The Center for

Rural Pennsylvania

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Pennsylvania Population Projections
2010-2040

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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, work force 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.

The Pennsylvania population projections were completed for the years 2015, 2020, 2025, 2030, 2035, and 2040 for the commonwealth and its 67 counties. These projections were developed by 5-year age and sex cohorts.

Projecting future population is a complex process built upon scientific methodologies and assumptions. The process starts with the July 1, 2010 Estimates-based[1] population for Pennsylvania and its counties and applies mortality, fertility, and migration rates to project the population forward by 5-year intervals using a cohort-component methodology. This demographic approach is distinctly different from projections based on economic factors and does not take into account recent employment or business activity trends.

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[1] U.S. Bureau of the Census, State and County Total Resident Population Estimates (Vintage 2012): April 1, 2010 to July 1, 2012.

If the projections are accurate, the population of Pennsylvania will increase to 14.1 million in 2040, up from 12.7 million in 2010. Almost 72 percent of the increase will be due to domestic net-migration or overseas migrants arriving from 2010 to 2040, with overseas migrants accounting for more than 85 percent of this portion of the increase. The remaining 28 percent of the increase during this period is due to natural increase (births exceeding deaths).

The projections also provide an analysis of Pennsylvania's future "dependency ratio" – the number of children and elderly compared with the number of working-age residents. There were 68 children and elderly people per 100 adults of working age in 2010[2]. That number will rise to 86 dependents per 100 adults of working age in 2040.

While Pennsylvania will see an overall growth in population during this period, some counties will experience a decline in population. Map 1 shows that 13 of Pennsylvania's 67 counties will see an increase in population greater than 15 percent, while 35 counties will see no change or a change of 15 percent or less. A total of 19 counties will experience a decrease in population over the projection time period.

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[2] For the dependency ratio, children are defined as those less than 20 years of age, elderly is defined as those aged 65 and over, and working age is those between the ages of 20 and 64.

Map 1: Percent Change in Total Population: 2010 – 2040

Percent Change

☐ Population Loss   ▨ 0.0% to 15.0%   ■ 15.1% and Greater
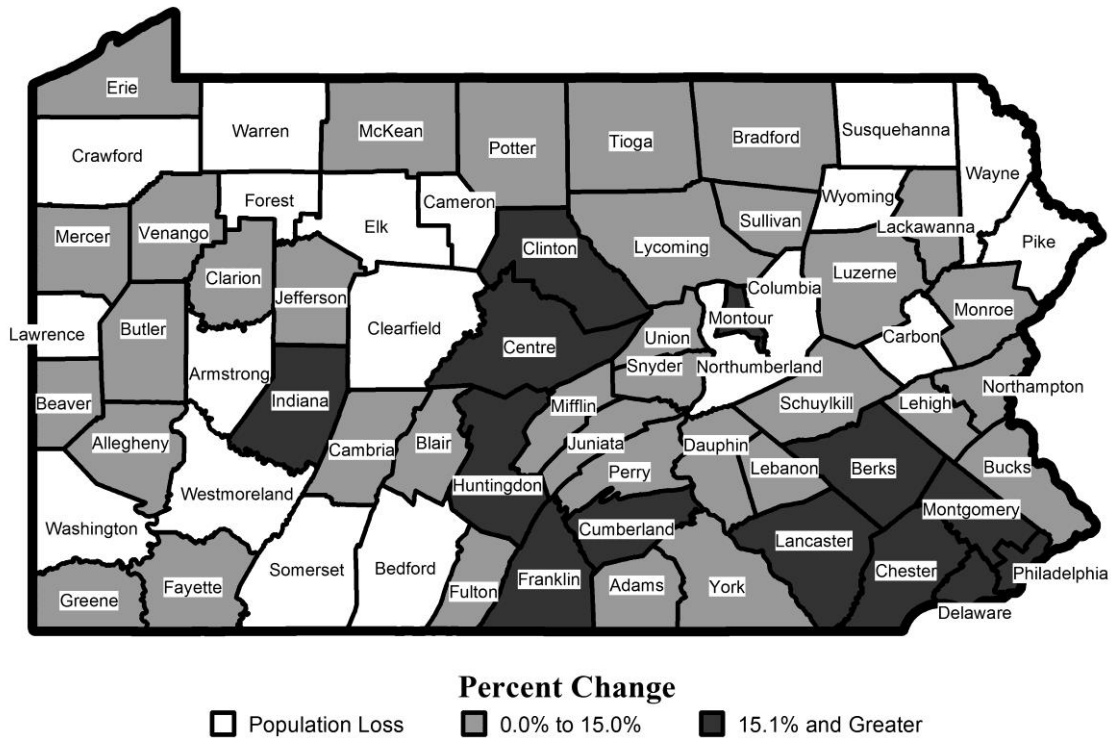
Almost 90 percent of the population increase during the 2010 to 2040 period is expected to occur in urban counties, and the remaining 10 percent will occur in rural counties. This means that the state's population will become more urban, increasing from about 73 percent in 2010 to 74 percent in 2040. Population in rural counties will decrease from about 27 percent to about 26 percent during this same period. The southeast region of the state is expected to have the largest increase in population, gaining more than 891,000 during the 30-year period. The southcentral region is expected to gain more than 184,000 during this same period. Other regions of the state are expected to have more modest gains (southwest - 127,000, northeast - 123,000, northcentral - 66,000, and northwest - 28,000).

Of the 10 largest counties in Pennsylvania, three (Lancaster, Philadelphia, and Chester) showed overall percentage growth in population of more than 20 percent. Montour, Clinton, Centre, and Berks counties also showed increases of more than 20 percent. Cameron, Forest, and Warren counties showed the greatest overall percentage decreases (greater than 10 percent) in population from 2010-2040.

An analysis of the age structure in Pennsylvania shows that the population is getting older over the 30-year period. The numbers of persons age 44 and younger and those age 65 and older are increasing, while the number of those age 45 to 64 is decreasing. This is due to baby boomers[3] moving through and out of these age groups. The largest percentage increase is seen in the age 65 and older cohort. In fact, all age groups of those 70 and older show a greater than 63 percent increase over the course of the study period. In 2010, the population age 65 and older accounted for about 15 percent of the population. By 2040, that percentage is expected to increase to about 23 percent of the total population. This change is due largely to the aging of the baby boomers and Pennsylvania's consistently low fertility rate.

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[3] Person who was born between the years of 1946 and 1964.

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Goals and Objectives

[Note: For a glossary of terms used in the report, see Appendix D.)

The study team conducted the following research activities for this project.

First, data sources were researched, data were obtained, and data files were manipulated into a format needed to develop the population projections. Data acquired during this activity included: Population in households by 5-year age and sex cohorts, population in group quarters by 5-year age and sex cohorts, birth and death data files, and domestic and international migration data.

Next, working assumptions of fertility and survivorship were developed. Assumptions included trends at the county level in regard to fertility by age and survivorship by age and sex.

Next, 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, and then migration typologies of projected net-migration were developed based on past- and near-term trends. Overseas migrants were also determined during this phase of the activity.

Finally, a computer 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 age and sex.

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 of these assumptions are built on 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 immigration 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 trends that have been incorporated into the model. The greatest value of projections is as a reference tool for planning, policy evaluation, the consideration of alternative public or private intervention activities, and the formulation and management of programs developed to deal with particular situations.

Demographic Cohort Model

The approach used to create the population projections is a cohort-component demographic 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 demographic

approach is distinctly different from projections based on economic factors and does not take into account recent employment or business activity trends.

The projection process starts by modifying the base population for the state and its counties. First, the group quarters population is removed from the July 1, 2010 Estimates Based (Vintage 2012) population. Next, the population is survived to create a preliminary population using survival rates. Births are projected by applying fertility rates to survived females of childbearing age, which provides an estimate of the population's natural increase. The survived population for each age group is then adjusted for projected domestic net migration by sex. International migration is added to each age and sex cohort. Finally, group quarters data are added back into the projected population. This process is repeated for the remaining 5-year time iterations. The adequacy of this model depends on the accuracy with which the assumptions about future fertility, mortality, and migration reflect future demographic reality. Chart 1 shows the process flow of the model:

Chart 1: Population Projection Model Process

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┌─────────────┐      ┌─────────────┐    ┌──────────┐    ┌─────────────┐   ┌──────────┐
│  Average    │      │             │    │          │    │  Residents  │   │          │
│ Annual Deaths,│ ──▶ │  Survival   │──▶ │          │──▶ │  Survived   │──▶│          │
│ 2007 - 2011 │      │   Rates     │    │  2010    │    │             │   │  Future  │
└─────────────┘      └─────────────┘    │          │    └─────────────┘   │          │
                                        │ County   │                      │ County   │
┌─────────────┐      ┌─────────────┐    │          │    ┌─────────────┐   │          │
│  Estimated  │      │    Net      │    │Populations│    │             │   │Population │
│Net Migration,│ ──▶ │  Migration  │──▶ │          │──▶ │  Migration  │──▶│          │
│ 2006 - 2010 │      │   Rates     │    │   by     │    │             │   │   by     │
└─────────────┘      └─────────────┘    │          │    └─────────────┘   │          │
                                        │  Age     │                      │  Age     │
┌─────────────┐      ┌─────────────┐    │          │    ┌─────────────┐   │          │
│  Average    │      │   Total     │    │  and     │    │             │   │  and     │
│Annual Births,│ ──▶ │  Fertility  │──▶ │          │──▶ │   Births,   │──▶│          │
│ 2007 - 2011 │      │   Rates     │    │  Sex     │    │  Survived   │   │  Sex     │
└─────────────┘      └─────────────┘    │          │    └─────────────┘   │          │
                                        └────┬─────┘                      └────▲─────┘
                                             │         ┌─────────────┐        │
                                             │         │Group Quarters│       │
                                             └────────▶│ Population   │───────┘
                                                       └─────────────┘
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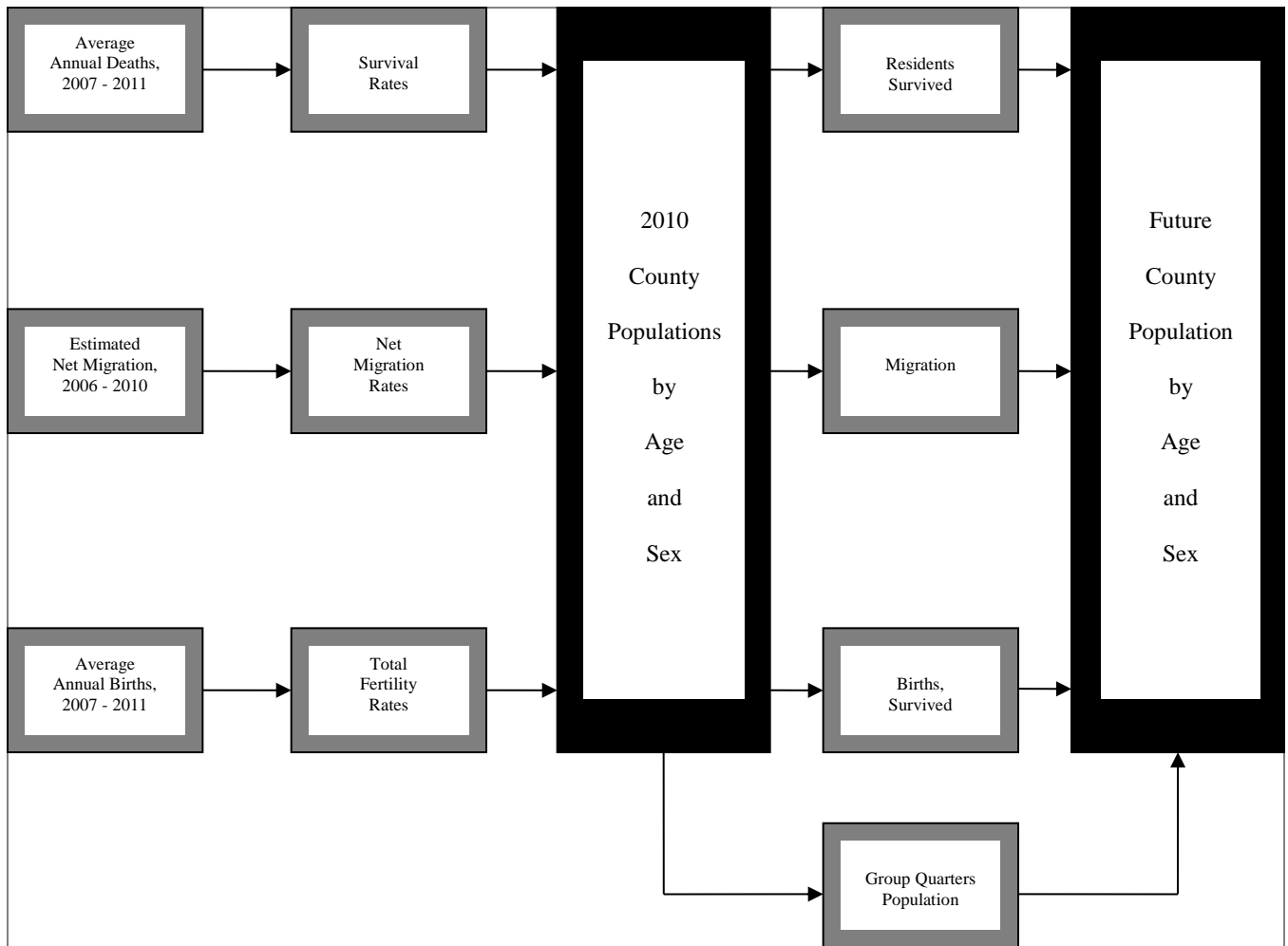
Data File Preparation and Assumptions for Inclusion in the Cohort-Component Projection Model

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

- Base Population

- Fertility Rates

- Survival Rates

- Migration Rates

- Migration Typologies

- International Migrants

- Group Quarters Population

Base Population

The population projections use the July 1, 2010 U.S. Bureau of the Census State and County Total Resident Population Estimates (Vintage 2012): April 1, 2010 to July 1, 2012. The base population includes both persons living in households and persons living in group quarters. With each annual release of population estimates, the entire time-series of estimates beginning on April 1, 2010 is revised and updated. The enumerated resident population from the 2010 Census was the starting point for the post-2010 population estimates. This enumerated population was updated to reflect changes to the 2010 Census population due to the Count Question Resolution (CQR) program, legal boundary updates reported by January 1 of the vintage year, and other geographic program revisions.
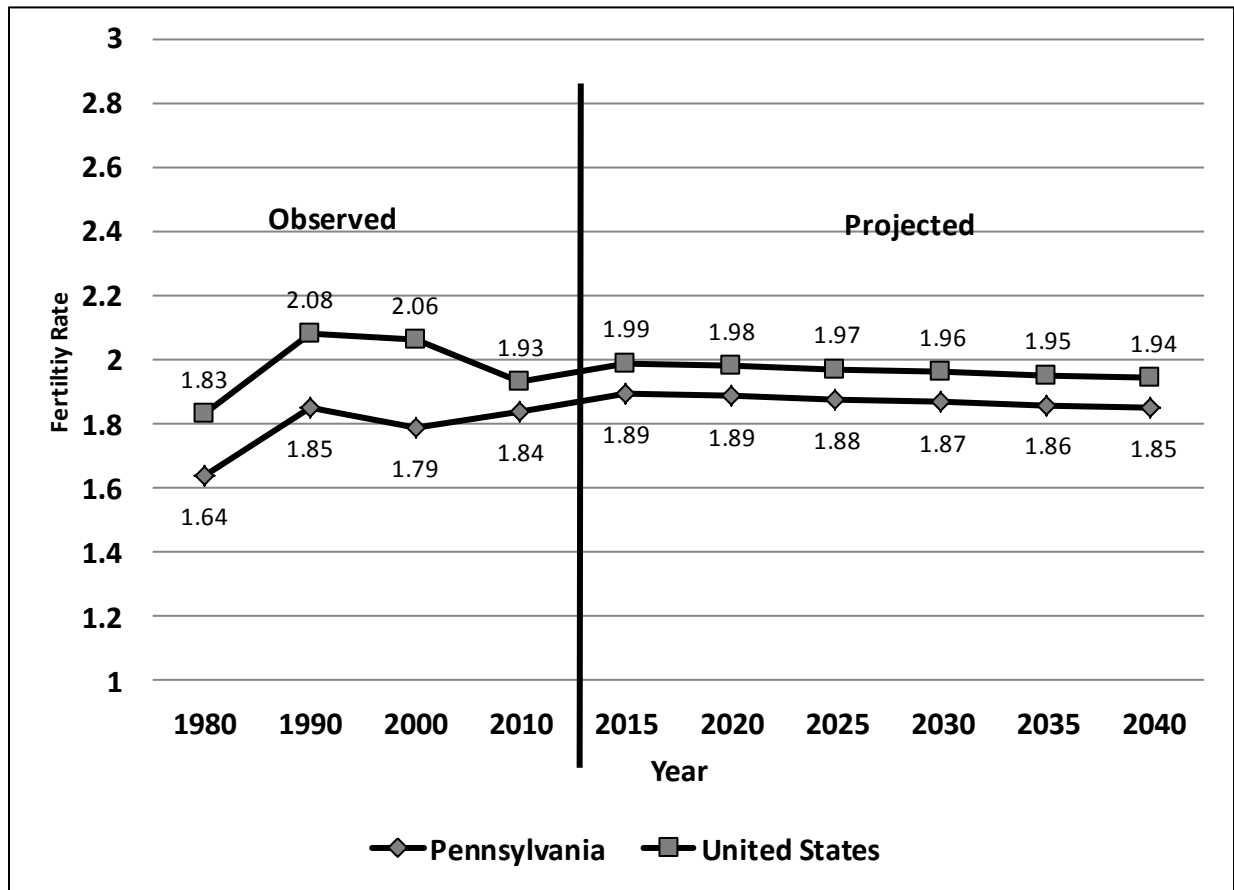
Fertility Rates

The cohort-component model requires that assumptions be made about future fertility. 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 U.S. 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 U.S. will be 1.99 births per woman in 2015 and will decrease slightly to 1.94 births per woman by 2040.

To create Pennsylvania's projected fertility rates, the study team developed a total fertility rate for the year 2010. The average number of births for the 5-year time frame (2007-2011) was calculated. Birth data were provided by the Pennsylvania Department of Health. The average number of births 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 produce age-specific fertility rates going forward, the age-specific fertility rates for the base year (2010) were multiplied by 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 Chart 2.

Chart 2: Total Fertility Rates: Births per Woman of Childbearing Age

The population projections incorporate rates that capture the unique 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 1.84 births per woman in 2010 and will be approximately 1.85 births per woman in 2040.

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.
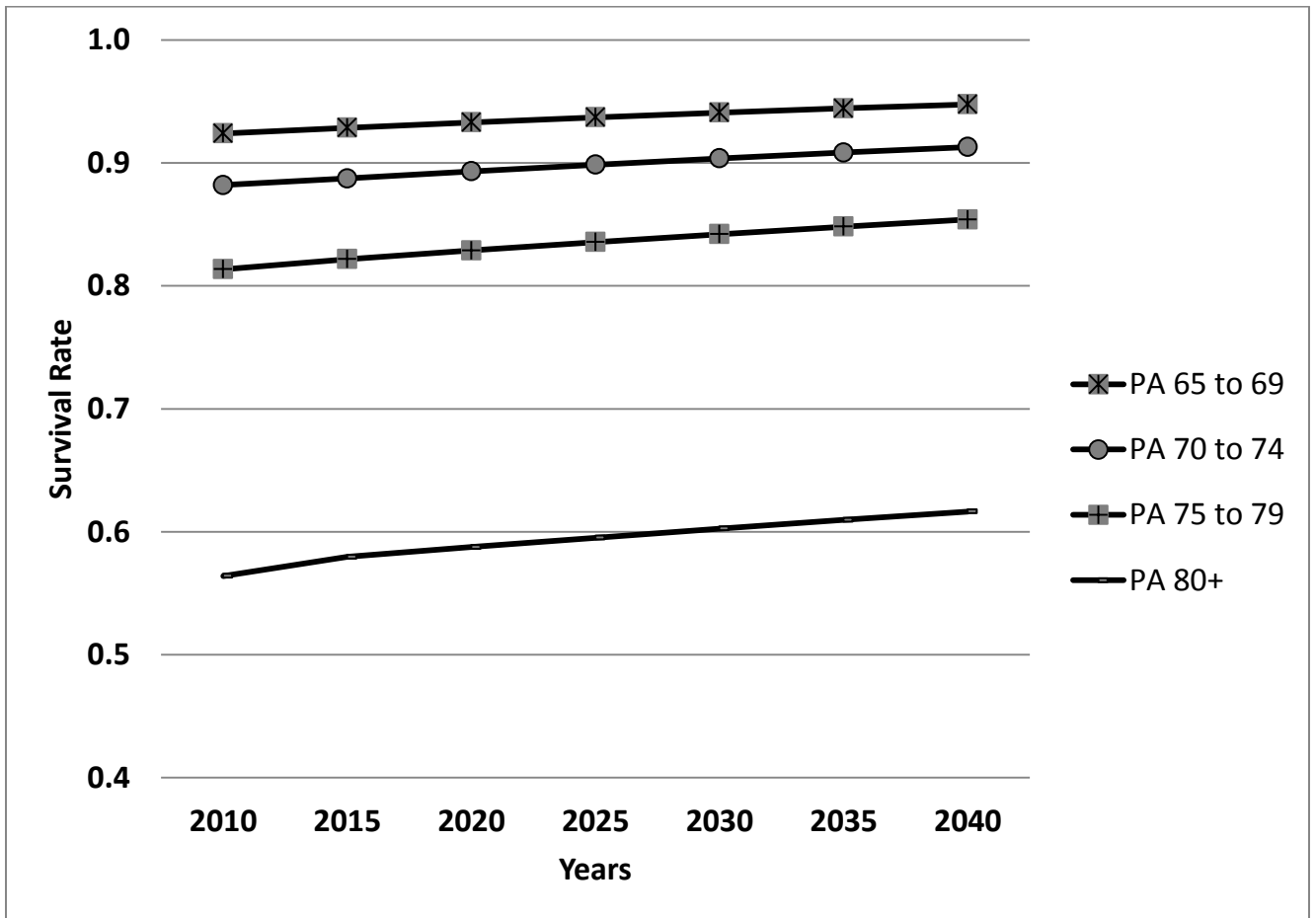
Survival Rates

The cohort-component model requires that assumptions be made about future mortality. To develop these assumptions, the study team created state life tables. The number of deaths by age and sex for 2007 through 2011 was supplied by the Pennsylvania Department of Health. The average number of deaths for the 5-year time frame was calculated. 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 2040. Pennsylvania's rates for both males and females are expected to continue to mirror the U.S. rates.

No major medical developments have been assumed in the model. Survival rates are applied to births and to each age/sex cohort. County level variation in life expectancy in Pennsylvania is due primarily to local area differences in the age/sex composition of county populations. In using age/sex-specific schedules, the projections model is able to assume that state rates are applicable for all counties. To project the rates going forward, the survival rate for the base year (2010) was multiplied by 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 U.S. Chart 3 and Chart 4 show the survival rates for Pennsylvania's older age cohorts for females and males, respectively.

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

Legend:
- PA 65 to 69
- PA 70 to 74
- PA 75 to 79
- PA 80+

Chart 4: Pennsylvania Survival Rates, 65 and Over: Males
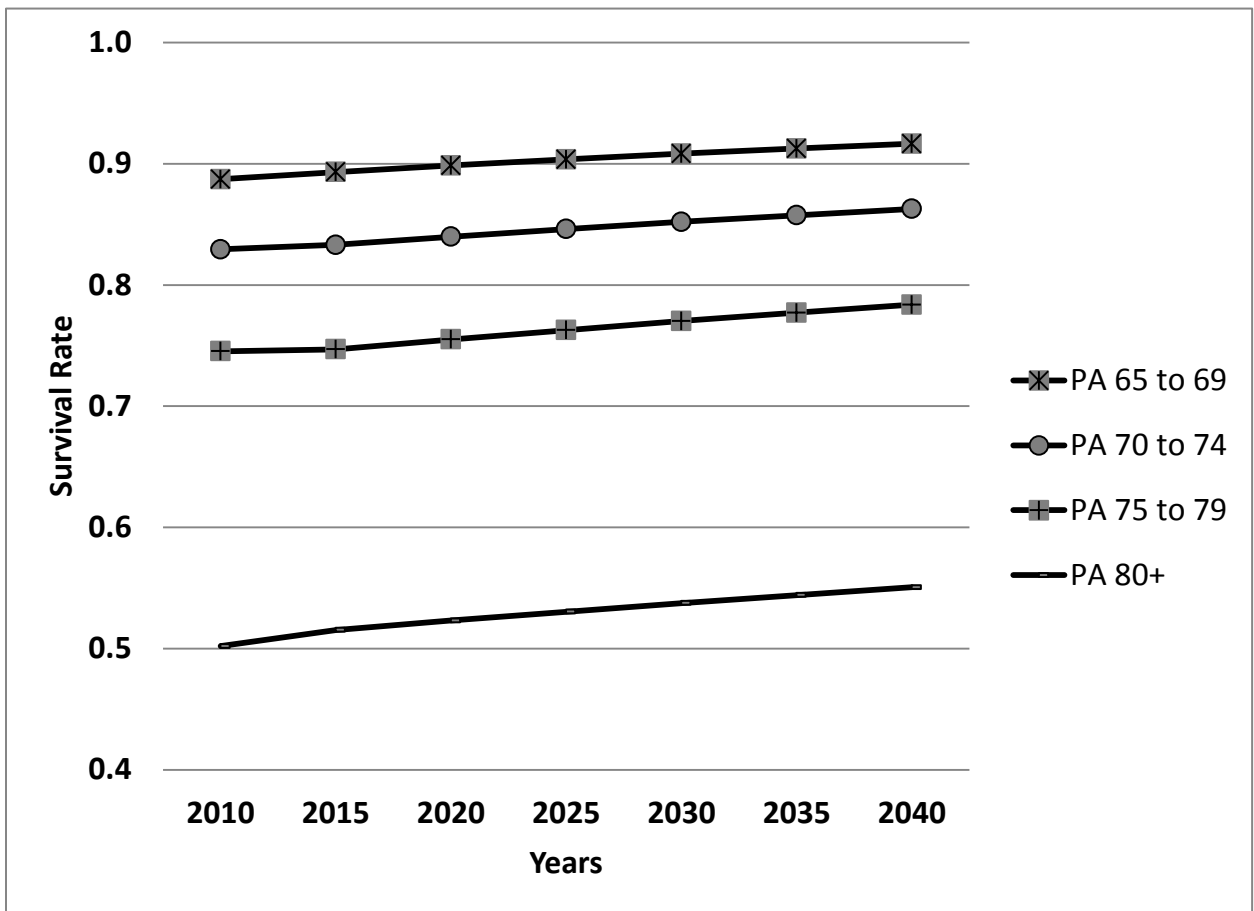
Migration Rates

In contrast to the fertility and mortality trends, the Census Bureau does not project future patterns of net migration that are applicable to the local level. The migration rates used in this study 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 these state and county population subgroups. The state migration rates that were used were derived from the 2007-2011 American Community Survey Public

Use Microdata Sample (PUMS) file from the U.S. Census Bureau. The county migration rates that were used were derived from the 2006-2010 American Community Survey (ACS) County-to-County Migration Flow file. The data are a result of the questions asked concerning place of residence "1 year ago." Net migration rates were calculated from this file as the ratio of net migrants to the total population living in the state "1 year ago" for each population subgroup in the state. The age distribution of net migration derived from these tabulations is held fixed throughout the projection period. A comparative analysis of age-specific migration patterns from previous decennial census files for 1985-1990 and 1995-2000 showed stability in the age pattern of net migration rates, as shown in Chart 5.

Please note that the American Community Survey is a new survey conducted by the U.S. Census Bureau to replace the decennial long-form in Census 2010. Although the question and methodology are similar to that used in the past decennial samples, the time period for the question – 1 year ago vs. 5 years ago – and other sample design differences in this survey make direct comparison of age-specific migration rates difficult.

Chart 5: Pennsylvania Domestic Migration: 1985-2010 by Age

In addition to the age patterns of migration, the demographic projections are based on a thorough analysis of the level of net migration. Pennsylvania has historically been an out-migration state, but latest statistics show a reversal of this trend. The projection model uses trended state and county level 2006-2010 age-specific migration rates in future projection cycles to the year 2040.

Migration Typologies

Based on a detailed analysis of 1985-1990, 1995-2000, and 2006-2010 net migration patterns that were derived from U.S. Census Bureau sources, typologies of projected net migration patterns for counties were developed. The typologies used the decennial

censuses and the most recent trends shown in the 2006-2010 ACS migration files and the Internal Revenue Service (IRS) administrative record data on yearly changes in total county net migration rates from 2006 to 2010. The IRS data provide a reasonably good picture of recent migration trends. Based on the above analysis, counties were assigned to one of 10 migration typology categories. After the typologies were applied, the resulting expected number of migrants, derived from the trended migration rates for each year of the projection, was added to or subtracted from the survived population. A more detailed discussion on migration typologies are in Appendix A.

Overseas Migration

The overseas migration data for Pennsylvania are from the U. S. Census Bureau 2012 National Projections. The U.S. Census projections include a net overseas rate for each state. Pennsylvania's rate was applied to the projected U.S. overseas migration to determine the number of overseas migrants in Pennsylvania for each 5-year period through 2040. Age/sex ratios for the state were then created based on international migration data from the 2007-2011 ACS file. These ratios were applied to the total number of overseas migrants in both Pennsylvania and each county to obtain the data for the age/sex cohorts. These ratios were held constant throughout the projection process.

Group Quarters Population

The group quarters population refers to the number of people not living in households. The study team used data collected by the Pennsylvania State Data Center (PaSDC) annually on group quarters for inclusion in the U. S. Census Population Estimate program. The total number of persons in group quarters is collected for all college/university dormitories, state and federal correctional facilities, state centers, and state hospitals. For the population projections, group quarters data are needed by age and sex. To satisfy this need, group quarters data from the 2010 Decennial Census were used to create age and sex ratios that were subsequently applied to the group quarters data collected on an annual basis by the PaSDC. The 2010 group quarters data were removed from the 2010 population to start the population projection process. The most recently collected group quarters for 2012 are assumed to be constant for the purpose of creating the remaining projection calculations.

Population Projections Model

Using the components described above, the study team processed the cohort-component demographic projection model. Table 1 shows a summary of the components of change as a result of applying the model.

Table 1: Pennsylvania Population Projections: Components of Change

Population Component	Time Period					
	2010-2015	2015-2020	2020-2025	2025-2030	2030-2035	2035-2040
Base Population	12,711,308	12,962,624	13,230,170	13,504,614	13,759,594	13,967,439
Group Quarters[4] (−)	272,793	289,130	289,130	289,130	289,130	289,130
Total Births (+)	710,911	738,830	751,299	755,998	754,471	752,679
Total Deaths (−)	609,592	618,254	640,484	681,646	736,419	780,322
Domestic Migration (+)	24,549	23,989	24,154	24,652	25,594	25,866
Overseas Migration (+)	109,111	122,981	139,475	155,976	164,199	166,926
Group Quarters (+)	289,130	289,130	289,130	289,130	289,130	289,130
Final Population	12,962,624	13,230,170	13,504,614	13,759,594	13,967,439	14,132,588

[4] The 2010 group quarters population (272,793) was subtracted from the 2010 base population and the 2012 group quarters population (289,130) was added to the survived population in 2015. The 2012 group quarters population was referenced in subsequent time periods.

The model starts with the base population, in this case, the July 1, 2010 Estimates Based population. The 2010 group quarters population is subtracted from the base population.

The number of births is projected by applying age-specific fertility rates to females of childbearing age. Next, the population is survived using age-specific survival rates.

The migration rate is then applied to the survived population, thereby producing a count of domestic migrants. The overseas migrants are then added to the population projections.

Finally, the 2012 group quarters data are added back in to create the final population for the 5-year period. The 2012 number of persons in group quarters is assumed to be constant throughout the remaining projection calculations. The resulting population figure for that 5-year period then becomes the resident base population for the next 5-year projection cycle. The process was repeated for 2015 to 2040 (see Table 1).

Final Population Projections

The cohort-component model was applied and population projections were produced.

Table 2 shows the final projected populations for Pennsylvania and its 67 counties for

each decade from 2010 through 2040. Percent change for each decade is also displayed.

Table 2: Pennsylvania Population Projections: 2010-2040

County	July 1, 2010 Estimate	July 1, 2020 Projection	July 1, 2030 Projection	July 1, 2040 Projection	Percent Change 2010-2020	Percent Change 2010-2030	Percent Change 2010-2040
Pennsylvania	12,711,308	13,230,170	13,759,594	14,132,588	4.1%	8.2%	11.2%
Adams	101,423	103,993	106,380	106,210	2.5%	4.9%	4.7%
Allegheny	1,223,840	1,265,919	1,307,654	1,343,354	3.4%	6.8%	9.8%
Armstrong	68,864	66,750	64,982	62,474	-3.1%	-5.6%	-9.3%
Beaver	170,595	172,348	174,352	173,365	1.0%	2.2%	1.6%
Bedford	49,737	50,062	50,025	48,779	0.7%	0.6%	-1.9%
Berks	411,791	440,143	471,457	495,416	6.9%	14.5%	20.3%
Blair	127,038	128,862	130,220	130,036	1.4%	2.5%	2.4%
Bradford	62,609	64,106	65,812	67,051	2.4%	5.1%	7.1%
Bucks	625,505	629,420	637,730	634,771	0.6%	2.0%	1.5%
Butler	184,053	190,619	197,650	198,873	3.6%	7.4%	8.1%
Cambria	143,484	145,615	147,518	147,507	1.5%	2.8%	2.8%
Cameron	5,070	4,759	4,422	3,988	-6.1%	-12.8%	-21.3%
Carbon	65,204	63,692	62,144	60,536	-2.3%	-4.7%	-7.2%
Centre	154,193	168,182	180,148	188,564	9.1%	16.8%	22.3%
Chester	499,739	533,837	573,576	603,068	6.8%	14.8%	20.7%
Clarion	39,934	40,840	41,453	41,142	2.3%	3.8%	3.0%
Clearfield	81,579	82,984	83,423	81,107	1.7%	2.3%	-0.6%
Clinton	39,245	41,957	44,973	48,164	6.9%	14.6%	22.7%
Columbia	67,311	67,759	67,922	67,091	0.7%	0.9%	-0.3%
Crawford	88,690	88,201	88,156	87,422	-0.6%	-0.6%	-1.4%
Cumberland	235,938	251,836	268,063	280,505	6.7%	13.6%	18.9%
Dauphin	268,281	279,506	289,132	296,766	4.2%	7.8%	10.6%
Delaware	559,373	588,436	622,307	648,439	5.2%	11.3%	15.9%
Elk	31,857	30,826	30,081	28,758	-3.2%	-5.6%	-9.7%
Erie	280,749	294,425	305,877	312,991	4.9%	9.0%	11.5%
Fayette	136,507	137,756	139,981	140,353	0.9%	2.5%	2.8%
Forest	7,699	7,531	7,118	6,608	-2.2%	-7.5%	-14.2%
Franklin	149,908	156,911	165,139	173,765	4.7%	10.2%	15.9%
Fulton	14,863	14,934	15,138	15,407	0.5%	1.9%	3.7%
Greene	38,623	40,031	40,706	39,990	3.6%	5.4%	3.5%

| County	July 1, 2010 Estimate	July 1, 2020 Projection	July 1, 2030 Projection	July 1, 2040 Projection	Percent Change 2010-2020	Percent Change 2010-2030	Percent Change 2010-2040
Huntingdon	45,903	49,200	52,306	54,399	7.2%	13.9%	18.5%
Indiana	88,818	94,712	99,756	103,997	6.6%	12.3%	17.1%
Jefferson	45,224	45,084	45,220	45,245	-0.3%	0.0%	0.0%
Juniata	24,548	24,681	25,013	25,094	0.5%	1.9%	2.2%
Lackawanna	214,411	221,688	229,062	233,436	3.4%	6.8%	8.9%
Lancaster	520,344	559,247	602,153	641,815	7.5%	15.7%	23.3%
Lawrence	90,964	89,837	89,768	88,743	-1.2%	-1.3%	-2.4%
Lebanon	133,717	139,272	145,663	149,347	4.2%	8.9%	11.7%
Lehigh	350,093	365,909	385,431	402,087	4.5%	10.1%	14.9%
Luzerne	320,925	327,889	334,201	335,149	2.2%	4.1%	4.4%
Lycoming	116,159	118,551	120,589	120,969	2.1%	3.8%	4.1%
McKean	43,366	44,480	45,099	44,445	2.6%	4.0%	2.5%
Mercer	116,541	118,420	121,313	122,884	1.6%	4.1%	5.4%
Mifflin	46,660	48,102	49,578	50,709	3.1%	6.3%	8.7%
Monroe	169,981	174,721	179,312	177,000	2.8%	5.5%	4.1%
Montgomery	801,134	838,883	891,868	938,580	4.7%	11.3%	17.2%
Montour	18,301	19,524	21,037	22,807	6.7%	15.0%	24.6%
Northampton	298,065	309,231	321,338	326,487	3.7%	7.8%	9.5%
Northumberland	94,367	95,481	95,264	93,027	1.2%	1.0%	-1.4%
Perry	45,993	48,597	50,348	50,198	5.7%	9.5%	9.1%
Philadelphia	1,528,458	1,653,729	1,753,054	1,859,944	8.2%	14.7%	21.7%
Pike	57,311	56,192	55,783	54,257	-2.0%	-2.7%	-5.3%
Potter	17,476	18,109	18,672	18,504	3.6%	6.8%	5.9%
Schuylkill	148,199	154,676	161,671	166,154	4.4%	9.1%	12.1%
Snyder	39,741	41,438	42,156	41,678	4.3%	6.1%	4.9%
Somerset	77,706	76,694	76,267	75,132	-1.3%	-1.9%	-3.3%
Sullivan	6,416	6,608	6,531	6,482	3.0%	1.8%	1.0%
Susquehanna	43,348	42,335	41,525	40,133	-2.3%	-4.2%	-7.4%
Tioga	42,009	43,227	44,136	44,325	2.9%	5.1%	5.5%
Union	44,942	47,499	49,931	51,641	5.7%	11.1%	14.9%
Venango	54,940	55,308	55,516	55,157	0.7%	1.0%	0.4%
Warren	41,756	40,605	39,459	37,535	-2.8%	-5.5%	-10.1%
Washington	207,882	206,942	207,065	203,270	-0.5%	-0.4%	-2.2%
Wayne	52,975	53,511	53,029	49,713	1.0%	0.1%	-6.2%
Westmoreland	365,086	358,574	354,298	344,230	-1.8%	-3.0%	-5.7%
Wyoming	28,261	28,460	28,146	27,269	0.7%	-0.4%	-3.5%
York	435,586	460,514	484,497	498,246	5.7%	11.2%	14.4%

Population projections show that Pennsylvania's population is projected to grow from

12.7 million in 2010 to 14.1 million in 2040. This represents an increase of 11.2 percent,

or 1.4 million people over the 30-year time span. Almost 72 percent of the increase will

be due to domestic net-migration or overseas migrants arriving from 2010 to 2040, with overseas migrants accounting for more than 85 percent of this portion of the increase. The remaining 28 percent of the increase during this period is due to natural increase (births exceeding deaths).

The projections also provide an analysis of Pennsylvania's future "dependency ratio," which is the number of children and elderly compared with the number of working-age residents. There were 68 children and elderly people per 100 adults of working age in 2010. That number will rise to 86 dependents per 100 adults of working age in 2040.

Map 1: Percent Change in Total Population: 2010 – 2040
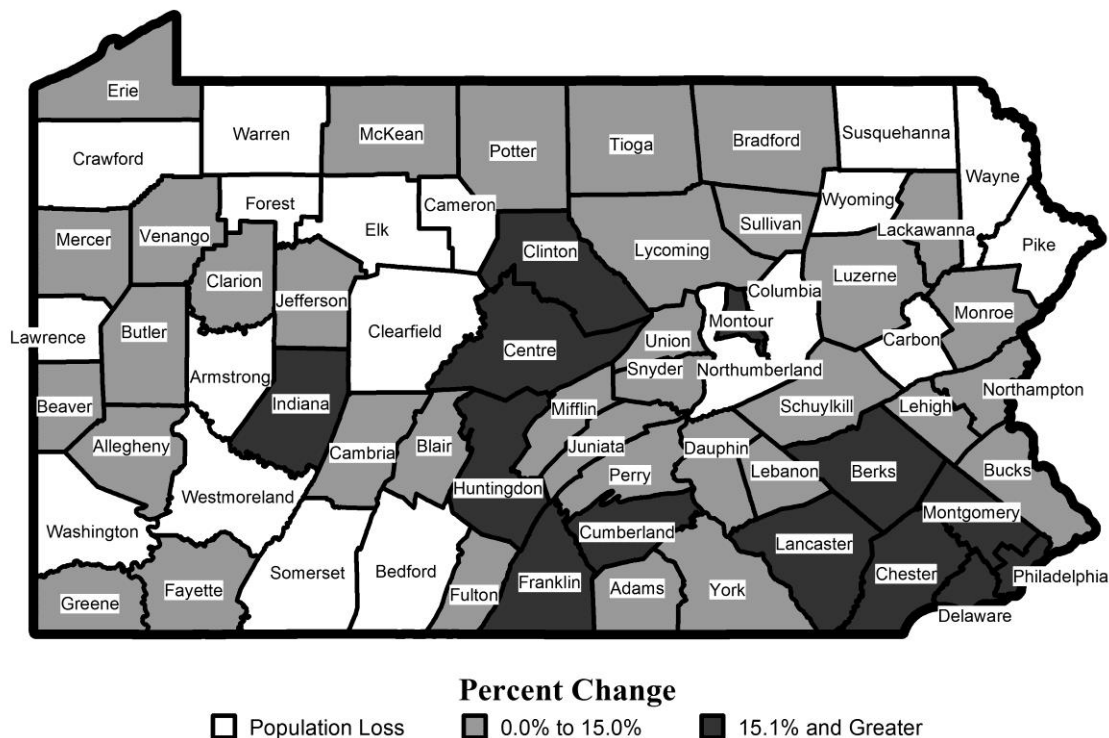
Percent Change

☐ Population Loss   ☐ 0.0% to 15.0%   ■ 15.1% and Greater

While Pennsylvania will see an overall growth in population during this period, some counties will experience a decline in population. Map 1 shows that 13 of Pennsylvania's

67 counties will see an increase in population greater than 15 percent, while 35 counties will see no change or a change of 15 percent or less. A total of 19 counties will experience a decrease in population over the projection time period.

Almost 90 percent of the population increase during the 2010 to 2040 period is expected in urban counties, and the remaining 10 percent will occur in rural counties. This means that the state's population will become more urban, increasing from about 73 percent in 2010 to about 74 percent in 2040. Population in rural counties will decrease from about 27 percent to about 26 percent during this same period. The southeast region of the state is expected to have the largest increase in population, gaining more than 891,000 during the 30-year period. The southcentral region is expected to gain more than 184,000 during this same period. Other regions of the state are expected to have more modest gains (southwest - 127,000, northeast - 123,000, northcentral - 66,000, and northwest - 28,000). Maps showing urban and rural counties and the regions used for analysis are in Appendix B.

Of the 10 largest counties in Pennsylvania, three (Lancaster, Philadelphia, and Chester) showed overall percentage growth in population of more than 20 percent. Montour, Clinton, Centre, and Berks counties also showed increases of more than 20 percent. Cameron, Forest, and Warren counties showed the greatest overall percentage decreases (greater than 10 percent) in population from 2010-2040.

An analysis of the age structure in Pennsylvania shows that the population is getting older over the 30-year time period. The number of people age 44 and younger and those age 65

and older is increasing, while the number of those age 45 to 64 is decreasing. This is due to baby boomers[4] moving through and out of these age groups. The largest percentage increase is seen in the 65 and older cohort. In fact, all age groups age 70 and older show a greater than 63 percent increase over the course of the projection period. In 2010, the 65 and older population accounted for about 15 percent of the population. By 2040, that percentage is expected to increase to about 23 percent of the total population. This change is largely due to the aging of the baby boomers and Pennsylvania's consistently low fertility rate.

The highlighted area in Table 3 shows how each age group, starting in 2010, ages through the projection cycle to 2040. The end of the baby boomer group, those born in 1964, is shown in the 45-49 age group, while the beginning of the baby boomer group, those born in 1946, is in the 60-64 age group.

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[4] Person who was born between the years of 1946 and 1964.

Table 3: Pennsylvania Population Projections: Total by Age

Age	2010	2015	2020	2025	2030	2035	2040	% Change 2010 - 2040
0-4	728,495	720,760	750,166	764,374	770,801	770,312	769,115	5.6%
5-9	752,127	735,675	728,674	759,051	774,193	781,084	780,816	3.8%
10-14	790,478	757,103	741,437	735,365	766,708	782,287	789,297	-0.1%
15-19	901,883	926,979	895,431	882,144	878,552	911,561	927,825	2.9%
20-24	878,090	924,486	946,087	918,493	909,071	907,562	941,353	7.2%
25-29	782,939	806,123	849,012	874,621	851,010	843,741	843,163	7.7%
30-34	733,352	794,190	818,627	864,166	892,464	870,343	863,769	17.8%
35-39	758,692	738,755	800,645	826,561	873,620	902,895	881,182	16.1%
40-44	850,812	758,993	740,145	802,945	829,862	877,816	907,713	6.7%
45-49	951,152	842,954	753,001	735,325	798,489	826,052	874,524	-8.1%
50-54	985,923	935,309	830,171	742,727	726,295	789,639	817,827	-17.0%
55-59	884,133	961,429	913,858	812,698	728,335	713,257	776,551	-12.2%
60-64	750,282	850,049	926,981	883,549	787,676	707,284	693,898	-7.5%
65-69	555,121	705,575	802,433	878,347	839,978	750,827	675,805	21.7%
70-74	427,848	505,999	646,180	738,257	811,716	779,381	699,203	63.4%
75-79	361,110	368,934	439,126	564,095	648,345	716,821	691,922	91.6%
80-84	311,498	285,386	294,025	352,765	456,682	528,789	588,905	89.1%
85+	307,373	343,925	354,171	369,131	415,797	507,788	609,720	98.4%
Total	12,711,308	12,962,624	13,230,170	13,504,614	13,759,594	13,967,439	14,132,588	11.2%
50+	4,583,288	4,956,606	5,206,945	5,341,569	5,414,824	5,493,786	5,553,831	21.2%
55+	3,597,365	4,021,297	4,376,774	4,598,842	4,688,529	4,704,147	4,736,004	31.7%
60+	2,713,232	3,059,868	3,462,916	3,786,144	3,960,194	3,990,890	3,959,453	45.9%
65+	1,962,950	2,209,819	2,535,935	2,902,595	3,172,518	3,283,606	3,265,555	66.4%

Table 4 shows that the dependency ratio increases from 67.8 to 86.0 during the projection period. The dependency ratio is a measure of the number of persons in the working age group (persons age 20 to 64) compared to the number of persons who are dependent on the working age group (those persons under age 20 and 65 and older). Therefore, in 2040, there will be 86.0 persons under the age of 20 and above the age of 64 for every 100

persons between the ages of 20 and 64, compared to 67.8 persons in 2010. The youth dependency ratio remains relatively constant over the time period, increasing slightly from 41.9 to 43.0. The old age dependency ratio is where Pennsylvania will see the largest increase in dependency on the working age population. The old age dependency ratio will increase from 25.9 persons age 65 and older for every 100 persons between the ages of 20 and 64 to 43.0 persons age 65 and older for every 100 persons between the ages of 20 and 64.

Table 4: Demographics Indicators

Demographic Indicator	2010	2015	2020	2025	2030	2035	2040
Dependency Ratio[5]	67.8	70.3	74.6	81.0	86.0	87.8	86.0
Youth[6]	41.9	41.3	41.1	42.1	43.1	43.6	43.0
Old Age[7]	25.9	29.0	33.5	38.9	42.9	44.1	43.0
Child-Women Ratio[8]	29.8	29.4	30.1	30.1	30.1	29.6	29.2
Sex Ratio[9]	95.1	95.6	95.9	96.1	96.3	96.4	96.5

Chart 6, Population Pyramid: 2010 & 2040, overlays the age structure in 2010 with the projected age structure in 2040. The shaded bars represent 2010; the clear bars represent 2040. As shown, the baby boom group will cause the increase in the 65 and older population in 2040, while there will be a reduction in the age 45 to 64 population. The population pyramids for each 5-year period are in Appendix C.

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[5] Dependency ratio = (Age < 20 + Age 65 and over) / (Age 20 to 64) X 100
[6] Youth dependency ratio = (Age < 20) / (Age 20 to 64) X 100
[7] Old age dependency ratio = (Age 65 and over) / (Age 20 to 64) X 100
[8] Child-women ratio = (Age < 5) / (Females 15 to 44) X 100
[9] Sex Ratio = Males / Females X 100

Chart 6: Population Pyramid: 2010 & 2040

Males

Females

| 85+ |
| 80 - 84 |
| 75 - 79 |
| 70 - 74 |
| 65 - 69 |
| 60 - 64 |
| 55 - 59 |
| 50 - 54 |
| 45 - 49 |
| 40 - 44 |
| 35 - 39 |
| 30 - 34 |
| 25 - 29 |
| 20 - 24 |
| 15 - 19 |
| 10 - 14 |
| 5 - 9 |
| 0 - 4 |

6   5   4   3   2   1   0   1   2   3   4   5   6

□ 2040   ■ 2010
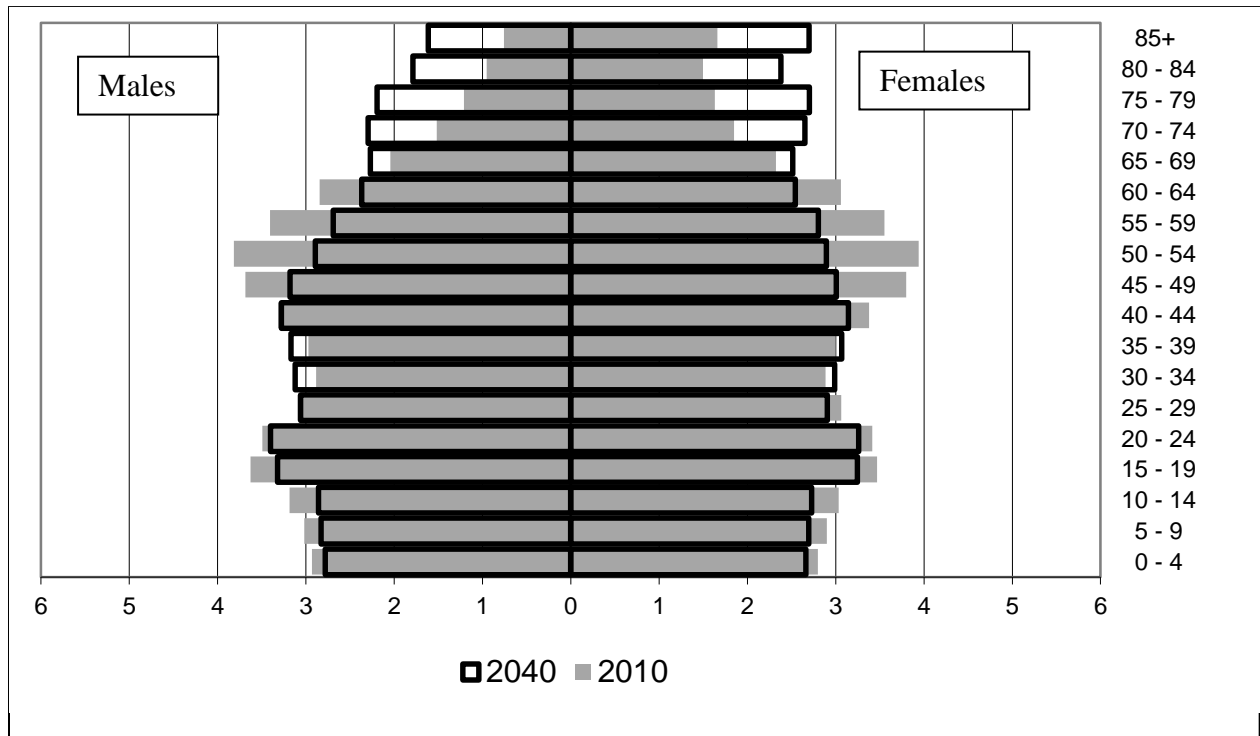
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Bureau of Health Statistics and Research, Pennsylvania Department of Health, Births, 2007-2011.

Bureau of Health Statistics and Research, Pennsylvania Department of Health, Deaths, 2007-2011.

National Center for Health Statistics, Division of Vital Statistics, U.S. Abridged Life Tables, 2010.

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U.S. Census Bureau American Community Survey, 5-year Estimate, 2007-2011.

U.S. Census Bureau, 2010 Decennial Census.

Appendix A

Population Projection Typologies

Typologies were created from net migration data from the U.S. Census Bureau and Internal Revenue Service (IRS) administrative record data. Counties were assigned to one of 10 migration typology categories based on Census migration rates, IRS migration trends, and projected population using the following criteria.

First, the 2006-2010 American Community Survey (ACS) county-to-county migration flow file was analyzed and counties were separated into two groups: Positive ACS migration rates and negative ACS migration rates. Next, each of these two categories was further divided into two sub-categories based on the trends found in the Decennial Census data from 1990 to 2000. For positive ACS migration counties, the two additional categories included counties with continued growth over the period (upward trend) and counties with a slowing of growth over the period (downward trend). For negative ACS migration counties, the two additional sub-categories included counties with continued loss (downward trend) and counties with a slowing of the loss (upward trend). These four groups were further divided based on the trends seen in the 2006-2010 IRS data, using the same categorizations as those used in reviewing the Decennial Census data. Finally, two additional categories were created for counties experiencing little migration change or large natural change.

For example, the migration rate for County A in the 2006-2010 ACS county-to-county migration flow file is 0.0273, making it a postive migration county. The trends in both the Decennial Census and IRS migration data, as seen in the graphs below, are downward. Using the definitions below, County A would be placed in typology 1.
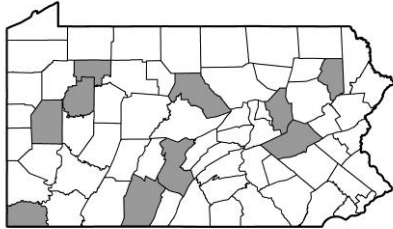

County A Census Migration Rates and Trend 1990-2010

County A IRS Migration Rates and Trend 2006-2010
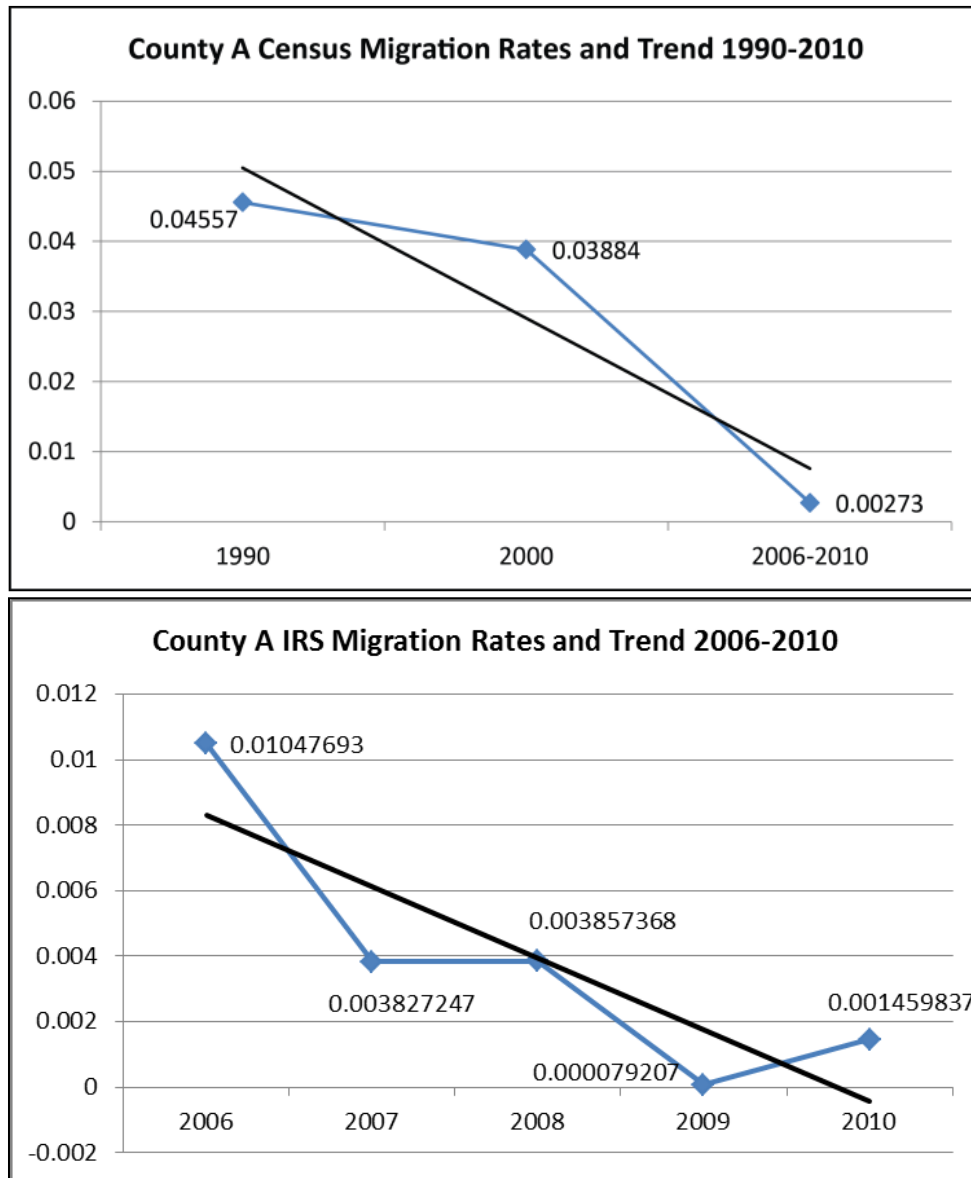
Positive Migration
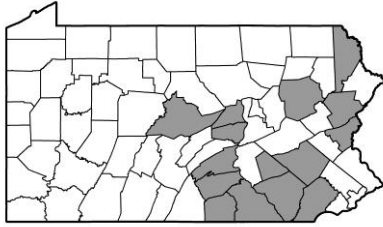
Typology 1 – Counties in this typology showed a positive migration based on the 2006 – 2010 ACS county-to-county migration flow file. Although there is positive migration, both the Decennial Census data (1990-2000) and IRS data (2006-2010) showed downward migration trends for each of these counties. As a result, their projected migrations were adjusted significantly downward.

Adams	Monroe
Berks	Northampton
Centre	Perry
Chester	Snyder
Cumberland	Union
Lancaster	Wayne
Lebanon	York
Luzerne	

Typology 2 – Counties in this typology showed a positive migration based on the 2006 – 2010 ACS county-to-county migration flow file. Although there is positive migration, Decennial Census data showed that the counties experienced a downward trend from 1990 – 2000; however, the IRS data from 2006 – 2010 showed an upward trend. In response to the opposing trends found between the Decennial Census and IRS data, their projected migrations were adjusted slightly downward.

|	
Bedford	Forest
Butler	Greene
Clarion	Huntingdon
Clinton	Lackawanna
Columbia	Schuylkill
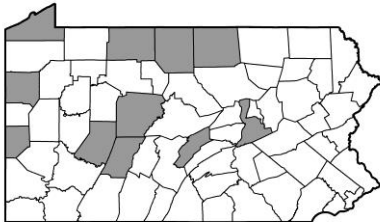
Typology 3 – Counties in this typology showed a positive migration based on the 2006 – 2010 ACS county-to-county migration flow file. Both Decennial Census data (1990 –2000) and IRS data (2006 – 2010) showed upward trends, so their migrations were adjusted moderately downward.

Beaver	Mercer
Cambria	Mifflin
Clearfield	Northumberland
Erie	Potter
Indiana	Tioga
McKean	
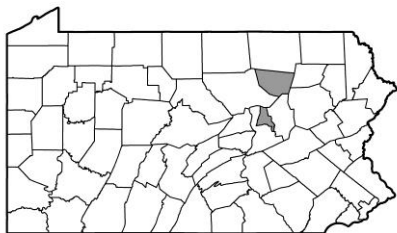
Typology 4 – Counties in this typology showed a positive migration based on the 2006 – 2010 ACS county-to-county migration flow file. The Decennial Census data (1990 –2000) indicated an upward trend, while the IRS data (2006 – 2010) showed a downward trend. In response to the opposing trends found between the Decennial Census and IRS data, their projected migrations were adjusted slightly downward.

Montour   Sullivan

Negative Migration
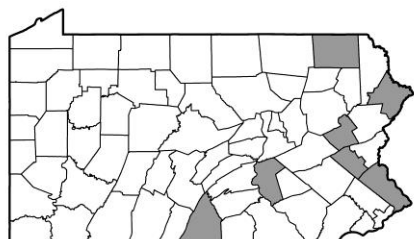
Typology 5 – Counties in this typology showed a negative migration based on the 2006 – 2010 ACS county-to-county migration flow file. Both the Decennial Census data (1990-2000) and IRS data (2006-2010) showed downward migration trends for each of these counties. As a result, their projected migrations were adjusted significantly downward.

Bucks   Lehigh
Carbon   Pike
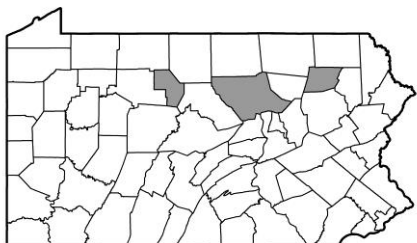Dauphin   Susquehanna
Franklin
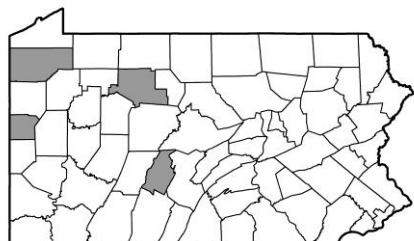
Typology 6 – Counties in this typology showed a negative migration based on the 2006 – 2010 ACS county-to-county migration flow file. Decennial Census data showed that the counties experienced a downward trend from 1990 – 2000; however, the IRS data from 2006 – 2010 showed an upward trend. In response to the opposing trends found between the Decennial Census and IRS data, their projected migrations were adjusted slightly downward.

Blair   Elk
Crawford   Lawrence
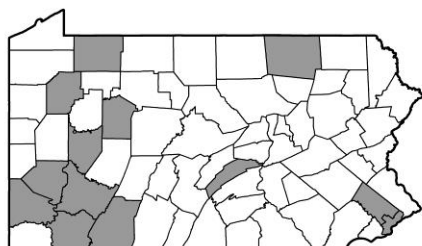
Typology 7 – Counties in this typology showed a negative migration based on the 2006 – 2010 ACS county-to-county migration flow file. Both Decennial Census data (1990 –2000) and IRS data (2006 – 2010) showed upward trends, so their migrations were adjusted moderately downward.

Allegheny   Philadelphia
Armstrong   Somerset
Bradford   Venango
Fayette   Warren
Jefferson   Washington
Juniata   Westmoreland
Montgomery

Typology 8 – Counties in this typology showed a negative migration based on the 2006 – 2010 ACS county-to-county migration flow file. The Decennial Census data (1990 –2000) indicated an upward trend, while the IRS data (2006 – 2010) showed a downward trend. In response to the opposing trends found between the Decennial Census and IRS data, their projected migrations were adjusted slightly downward.

Cameron   Wyoming
Lycoming
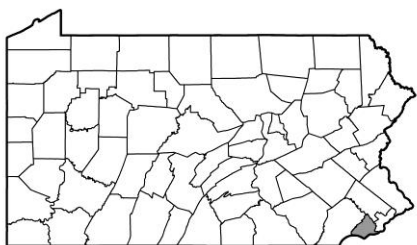
Typology 9 – Counties in this typology showed a negative migration based on the 2006 – 2010 ACS county-to-county migration flow file. Decennial Census data showed that the counties experienced a downward trend from 1990 – 2000; however, the IRS data from 2006 – 2010 showed an upward trend. However, since a strong natural change is expected over time, no adjustments were made to their projected migrations.

Delaware
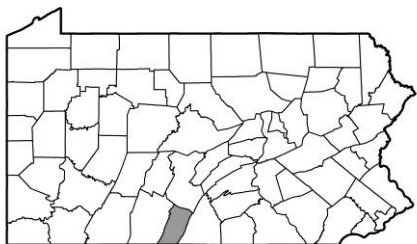
Typology 10 – Counties in this typology showed a negative migration based on the 2006 – 2010 ACS county-to-county migration flow file. Both Decennial Census data (1990 –2000) and IRS data (2006 – 2010) showed downward trends. However, since a strong natural change is expected over time, no adjustments were made to their projected migrations.
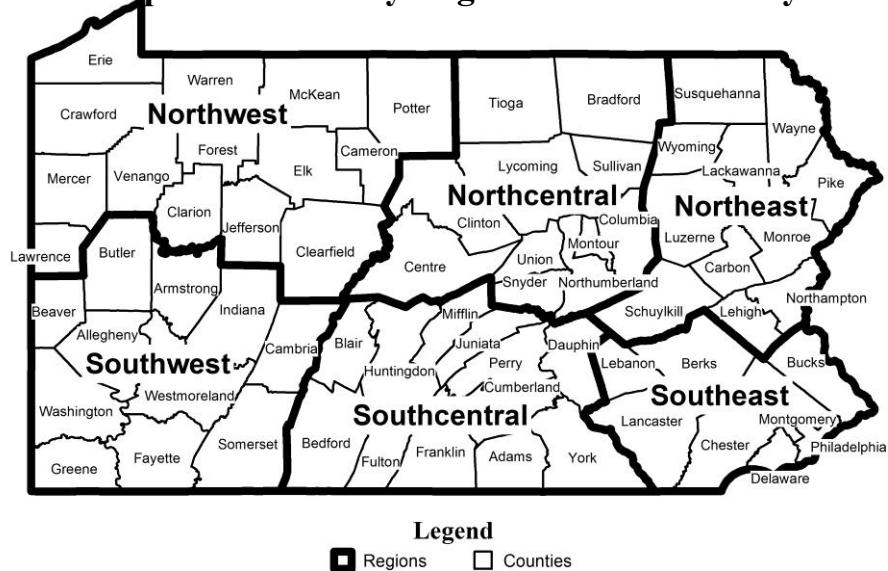
Fulton

Appendix B

Maps Delineating Regional Breakdowns Used in Analysis:
Urban/Rural and Regions

Map 2: Urban and Rural Counties,
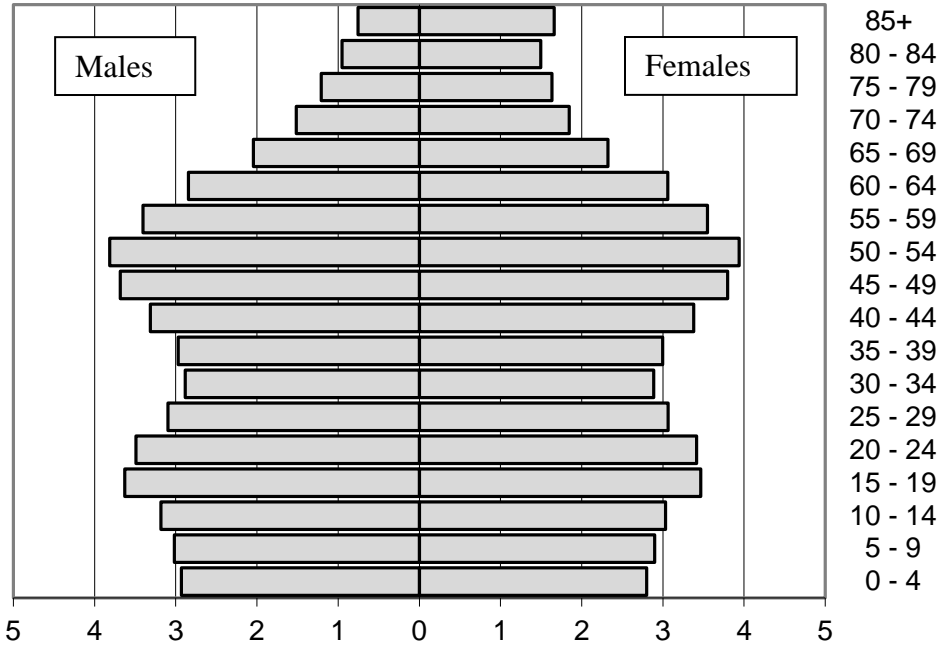## Based on Center for Rural Pennsylvania Definition

Urban - Rural
☐ Urban (19) ■ Rural (48)
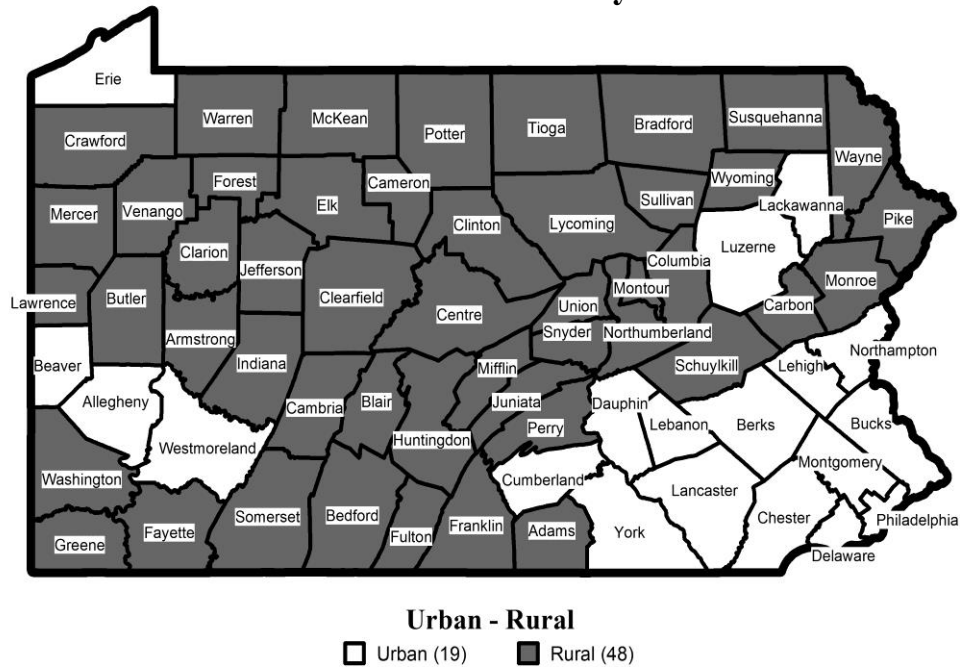
Map 3: Counties by Region as Used in Analysis

Legend
■ Regions ☐ Counties
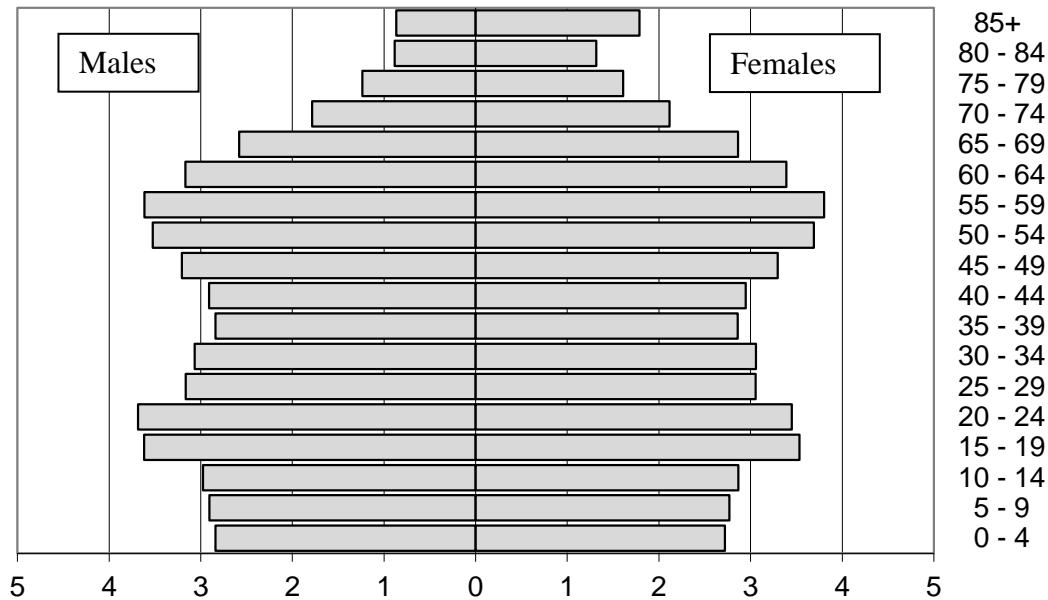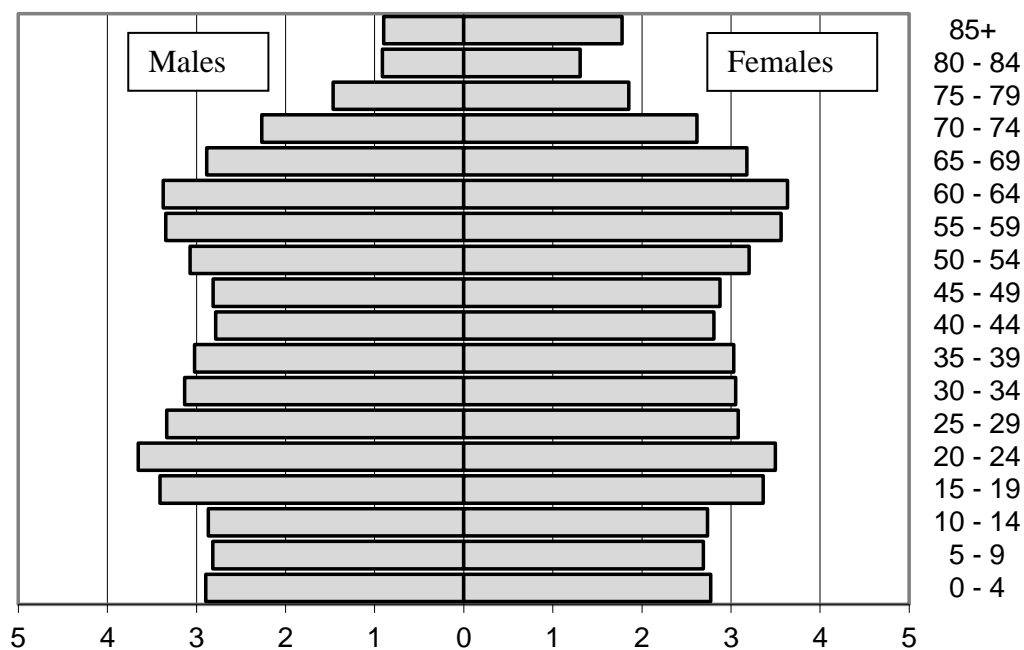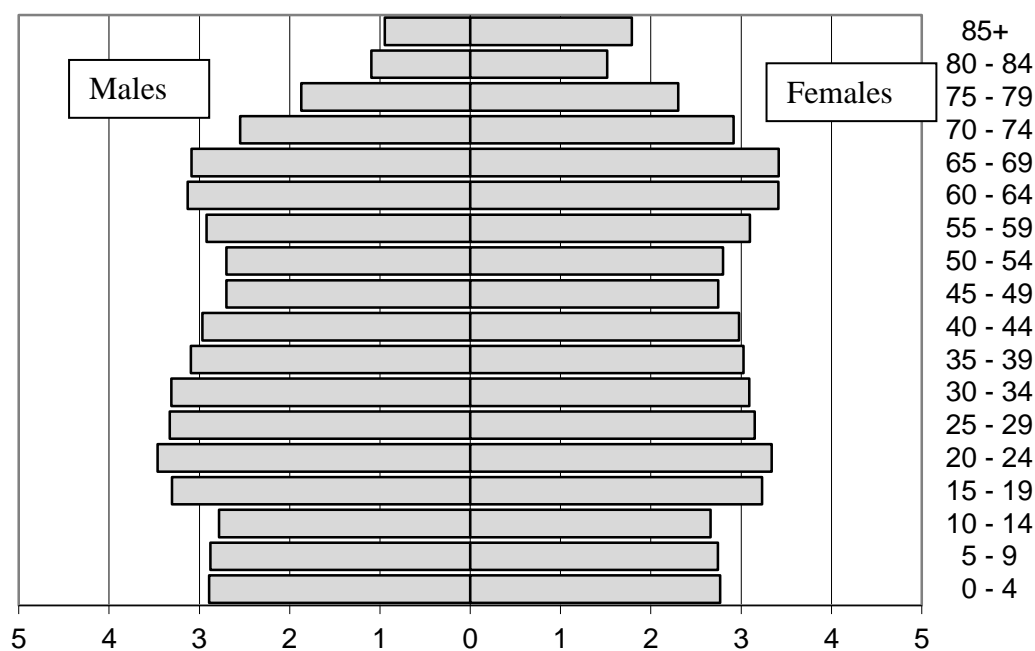
Appendix C

Population Pyramids

Percent Males and Females of Total Population by Age, 2010

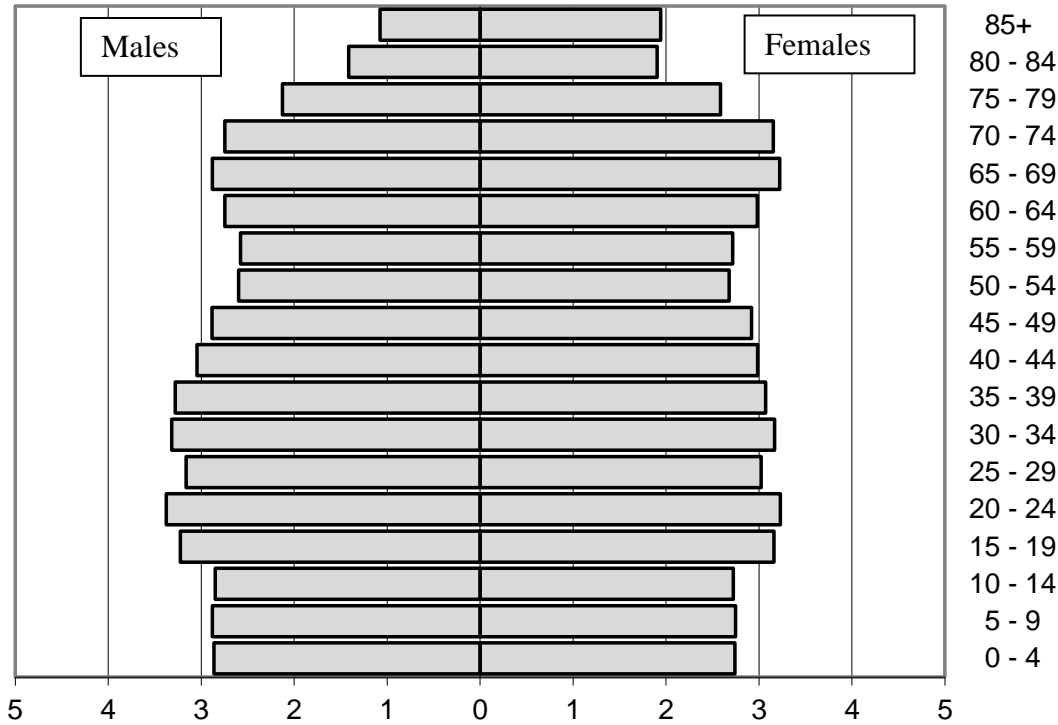
Percent Males and Females of Total Population by Age, 2015

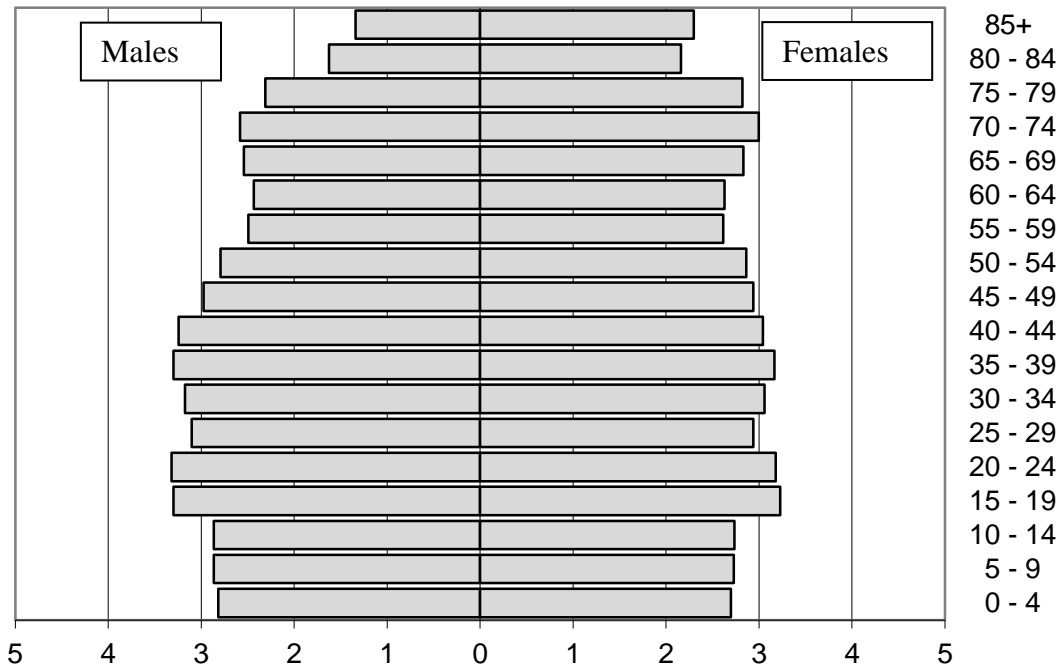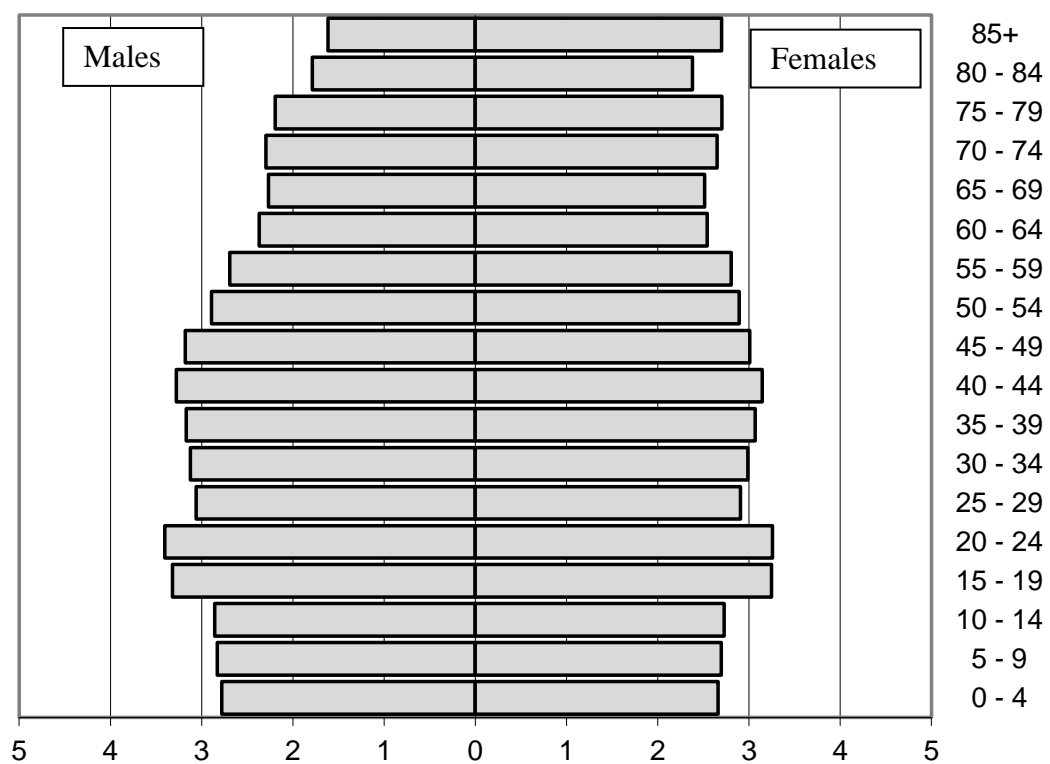## Percent Males and Females of Total Population by Age, 2020

	85+
Males	80 - 84
	75 - 79
	70 - 74
	65 - 69
	60 - 64
	55 - 59
	50 - 54
	45 - 49
	40 - 44
	35 - 39
	30 - 34
	25 - 29
	20 - 24
	15 - 19
	10 - 14
	5 - 9
	0 - 4

Females

5 4 3 2 1 0 1 2 3 4 5

Percent Males and Females of Total Population by Age, 2025

	85+
Males	80 - 84
	75 - 79
	70 - 74
	65 - 69
	60 - 64
	55 - 59
	50 - 54
	45 - 49
	40 - 44
	35 - 39
	30 - 34
	25 - 29
	20 - 24
	15 - 19
	10 - 14
	5 - 9
	0 - 4

Females

5 4 3 2 1 0 1 2 3 4 5

Percent Males and Females of Total Population by Age, 2030

	85+
	80 - 84
	75 - 79
	70 - 74
	65 - 69
	60 - 64
	55 - 59
	50 - 54
	45 - 49
	40 - 44
	35 - 39
	30 - 34
	25 - 29
	20 - 24
	15 - 19
	10 - 14
	5 - 9
	0 - 4

5   4   3   2   1   0   1   2   3   4   5

Percent Males and Females of Total Population by Age, 2035

	85+
	80 - 84
	75 - 79
	70 - 74
	65 - 69
	60 - 64
	55 - 59
	50 - 54
	45 - 49
	40 - 44
	35 - 39
	30 - 34
	25 - 29
	20 - 24
	15 - 19
	10 - 14
	5 - 9
	0 - 4

5   4   3   2   1   0   1   2   3   4   5

Percent Males and Females of Total Population by Age, 2040

Males	Females

85+
80 - 84
75 - 79
70 - 74
65 - 69
60 - 64
55 - 59
50 - 54
45 - 49
40 - 44
35 - 39
30 - 34
25 - 29
20 - 24
15 - 19
10 - 14
5 - 9
0 - 4

5   4   3   2   1   0   1   2   3   4   5

Appendix D

Glossary of Terms for Population Projections

1. *Age-Specific Rate*. Rate obtained for specific age groups (for example, age-specific birth rate or death rate).

2. *Baby Boom*. The period following World War II from 1947-1961 marked by dramatic increases in fertility rates and in the absolute number of births in the U.S., Canada, Australia, and New Zealand.

3. *Baby Bust*. The period immediately after the baby boom marked by a rapid decline in the U.S. fertility rates to record low levels.

4. *Birth Rate*. The number of births per 1,000 population in a given year. Not to be confused with growth rate.

5. *Census*. A canvass of a given area, resulting in an enumeration of the entire population, and the compilation of demographic, social and economic information pertaining to that population at a specific time.

6. *Death Rate*. The number of deaths per 1,000 population in a given area.

7. *Dependency Ratio*. The ratio of the economically dependent part of the population to the productive part; arbitrarily defined as the ratio of the elderly (those 65 years and over) plus the young (those under 20 years of age) to the population in the "working ages" (those 20-64 years of age).

8. *Emigration*. The process of leaving one county to take up residence in another.

9. *Fertility*. The childbearing performance of an individual, a couple, a group, or a population.

10. *General Fertility Rate* (also referred to as fertility rate). The number of live births per 1,000 women aged 15-44 years in a given year.

11. *Growth Rate*. The rate at which a population is increasing (or decreasing) in a given period due to natural increase and net migration, expressed as a percentage of the base population.

12. *In-Migration*. The process of entering one administrative subdivision of a country (e.g., county or state) from another subdivision to take up residence.

13. *Life Expectancy*. The average number of additional years a person would live if current mortality trends were to continue. Most commonly cited as life expectancy at birth.

14. *Life table*. A tabular display of life expectancy and the probability of dying at each age for a given population, according to the age-specific death rates prevailing at that time. The life table gives an organized, complete picture of a population's mortality.

15. *Migration*. The movement of people across a specified boundary for the purpose of establishing a new permanent residence. Divided into international migration (migration between countries) and internal migration (migration within a country).

16. *Mortality*. Death as a component of population change.

17. *Natural Increase*. The surplus (or deficit) of births over deaths in a population in a given time period.

18. *Negative Population Growth*. A net decrease in the size of a population.

19. *Net-Migration*. The net effect of immigration and emigration on an area's population in a given time period, expressed as increase or decrease.

20. *Net-Migration Rate*. The net effect of immigration and emigration on an area's population, expressed as an increase or decrease per 1,000 population of the area in a given year.

21. *Out-Migration*. The process of leaving one subdivision of a country to take up residence in another.

22. *Population Estimate*. An indication of the current population. Estimates are calculated from administrative records in lieu of an actual census count and are used to update population figures from the last census.

23. *Population Forecast*. The set of population projections most likely to occur.

24. *Population Increase*. The total population gain resulting from the interaction of births, deaths, and migration in a population in a given period of time.

25. *Population Projection*. Computation of future changes in population numbers, given certain assumptions about future trends in the rates of fertility, mortality, and migration.

26. *Population Pyramid*. A special type of bar chart that shows the distribution of a population by age and sex. Most countries fall into one of three general types of pyramids: (1) Expansive: A broad base, indicating a high proportion of children and a rapid rate of population growth; (2) Constrictive: A base that is narrower than the middle of the pyramid, usually the result of a recent rapid decline in fertility; (3) Stationary: A narrow base and roughly equal numbers in each age group, tapering off at the older ages, indicating a moderate proportion of children and a slow or zero rate of growth.

27. *Rate of Natural Increase*. The rate at which a population is increasing (or decreasing) in a given year due to a surplus (or deficit) of births over deaths, expressed as a percentage of the base population.

28. *Sex Ratio*. The number of males per 100 females in a population.

29. *Stable Population*. A population with an unchanging rate of growth and an unchanging age composition because of birth and death rates having remained constant over a sufficiently long period of time.

30. *Survival Rate*. The proportion of persons in a specified group (age, sex, health status, etc.) alive at the beginning of an interval (e.g. a 5-year period) who survive the end of the interval.

31. *Total Fertility Rate (TFR)*. The average number of children that would be born alive to a woman (or group of women) during her lifetime if she were to pass through her childbearing years conforming to the age-specific fertility rates for a given year.