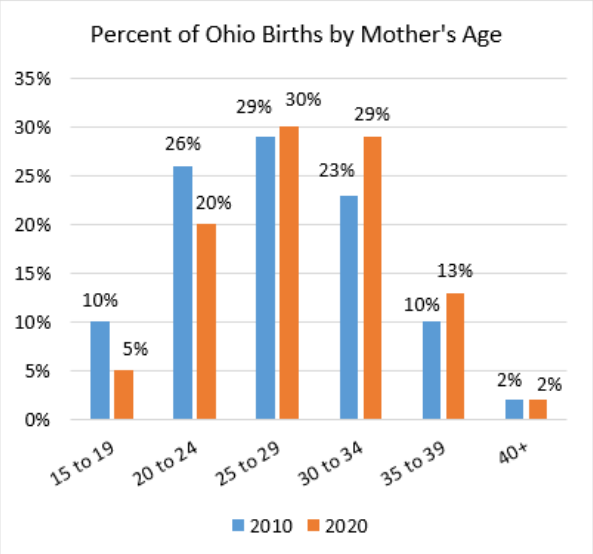
Table 2. Ohio Fertility Rates, 2010 to 2020

| Age | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2010 to 2020 ASFR Change | 2016 to 2020 Avg ASFR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 to 19 | 34.0 | 31.0 | 29.4 | 27.5 | 25.4 | 23.6 | 22.0 | 21.0 | 19.1 | 19.0 | 17.6 | -48.3% | 19.7 |
| 20 to 24 | 93.3 | 90.0 | 89.7 | 88.4 | 86.2 | 84.7 | 81.8 | 81.0 | 77.8 | 76.8 | 71.5 | -23.4% | 77.8 |
| 25 to 29 | 113.7 | 113.5 | 114.5 | 114.1 | 113.9 | 112.8 | 110.9 | 107.1 | 106.1 | 105.1 | 99.7 | -12.3% | 105.8 |
| 30 to 34 | 92.9 | 93.0 | 94.4 | 96.1 | 99.4 | 101.3 | 102.3 | 102.6 | 102.1 | 101.3 | 99.5 | 7.1% | 101.6 |
| 35 to 39 | 37.5 | 39.3 | 40.0 | 41.7 | 42.9 | 43.7 | 44.2 | 44.2 | 44.8 | 45.4 | 45.3 | 20.9% | 44.8 |
| 40 to 44 | 7.9 | 8.0 | 7.9 | 8.3 | 8.0 | 8.2 | 8.6 | 8.7 | 9.4 | 9.4 | 9.4 | 18.9% | 9.1 |
| TFR | 1896.3 | 1874.3 | 1879.4 | 1880.3 | 1879.2 | 1871.2 | 1849.3 | 1823.7 | 1796.7 | 1784.4 | 1714.7 | -9.6% | 1793.7 |

Fertility rates have fallen for the younger cohorts, including a nearly 50% drop in teenage fertility over the past decade. In 2010, 10% of all Ohio births were to mothers between the ages of 15 and 19. By 2020, 5% of all births were to mothers of that cohort. Fertility increases in the older cohorts have not offset overall declines.

Charts 2a and 2b. Total Fertility Rate and Birth Percent by Mother's Age, 2010 to 2020



Fertility rates fluctuate significantly by county. For these projections, age-specific rates were calculated for each county and were held constant at their 2016 to 2020 average for each projection period (TFR 1794, see Table 2). These projections make no attempt to "predict" whether fertility rates will increase or decrease in the future.

Mortality

Current trends in mortality are highly unstable. In 2020, there was an unprecedented increase in the number of Ohio resident deaths. 143,660 Ohio residents died, up 16.1% from 2019 (123,705). Although 2021 demographic trends are not considered in this construction of these projections, data indicates that overall deaths rose again in 2021, to approximately 147,500. Using the 2000 standard population to control for the aging population,[11] Ohio's 2020 age-adjusted mortality rate (AAMR) was 953 (approximately 953 deaths per 100,000 residents), compared to 829 nationally. According to the U.S. Centers for Disease Control and Prevention, as of 2019, Ohio ranks ninth among all states in deaths per 100,000 residents.

Chart 3. Ohio and United States Age-Adjusted Mortality Rate, 2010 to 2020[12]

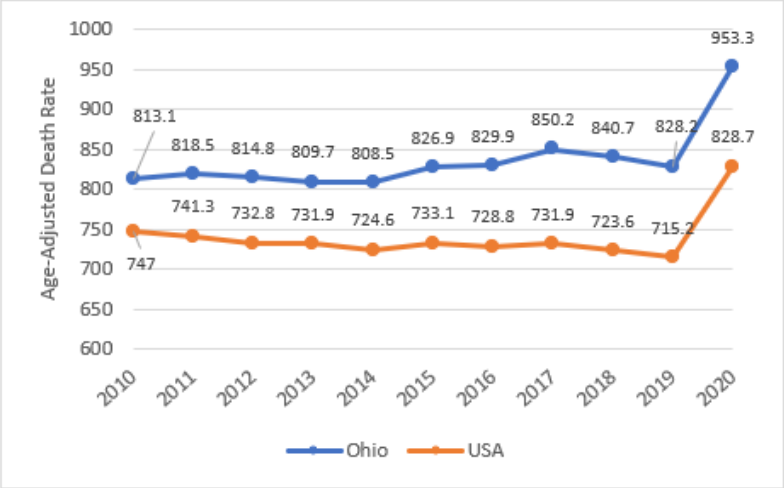



Table 4. Age-Specific Mortality Rates for Ohio Age Cohorts, 2010 to 2020[13]

| Age | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2010 to 2019 Change | 2019 to 2020 Change |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-4 | 173.8 | 175.2 | 172.9 | 171.3 | 155.7 | 163.3 | 170.5 | 162.7 | 158.7 | 154.7 | 146.4 | -11.0% | -5.4% |
| 5-14 | 12.2 | 11.9 | 11.9 | 13.4 | 12.5 | 14.0 | 13.8 | 15.2 | 13.3 | 14.7 | 14.6 | 20.1% | -0.7% |
| 15-24 | 67.3 | 67.0 | 67.1 | 64.8 | 65.8 | 76.4 | 83.2 | 93.3 | 79.5 | 75.7 | 89.9 | 12.5% | 18.8% |
| 25-34 | 114.2 | 118.2 | 123.3 | 126.0 | 135.6 | 155.0 | 179.1 | 196.0 | 169.3 | 170.5 | 203.9 | 49.3% | 19.6% |
| 35-44 | 189.7 | 195.8 | 201.0 | 203.1 | 214.2 | 227.9 | 255.0 | 281.3 | 257.1 | 260.1 | 299.5 | 37.1% | 15.1% |
| 45-54 | 449.5 | 459.0 | 450.9 | 470.1 | 458.8 | 474.7 | 486.8 | 494.8 | 473.4 | 465.3 | 541.7 | 3.5% | 16.4% |
| 55-64 | 921.8 | 929.3 | 945.6 | 941.4 | 966.6 | 973.5 | 1005.8 | 1030.7 | 1018.1 | 1033.5 | 1160.0 | 12.1% | 12.3% |
| 65-74 | 2077.6 | 2084.6 | 2051.3 | 2030.4 | 2045.8 | 2046.9 | 2029.7 | 2057.8 | 2072.4 | 2042.7 | 2324.6 | -1.7% | 13.8% |
| 75-84 | 5247.4 | 5294.9 | 5248.4 | 5113.5 | 5103.0 | 5169.5 | 5052.4 | 5122.9 | 5075.4 | 4992.5 | 5772.7 | -4.9% | 15.6% |
| 85+ | 14683.9 | 14795.8 | 14722.7 | 14697.9 | 14406.4 | 14765.1 | 14494.8 | 14782.0 | 15145.1 | 14684.4 | 17128.4 | 0.0% | 16.6% |
| AAMR | 810.7 | 818.5 | 814.8 | 809.7 | 808.5 | 826.9 | 829.9 | 850.2 | 840.7 | 828.2 | 953.3 | 2.2% | 15.1% |

As illustrated in Chart 3 and Table 4, mortality trends are currently unstable. Prior to 2020, trends in Ohio over the past decade have indicated decreasing mortality in the youngest and oldest cohorts, with increases in the middle cohorts – especially Ohioans aged 25-to-34 and 35-to-44. From 2010 to 2019, rates for the 25-to-34 and 35-to-44 cohorts rose significantly, but because deaths among those cohorts account for a relatively small fraction of overall deaths, those gains did not translate into sharply higher AAMRs during the same period, with a 2.2% overall increase in Ohio's AAMR.

Once 2020 is taken into consideration, mortality rates for all cohorts (except 0-to-4 and 5-to-14) rose sharply, leading to a single-year increase of 15.1% in Ohio's AAMR. It is beyond the scope of these projections to predict whether the 2020 rates will remain the "new normal" or whether Ohio's AAMR will return to pre-pandemic levels. In terms of projections methodology, the rates used were calculated based on average deaths for each age / sex cohort from 2016 to 2020, and an actuarial table was used to construct survival rates for each cohort. This was done for every cohort in each of the 88 counties. After the rates were constructed, comparisons were made with prior projections models. In most instances, age / sex survival rates were adjusted slightly upward such that the 2020 rates were given less weight in the overall modeling. If mortality does not return to levels associated with pre-2020 levels, overall deaths will exceed those presented here, and population losses may be greater than projected. The increases in deaths (see Table 5) through 2045 are associated with the baby boomers reaching the end of their life cycle.

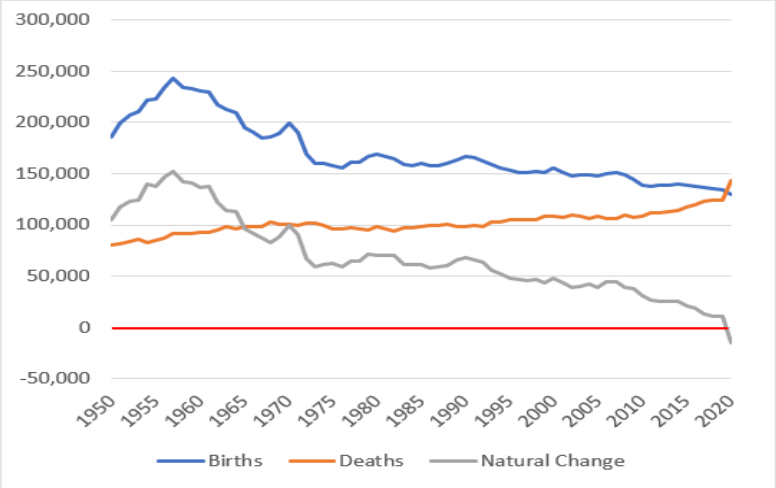
Table 5. Five-Year Projected Deaths by Sex for Ohio Residents, 2020 to 2050[14]

| Year | Total | Male | Female |
|---|---|---|---|
| 2020 to 2025 | 723,457 | 389,944 | 333,513 |
| 2025 to 2030 | 757,600 | 407,021 | 350,579 |
| 2030 to 2035 | 791,827 | 423,541 | 368,285 |
| 2035 to 2040 | 809,079 | 431,140 | 377,939 |
| 2040 to 2045 | 806,562 | 430,172 | 376,390 |
| 2045 to 2050 | 784,944 | 421,059 | 363,885 |

## Natural Change

The historic growth of Ohio's population has been exclusively because of the natural increase – annual births outnumbering deaths. The height of Ohio's baby boom occurred in 1957. In that year, 243,470 babies were born to Ohio resident mothers, and the annual natural increase of the population was more than 150,000. Despite short-term fluctuations, the natural increase has declined steadily since then, with the decline accelerating from 2007 to present. In 2020, the annual natural change of Ohio's population was negative, meaning that annual deaths exceeded births (by more than 14,000). This was the first time in Ohio's recorded demographic history in which there was a natural decline of the population.

Chart 4: Annual Births, Deaths, and Natural Increase of the Ohio Population, 1950 to 2020

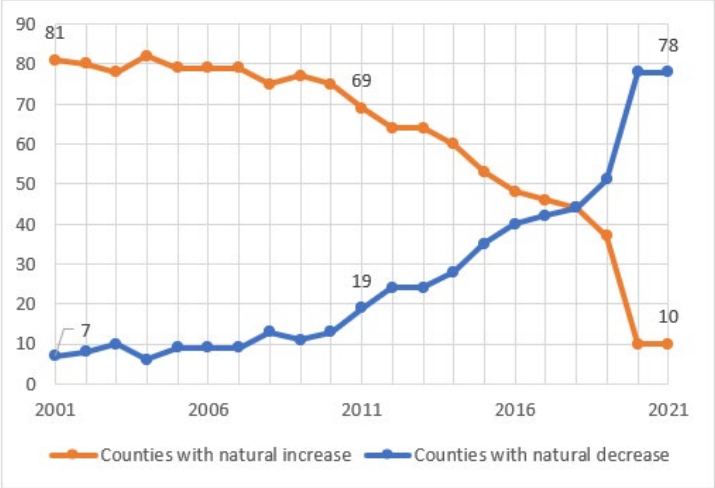



Prior to the pandemic, because of falling fertility rates and the aging of the baby boomers, deaths had been projected to overtake births sometime between 2025 and 2030. However, because fertility has continued to fall and because of the spike in deaths that occurred in 2020 (and which persists through at least 2021), the transition to natural decline has taken place sooner and more abruptly than had been previously forecast.

Whether the annual natural change briefly returns to positive territory because of short-term fluctuations is of little bearing to the longer-term outlook for Ohio's population in which negative natural change is all but assured. This is because Ohio's 2.6 million baby boomers, the state's most populous generational group, will drive overall deaths in the state upward in the years to come.

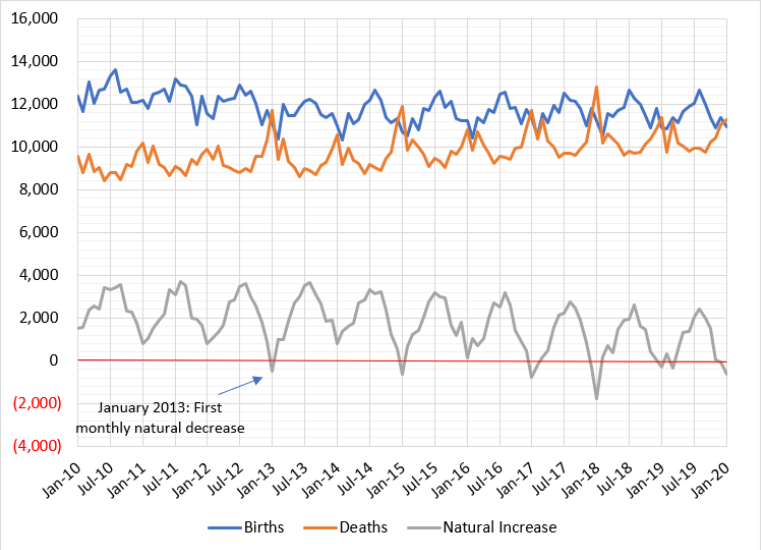
At the county level, most areas in Ohio are already undergoing a natural decline of the population (see Chart 5 below). In those counties in which there is consistent net out-migration, population losses will accelerate, as the natural change moves deeper into negative territory. The natural decline combined with out-migration represents a new, dual downward pressure that will accelerate population losses for many local areas across Ohio.

Chart 5. Ohio Counties with Positive and Negative Natural Change




As of 2021, there are 10 Ohio counties with positive natural change.[15]

Chart 6. Ohio Monthly Natural Change, 2010 to 2020




Birth and death trends tend to be cyclical, and deaths tend to be significantly higher during the colder months. As such, the first recorded monthly natural decline of the Ohio population occurred in January 2013. It was not until 2020 that annual deaths outnumbered births (see Chart 4).

## Migration

Migration includes the international movement of people, as well as people relocating within the United States – and within Ohio. Even states or counties with large net positive migratory flows also have significant numbers of residents leaving. Conversely, places with large net outflows may also have significant numbers of people moving in. In terms of general and comparative trends, two other states have a greater percentage of current residents who were born in-state. In other words, more than nearly any other state, Ohio is populated by people who were born in Ohio.[16]

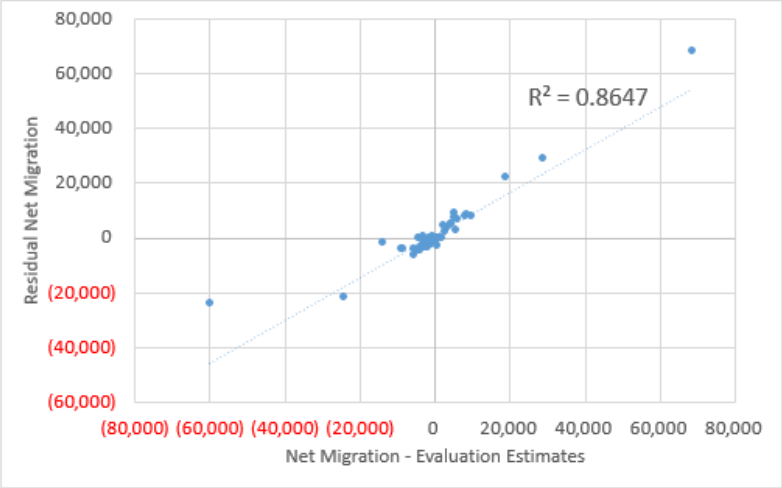
Despite these potential complexities, these projections make no distinction between domestic and international migration and treat migration as a "net" phenomenon. This is because of the methodology used in these projections that defines migration as a residual category. In other words, population growth or decline that is unaccounted for in the natural change is attributed to migration. Therefore, after isolating all births and deaths of Ohio residents between April 1, 2010 (Census Day), and March 31, 2020 (the day before Census Day), excess population change is attributed to migration.

Table 6. Intercensal Natural Change and Residual Migration[17]

| | 1960 | 1970 | 1980 | 1990 | 2000 | 2010 | 2020 |
|---|---|---|---|---|---|---|---|
| Census | 9,707,136 | 10,657,423 | 10,797,604 | 10,847,115 | 11,353,140 | 11,536,504 | 11,799,448 |
| Population Change | 1,760,509 | 950,287 | 140,181 | 49,511 | 506,025 | 183,364 | 262,944 |
| Natural Change | 1,441,674 | 1,060,945 | 692,104 | 637,822 | 532,055 | 413,011 | 202,128 |
| Residual Migration | 318,835 | -110,658 | -551,923 | -588,311 | -26,030 | -229,647 | 60,816 |

Table 6 shows Ohio's census population, population change compared to the prior census, the observed natural change as well as intercensal net migration as a residual category. This is the primary basis for determining overall net migration to Ohio since 2010. The prior decade was the first time since the 1950s in which Ohio experienced net positive residual migration. Although there was a likely overcount of Ohio's 2020 census population,[18] Ohio's migration patterns continue to trend upward. Furthermore, residual migration is strongly correlated with the migration data in the Census Bureau estimates (see Chart 7).

Chart 7. 2010 to 2020 Net Migration in Ohio Counties: Census Estimates and Residual Method[19]




The overall rate of net migration was kept constant for each projection period. Birth and death data was then used to calculate the expected age / sex breakdown of Ohio's 2020 household population. The differences between the expected and observed (estimated) household population in 2020 were attributed to net migration, as follows:

Table 7. Projected 10-Year Migratory Totals by Sex and Age, 2020 to 2050[20]

| | 2020 to 2030 | | 2030 to 2040 | | 2040 to 2050 | |
|---|---|---|---|---|---|---|
| Age | Male | Female | Male | Female | Male | Female |
| 0-4 | 10,616 | 7,495 | 10,419 | 7,356 | 10,135 | 7,156 |
| 5-9 | 18,902 | 14,893 | 18,536 | 14,608 | 18,032 | 14,211 |
| 10-14 | 4,352 | 1,354 | 4,207 | 1,271 | 4,094 | 1,237 |
| 15-19 | (30,191) | (25,402) | (29,633) | (24,916) | (28,826) | (24,239) |
| 20-24 | (24,999) | (9,354) | (24,436) | (9,095) | (23,773) | (8,849) |
| 25-29 | 14,840 | 23,012 | 14,595 | 22,572 | 14,197 | 21,958 |
| 30-34 | 28,887 | 22,026 | 28,299 | 21,565 | 27,530 | 20,979 |
| 35-39 | 19,982 | 9,902 | 19,572 | 9,694 | 19,040 | 9,431 |
| 40-44 | 14,458 | 4,127 | 14,168 | 4,039 | 13,783 | 3,930 |
| 45-49 | 14,109 | 2,017 | 13,830 | 1,977 | 13,454 | 1,923 |
| 50-54 | 16,459 | 1,150 | 16,136 | 1,125 | 15,698 | 1,094 |
| 55-59 | 14,676 | (2,770) | 14,373 | (2,724) | 13,982 | (2,650) |
| 60-64 | 7,313 | (6,664) | 7,157 | (6,532) | 6,963 | (6,355) |
| 65-69 | (1,045) | (7,828) | (1,039) | (7,675) | (1,010) | (7,466) |
| 70-74 | (5,194) | (6,993) | (5,087) | (6,848) | (4,948) | (6,662) |
| 75-79 | (3,108) | (4,142) | (3,044) | (4,057) | (2,961) | (3,947) |
| 80-84 | (8,836) | (8,667) | (8,680) | (8,512) | (8,444) | (8,280) |
| 85+ | (25,222) | (23,147) | (24,696) | (22,664) | (24,025) | (22,049) |
| Subtotal | 66,001 | (8,990) | 64,679 | (8,818) | 62,921 | (8,578) |
| Total | 57,011 | | 55,861 | | 54,343 | |

These projections do not attempt to "predict" whether future migration to Ohio will increase or decrease. If Ohio does not experience positive net migration in the years to come, overall population losses may exceed those presented here. Conversely, if net migration to Ohio exceeds what is presented here (an annual average of about 5,600 from 2020 to 2050), population loss may be smaller than what is projected.

Expected Revisions Timetable

Because of the various delays in the federal processing of Census 2020 data, these projections relied upon the best available data at the time of writing, including estimates rather than census tabulations of Ohio's 2020 population. Some of these estimates, such as the base population, have been published by the Census Bureau, while others, such as the household and group quarters age / sex cohorts, have been produced internally by the Department of Development Research Office.

The Census Bureau has indicated that it will publish detailed age / sex data from Census 2020 in the spring of 2023. That data is expected to resemble the characteristics of the population used in these projections. However, if anticipated Census 2020 data is significantly different from the data used in the publishing of these projections, necessary revisions will be made.

Another opportunity to revisit these projections will take place after the publication of the 2025 county population estimates, which are expected in March 2026. Consistent with the revisions made to the previous iteration of projections published by this office, any 2025 county population totals that diverge from the 2025 projections by more than + / - 2% will be revised accordingly.

The Department of Development Research Office welcomes inquiries about the population projections.

## Endnotes

[1] According to the CDC, Ohio's 2020 life expectancy was 75.3. See https://www.cdc.gov/nchs/pressroom/sosmap/life_expectancy/life_expectancy.htm.

[2] As of this writing, age / sex data from Census 2020 is not yet available. In order to expedite the availability of updated projections, the population estimates for 2020 were used as the base population instead of the census count. All county population totals in the 2020 estimates will match census count totals, although specific age / sex cohort data will not. After the publication of Census 2020 age / sex data, which is expected in spring 2023, necessary revisions will be made if significant differences are determined to exist between these base populations and the census data.

[3] Births recorded to females under the age of 15 are included in the calculation of the 15-to-19-year-old fertility rate, and births to females over the age of 44 are included in the calculation of the 40-to-44 rate.

[4] The ODH disclaims any responsibility for analysis presented here.

[5] April 1 in years ending in "0" is Census Day, and the date for which the population is recorded during the national censuses. If someone dies on March 30 or if a baby is born on April 2 of that year, for example, they are not recorded in the census. Therefore, births and deaths that occurred between April 1, 2010, and March 30, 2020, represent the intercensal natural increase or decrease.

[6] See Kennedy, J.M., De Jong, G.F., & Lichter, D.T. (1986). Updating Local Area Population Projections with Current Migration Estimates. *Journal of Economic and Social Measurement*, 14, pp. 107-120.

[7] The Census Bureau publishes annual estimates of net domestic and international migration for all counties in the United States. The IRS also publishes migration data, here: https://www.irs.gov/statistics/soi-tax-stats-migration-data.

[8] As is the case with the household population, Census 2020 data by age and sex is not yet available for group quarters residents. In order to determine the age / sex composition of group quarters residents, 2010 ratios were used with controls for the updated 2020 group quarters population totals. For example, if 16% of the group quarters residents in Franklin County were females between age 20 and 24, then 16% of the group quarters population for 2020 was assumed to be female 20-to-24-year-olds.

[9] Single-year age / sex data used in the construction of the two population pyramids is derived from Summary File 1 data from Census 1990 and from the 2020 Single Year of Age and Sex for the Civilian Population in Ohio, from the 2020 evaluation estimates. X-axis percentages represent each single-year cohort as a percent of their respective sex totals.

[10] As of 2021, Ohio's generational populations are as follows: Baby boomers (b. 1946 to 1964), 2,643,485; Millennials (b. 1981 to 1996), 2,443,886; Generation Z (b. 1997 to 2012), 2,408,098; Generation X (b. 1965 to 1980), 2,292,428.

[11] For the use of a standard population to control for aging in the calculation of rates, see: https://www.cdc.gov/nchs/data/nvsr/nvsr47/nvs47_03.pdf.

[12] The national mortality rate is from the CDC Wide-ranging OnLine Data for Epidemiologic Research (WONDER) system (https://wonder.cdc.gov/) and the CDC preliminary report for 2020 here. Age-adjusted death rates for Ohio may not match those published elsewhere. For example, the CDC lists Ohio's 2019 rate as 827.1; here it is calculated as 828.2. This small difference is likely because of different sources of death data and / or because of different vintage population estimates used in the denominator.

[13] Age-specific mortality rates are calculated as the total number of annual deaths in each cohort, divided by the midyear population of that cohort, multiplied by 100,000.

[14] Because the projections are ultimately evaluated against the midyear population estimates of the Census Bureau, the five-year period from 2020 to 2025 (for example) technically represents July 1, 2020, to June 30, 2025.

[15] As of 2021, the 10 Ohio counties with a natural increase of the population are: Butler, Delaware, Franklin, Hamilton, Holmes, Mercer, Putnam, Shelby, Union, and Warren.

[16] See Table B05002, ACS 2021 1-year estimates. Ohio is third among all states with 74.9% of its total population having been born in-state. Michigan (76.5%) and Louisiana (78%) rank higher.

[17] Monthly birth and death records are not readily available for years prior to 2008, so all proceeding natural increases were calculated on an annual basis rather than as April 1 to March 30 of successive census years.
[18] See https://www.census.gov/newsroom/press-releases/2022/2020-census-pes-survey-results.html.
[19] Residual migration is calculated as described above, while the intercensal net migration estimates are the totals from the evaluation estimates, here: https://www.census.gov/programs-surveys/popest/technical-documentation/research/evaluation-estimates.html.
[20] Net out-migration of the post-high school and college-aged cohorts and of retirees, with in-migration for other cohorts, is consistent with expected patterns. The differing migratory trends for males and females observed in the 55-to-59 and 60-to-64 age cohorts was not expected. These differences may stem from the estimated household population data used in the migration model. After the publication of age / sex household and group quarters data in spring 2023, these trends will be re-evaluated.