Pennsylvania Population Projections for the Next 30 Years: An Overview of the Methodology, 2020 to 2050

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Executive Summary

Population data are used by public and private agencies and businesses in numerous ways for policy development, project planning, and program evaluation. Policy and program development often require information on how the state's population is expected to change over the next 5, 10, or 15 years. Data are especially needed to plan for schools, transportation, day care and elderly care centers, workforce development, long-term care, and many other areas. While the decennial census and affiliated survey programs are rich sources of data on the social and economic characteristics of Pennsylvania's residents, each census/survey presents a static portrait of life in the commonwealth at one fixed point in time. Projections provide a way to look at future population.

Population projections for Pennsylvania were developed under contract with the Center for Rural Pennsylvania. Population projections were completed for the years 2025, 2030, 2035, 2040, 2045, and 2050, for the Commonwealth and its 67 counties. These projections were developed by five-year age and sex cohorts.

Projecting future population is built upon scientific methodologies and assumptions. The process starts with the July 1, 2020, estimates-based[1] population for Pennsylvania and its counties, and applies mortality, fertility, and migration rates to project the population forward by five-year intervals using a cohort-component methodology. This demographic approach is distinctly different from projections based on economic factors and does not consider recent employment or business activity trends.

While Pennsylvania as a whole, and most counties, will see an overall growth in population during this period, some counties will experience a decline in population. Map 1 shows the percent change in total population between 2020-2050 by county.

[1] U.S. Bureau of the Census, State and County Total Resident Population Estimates (Vintage 2022): April 1, 2020, to July 1, 2022.

Table of Contents

Table of Figures

Table of Tables

Goals and Objectives

The Pennsylvania State University study team conducted four major research activities for this project:

1. Data were collected, analyzed, and prepared for inclusion in the model. The base distribution is the U.S. Census Bureau's population estimate for July 1, 2020, from the Vintage 2022 Population Estimates. Each new series of estimates (referred to as a "vintage") is revised annually to incorporate the latest administrative record data, geographic boundaries, and methodology. The Census Bureau recommends using the most recent vintage available, and the 2022 vintage was the most recent available during the data collection phase of the project. County-level birth and death data for the years 2015-2019 from the Pennsylvania Department of Health were used in the analysis. County-level domestic migration data were obtained from the U.S. Census Bureau's 2015-2019 American Community Survey (ACS). Net international migrants by age/sex group were calculated using the National Population Projections Dataset.
2. Working assumptions of fertility and survivorship were developed. The model assumes the rate of change in fertility rates for Pennsylvania will match the change at the national level. Mortality rates are assumed to remain constant throughout the projection cycle. These assumptions are based on an analysis of historic data and are consistent with the methodology used in previous decades.
3. Migration trends and typologies for each of Pennsylvania's counties were developed. Migration rates by age and sex were developed using the most current data available on in- and out-migration. A typology classification system was created using migration rates based on past and near-term trends. Typology classes grouped counties with similar migration trends into classes of counties that were adjusted based on their migration rate values. Using typology classification reduces the need to adjust each county individually.
4. The model was developed to utilize the data obtained and the assumptions created to develop population projections. The model calculated population projections for Pennsylvania and its 67 counties by 5-year age and sex cohorts.

Methodology

A projection is a measurement of a future population that would exist if the assumptions of the method proved to be empirically valid. Projections may assume continuations of past conditions, revisions based on present conditions, or trended changes in these conditions. While all these assumptions are built upon recent trends, it is important to note that these trends can change. All population projections have inherent uncertainties, especially for years further in the future, because they can be affected by changes in behavior, by new policies, or by other events. Nonetheless, projections offer a starting point for understanding and analyzing the parameters of future demographic change.

These projections are based on demographic data and trends that have been incorporated into the model. The greatest value of projections is as a reference tool to understand how a population's age structure and size will change, which helps to inform important decisions.

Demographic Cohort Model

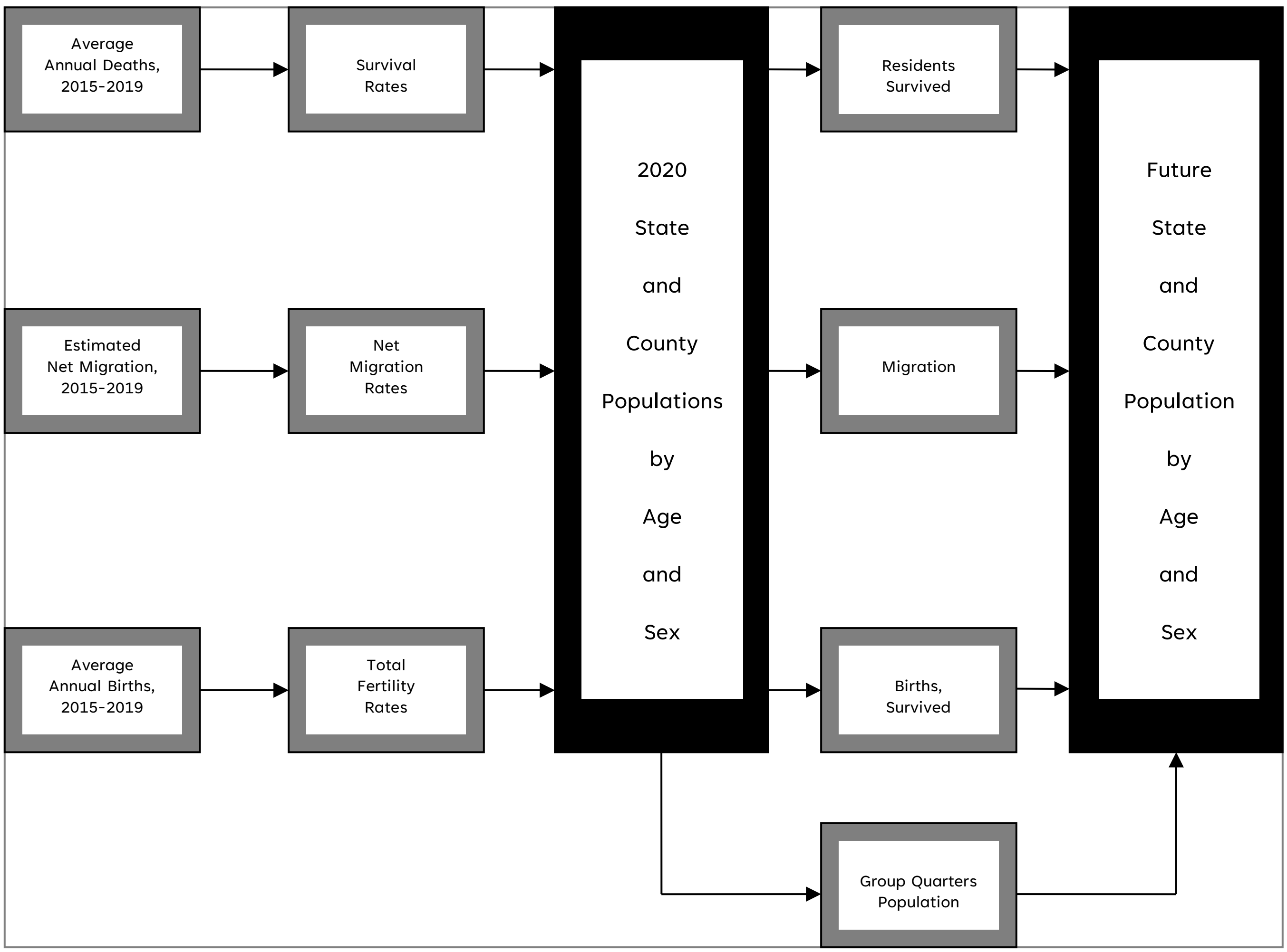
To produce the 2020 to 2050 population projections, the Center used a cohort component population projection model that accounts for population change based on detailed assumptions about births, deaths, and migration levels—the three key components of population change. It categorizes this change according to natural increase (births minus deaths) and net migration (in-migration minus out-migration). This model is widely used in demography and population studies to estimate and project future population sizes and characteristics. A recent review of state methodologies found that 47 states utilize the cohort component methodology to compute projections. The model involves breaking down a population into various demographic groups or cohorts based on age, sex, and other relevant factors and then projecting how each cohort will **change over time.**

The steps for the projection process for Pennsylvania and its 67 counties are described in this section. The model begins with an initial population by 5-year age and sex cohort as of July 1, 2020. Group quarters, which include individuals residing in settings such as correctional facilities, college dormitories, and military barracks, are initially removed from that population distribution. The remaining population is aged by 5 years, transitioning each age cohort to the next age category. For example, the population aged 5-9 becomes the population aged 10-14; then, survival rates specific to each 5-year age and sex cohort are applied to the resulting base population to determine the number of individuals expected to survive. These rates consider historical patterns of mortality and life expectancy. Births are added by applying modified general fertility rates to the survived females of childbearing age. These rates consider factors such as age-specific fertility rates and fertility trends.

The population is then adjusted for domestic net migration and international in-migration. Domestic net migration is projected by 5-year age cohort and sex, considering current data as well as historical migration patterns within the state. International in-migrants are then added to each 5-year age cohort by sex, considering trends in international migration. Finally, group quarters data by 5-year age cohort and sex are added back to determine the projected population.

The entire process is repeated for subsequent 5-year time periods to generate population projections for future years. The projected population for each iteration serves as the base population for the next iteration, with updates made to reflect changes in births, deaths, and migration. The adequacy of this model depends on the accuracy with which the assumptions about future fertility, mortality, and migration reflect future demographic reality. Figure 1 shows, in general, the interactions among the components of change and the process flow of the model:

Figure 1: Population Projection Model Process



Data File Preparation and Assumptions for Inclusion in the Cohort-Component Projection Model

The cohort-component projection model uses the following demographic data files:

- Base Population
- Fertility Rates
- Survival Rates
- Migration Rates
- Migration Typologies
- International Migrants
- Group Quarters Population

Base Population

1. The base distribution is the U.S. Census Bureau's population estimate for July 1, 2020, from the Vintage 2022 Population Estimates. The 2022 Vintage estimates incorporate the results of the 2020 Decennial Census, the 2020 Demographic Analysis Estimates, and additional years of birth and death data beyond 2020.

Fertility and Mortality Rates

The cohort-component model requires that assumptions be made about future fertility and mortality. Because the COVID-19 pandemic occurred within the population projection range, the study team assessed the impact of the pandemic on births and deaths.

The key findings include:

a. In Pennsylvania, the average annual number of deaths from 2010 to 2019 was approximately 130,000. However, during the COVID pandemic, the state witnessed an additional 25,000 deaths in each of the years 2020 and 2021.
b. Likewise, Pennsylvania's average annual number of births from 2010 to 2019 was just under 140,000. However, during the pandemic, there were over 8,000 fewer births in each of the years 2020 and 2021.
c. Migration data from the IRS indicated a decrease in the out-migration rate for Pennsylvania in 2020 due to the COVID-19 pandemic, which returned to pre-pandemic levels in 2021. A comparison between migration data from the 2017-2021 ACS 5-Year Estimates and the 2015-2019 ACS 5-Year Estimates highlighted weakened in-migration rates for the population aged 18 to 19 years and strengthened in-migration rates for the population aged 25-29 years and 40-44 years. These trends differ from the decade-long patterns observed in previous estimates. Based on this analysis, the 2015-2019 ACS 5-Year Estimates were used to calculate migration rates by age and sex cohort.
d. The Vintage 2022 Population Estimates incorporate methodological adjustments that account for the effects of the pandemic.

Based on these findings the study team utilized data that was collected prior to the COVID-19 pandemic, and used the Vintage 2022 Population Estimates, which incorporate methodological adjustments that account for the pandemic.

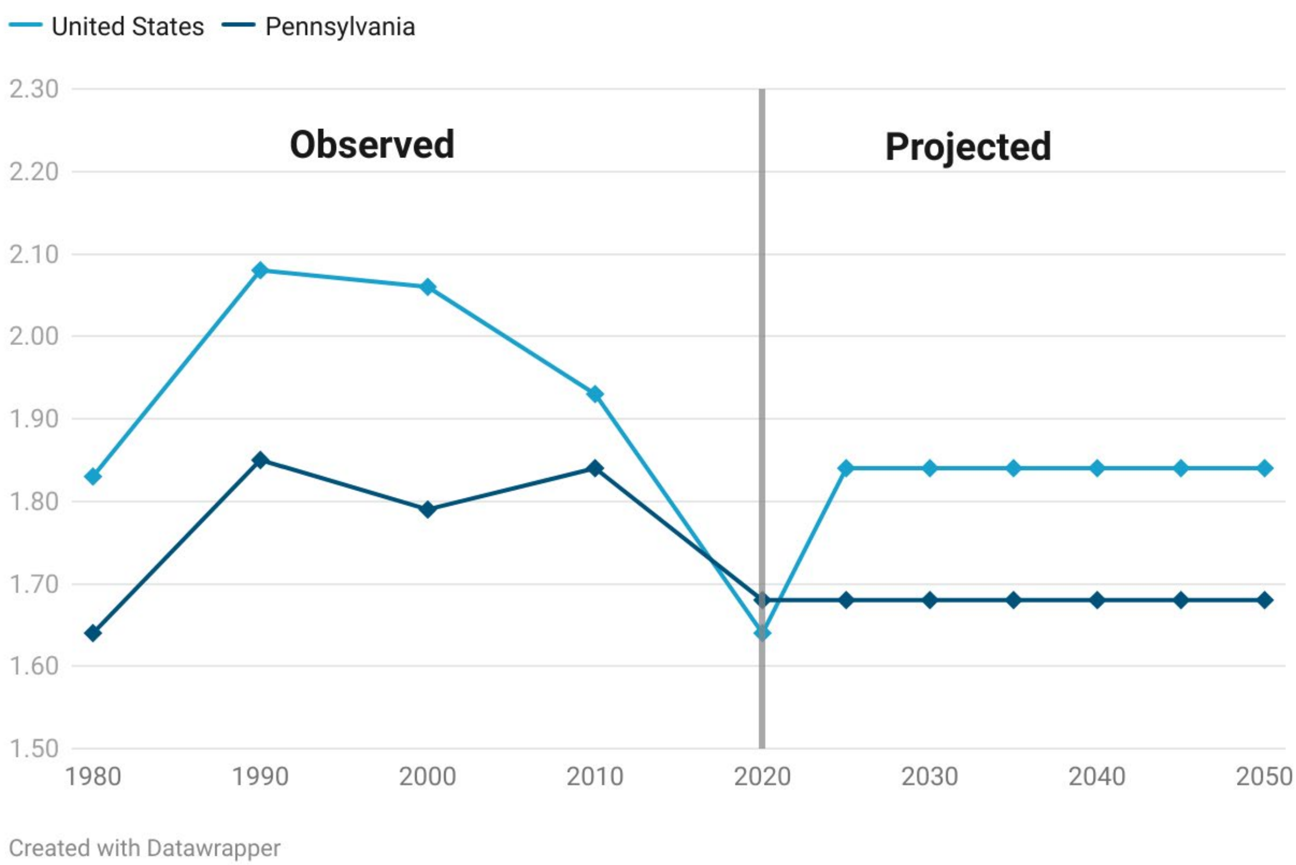
Fertility Rates

The assumption about future trends in state fertility is that Pennsylvania's fertility will follow closely to the Census Bureau's projected age-specific fertility rates for the United States. State trending was based on a careful analysis of the historic relationship between national and Pennsylvania age-specific fertility rates. The national series assumes that overall fertility for the United States will be 1.64 births per woman in 2020 and will increase slightly to 1.84 births per woman by 2050.

To create Pennsylvania's projected fertility rates, the study team analyzed births by age of mother from 2015 through 2019. This data was used with population data for females by age cohort to develop fertility rates by age for the year 2020. The fertility rate by age group was applied to the number of women in each of the corresponding childbearing age groups (10-14, 15-19, 20-24...45-49). To project age-specific fertility rates, the age-specific fertility rates for the base year (2020) were adjusted based on the change in the U.S. rate for each 5-year projection period.

The analysis showed that Pennsylvania's fertility rates have been consistently lower than those for the nation, as seen in Figure 2.

Figure 2: Total Fertility Rate



The population projections incorporate rates that capture the pattern of lower fertility and delayed childbearing that lengthens the time between generations in Pennsylvania. Based on the above methodology, the fertility rate for Pennsylvania was 1.68 births per woman in 2020 and is projected to be 1.68 births per woman in 2050.

Projections of county patterns of fertility are based on a time-series analysis of the relationship between general fertility rates for counties and those of the state. The sum of the county births by sex is adjusted to equal the projected number of state births by sex.

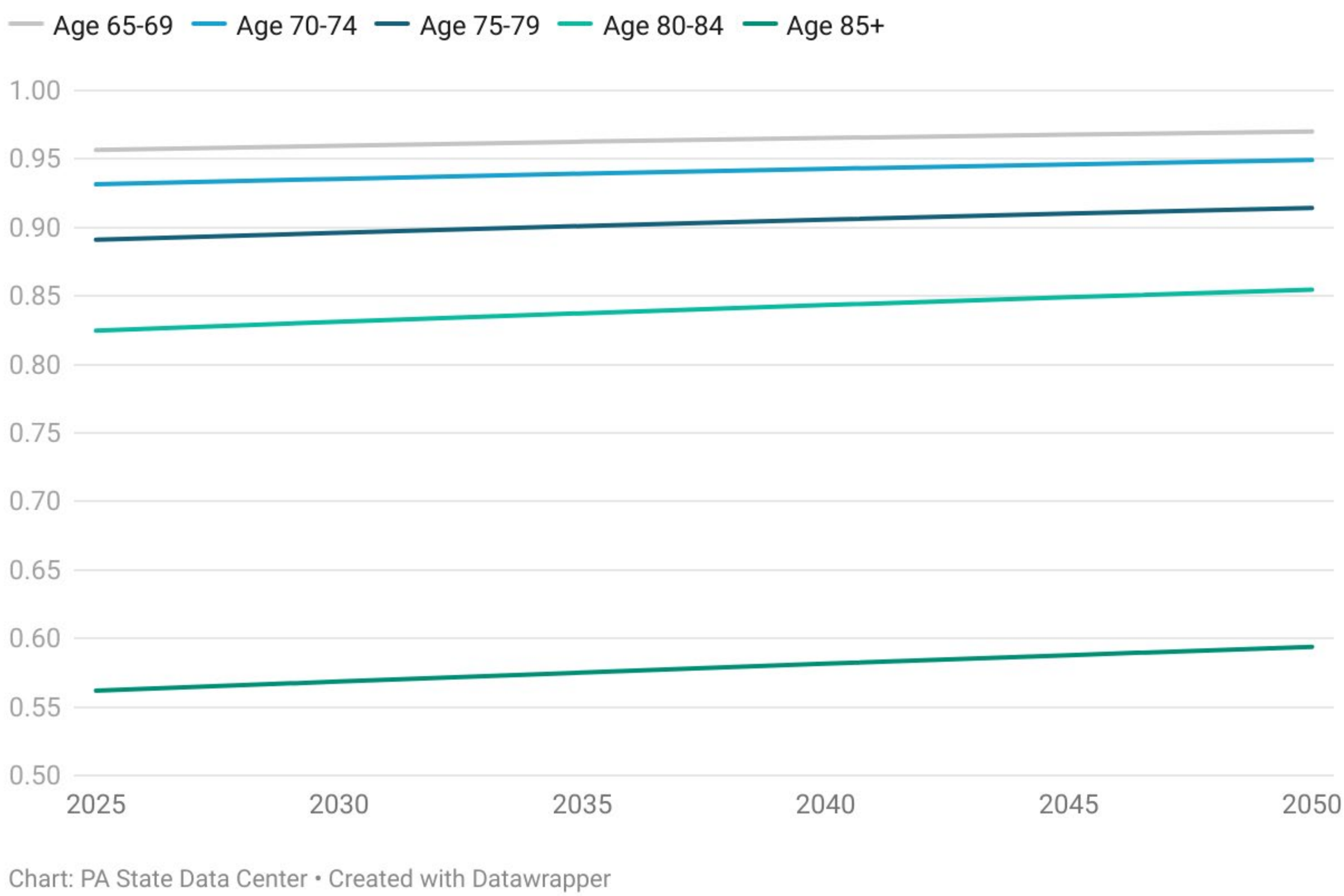
Survival Rates

To develop survival rates, state life tables were created by the study team. The number of deaths by age and sex for 2015 through 2019 were used in this analysis. The average number of deaths and the population by 5-year age and sex cohort for the 5-year period were used in the calculation. This information was then used to create life tables for the state by age and sex.

State age/sex-specific survival rates based on state life tables were created by the study team. The survival rate schedules for Pennsylvania assume a continuation of the historic relationship of Pennsylvania’s rates to national rates through the year 2050. Pennsylvania’s rates for both males and females are expected to continue to mirror the U.S. rates.

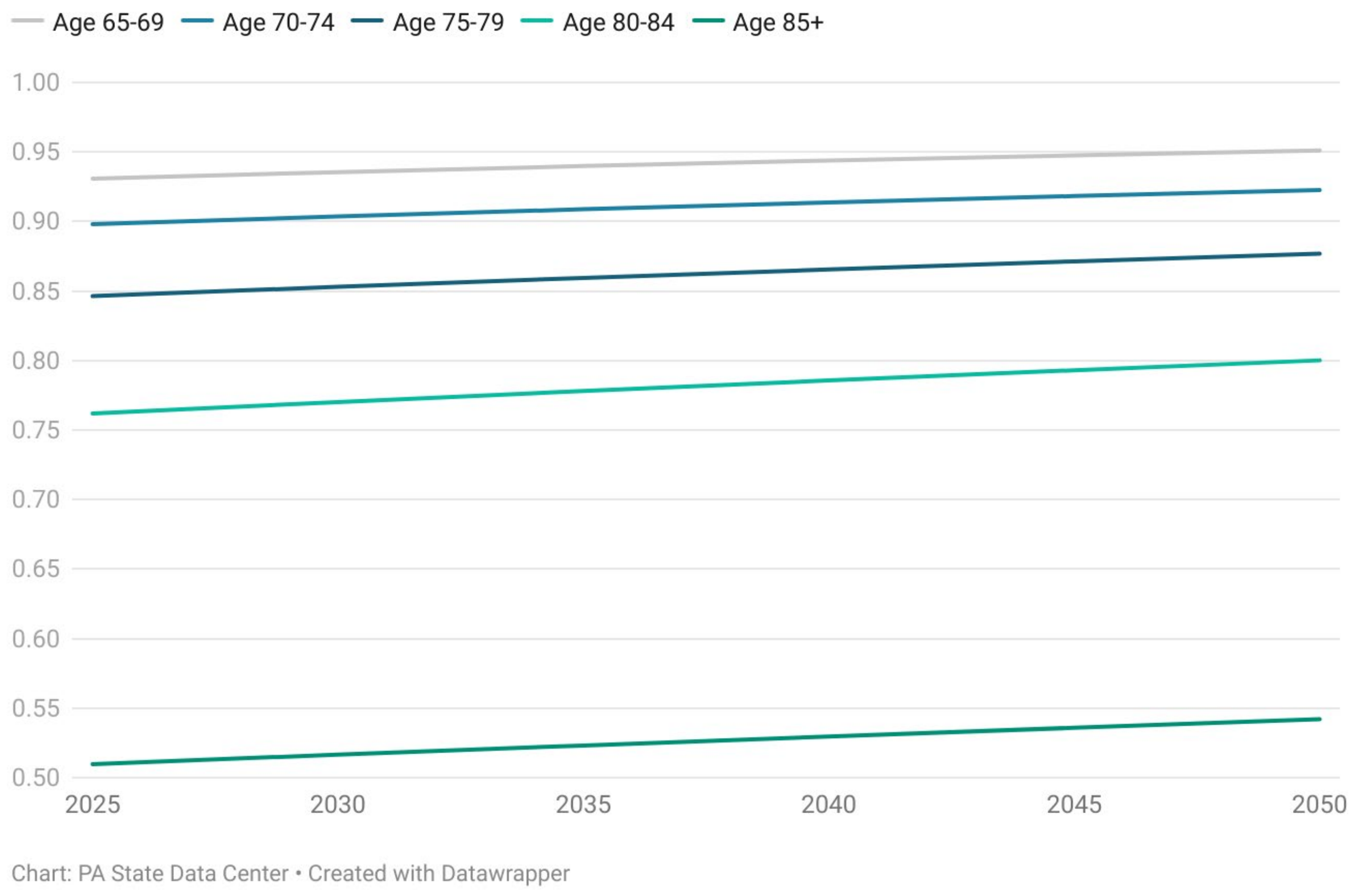
Survival rates are applied to births and to each 5-year age and sex cohort. County level variation in life expectancy in Pennsylvania is due primarily to local area differences in the age by sex composition of county populations. In using age by sex-specific schedules, the projections model assumes that state rates are applicable for all counties. To project age by sex specific survival rates, the survival rates for the base year (2020) were adjusted based on the change in the U.S. rate for each 5-year projection period. As with fertility, Pennsylvania survival rates are, in most cases, lower than those for the United States. Figure 3 and Figure 4 show the survival rates for Pennsylvania’s age cohorts 65 and older for females and males respectively. The survival rate is used to calculate the number of people who will survive for the next 5-year period.

Figure 3: Pennsylvania Survival Rates, 65 and Over: Females



Note: The lowest green line in the chart represents the survival rates for females aged 85 and older. In 2025 their survival rate was 56.2% which increased to 59.3% by 2050.

Figure 4: Pennsylvania Survival Rates, 65 and Over: Males



Migration Rates
The migration rates used in this report rely on a thorough analysis of the unique age/sex-specific patterns of migration for the state and each county, and on an analysis of trended changes in the levels of migration.

To provide population projections by age and sex, it is necessary to have high-quality migration rates for the state and county population subgroups. Domestic migration data by 5-year age cohorts and sex for both the state and counties during 2015-2019 was obtained from the U.S. Census Bureau's American Community Survey (ACS). The data are a result of the questions asked concerning place of residence "one year ago." This dataset includes information on in-migrants categorized by 5-year age cohorts and sex. In addition to the age patterns of migration, the demographic projections are based on a thorough analysis of net migration. The projection model uses trended state and county level 2015-2019, age-specific migration rates in future projection cycles to the year 2050.

The projected net international migration data by single year of age and sex is extracted from the 2017 National Population Projections release. This dataset provides projected net international migrants by age, sex, and race through 2060. Net migrants for the nation were aggregated from this data to the 5-year age and sex cohorts for each five-year period used in this analysis. The ratio of Pennsylvania migrants to U.S migrants by 5-year age and sex cohort was calculated using American Community Survey data and this ratio was applied to the projected international net migrants in the U.S. to calculate the projected net international migrants for Pennsylvania.

Migration Typologies

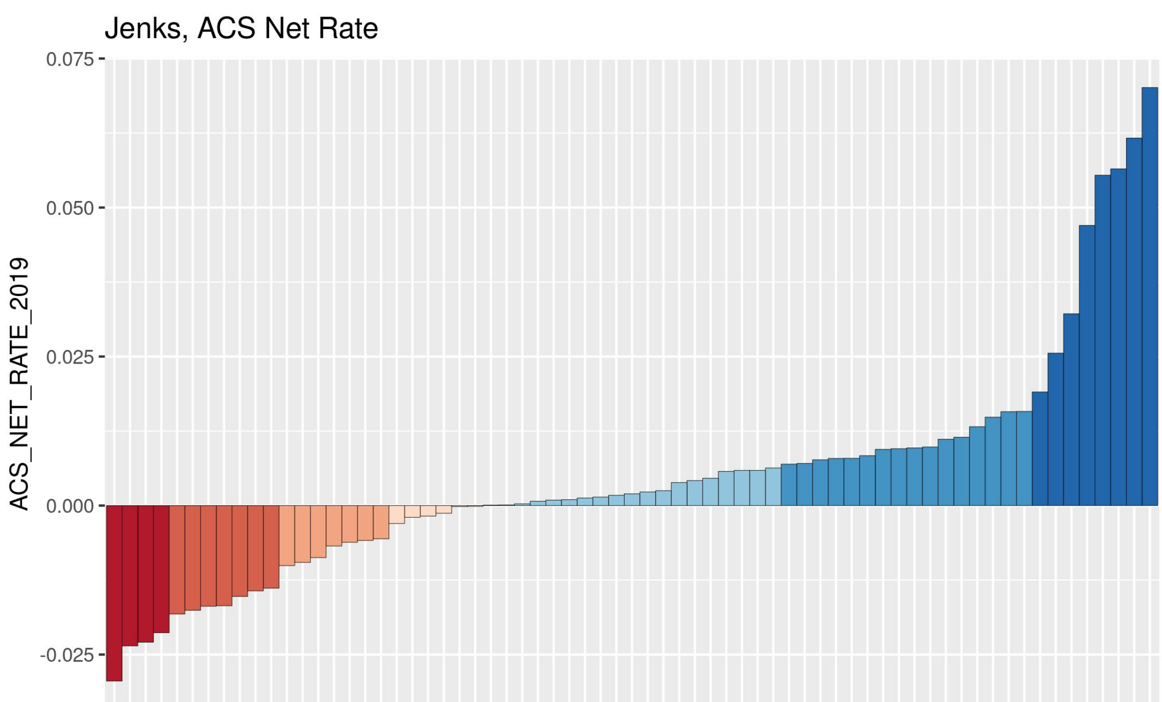
Jenks Natural Breaks Classification

The Jenks Natural Breaks method was used to divide counties into four classes on each side of zero (4 negative and 4 positive) for each indicator, i) 2015-2019 ACS 5-Year Net Migration Rate and ii) percent change in net migration from 2010-2014 ACS 5-Year Estimates to 2015-2019 ACS 5-Year Estimates.

Net Migration Rates

Net migration classes were indicated as negative or positive (N/P) and a number was assigned based on the distance from zero (1-4, where 1 is closest to zero and 4 is furthest away). For instance, Adams County had a negative net migration rate and fell into the second class (N2). This can be interpreted as Adams County having a negative net migration and falling in the second class in terms of migration strength when compared to other counties.

Figure 5: Jenks Natural Breaks Classification of PA Counties' Migration Rates, 2015-2019, 5-Year ACS Estimates

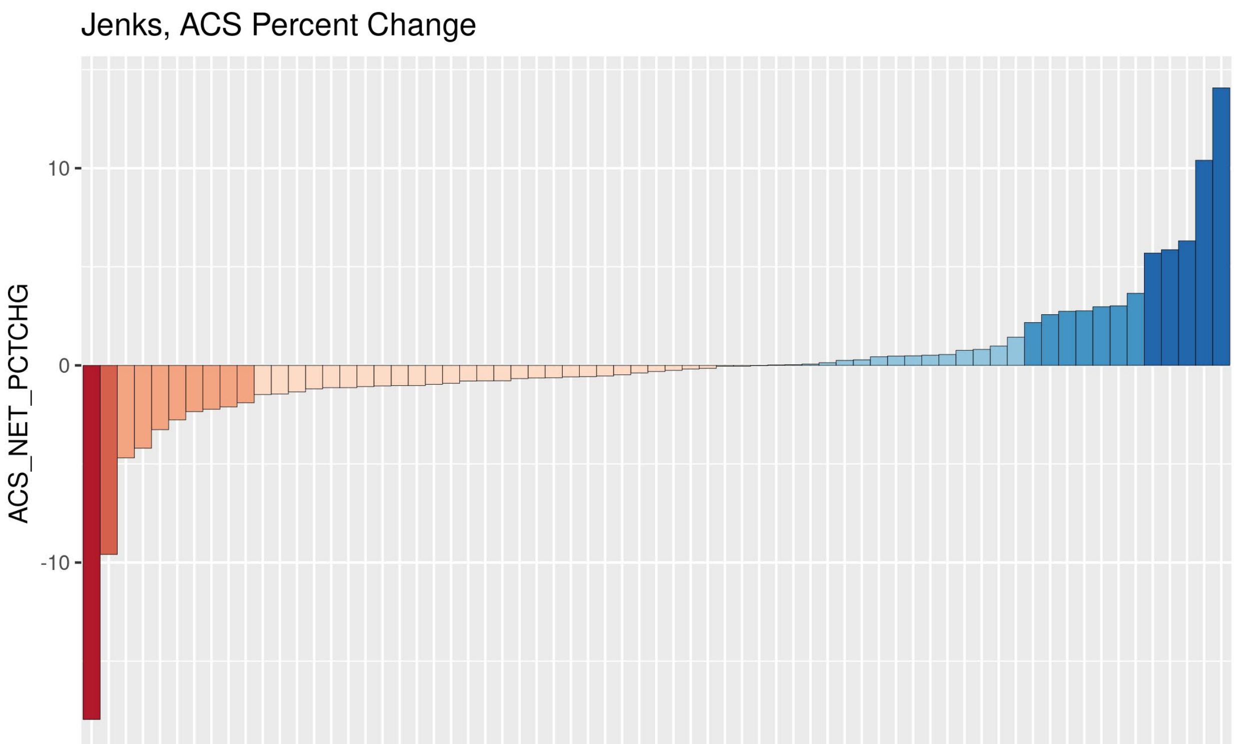


Note: Counties with negative net migration rates are captured to the left of the X axis in shades of red while those with positive net migration rates are captured to the right of the X axis. The Y axis shows the strength of the migration rate. Different shades of red and blue are used to show the classification results of the Jenks Classification method.

Percent Change in Net Migration Rates

Percent change classes were indicated as decreasing or increasing (D/I) and a number was assigned in a similar manner noted above. For instance, Adams County had a decrease in the percent change of its net migration rate across the two ACS periods and fell within the first (weakest) class.

Figure 6: Jenks Natural Breaks Classification of Percent Change in PA Counties' Migration Rates from 2010-2014 to 2015-2019, 5-Year ACS Estimates



Note: Counties with negative percent change in migration rates are captured to the left of the X axis in shades of red while those with positive percent change in migration rates are captured to the right of the X axis. The Y axis shows the strength of the migration rate's percent change. Different shades of red and blue are used to show the classification results of the Jenks Classification method.

Combining Rate and Percent Change Classes

In tandem, these codes created classes that described the counties' net migration rates (positive or negative) and percent change in migration rate (increase or decrease). For example, Adams County was classified as N2-D1. It fell in the second lowest negative class for its net migration rate and the lowest class, decreasing class, in terms of percent change.

This resulted in 26 distinct Jenks classes. Since 14 of these combined Jenks classes contained only a single county, the Jenks classes were combined into 8 distinct typology classes manually based on their migration rate and percent change values.

Table 1: Overview of Migration Typology Classes

Code	Description	Count	Migration Rate	Percent Change
SN-SD	Strong Negative Migration with Strong Decrease in Migration Rate	4	-0.023	-8.524
MN-MD	Moderate Negative Migration with Moderate Decrease in Migration Rate	8	-0.003	-0.751
MP-SD	Moderate Negative Migration with Strong Decrease in Migration Rate	6	0.008	-2.824
MP-MD	Moderate Negative Migration with Moderate Decrease in Migration Rate	19	0.004	-0.784
SP-MD	Strong Positive Migration with Moderate Decrease in Migration Rate	3	0.045	-0.235
SP-MI	Strong Positive Migration with Moderate Increase in Migration Rate	12	0.026	0.830
SP-SI	Strong Positive Migration with Strong Increase in Migration Rate	3	0.007	6.496
XN-XI	Negative Migration with Increase in Migration Rate	12	-0.013	3.338

Table 1 shows the migration typology classes developed for the projections with short-hand codes, titles, county counts, average migration rates, and average percent changes in migration rate by class.

Decaying Migration Effects Over Time

Creating Decay Factors

Polynomial decay was used to project migration rates over time in a fashion that the rates approached zero over time, mitigating the influence of the migration rate. The base migration rates, derived from 2015-2019 ACS 5-Year data, were adjusted by a decay multiplier that corresponds to each county's typology class.

The time periods ranged from 1 (representing the year 2020) to 7 (representing the year 2050). As time advances, the decay multiplier, represented by the 'decay factor,' decreases over time. This progressive decrease in the decay factor reflects the diminishing influence of the initial migration rate on the projections. In other words, as we move towards the later years, the impact of migration on the projections gradually becomes less significant, and this is precisely captured by the declining decay factor. This is important due to the volatility of migration data. Long term trends are often hard to consider as migration can fluctuate widely from one decade to the next. As such, limiting the effect of migration over time also limits the volatility of our long-term projections.

To determine the decay factor of each typology class, the average rate of change for each typology class was calculated and normalized via a Z-score, treating positive and negative changes separately. By doing so, we highlight the magnitude of the change in relation to its class mean, while preserving the direction of change.

Typology	Avg. Pct. Chg.	z (+/-)	Decay Factor
SN-SD	-8.524	-2.624	3.249
MP-SD	-2.824	-2.624	1.076
MP-MD	-0.784	-2.624	0.299
MN-MD	-0.751	-2.624	0.286
SP-MD	-0.235	-2.624	0.090
SP-MI	0.830	3.555	0.233
XN-XI	3.338	3.555	0.939
SP-SI	6.496	3.555	1.827

The function was calculated as:

$$f = m * \frac{1}{\frac{m}{d^t}}$$

where

m : base migration rate

d : decay factor

t : time factor

Here, the term (m/d^t) acts as a decay term that reduces over time, where *t* is the time step and d is the decay rate. As time increases, the denominator becomes larger due to the d^t term, thus reducing the overall value of the function, hence capturing the diminishing influence.

Table 2: Counties by Typology Classes

County	Class Code	Class Description
Greene	SN-SD	Strong Negative Rate with Strong Decrease in Rate
Montour	SN-SD	Strong Negative Rate with Strong Decrease in Rate
Tioga	SN-SD	Strong Negative Rate with Strong Decrease in Rate
Wyoming	SN-SD	Strong Negative Rate with Strong Decrease in Rate
Adams	MN-MD	Moderate Negative Rate with Moderate Decrease in Rate
Bradford	MN-MD	Moderate Negative Rate with Moderate Decrease in Rate
Bucks	MN-MD	Moderate Negative Rate with Moderate Decrease in Rate
Cambria	MN-MD	Moderate Negative Rate with Moderate Decrease in Rate
Erie	MN-MD	Moderate Negative Rate with Moderate Decrease in Rate
Fayette	MN-MD	Moderate Negative Rate with Moderate Decrease in Rate
Montgomery	MN-MD	Moderate Negative Rate with Moderate Decrease in Rate
Perry	MN-MD	Moderate Negative Rate with Moderate Decrease in Rate
Armstrong	XN-XI	Negative Rate with Increase in Rate
Carbon	XN-XI	Negative Rate with Increase in Rate
Elk	XN-XI	Negative Rate with Increase in Rate
Jefferson	XN-XI	Negative Rate with Increase in Rate
Northumberland	XN-XI	Negative Rate with Increase in Rate
Pike	XN-XI	Negative Rate with Increase in Rate
Potter	XN-XI	Negative Rate with Increase in Rate
Schuylkill	XN-XI	Negative Rate with Increase in Rate
Somerset	XN-XI	Negative Rate with Increase in Rate
Susquehanna	XN-XI	Negative Rate with Increase in Rate
Warren	XN-XI	Negative Rate with Increase in Rate
Westmoreland	XN-XI	Negative Rate with Increase in Rate
Beaver	MP-SD	Moderate Negative Rate with Strong Decrease in Rate
Columbia	MP-SD	Moderate Negative Rate with Strong Decrease in Rate
Juniata	MP-SD	Moderate Negative Rate with Strong Decrease in Rate
Lawrence	MP-SD	Moderate Negative Rate with Strong Decrease in Rate
Mercer	MP-SD	Moderate Negative Rate with Strong Decrease in Rate
Monroe	MP-SD	Moderate Negative Rate with Strong Decrease in Rate
Allegheny	MP-MD	Moderate Negative Rate with Moderate Decrease in Rate
Bedford	MP-MD	Moderate Negative Rate with Moderate Decrease in Rate
Berks	MP-MD	Moderate Negative Rate with Moderate Decrease in Rate
Blair	MP-MD	Moderate Negative Rate with Moderate Decrease in Rate
Butler	MP-MD	Moderate Negative Rate with Moderate Decrease in Rate
Cameron	MP-MD	Moderate Negative Rate with Moderate Decrease in Rate

Table 2: Counties by Typology Classes (Cont.)

County	Class Code	Class Description
Clearfield	MP-MD	Moderate Negative Rate with Moderate Decrease in Rate
Crawford	MP-MD	Moderate Negative Rate with Moderate Decrease in Rate
Franklin	MP-MD	Moderate Negative Rate with Moderate Decrease in Rate
Lackawanna	MP-MD	Moderate Negative Rate with Moderate Decrease in Rate
Lancaster	MP-MD	Moderate Negative Rate with Moderate Decrease in Rate
Lycoming	MP-MD	Moderate Negative Rate with Moderate Decrease in Rate
McKean	MP-MD	Moderate Negative Rate with Moderate Decrease in Rate
Mifflin	MP-MD	Moderate Negative Rate with Moderate Decrease in Rate
Snyder	MP-MD	Moderate Negative Rate with Moderate Decrease in Rate
Venango	MP-MD	Moderate Negative Rate with Moderate Decrease in Rate
Washington	MP-MD	Moderate Negative Rate with Moderate Decrease in Rate
Wayne	MP-MD	Moderate Negative Rate with Moderate Decrease in Rate
York	MP-MD	Moderate Negative Rate with Moderate Decrease in Rate
Centre	SP-MD	Strong Positive Rate with Moderate Decrease in Rate
Clinton	SP-MD	Strong Positive Rate with Moderate Decrease in Rate
Union	SP-MD	Strong Positive Rate with Moderate Decrease in Rate
Chester	SP-MI	Strong Positive Rate with Moderate Increase in Rate
Clarion	SP-MI	Strong Positive Rate with Moderate Increase in Rate
Cumberland	SP-MI	Strong Positive Rate with Moderate Increase in Rate
Forest	SP-MI	Strong Positive Rate with Moderate Increase in Rate
Fulton	SP-MI	Strong Positive Rate with Moderate Increase in Rate
Huntingdon	SP-MI	Strong Positive Rate with Moderate Increase in Rate
Indiana	SP-MI	Strong Positive Rate with Moderate Increase in Rate
Lebanon	SP-MI	Strong Positive Rate with Moderate Increase in Rate
Lehigh	SP-MI	Strong Positive Rate with Moderate Increase in Rate
Luzerne	SP-MI	Strong Positive Rate with Moderate Increase in Rate
Northampton	SP-MI	Strong Positive Rate with Moderate Increase in Rate
Sullivan	SP-MI	Strong Positive Rate with Moderate Increase in Rate
Dauphin	SP-SI	Strong Positive Rate with Strong Increase in Rate
Delaware	SP-SI	Strong Positive Rate with Strong Increase in Rate
Philadelphia	SP-SI	Strong Positive Rate with Strong Increase in Rate

Group Quarters Population

The Group Quarters population refers to persons who, under care or custody, stay in a group living arrangement that is managed by or owned by an organization. Group quarter arrangements include correctional facilities, student housing, military quarters, and other facilities. Unlike the resident population, the demographic structure of a group quarter remains constant. For example, college dormitory populations do not age but typically remain between ages 18 and 22. Therefore the Group Quarters population is held constant throughout the projection cycle.

The study team obtained data from the U.S. Census Bureau's 2020 Demographic and Housing Characteristics (DHC) data file. This dataset includes the population living in group quarters by 5-year age cohorts and sex for both the state and its 67 counties by type of group quarters. Those living in correctional facilities, juvenile centers, student housing, and other institutionalized population were included in the group quarters count used in the analysis. An analysis of the age/sex distribution for the college/university population from the 2020 DHC file revealed the distribution differed significantly from previous Decennial Census and Population Estimates data releases. For example, in Centre County the population under age 20 was reported as 17% male versus 83% female in 2020. In Clarion County the age cohort was reported as 24% male versus 76% female. In 2010, this age cohort was reported as 50% male in Centre County and 40% male in Clarion County. Current university enrollment data shows that the 2020 distribution is inaccurate, and the 2010 distribution trend continues. To adjust for this, the age/sex distribution from the 2010 Decennial Census by group quarters type was applied to the 2020 Decennial Census total counts by group quarters type.

In addition to the group quarters population in college dormitories reported in the DHC file, an additional analysis was done to estimate the count of students living in off-campus housing. This analysis was done for counties with large university populations including Centre (Penn State), Clarion (Clarion), Clinton (Lock Haven), Columbia (Bloomsburg), Indiana (Indiana) and Union (Bucknell) counties. Two data sources were used in this analysis: the Integrated Postsecondary Education Data System (IPEDS) and counts of students living in college dormitories collected by the PaSDC for annual reporting to the U.S Census Bureau’s Population Estimates Program. IPEDS provides the total fall enrollment by college, university, and technical and vocational institution. The PaSDC collects data by dormitory for Pennsylvania colleges and universities. By subtracting the dormitory population from the total enrollment, we can estimate the count of students living in off-campus housing. Because the total student enrollment could include county residents, on-line learners, or other housing situations, 80% of this estimate was considered additional group quarters population for these six counties.

Adjustments were made to Forest County’s group quarters population because it contains a correctional facility with a large male population compared to the overall county population. The resident female distribution by age was used to estimate the resident male distribution and the group quarters population was adjusted accordingly. This adjustment was made for the population in age groups 15-19 through 60-64.

Population Projections Model

Table 3 shows a summary of the components of change resulting from application of the model.

Table 3: Pennsylvania Population Projections: Components of Change

Year	2020-2025	2025-2030	2030-2035	2035-2040	2040-2045	2045-2050
Base Population	**12,994,440**	**13,108,642**	**13,185,540**	**13,219,833**	**13,226,568**	**13,212,864**
Group Quarters (-)	261,185	261,185	261,185	261,185	261,185	261,185
Total Births (+)	650,783	642,106	644,900	653,924	653,691	642,001
Total Deaths (-)	677,884	710,161	759,031	798,199	819,814	811,727
Domestic Migration (+)	-5,954	-6,629	-6,339	-6,007	-5,783	-5,939
Overseas Migration (+)	147,257	151,583	154,762	157,018	158,201	158,698
Group Quarters (+)	261,185	261,185	261,185	261,185	261,185	261,185
Final Population	**13,108,642**	**13,185,540**	**13,219,833**	**13,226,568**	**13,212,864**	**13,195,897**

Final Population Projections

Table 4 shows the final projected populations and percent change for Pennsylvania and its 67 counties for each decade from 2020 through 2050.

Population projections show that Pennsylvania's population is projected to grow from 13 million in 2020 to 13.2 million in 2050. This represents an increase of 1.6 percent, or 200,000 people over the 30-year period.

Table 4: Pennsylvania Population Projections: 2020-2050

County	July 1, 2020 Estimate	July 1, 2030 Projection	July 1, 2040 Projection	July 1, 2050 Projection	% Change 2020-2030	% Change 2020-2040	% Change 2020-2050
Pennsylvania	**12,994,440**	**13,185,540**	**13,226,568**	**13,195,897**	**1.5%**	**1.8%**	**1.6%**
Adams	103,779	100,621	96,297	91,297	-3.0%	-7.2%	-12.0%
Allegheny	1,249,524	1,254,923	1,240,311	1,226,933	0.4%	-0.7%	-1.8%
Armstrong	65,459	62,443	59,004	55,277	-4.6%	-9.9%	-15.6%
Beaver	167,860	164,741	159,316	152,940	-1.9%	-5.1%	-8.9%
Bedford	47,569	46,534	45,091	43,624	-2.2%	-5.2%	-8.3%
Berks	428,631	442,748	453,624	460,295	3.3%	5.8%	7.4%
Blair	122,651	121,272	118,339	114,846	-1.1%	-3.5%	-6.4%
Bradford	59,969	59,009	57,978	57,080	-1.6%	-3.3%	-4.8%
Bucks	646,112	638,955	623,755	597,516	-1.1%	-3.5%	-7.5%
Butler	194,056	191,826	186,771	179,504	-1.1%	-3.8%	-7.5%
Cambria	133,199	129,572	125,140	120,889	-2.7%	-6.1%	-9.2%
Cameron	4,531	4,417	4,222	4,091	-2.5%	-6.8%	-9.7%
Carbon	64,744	62,559	59,746	56,315	-3.4%	-7.7%	-13.0%
Centre	157,962	165,510	171,485	177,459	4.8%	8.6%	12.3%
Chester	534,783	552,077	567,038	571,892	3.2%	6.0%	6.9%
Clarion	37,193	36,845	36,165	35,428	-0.9%	-2.8%	-4.7%
Clearfield	80,438	79,390	77,248	74,585	-1.3%	-4.0%	-7.3%
Clinton	37,380	38,029	38,030	37,649	1.7%	1.7%	0.7%
Columbia	64,682	62,478	58,821	54,437	-3.4%	-9.1%	-15.8%
Crawford	83,797	83,049	81,369	79,890	-0.9%	-2.9%	-4.7%
Cumberland	260,223	274,199	286,305	297,010	5.4%	10.0%	14.1%
Dauphin	286,685	300,606	310,249	318,974	4.9%	8.2%	11.3%
Delaware	576,323	593,013	603,518	608,268	2.9%	4.7%	5.5%
Elk	30,926	29,524	27,942	26,154	-4.5%	-9.6%	-15.4%
Erie	270,539	272,949	272,721	271,352	0.9%	0.8%	0.3%
Fayette	128,569	127,643	124,833	122,279	-0.7%	-2.9%	-4.9%
Forest	6,959	6,533	5,993	5,585	-6.1%	-13.9%	-19.7%
Franklin	155,939	157,034	157,036	156,786	0.7%	0.7%	0.5%
Fulton	14,572	14,535	14,504	14,416	-0.3%	-0.5%	-1.1%
Greene	35,859	35,536	34,858	34,145	-0.9%	-2.8%	-4.8%
Huntingdon	44,047	43,781	43,301	42,809	-0.6%	-1.7%	-2.8%
Indiana	83,142	86,551	89,177	92,213	4.1%	7.3%	10.9%

Table 4: Pennsylvania Population Projections: 2020-2050 (Cont.)

County	July 1, 2020 Estimate	July 1, 2030 Projection	July 1, 2040 Projection	July 1, 2050 Projection	% Change 2020-2030	% Change 2020-2040	% Change 2020-2050
Jefferson	44,478	43,752	42,942	42,046	-1.6%	-3.5%	-5.5%
Juniata	23,471	24,515	25,732	27,013	4.4%	9.6%	15.1%
Lackawanna	215,523	217,307	217,570	217,277	0.8%	0.9%	0.8%
Lancaster	552,761	569,039	583,665	599,146	2.9%	5.6%	8.4%
Lawrence	85,959	84,745	82,628	80,246	-1.4%	-3.9%	-6.6%
Lebanon	143,282	148,872	155,167	161,410	3.9%	8.3%	12.7%
Lehigh	374,477	391,415	405,502	416,810	4.5%	8.3%	11.3%
Luzerne	325,197	331,038	334,017	336,757	1.8%	2.7%	3.6%
Lycoming	114,108	114,059	113,363	112,305	0.0%	-0.7%	-1.6%
McKean	40,392	39,748	38,643	37,123	-1.6%	-4.3%	-8.1%
Mercer	110,534	109,167	106,997	104,858	-1.2%	-3.2%	-5.1%
Mifflin	46,144	46,727	47,348	48,275	1.3%	2.6%	4.6%
Monroe	168,316	169,715	166,837	160,476	0.8%	-0.9%	-4.7%
Montgomery	856,938	864,526	866,836	858,686	0.9%	1.2%	0.2%
Montour	18,129	17,975	17,706	17,547	-0.8%	-2.3%	-3.2%
Northampton	312,774	313,590	311,399	306,295	0.3%	-0.4%	-2.1%
Northumberland	91,542	89,734	86,829	83,826	-2.0%	-5.1%	-8.4%
Perry	45,828	45,781	44,779	43,761	-0.1%	-2.3%	-4.5%
Philadelphia	1,600,600	1,706,670	1,772,833	1,836,216	6.6%	10.8%	14.7%
Pike	58,560	54,723	49,884	44,313	-6.6%	-14.8%	-24.3%
Potter	16,385	15,785	15,267	14,856	-3.7%	-6.8%	-9.3%
Schuylkill	142,946	138,732	133,698	127,877	-2.9%	-6.5%	-10.5%
Snyder	39,727	39,602	39,395	39,212	-0.3%	-0.8%	-1.3%
Somerset	74,016	71,573	68,632	65,754	-3.3%	-7.3%	-11.2%
Sullivan	5,823	5,791	5,640	5,663	-0.5%	-3.1%	-2.7%
Susquehanna	38,334	36,845	35,043	33,184	-3.9%	-8.6%	-13.4%
Tioga	41,014	39,840	38,491	37,011	-2.9%	-6.2%	-9.8%
Union	42,639	44,308	46,421	49,022	3.9%	8.9%	15.0%
Venango	50,354	49,092	47,158	45,041	-2.5%	-6.3%	-10.6%
Warren	38,516	37,092	35,590	34,223	-3.7%	-7.6%	-11.1%
Washington	209,382	204,813	197,159	188,354	-2.2%	-5.8%	-10.0%
Wayne	51,151	49,332	46,476	43,489	-3.6%	-9.1%	-15.0%
Westmoreland	354,316	338,375	318,761	297,459	-4.5%	-10.0%	-16.0%
Wyoming	26,030	25,414	24,442	23,344	-2.4%	-6.1%	-10.3%
York	456,692	466,946	473,531	475,084	2.2%	3.7%	4.0%

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