PLAN forward

Lincoln-Lancaster County
2050 Comprehensive Plan

The Lincoln-Lancaster County 2050 Comprehensive Plan is a roadmap to "plan forward", not only in time, but in concept, to envision a community that is Livable, Equitable, Thriving, Resilient, and Innovative.

Appendix E

2050 Demographic Projections

CITY OF LINCOLN NEBRASKA

LANCASTER NEBRASKA COUNTY

LANCASTER COUNTY POPULATION PROJECTIONS: 2010 to 2050

Summary Report

Prepared for:
Lincoln/Lancaster County Planning Department

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EXECUTIVE SUMMARY

In projections prepared for Lancaster County, population and household growth continues in each decade between 2010 and 2050. The projections show the population increasing to about 321,000 in 2020, rising by more than 35,000 people or 12.4% from 2010. The number of households rises to nearly 130,000 in 2020, an increase of 14.4%, nearly identical to the growth rate during the 2000s.

The adjectives "steady" and "stable" accurately describe Lancaster County's expected future growth. Between 2020 and 2050, the projections indicate growth of nearly 40,000 persons and 18,000 households each decade. The county should reach the milestones of having 150,000 households just after 2030, and 400,000 people in 2040.

In recent decades, Lancaster County's population has become more diverse.

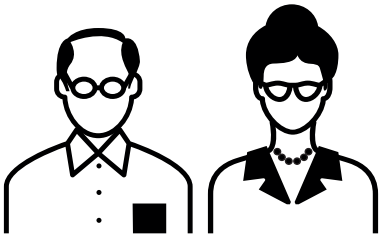
To understand future changes, the projections compare population values between non-Hispanic Whites and all other population groups. The projections indicate the portion of Lancaster County's population comprised of persons of color rises by five percentage points per decade, similar to what occurred in the 1990s and 2000s. The number of diverse individuals more than doubles from about 65,000 in 2020 to 155,000 in 2050, when one in three Lancaster County residents will be a person of color.

The projections utilize birth, death, and migration rates calculated for each single year of age. Given the large segment of college students that move into and out of the area, analyzing by single year of age substantially enhances data quality.

Detailed evaluations of the college-age population structure and its corresponding migration enrich key components and strengthen these projections.

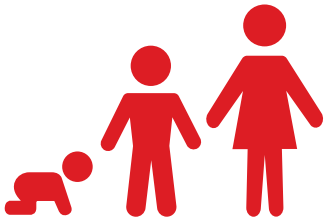
While those age 20 to 24 remain the largest Lancaster County population segment out to 2050, aging represents a central element of future population change. Growth occurs across all age groups, but the projections show the highest percentage gains happen as "baby boomers" born from 1946 to 1964 age into older age categories.

Specific examples of aging include:



- those age 65 and older doubling from 31,000 in 2010 to 61,000 in 2030 and rising to 75,000 by 2050
- those age 75 and older exceeding children under age 5 by 2025, likely for the first time in history
- households headed by a person age 85 or older, of which 70% currently live alone and often with a disability or special needs, tripling from 3,500 in 2010 to nearly 11,500 in 2050

Other notable findings from the projections include:



- rising levels of both births and deaths within the county, with deaths increasing faster, softening population growth from natural change
- an increasing number of children under age 18, exceeding 75,000 by 2030 and 90,000 by 2050

- continuation of long-term trends of family households and those with children declining as a share of all households
- an increased prevalence of one-person households, representing about one-third of households by 2040
- average household size continuing a slow and steady decline, ending at 2.30 persons per household in 2050 versus 2.40 in 2010 and 2.89 in 1970

While no projections will match future values exactly and future local or world events can change population dynamics quickly, area leaders can use these projections as a guide for understanding Lancaster County's growth, which should continue unabated for the foreseeable future.

1990 to 2010 Lancaster County Statistics with 2020 to 2050 Projection

Year	Total Households		Total Population		Persons of Color		
	Number	Growth Rate	Number	Growth Rate	Number	Growth Rate	Portion of Population
1990	82,759	n/a	213,641	n/a	13,120	n/a	6.1%
2000	99,187	19.9%	250,291	17.2%	28,224	115.1%	11.3%
2010	113,373	14.3%	285,407	14.0%	44,705	58.4%	15.7%
2020	129,716	14.4%	320,670	12.4%	65,608	46.8%	20.5%
2030	147,809	13.9%	360,558	12.4%	92,444	40.9%	25.6%
2040	165,615	12.0%	399,519	10.8%	121,816	31.8%	30.5%
2050	182,845	10.4%	439,258	9.9%	155,250	27.4%	35.3%

OVERVIEW

The population in Lancaster County and the city of Lincoln have been growing. In every decade since 1900, the population has risen, even managing a small gain in the depression years of the 1930s. In more recent times, population growth has achieved a high decade rate above 17 percent in the 1990s, a low decade rate slightly above 10 percent in the 1980s, with the 1970s and 2000s being in the middle of this range, with growth rates of about 14 percent.

Will the local population grow each decade in the near future? What rate of growth is most likely? Will increases occur primarily in certain age groups? How will the number of households and average household size change? These are the types of questions that population projections can answer. No one knows exactly how population changes will occur, and unforeseen future local and world events such as recessions or wars can change population dynamics dramatically. In general, however, mathematical modeling based on the past and utilizing assumptions for the future provides a sense of expected changes likely to occur.

Population projections are especially important as preparations continue for the needs of the sizable baby-boom population. With the first "boomers" turning age 75 in 2021, their changing needs given housing preferences, greater possibilities of losing a spouse, and eventual possible need for long-term care or nursing home facilities come into focus as one looks 15 to 30 years into the future to 2035 and 2050. Current and future development of housing and infrastructure will need to adapt and prepare for the coming demographic changes. Population and housing projections are a useful tool in the planning process.

Lancaster County has additional complexities regarding its population since a major university, a penitentiary, and Nebraska's state government are located there. As such, Lancaster County experiences a relatively high rate of migration, attracting college-aged students and some in their early working years but also often having those with a newly completed degree move out of the area. Migration not only has a direct influence on the residential location of families and individuals but also upon potential future families (where people will be when they eventually get married and have children). Thus, understanding and modeling migration accurately is a key component in portraying the future population structure of Lancaster County.

With migration in mind, these projections utilize the "trend" level of migration that has occurred in the recent past. With birth and survival rates remaining relatively steady over time, changes in migration are a more variable factor for how the population will change. This has been witnessed locally when lower levels of migration in the 1980s (+ 2.0% decade rate) lead to lower population growth, while the 1990s had relatively high levels of growth due to high migration (+ 9.3%). This trend level of migration can be viewed not only as an average between these high and low levels but also indicative of the longer-term trend since 1970 and what occurred most recently in the 2000s (+ 4.9% decade rate, used in calculating age-specific migration rates). Population estimates from the Census Bureau establish migration rates for the 2010s in this range as well (+ 6.0% for the full decade as extrapolated from 2019 estimates).

The trend level of migration is pegged at + 5.5 percent per decade, based upon similar averages of rates from the last three completed decades (average of 5.4%) as well as the average of those three decades plus estimates for the 2010s (average of 5.6%). The trend level is the scenario most likely to occur, as it smoothes the actual future changes that will likely sometimes be above and sometimes below the trend level. The trend level of migration and population growth represents the most reasonable method for evaluating longer periods of time, as Lancaster County has not experienced consecutive decades of either high or low migration in recent times.

With the targeted decade rate of migration established, an analysis of age-specific migration rates based upon population changes in the 2000s followed. This process involved determining migration rates for five-year age groups and then smoothing those values into rates for individual ages. Having rates for each single year of age was crucial to correctly pattern the "jumps" in migration that occur as college students both come into and often later leave Lancaster County.

A comprehensive analysis conducted on the population structure for college ages improved the overall precision of these projections by age. The detailed patterning of college age changes and utilizing migration rates for single years of age strengthen these projections when compared to others. Since these projections were tailored to specific Lancaster County trends and prepared using the most current data available, they provide a locally grounded approach to detailing the complex nature of Lancaster County's population.

Based upon the trend level of growth, the projections also provide information on the future housing structure in Lancaster County. These projections detail not only the total number of persons, but also those living in housing units and group quarters settings. With this information, the total number of households and average household size were determined, along with projections by age of the householder. Additionally, the number of one-person households and the number of nonfamily and family households, including those that have children under age 18, illustrate further details on the future housing structure. Such projections further aid planning and development regarding the demand for 1-person households (apartments and smaller homes) as well as housing and other amenities for families with children (parks, playgrounds, etc.).

The Nebraska State Capitol in Lincoln

DATA SUMMARY

While users of data from projections should exercise discretion in the conclusions they draw from the information, the following points illustrate some of the key pieces of information gleaned from the projections. They are not necessarily listed in any particular order. The tables and figures referenced follow in the next section.

1. Based on the current 2019 population estimates from the U.S. Census Bureau, another year of growth typical for the 2010s period would give Lancaster County about 322,000 people in 2020. However, impacts on growth and the 2020 Census count by COVID-19 virus complications are undetermined. Given the closure of college campuses and movement to online learning, the migration and count of college students could be inaccurate. Thus, having a 2020 Census count around 320,000 persons is quite plausible, under the assumption that the Census estimates program has been accurate in tracking the area's population since 2010. The projection model puts the 2020 population near 321,000, which appears reasonable (Table 1).

2. The projection model pegs the 2035 population at nearly 380,000, a growth of more than 59,000 persons from 2020 or about 18 percent (Table 1). By 2050, the Lancaster County population will approach 440,000, for an additional growth of 59,000 over the projected 2035 level, or a rise of 16% from 2035 to 2050.

3. Natural change steadily will increase population growth in each five-year period early in the projection period, the relative difference between these two factors will shrink over time and net migration is expected to be larger in the 2040s (Figure 1). Natural change will steadily increase the population by about 10,000 per five-year period, until softening in the 2040s. Net migration, following a 5.5% target rate, will trend upward as the overall population increases.

4. The number of births and deaths steadily trend upward, but the rise in deaths eventually will outpace the increase in births, leading to the lower levels of natural change (Figure 2). Thus, it appears that there may be an increased need for schools based on the growth in births and child population over the projection period.

5. The composition of natural change will change, with levels trending downward for non-Hispanic Whites while rising for other population groups (Figure 3). The changes for Whites will stem primarily from a rise in deaths, as White births remain quite consistent in a range of 15,500 to 16,500 for each five-year period (Table 2). Conversely, births among diverse population groups will increase from about 4,500 per five-year period in the 2010s to around 10,000 per five year period in the 2040s (Table 3). Deaths will rise for diverse populations as well, but will remain relatively low given the relatively young age structure of diverse populations versus the relatively older population of non-Hispanic Whites, which is heavily composed of the aging "baby boom" population.

6. Overall, the projected populations of both non-Hispanic Whites and diverse populations grow in each 5-year period, but the gains will be increasingly larger for diverse populations and increasingly smaller for Whites (Figures 4). Diverse populations have and will continue to increase their respective share of the total population by about 5 percentage points per decade, from about 6% in 1990 to 16% in 2010 and 26% by 2030. In 2050, diverse populations should represent more than 1 in 3 Lancaster County residents (35.3%), with the number of diverse residents more than doubling from a projected 66,000 in 2020 to more than 155,000 by 2050 (Table 3). The non-Hispanic White population will nearly total 285,000 in 2050, up about 30,000 or 11% over the projected 255,000 in 2020 (Table 2).

7. Figures 5-8 show the population values among major racial groups from 1990 to 2050 for the total population, those under age 18, those 18 to 64, and those age 65 and older respectively. Each shows the same pattern, with the total population and each major racial group "stepping" upward to new population highs each decade. Sometimes the "steps" are large, such as sizeable growth among diverse population of primary working ages (18-64), while sometimes they are small, such as among non-Hispanic Whites under age 18. Notable increases will occur among the 65 and older population, from about 31,000 in 2010 to 46,000 in 2020 and 61,000 in 2030 (Figure 8). Most of this growth will occur among non-Hispanic Whites, but diverse populations will contribute to the increases as well. With all "baby boomers" being age 65+ in 2030, senior growth will slow in the 2030s and 2040s, but continue rising. Thus, housing for seniors, hospitals, and aspects of care and quality of life will take on increased needs as the population ages and the senior population grows.

8. To illustrate the impact of aging, Figure 9 shows that by 2025 the population age 75 or older will exceed the number of children under age 5. It will likely be the first time in history with more elders of this age versus young children. In 2010, there were about 5,000 more young children than seniors aged 75+. However, with sustained but slow growth among children versus a large increase in those age 75+ as "baby boomers" enter this age range, such seniors not only overtake young children but eventually far exceed them, with sharp growth until 2040 before growth lessens. By 2050 there will be nearly 15,000 more people age 75+ than children under age five in Lancaster County. Thus, this suggests larger increases in needs for elder care workers relative to the continued rising need for childcare workers.

9. Given Lancaster County's migration structure where a large inmigration occurs among college-aged persons followed by a general outmigration of those aged 25-44, who take along their young children (Figures 12 and 13), any positive increase in net migration leads to a sizeable increase in births and the under 18 population. The demographic theory of more positive migration leading not only to more people overall but also a higher level of births and children is especially apparent in Lancaster County. Retaining more people age 25-44 who are considering moving away from the area would have significant impacts on the population's overall structure.

10. The total number of households increases steadily in a linear pattern reaching about 130,000 in 2020, 157,000 in 2035 and nearly 183,000 in 2050 (Table 4). While the numeric increase in households will be about 26,500 in both the 15-year periods from 2020 to 2035 and 2035 to 2050, the rate of household growth will slow as the housing base number increases in size. Figure 11 shows that while household growth during the 2010s decade (+ 14.4%) will increase at a nearly identical rate to what occurred in the 2000s (+ 14.3%), this decade rate of growth will slow over time, even as the rise in the number of households is consistent each decade (Table 4). Figure 11 shows the same pattern for decade growth in total population, with the projected increases in both population and households in the 2040s being the lowest of any decade since the 1970s.

11. While both family and nonfamily households will increase in number, the projection shows the rate of growth will be faster among nonfamily households. Part of this is due to increases in 1-person households (nonfamily by definition), which steadily rise to be about one-third of all households by 2040, versus being 27.5% of all households in 1990 (Table 4, Figure 10). Some of this change likely stems from married "baby boomer" couples moving into age cohorts where the loss of a spouse occurs more frequently, thus changing a 2-person household to a 1-person household. The portion of households where one person lives alone rises with age.

12. As the number and portion of households with one person living alone rises, the average household size slowly continues falling, as it has for several decades. Figure 10 shows the average household size in Lancaster County was nearly three persons per unit in 1970, when many "baby boom" children still lived in their parent's homes. Persons per household dropped below 2.5 in 1990 and stabilized at 2.40 in both 2000 and 2010. The projections show a declining average household size each decade, ending with 2.30 persons per household in 2050.

13. While both family households and those with children will increase in overall number, their relative percentage or share of the total number of households will decrease as it has tended to since 1970 (Table 4). Family households comprised more than 75% of Lancaster households in 1970, but that has dropped in each decade, with 60% of households being composed of families (two or more related individuals in the same unit) in 2010. Projected values continue this decline in each decade, although slowly, ending with 57% of households being composed of families in 2050. Likewise, family households with their own children under 18 used to comprise more than 40% of households in 1970, falling to below 30% of households by 2010. The projections indicate a slow decline will continue, with 26% of households being families with their own children under 18 in 2050.

14. While households headed by all various ages will each increase, the growth will be relatively faster among those headed by someone relatively older. The number of households with a householder age 65-74 will double from 2010 to when it sets a near-term peak in 2030, while those with a householder aged 85+ will more than triple from 2010 to 2050 (Table 4).

While these changes speak to the aging of the "baby boom" population, we can also easily identify the smaller "generation X" cohort that follows them. For example, the "baby boom" population was age 45-64 in 2010, and Table 4 shows there were more than 21,000 households headed by someone age 45-54 at that time. As "baby boomers" age out of this age range, the number of households headed by someone 45-54 declines to around 19,000 from 2015 to 2025 when the smaller "generation X" cohort is of this age. Then households headed by someone 45-54 rise to new highs in 2030 and beyond as the "millennial" population cohort (children of baby boomers) enters this age range. The smaller "generation X" cohort is age 55-64 in 2025 to 2035 and age 65-74 in 2035 to 2045 (Table 4).

Downtown Lincoln Skyline

DATA TABLES AND GRAPHS

Table 1: Lancaster County Total Population Projected from 2010 Census to 2050 by Sex and Age

Category	Census 2010	2015 Proj	2020 Proj	2025 Proj	2030 Proj	2035 Proj	2040 Proj	2045 Proj	2050 Proj
Total Population	285,407	302,860	320,670	340,568	360,558	379,781	399,519	419,117	439,258
Change in Population	n/a	17,453	17,810	19,898	19,990	19,223	19,739	19,598	20,141
Natural Change	n/a	9,957	9,795	10,367	10,592	10,558	10,012	9,159	9,050
Births	n/a	20,178	20,494	21,688	22,912	24,366	25,517	26,137	26,765
Deaths	n/a	10,221	10,699	11,321	12,320	13,808	15,505	16,978	17,715
Net Migration	n/a	7,496	8,015	9,531	9,398	8,665	9,727	10,439	11,091
% of change		42.9%	45.0%	47.9%	47.0%	45.1%	49.3%	53.3%	55.1%

Category	Census 2010	2015 Proj	2020 Proj	2025 Proj	2030 Proj	2035 Proj	2040 Proj	2045 Proj	2050 Proj
Male	143,048	152,053	161,158	171,248	181,330	191,019	201,023	211,067	221,450
Under 5	10,311	10,177	10,340	10,944	11,564	12,299	12,882	13,197	13,516
5 to 9	9,605	10,175	10,045	10,205	10,803	11,415	12,142	12,719	13,031
10 to 14	8,517	9,618	10,190	10,061	10,220	10,819	11,433	12,161	12,739
15 to 19	10,709	10,892	12,332	13,134	13,024	13,116	13,898	14,679	15,617
20 to 24	16,076	16,167	16,478	18,599	19,654	19,378	19,761	20,918	22,118
25 to 29	12,626	13,214	13,253	13,503	15,262	16,185	15,991	16,266	17,229
30 to 34	10,393	11,811	12,376	12,417	12,661	14,324	15,201	15,029	15,286
35 to 39	9,160	10,149	11,538	12,096	12,155	12,405	14,040	14,899	14,733
40 to 44	8,660	8,683	9,626	10,958	11,502	11,565	11,811	13,377	14,208
45 to 49	9,145	8,480	8,518	9,454	10,780	11,330	11,401	11,653	13,211
50 to 54	9,288	9,005	8,370	8,427	9,373	10,707	11,272	11,359	11,625
55 to 59	8,482	9,027	8,779	8,189	8,267	9,223	10,559	11,139	11,248
60 to 64	6,718	8,066	8,620	8,415	7,883	7,984	8,938	10,261	10,853
65 to 69	4,415	6,230	7,512	8,068	7,912	7,448	7,573	8,514	9,806
70 to 74	3,093	3,984	5,657	6,859	7,410	7,306	6,916	7,066	7,984
75 to 79	2,425	2,671	3,470	4,969	6,061	6,596	6,546	6,244	6,417
80 to 84	1,842	1,892	2,109	2,776	4,022	4,936	5,424	5,426	5,236
85+	1,583	1,813	1,944	2,172	2,777	3,983	5,237	6,160	6,595

Category	Census 2010	2015 Proj	2020 Proj	2025 Proj	2030 Proj	2035 Proj	2040 Proj	2045 Proj	2050 Proj
Female	142,359	150,807	159,512	169,320	179,228	188,761	198,497	208,051	217,808
Under 5	9,860	9,784	9,940	10,520	11,116	11,822	12,381	12,683	12,989
5 to 9	9,302	9,734	9,660	9,813	10,387	10,975	11,673	12,226	12,525
10 to 14	8,202	9,315	9,748	9,676	9,828	10,403	10,992	11,691	12,246
15 to 19	10,477	10,520	11,926	12,528	12,531	12,618	13,368	14,117	15,017
20 to 24	14,764	15,648	15,890	18,044	18,846	18,663	19,025	20,133	21,282
25 to 29	11,531	12,146	12,913	13,066	14,848	15,539	15,422	15,678	16,598
30 to 34	9,390	10,826	11,406	12,136	12,277	13,952	14,609	14,507	14,743
35 to 39	8,467	9,206	10,608	11,180	11,892	12,043	13,689	14,332	14,229
40 to 44	8,026	8,056	8,757	10,100	10,650	11,336	11,481	13,055	13,674
45 to 49	9,071	7,898	7,936	8,630	9,964	10,513	11,199	11,345	12,907
50 to 54	9,466	9,007	7,852	7,901	8,600	9,940	10,498	11,192	11,345
55 to 59	8,864	9,324	8,887	7,764	7,824	8,532	9,872	10,438	11,139
60 to 64	7,196	8,595	9,064	8,658	7,584	7,656	8,366	9,694	10,265
65 to 69	4,806	6,843	8,196	8,672	8,306	7,301	7,386	8,094	9,396
70 to 74	3,667	4,482	6,414	7,713	8,196	7,879	6,951	7,055	7,757
75 to 79	3,221	3,318	4,082	5,883	7,105	7,590	7,328	6,503	6,626
80 to 84	2,829	2,692	2,803	3,480	5,067	6,143	6,608	6,413	5,743
85+	3,220	3,413	3,428	3,555	4,208	5,859	7,647	8,895	9,330

Category	Census 2010	2015 Proj	2020 Proj	2025 Proj	2030 Proj	2035 Proj	2040 Proj	2045 Proj	2050 Proj
Totals: Under 5	20,171	19,961	20,280	21,465	22,679	24,121	25,263	25,880	26,505
5 to 9	18,907	19,909	19,704	20,019	21,189	22,390	23,815	24,944	25,555
10 to 14	16,719	18,933	19,939	19,737	20,049	21,222	22,425	23,852	24,984
15 to 19	21,186	21,412	24,259	25,662	25,555	25,734	27,266	28,795	30,634
20 to 24	30,840	31,815	32,368	36,643	38,500	38,041	38,786	41,051	43,400
25 to 29	24,157	25,361	26,167	26,569	30,110	31,724	31,413	31,943	33,827
30 to 34	19,783	22,637	23,782	24,553	24,938	28,275	29,810	29,537	30,029
35 to 39	17,627	19,356	22,145	23,276	24,047	24,448	27,729	29,231	28,961
40 to 44	16,686	16,739	18,383	21,058	22,152	22,901	23,292	26,432	27,881
45 to 49	18,216	16,377	16,455	18,084	20,744	21,843	22,600	22,998	26,117
50 to 54	18,754	18,011	16,222	16,328	17,974	20,647	21,770	22,551	22,971
55 to 59	17,346	18,352	17,666	15,954	16,091	17,755	20,431	21,577	22,387
60 to 64	13,914	16,661	17,684	17,073	15,467	15,640	17,305	19,955	21,118
65 to 69	9,221	13,073	15,707	16,740	16,218	14,749	14,958	16,608	19,202
70 to 74	6,760	8,466	12,071	14,571	15,606	15,184	13,868	14,121	15,741
75 to 79	5,646	5,989	7,553	10,853	13,166	14,186	13,874	12,748	13,043
80 to 84	4,671	4,584	4,913	6,257	9,088	11,079	12,032	11,839	10,979
85+	4,803	5,226	5,372	5,727	6,985	9,842	12,884	15,056	15,925

Table 2: Lancaster County Non-Hispanic White Population Projected from 2010 Census to 2050 by Sex and Age

Category	Census 2010	2015 Proj	2020 Proj	2025 Proj	2030 Proj	2035 Proj	2040 Proj	2045 Proj	2050 Proj
Total Population	240,702	248,302	255,062	262,302	268,114	273,470	277,703	281,002	284,008
Change in Population	n/a	7,600	6,761	7,240	5,811	5,356	4,234	3,299	3,006
Natural Change	n/a	6,452	5,737	5,486	4,786	3,775	2,536	1,531	1,265
Births	n/a	16,057	15,689	15,891	15,973	16,161	16,270	16,327	16,381
Deaths	n/a	9,605	9,952	10,405	11,187	12,386	13,734	14,796	15,116
Net Migration	n/a	1,148	1,024	1,754	1,025	1,581	1,698	1,768	1,741
% of change		15.1%	15.1%	24.2%	17.6%	29.5%	40.1%	53.6%	57.9%

Category	Census 2010	2015 Proj	2020 Proj	2025 Proj	2030 Proj	2035 Proj	2040 Proj	2045 Proj	2050 Proj
Male	119,472	123,490	127,085	130,866	133,779	136,494	138,701	140,547	142,323
Under 5	7,508	7,751	7,583	7,680	7,721	7,814	7,867	7,895	7,923
5 to 9	7,198	6,913	7,136	6,977	7,068	7,107	7,192	7,242	7,269
10 to 14	6,553	7,006	6,732	6,949	6,793	6,882	6,919	7,003	7,051
15 to 19	8,614	8,419	9,008	8,777	9,036	8,754	8,882	8,930	9,036
20 to 24	13,439	13,091	12,816	13,705	13,085	13,524	13,272	13,444	13,522
25 to 29	10,268	10,257	9,968	9,759	10,446	10,030	10,366	10,150	10,289
30 to 34	8,441	9,398	9,403	9,136	8,954	9,588	9,224	9,536	9,334
35 to 39	7,444	8,042	8,962	8,974	8,729	8,559	9,173	8,824	9,128
40 to 44	7,264	6,976	7,540	8,413	8,435	8,208	8,055	8,638	8,320
45 to 49	7,906	7,073	6,805	7,364	8,230	8,262	8,047	7,903	8,483
50 to 54	8,263	7,751	6,951	6,703	7,269	8,139	8,184	7,982	7,850
55 to 59	7,754	7,997	7,525	6,772	6,548	7,122	7,992	8,053	7,871
60 to 64	6,220	7,339	7,600	7,179	6,488	6,293	6,869	7,730	7,809
65 to 69	4,093	5,749	6,813	7,091	6,729	6,110	5,950	6,522	7,364
70 to 74	2,898	3,691	5,218	6,218	6,510	6,210	5,671	5,549	6,112
75 to 79	2,304	2,496	3,208	4,573	5,480	5,779	5,549	5,106	5,026
80 to 84	1,778	1,790	1,964	2,557	3,686	4,447	4,735	4,583	4,265
85+	1,527	1,751	1,854	2,039	2,574	3,666	4,755	5,457	5,671

Category	Census 2010	2015 Proj	2020 Proj	2025 Proj	2030 Proj	2035 Proj	2040 Proj	2045 Proj	2050 Proj
Female	121,230	124,811	127,977	131,437	134,335	136,976	139,002	140,455	141,685
Under 5	7,172	7,451	7,289	7,383	7,422	7,510	7,561	7,588	7,614
5 to 9	6,858	6,605	6,862	6,709	6,796	6,832	6,914	6,961	6,987
10 to 14	6,325	6,676	6,432	6,683	6,532	6,617	6,653	6,732	6,778
15 to 19	8,497	8,170	8,573	8,339	8,694	8,421	8,543	8,589	8,688
20 to 24	12,484	12,763	12,367	13,069	12,540	13,025	12,778	12,940	13,011
25 to 29	9,638	9,544	9,786	9,459	9,992	9,616	9,997	9,783	9,912
30 to 34	7,879	8,855	8,769	9,004	8,699	9,188	8,854	9,205	9,002
35 to 39	7,055	7,536	8,469	8,389	8,615	8,327	8,799	8,479	8,815
40 to 44	6,839	6,636	7,084	7,971	7,899	8,118	7,847	8,294	7,998
45 to 49	8,067	6,692	6,501	6,942	7,820	7,754	7,976	7,712	8,154
50 to 54	8,624	7,975	6,624	6,444	6,888	7,768	7,709	7,936	7,679
55 to 59	8,173	8,459	7,836	6,523	6,354	6,804	7,681	7,632	7,865
60 to 64	6,699	7,888	8,185	7,597	6,341	6,188	6,641	7,507	7,470
65 to 69	4,517	6,350	7,498	7,807	7,267	6,085	5,951	6,404	7,253
70 to 74	3,468	4,211	5,948	7,053	7,374	6,889	5,791	5,682	6,134
75 to 79	3,077	3,130	3,826	5,443	6,480	6,812	6,390	5,403	5,322
80 to 84	2,733	2,563	2,635	3,250	4,669	5,583	5,910	5,571	4,753
85+	3,125	3,307	3,292	3,372	3,953	5,438	7,008	8,037	8,250

Category	Census 2010	2015 Proj	2020 Proj	2025 Proj	2030 Proj	2035 Proj	2040 Proj	2045 Proj	2050 Proj
Totals: Under 5	14,680	15,202	14,872	15,063	15,143	15,324	15,428	15,484	15,537
5 to 9	14,056	13,518	13,999	13,686	13,864	13,939	14,106	14,203	14,255
10 to 14	12,878	13,682	13,164	13,633	13,325	13,499	13,572	13,735	13,830
15 to 19	17,111	16,589	17,580	17,117	17,730	17,175	17,425	17,519	17,724
20 to 24	25,923	25,855	25,183	26,774	25,625	26,549	26,049	26,383	26,533
25 to 29	19,906	19,801	19,755	19,217	20,438	19,646	20,363	19,933	20,201
30 to 34	16,320	18,254	18,172	18,140	17,653	18,776	18,078	18,740	18,337
35 to 39	14,499	15,578	17,431	17,363	17,344	16,886	17,972	17,303	17,943
40 to 44	14,103	13,612	14,624	16,384	16,334	16,327	15,902	16,932	16,318
45 to 49	15,973	13,765	13,306	14,305	16,050	16,016	16,023	15,615	16,637
50 to 54	16,887	15,726	13,576	13,146	14,157	15,907	15,893	15,918	15,528
55 to 59	15,927	16,456	15,360	13,295	12,901	13,926	15,674	15,685	15,736
60 to 64	12,919	15,226	15,785	14,776	12,829	12,481	13,510	15,238	15,280
65 to 69	8,610	12,099	14,311	14,898	13,995	12,195	11,902	12,926	14,618
70 to 74	6,366	7,902	11,166	13,270	13,884	13,099	11,461	11,231	12,246
75 to 79	5,381	5,626	7,034	10,016	11,960	12,591	11,939	10,509	10,347
80 to 84	4,511	4,353	4,599	5,807	8,355	10,030	10,644	10,154	9,017
85+	4,652	5,057	5,146	5,411	6,527	9,104	11,763	13,494	13,922

Table 3: Lancaster County Diverse Populations Projected from 2010 Census to 2050 by Sex and Age

Category	Census 2010	2015 Proj	2020 Proj	2025 Proj	2030 Proj	2035 Proj	2040 Proj	2045 Proj	2050 Proj
Total Population	44,705	54,558	65,608	78,266	92,444	106,311	121,816	138,115	155,250
Change in Population	n/a	9,853	11,049	12,658	14,178	13,867	15,505	16,299	17,135
Natural Change	n/a	3,505	4,058	4,881	5,806	6,783	7,476	7,628	7,785
Births	n/a	4,121	4,805	5,797	6,939	8,205	9,247	9,810	10,384
Deaths	n/a	616	747	916	1,133	1,422	1,771	2,182	2,599
Net Migration	n/a	6,348	6,991	7,777	8,372	7,084	8,029	8,671	9,350
% of change		64.4%	63.3%	61.4%	59.0%	51.1%	51.8%	53.2%	54.6%

Category	Census 2010	2015 Proj	2020 Proj	2025 Proj	2030 Proj	2035 Proj	2040 Proj	2045 Proj	2050 Proj
Male	23,576	28,563	34,073	40,382	47,551	54,525	62,322	70,519	79,128
Under 5	2,803	2,426	2,758	3,264	3,843	4,486	5,015	5,301	5,593
5 to 9	2,407	3,262	2,909	3,228	3,734	4,309	4,950	5,477	5,762
10 to 14	1,964	2,612	3,458	3,112	3,428	3,937	4,513	5,158	5,687
15 to 19	2,095	2,473	3,325	4,357	3,988	4,362	5,016	5,748	6,581
20 to 24	2,637	3,076	3,662	4,894	6,569	5,854	6,489	7,474	8,596
25 to 29	2,358	2,957	3,285	3,745	4,816	6,155	5,625	6,116	6,940
30 to 34	1,952	2,413	2,973	3,281	3,707	4,735	5,977	5,494	5,952
35 to 39	1,716	2,107	2,576	3,122	3,426	3,846	4,867	6,075	5,605
40 to 44	1,396	1,708	2,087	2,545	3,067	3,356	3,756	4,739	5,887
45 to 49	1,239	1,407	1,713	2,091	2,550	3,068	3,354	3,750	4,728
50 to 54	1,025	1,254	1,419	1,724	2,105	2,568	3,088	3,377	3,776
55 to 59	728	1,030	1,255	1,417	1,720	2,101	2,566	3,086	3,377
60 to 64	498	727	1,020	1,237	1,395	1,691	2,069	2,531	3,043
65 to 69	322	480	698	977	1,183	1,338	1,622	1,992	2,442
70 to 74	195	292	439	641	900	1,096	1,245	1,516	1,872
75 to 79	121	175	262	397	581	817	997	1,138	1,391
80 to 84	64	102	145	219	336	490	690	843	971
85+	56	62	90	133	203	317	482	704	924

Category	Census 2010	2015 Proj	2020 Proj	2025 Proj	2030 Proj	2035 Proj	2040 Proj	2045 Proj	2050 Proj
Female	21,129	25,995	31,535	37,883	44,892	51,786	59,495	67,596	76,123
Under 5	2,688	2,333	2,651	3,137	3,694	4,311	4,820	5,095	5,375
5 to 9	2,444	3,129	2,797	3,104	3,590	4,142	4,759	5,264	5,538
10 to 14	1,877	2,639	3,316	2,992	3,296	3,785	4,339	4,959	5,467
15 to 19	1,980	2,349	3,354	4,189	3,837	4,196	4,825	5,528	6,328
20 to 24	2,280	2,885	3,523	4,975	6,305	5,638	6,248	7,194	8,271
25 to 29	1,893	2,603	3,127	3,607	4,856	5,922	5,425	5,895	6,686
30 to 34	1,511	1,971	2,637	3,132	3,578	4,764	5,755	5,303	5,740
35 to 39	1,412	1,670	2,139	2,791	3,277	3,716	4,890	5,853	5,413
40 to 44	1,187	1,420	1,673	2,129	2,751	3,218	3,633	4,761	5,676
45 to 49	1,004	1,205	1,435	1,688	2,144	2,760	3,223	3,633	4,753
50 to 54	842	1,032	1,228	1,457	1,713	2,173	2,789	3,256	3,667
55 to 59	691	865	1,051	1,242	1,470	1,728	2,190	2,806	3,274
60 to 64	497	707	879	1,060	1,243	1,468	1,726	2,187	2,795
65 to 69	289	493	698	866	1,040	1,216	1,435	1,690	2,143
70 to 74	199	272	465	660	822	989	1,161	1,373	1,622
75 to 79	144	188	257	440	625	778	938	1,101	1,304
80 to 84	96	129	168	230	397	560	698	841	991
85+	95	106	136	183	255	421	639	858	1,080

Category	Census 2010	2015 Proj	2020 Proj	2025 Proj	2030 Proj	2035 Proj	2040 Proj	2045 Proj	2050 Proj
Totals: Under 5	5,491	4,759	5,408	6,401	7,536	8,797	9,835	10,396	10,968
5 to 9	4,851	6,391	5,706	6,333	7,325	8,451	9,709	10,741	11,300
10 to 14	3,841	5,251	6,774	6,104	6,724	7,722	8,853	10,117	11,155
15 to 19	4,075	4,822	6,678	8,546	7,825	8,559	9,841	11,276	12,910
20 to 24	4,917	5,960	7,185	9,869	12,875	11,492	12,737	14,668	16,867
25 to 29	4,251	5,559	6,412	7,352	9,673	12,078	11,050	12,011	13,626
30 to 34	3,463	4,384	5,610	6,413	7,285	9,499	11,732	10,797	11,692
35 to 39	3,128	3,777	4,715	5,913	6,703	7,562	9,757	11,928	11,018
40 to 44	2,583	3,128	3,760	4,674	5,819	6,574	7,389	9,500	11,563
45 to 49	2,243	2,612	3,149	3,779	4,693	5,827	6,577	7,383	9,481
50 to 54	1,867	2,286	2,647	3,182	3,817	4,741	5,877	6,633	7,442
55 to 59	1,419	1,895	2,306	2,659	3,190	3,829	4,757	5,891	6,651
60 to 64	995	1,434	1,899	2,297	2,638	3,159	3,795	4,718	5,838
65 to 69	611	974	1,396	1,842	2,223	2,554	3,057	3,682	4,584
70 to 74	394	564	905	1,301	1,722	2,085	2,406	2,890	3,494
75 to 79	265	362	519	837	1,205	1,595	1,935	2,239	2,695
80 to 84	160	231	313	450	733	1,050	1,388	1,685	1,962
85+	151	168	226	316	458	738	1,121	1,561	2,004

Table 4. Lancaster County Household Characteristics from Historic Censuses and Projections from 2010 to 2050

Sources: 1970 Census (Characteristics of the Population - Vol. 1, part 29 - table 36, pg 133); 1980 Census (General Population Characteristics - PC80-1-B29 - Table 47, pg 139 & Table 31, pg 56); 1990 Census (General Population Characteristics - 1990 CP-1-29 - Table 57, pg 120); 2000 Census (SF 1 data, AFF Quick Tables DP-1, QT-H1, and QT-P10); 2010 Census (AFF tables DP-1, H17); all U.S. Census Bureau

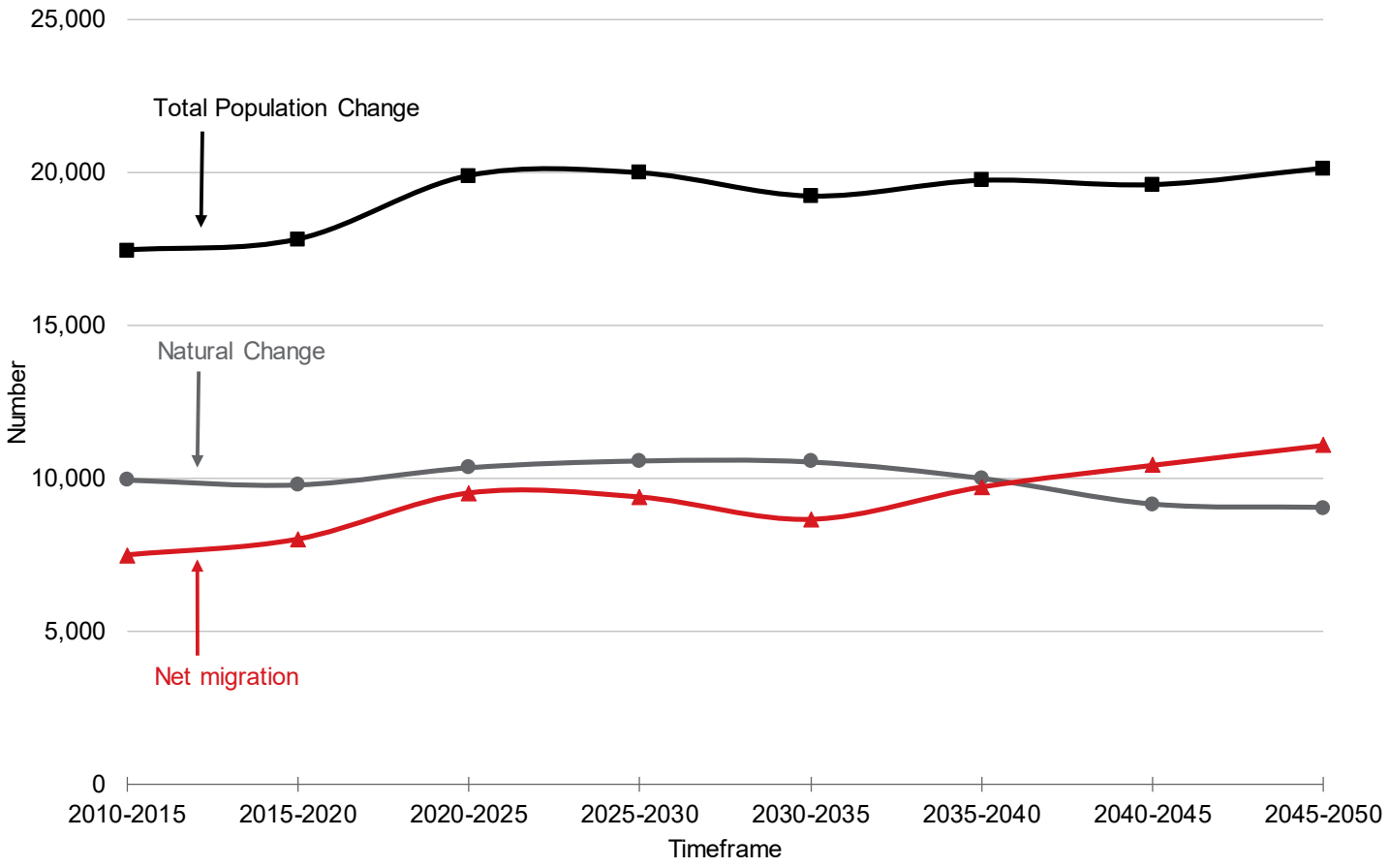
	Actual Historic Data					Projected Data							
Category	1970	1980	1990	2000	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total population	167,972	192,884	213,641	250,291	285,407	302,860	320,670	340,568	360,558	379,781	399,519	419,117	439,258
In households	156,002	180,612	202,170	238,094	271,591	288,537	306,155	325,609	344,854	363,490	382,317	400,904	420,050
In group quarters	11,970	12,272	11,471	12,197	13,816	14,323	14,515	14,959	15,704	16,291	17,203	18,213	19,209
% of total population in households	92.9	93.6	94.6	95.1	95.2	95.3	95.5	95.6	95.6	95.7	95.7	95.7	95.6
Total households	53,912	71,769	82,759	99,187	113,373	121,424	129,716	138,305	147,809	156,955	165,615	173,937	182,845
Decade change in households	n/a	17,857	10,990	16,428	14,186		16,343		18,093		17,806		17,230
Decade growth rate in households	n/a	33.1	15.3	19.9	14.3		14.4		13.9		12.0		10.4
Nonfamily households	12,986	24,190	29,774	38,485	45,163	49,219	52,924	57,000	61,747	66,555	70,919	74,638	78,431
Family households	40,926	47,579	52,985	60,702	68,210	72,205	76,793	81,305	86,062	90,400	94,696	99,299	104,414
With own children under 18	21,828	23,942	26,385	30,059	32,121	33,327	35,038	36,947	39,362	41,761	43,849	45,906	47,740
% of family households with children <18	53.3	50.3	49.8	49.5	47.1	46.2	45.6	45.4	45.7	46.2	46.3	46.2	45.7
% Family households	75.9	66.3	64.0	61.2	60.2	59.5	59.2	58.8	58.2	57.6	57.2	57.1	57.1
% of households with own children <18	40.5	33.4	31.9	30.3	28.3	27.4	27.0	26.7	26.6	26.6	26.5	26.4	26.1
Persons per household (average household size)	2.89	2.52	2.44	2.40	2.40	2.38	2.36	2.35	2.33	2.32	2.31	2.30	2.30

	Actual Historic Data					Projected Data							
Category	**1970**	**1980**	**1990**	**2000**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**
Head of household/ householder by age													
15 to 24 years	7,566	10,930	8,635	11,070	11,123	11,380	12,141	13,396	13,773	13,712	14,202	15,018	15,918
25 to 34 years	10,709	19,498	20,466	19,847	22,605	24,693	25,867	26,653	28,700	31,281	31,918	32,053	33,291
35 to 44 years	8,794	10,802	18,481	21,251	18,830	19,808	22,086	23,994	25,003	25,625	27,613	30,125	30,764
45 to 54 years	16,503	9,230	10,832	19,025	21,332	19,843	18,722	19,577	22,026	24,173	25,242	25,913	27,927
55 to 64 years		8,747	9,108	10,757	18,847	21,109	21,259	19,812	18,931	20,033	22,637	24,914	26,097
65 to 74 years	10,340	7,122	8,074	8,457	9,976	13,445	17,488	19,880	20,205	19,005	18,302	19,510	22,185
75 to 84 years		5,440	5,406	6,533	7,137	7,314	8,272	10,917	14,199	16,120	16,529	15,687	15,327
85+ years			1,757	2,247	3,523	3,833	3,881	4,076	4,972	7,005	9,171	10,717	11,336

Household size													
1 person	n/a	n/a	22,770	28,831	33,960	36,914	39,693	42,750	46,310	49,916	53,189	55,978	58,823
2 or more persons	n/a	n/a	59,989	70,356	79,413	84,510	90,023	95,555	101,499	107,039	112,426	117,959	124,022
% 1-person households	n/a	n/a	27.5	29.1	30.0	30.4	30.6	30.9	31.3	31.8	32.1	32.2	32.2

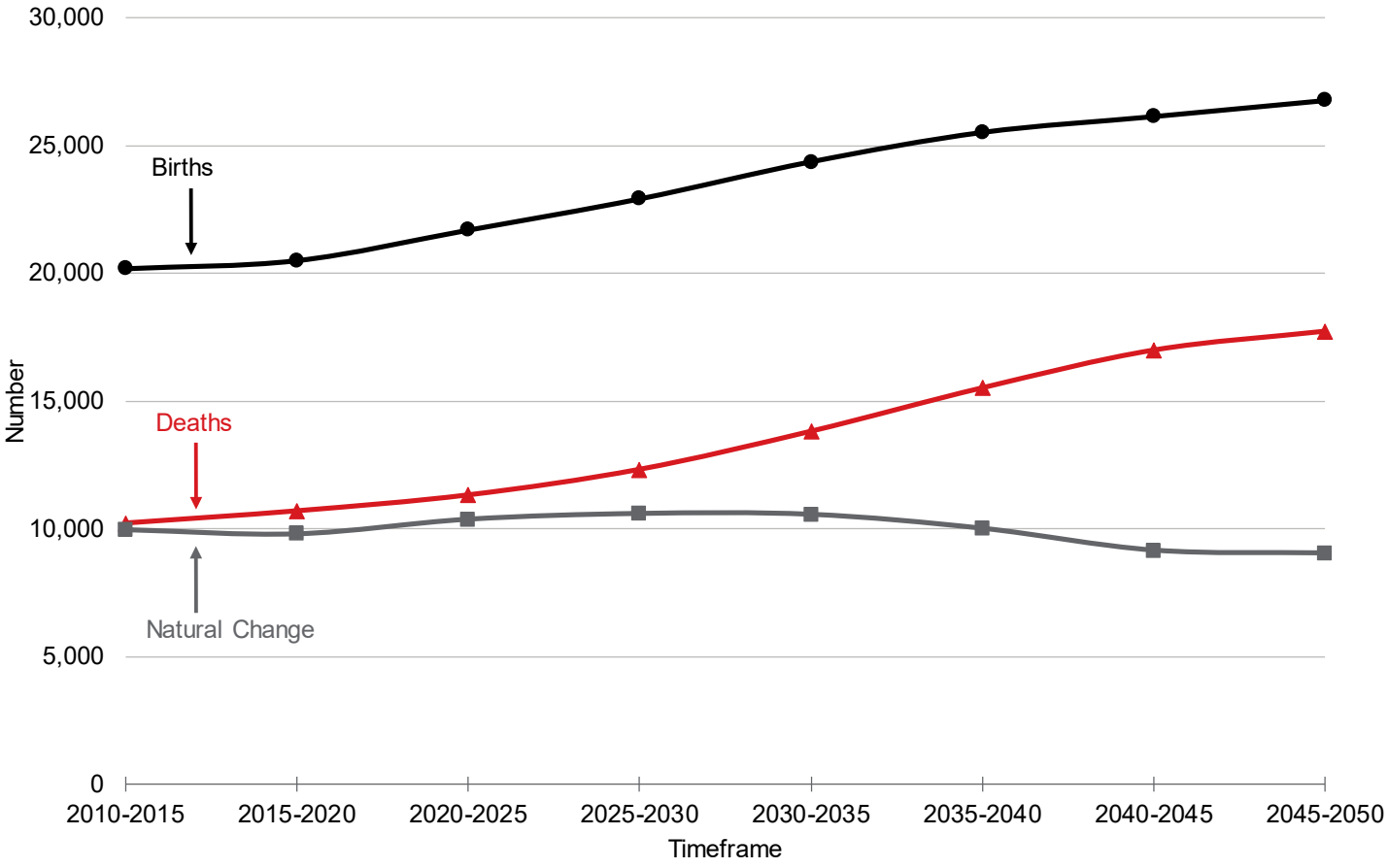
With deaths set to increase and natural change softening, net migration will likely contribute more to total population change in the future

Figure 1. Projected Lancaster County total population change with components of change: 2010-2050



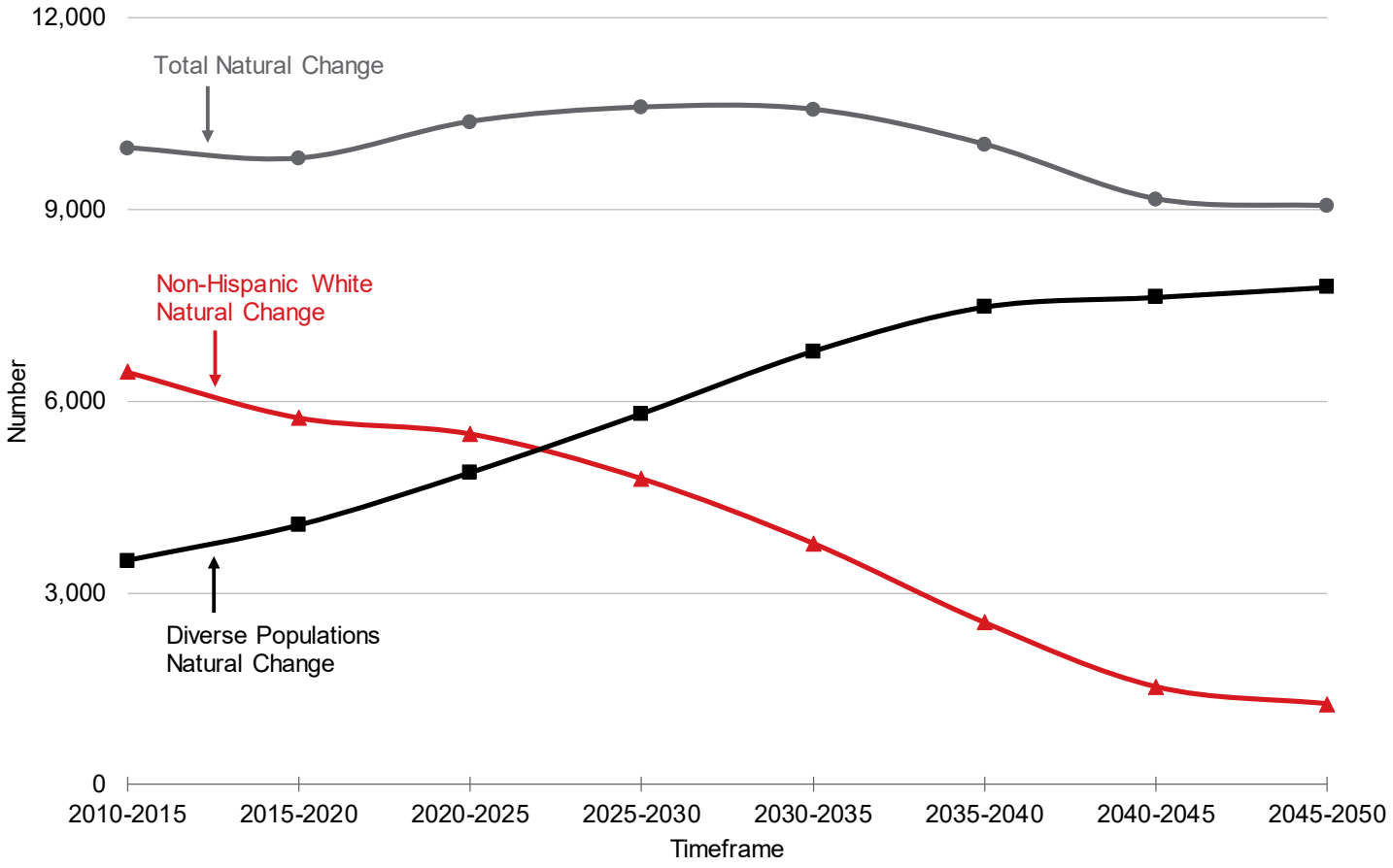
While both births and deaths are expected to rise, deaths will rise faster, lowering the level of natural change

Figure 2. Projected Lancaster County births, deaths and natural change: 2010-2050



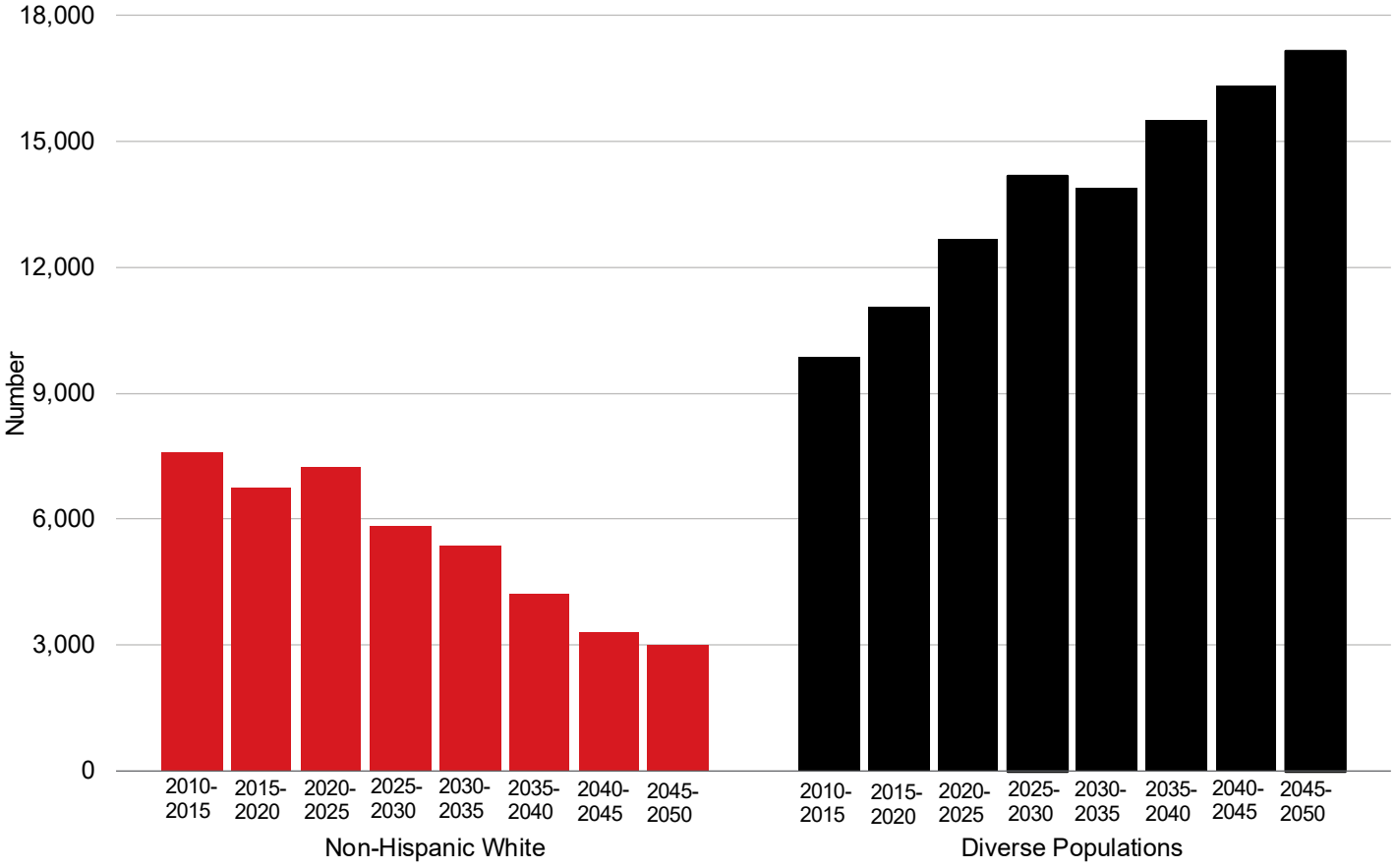
With non-Hispanic White births steady but deaths rising, associated natural change will fall, versus rising for other population groups

Figure 3. Projected Lancaster County natural change for major racial groups: 2010-2050



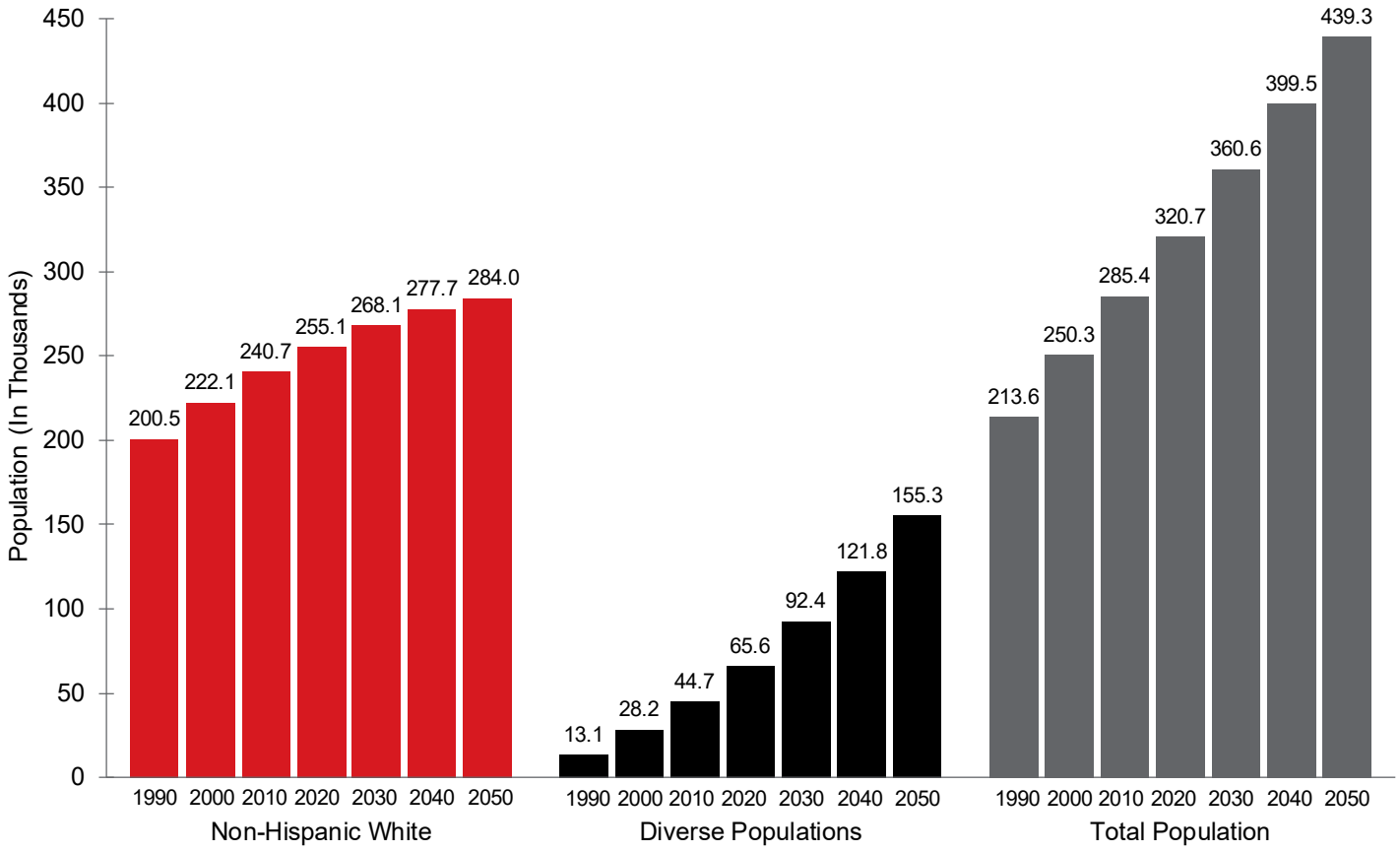
While the local population rises by about 20,000 persons every five years, the distribution of those gains will change with diverse populations contributing a larger share

Figure 4. Projected Lancaster County population change for major racial groups: 2010-2050



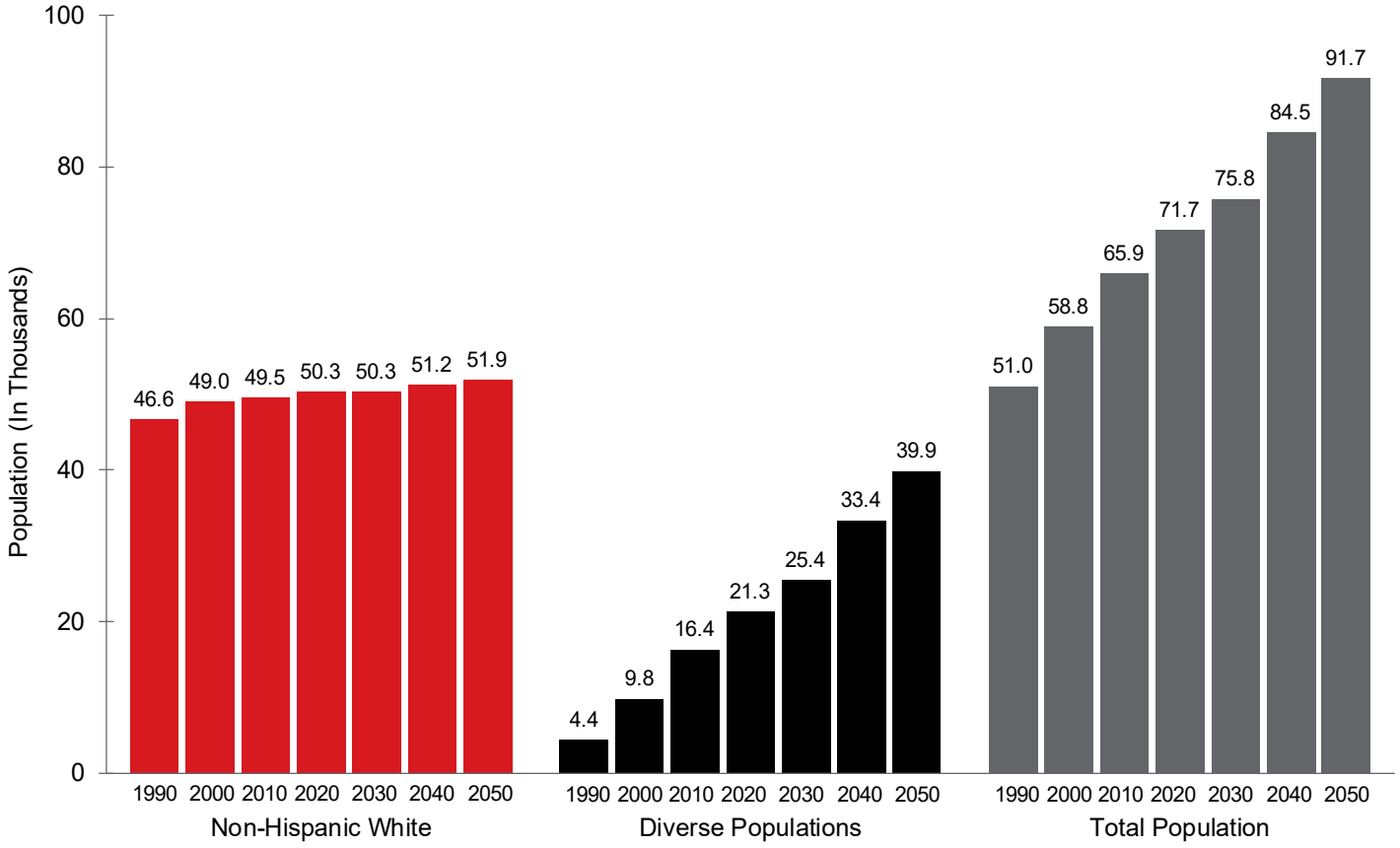
Both major racial groups have and will continue to increase in population, with larger gains among diverse populations, leading to future population growth of about 40,000 per decade

Figure 5. Actual and projected Lancaster County population for major racial groups: 1990-2050



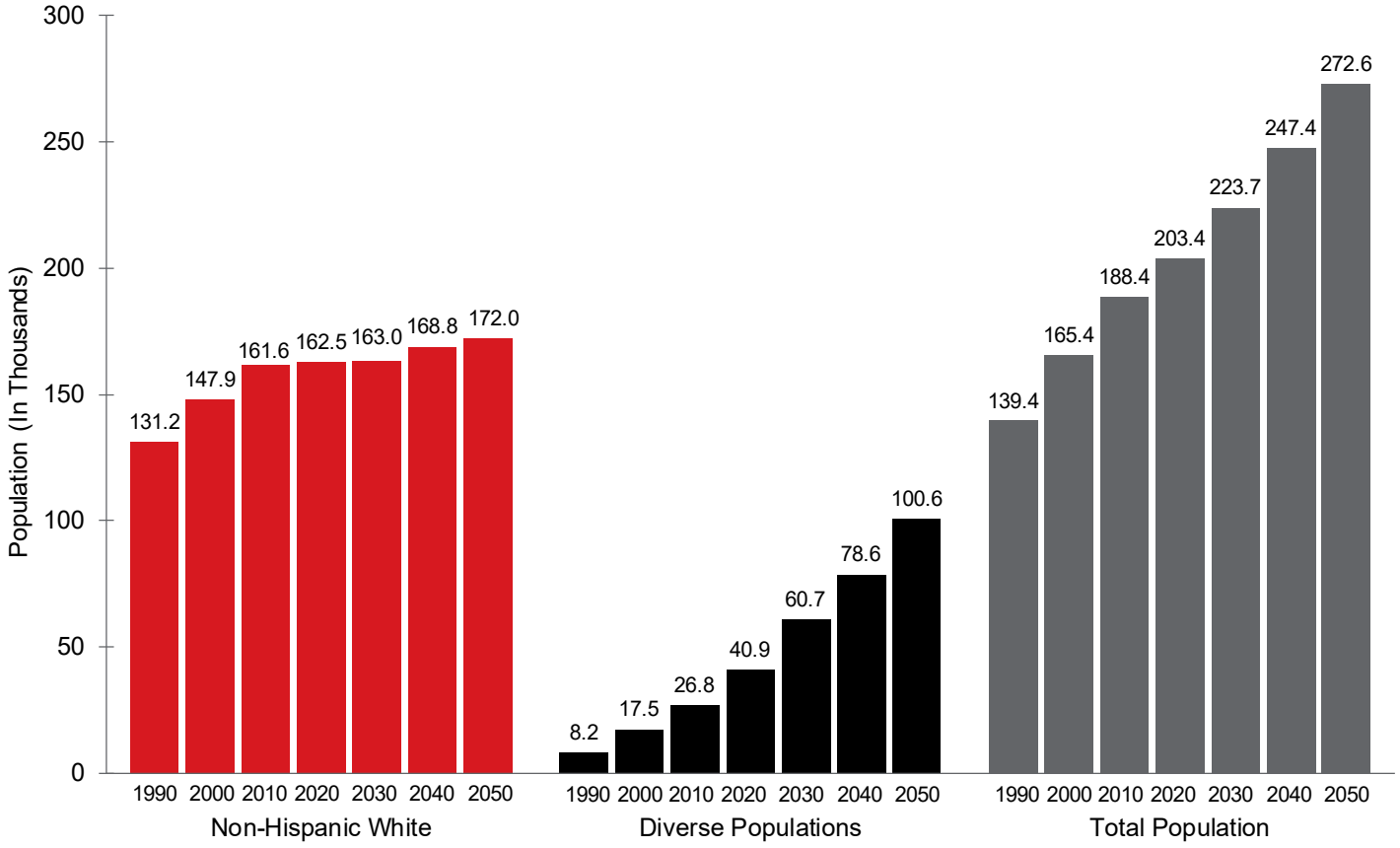
The number of children under age 18 will continue rising, increasing the need for schools and child care facilities, with the child population becoming increasingly diverse

Figure 6. Actual and projected Lancaster County under 18 population for major racial groups: 1990-2050



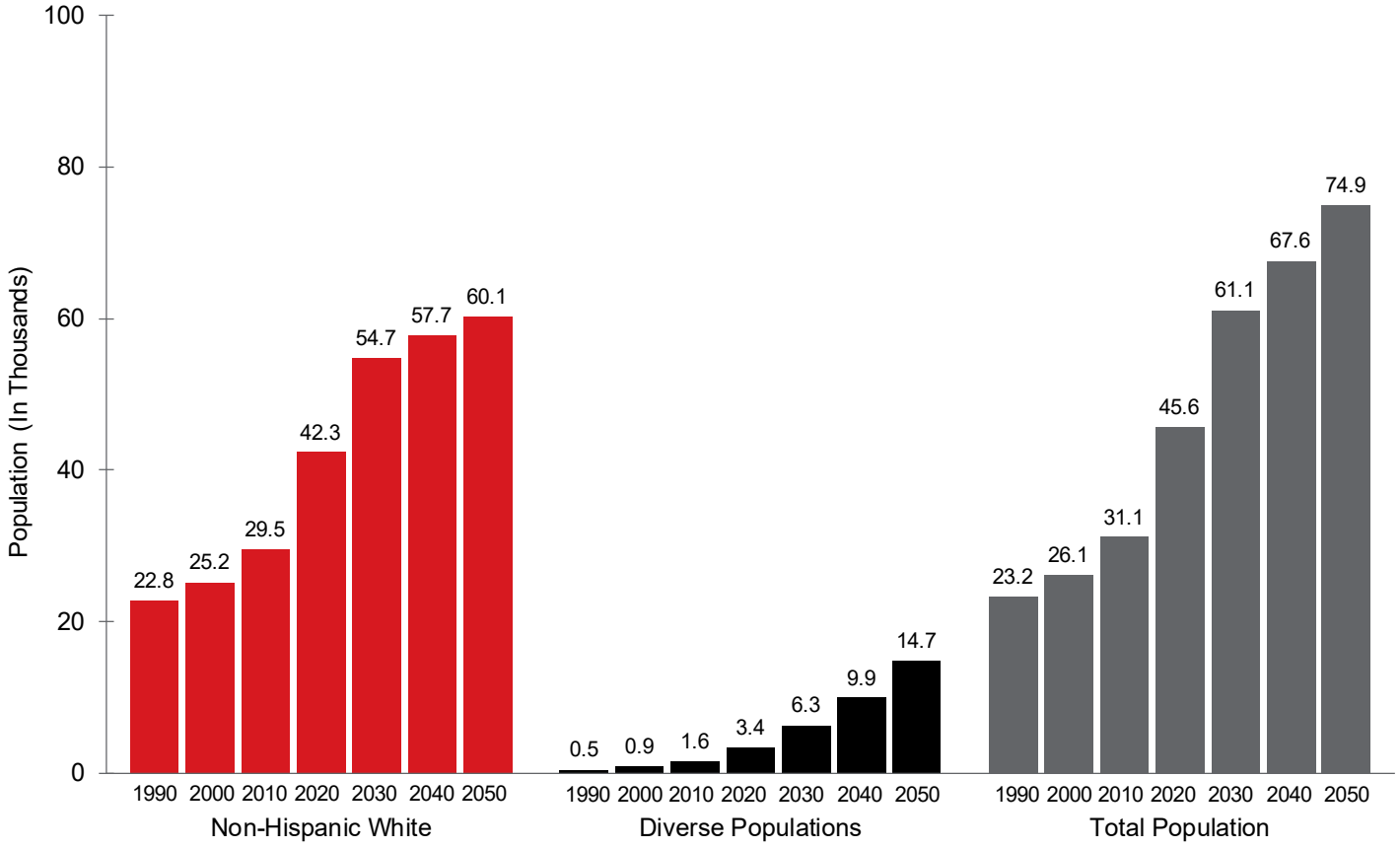
The number of working age adults will grow substantially, with larger gains among diverse populations

Figure 7. Actual and projected Lancaster County age 18-64 population for major racial groups: 1990-2050



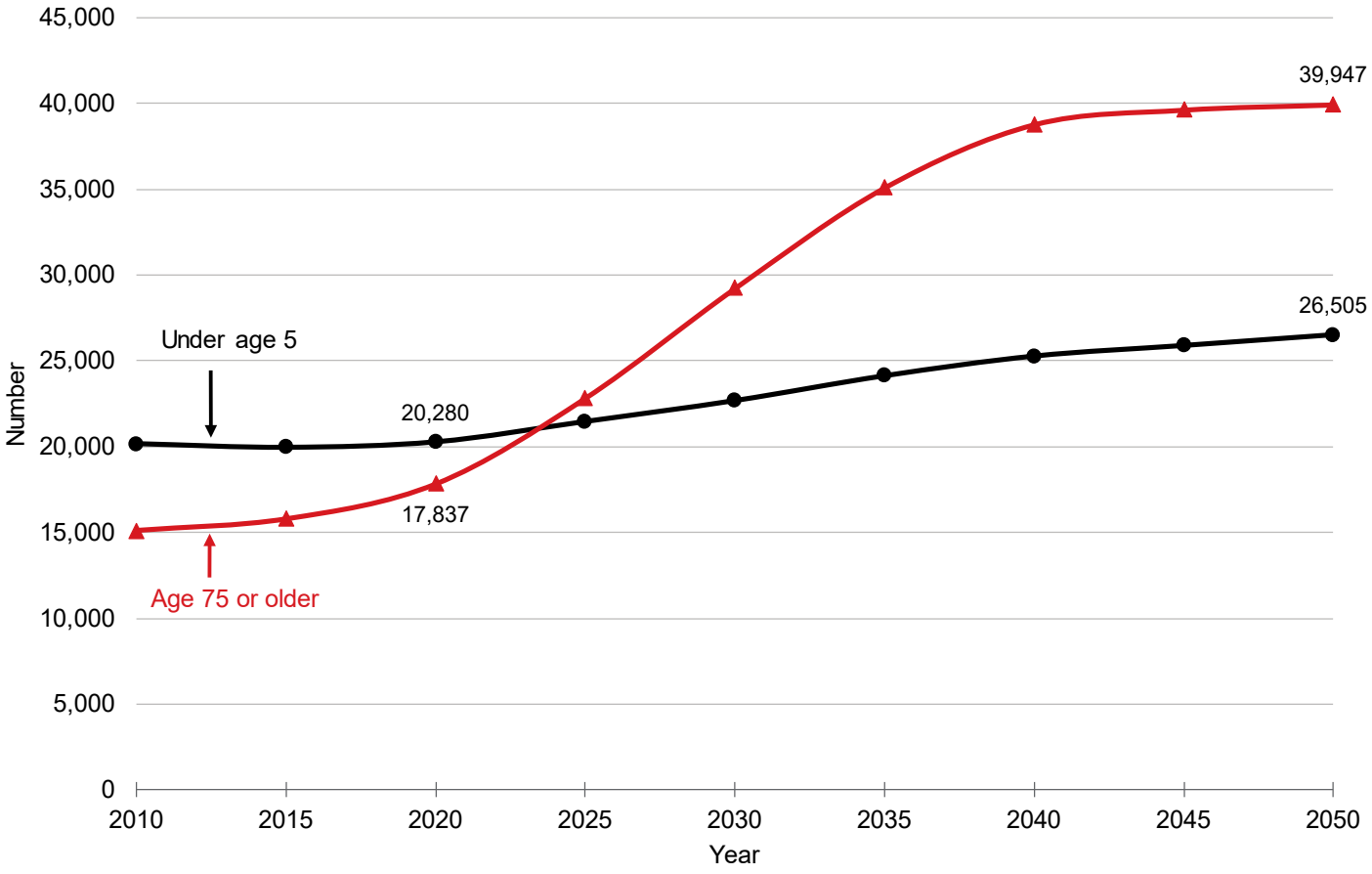
The age 65 and older population will rise greatly in the 2010s and 2020s, with a slower amount of continued growth thereafter, increasing needs for senior living and care facilities

Figure 8. Actual and projected Lancaster County age 65+ population for major racial groups: 1990-2050



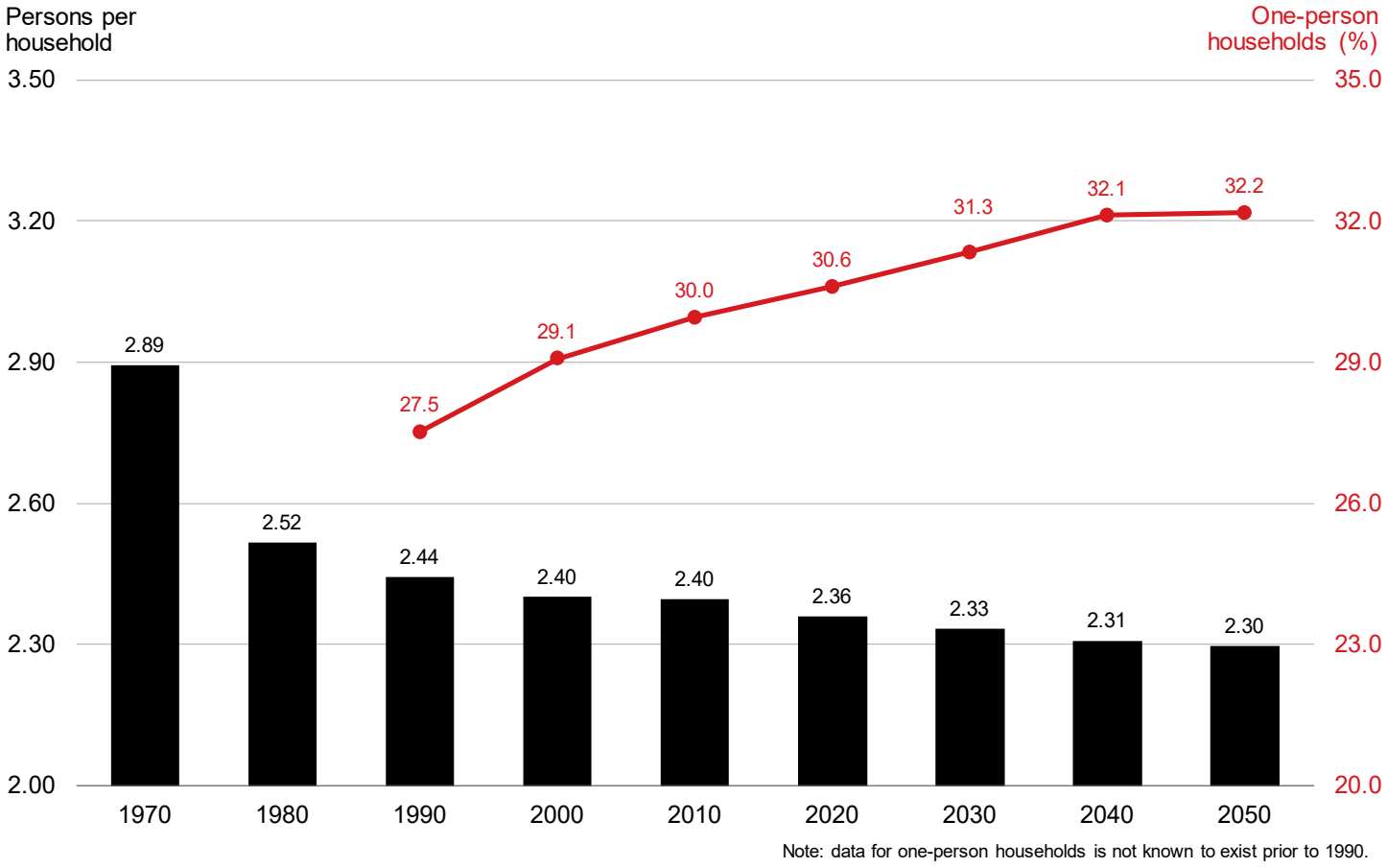
Aspects of aging will lead to situations not experienced in the past such as elders outnumbering children, implying relatively more needs for elder care versus child care

Figure 9. Projected Lancaster County population in select age groups: 2010-2050



Increases in the portion of households where one individual lives alone contribute in part to a declining average household size

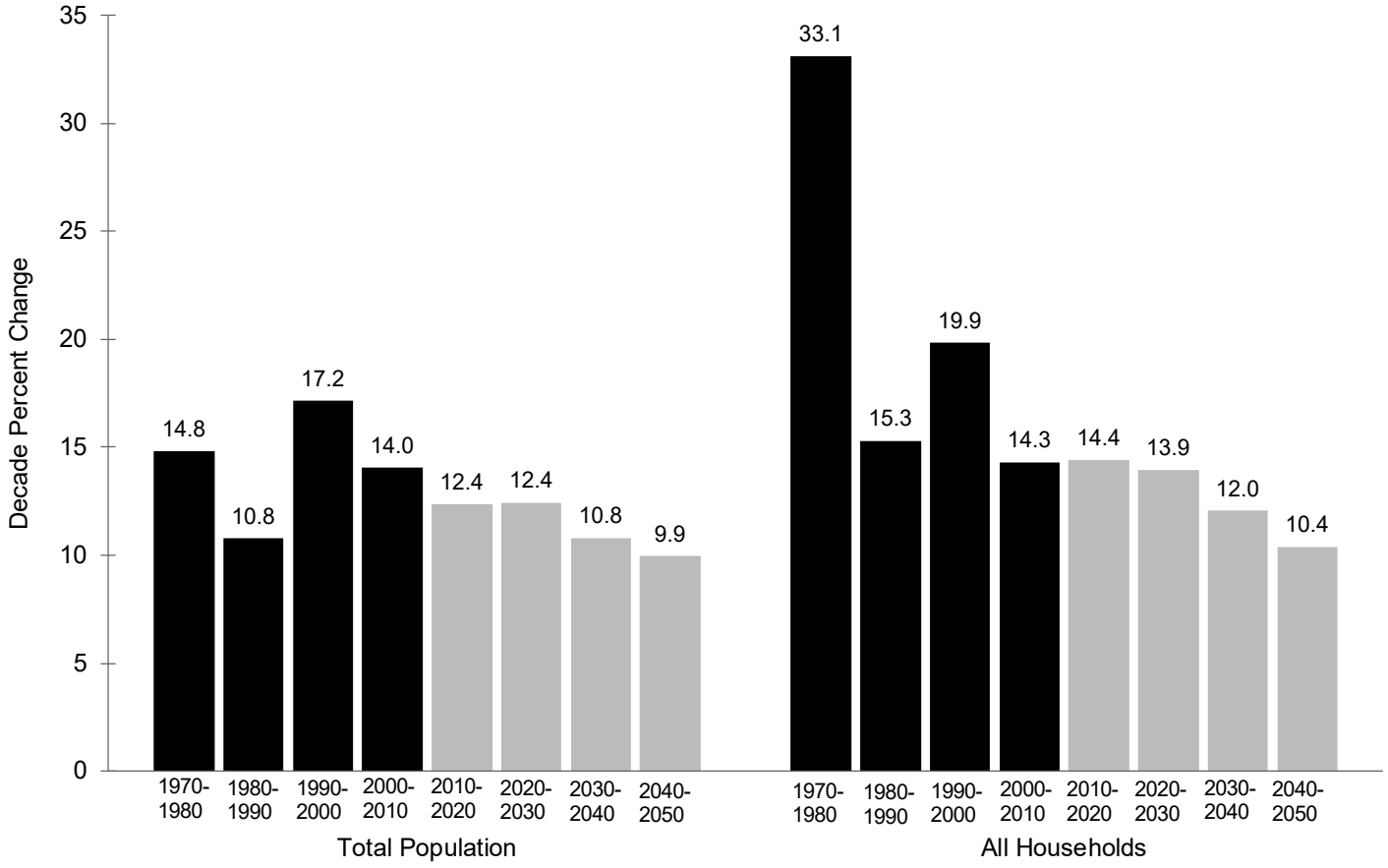
Figure 10. Actual and projected Lancaster County household size and one-person households: 1970-2050



Note: data for one-person households is not known to exist prior to 1990.

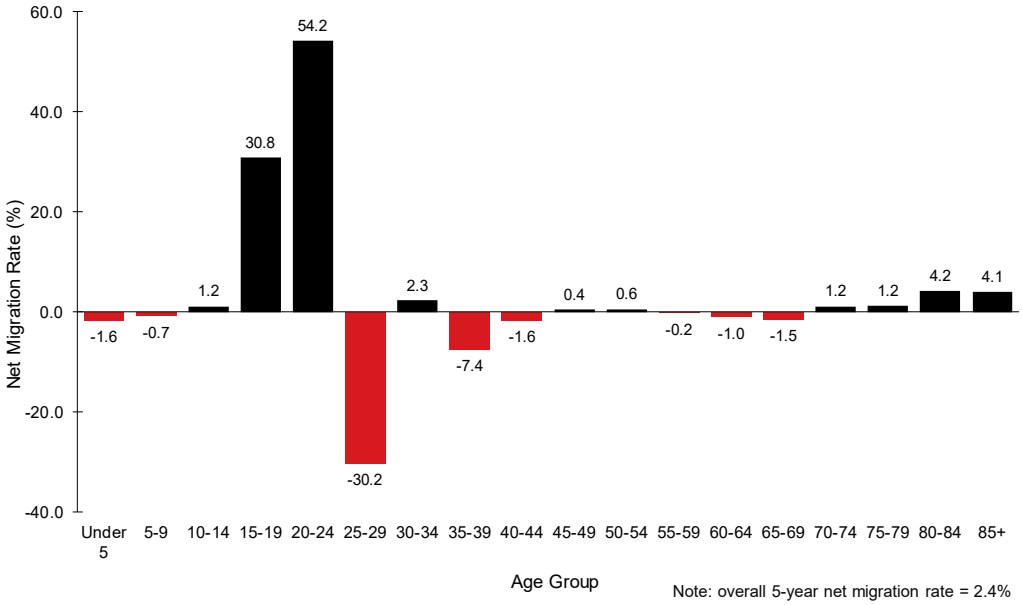
As the size of the base population and number of households increases, the decade rate of change will slow over time

Figure 11. Actual and projected Lancaster County population and household change rates: 1970-2050



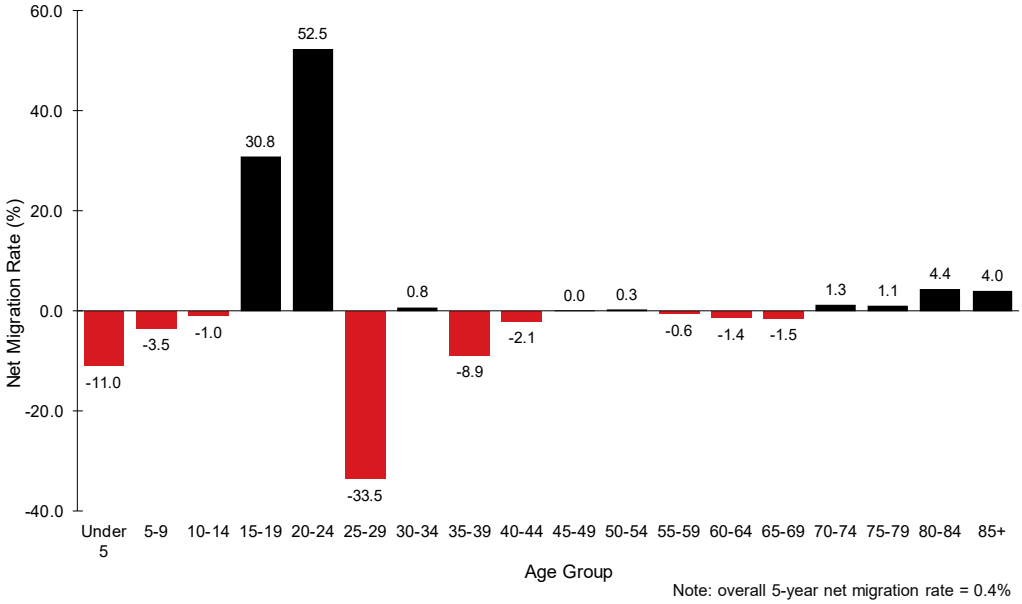
The arrival and departure of college students dominate Lancaster County migration patterns

Figure 12. Five-year net migration rates in Lancaster County by age for 2000-2010 using two 5-year periods



Lancaster County pulls in White college students and seniors but loses post college, children and retirees

Figure 13. Five-year net migration rates for non-Hispanic Whites in Lancaster County by age for 2000-2010 using two 5-year periods



METHODOLOGY

The methods used in preparing the projected values varied by the type of data being projected and the amount of available historic and projected data for the United States and/or Lancaster County. The methods also varied between Phase I of the project (population projections) and Phase II (household projections). The following section details the methods used for each phase.

PHASE I – POPULATION PROJECTIONS

Age-Specific Migration Rates

Determining age specific migration rates enhanced the projection's data quality. Given Lancaster County's structure as home to a major university, the county experiences a relatively high level of migration as many move to the county for college and often subsequently move away upon completion of a degree. Moreover, those of working age along with their families are moving into and out the area and many persons move after retiring. Establishing the age-specific migration rates were a key part of the projections process.

The calculation of migration rates involved comparing 2000 and 2010 Census counts accounting for the number of births and deaths that occurred during the decade. Overall, the county experienced a net inmigration, with the rate being 4.9 percent. This was comparable to the average that occurred between the economically challenged "farm crisis" decade of the 1980s when the net inmigration was relatively low (2.0 percent) and the economically robust "dot com" boom of the 1990s when the net inmigration strengthened to 9.0 percent. The average of these rates from the 1980s and 1990s was 5.5 percent and represented the "trend" level of migration in the projections completed in 2010. In addition, Census Bureau estimates of migration since 2010 and the longer-term average looking back to 1970 supported using a 5.5 percent decade rate.

Analyzing migration rates by age is a specialty of our office and we have completed such analyses for numerous geographic areas. Taking the 2000 population count by single year of age, the population is "flowed forward" by subtracting out annual deaths by the specific ages at which they occurred as well as adding annual births. Comparing the difference of this population flow to the Census Bureau estimated population in 2005, summarized in five-year age groups, effectively shows the net level of migration. The same analysis for the 2005 to 2010 period compares the "population flow" to the 2010 Census counts. Averaging the two sets of migration rates from 2000-2005 and 2005-2010 provided greater stability in the net migration figures for each specific 5-year age group. Figure 12 shows the 5-year migration rates for 5-year age groups in the 2000s.

An equal interval approach adjusted the 5-year migration rates for 5-year age groups into annual rates for single-year ages, since the model projected the data annually for each specific single year of age. Dividing the 5-year rates by five turned them into annual rates, assigned to the midpoint of each 5-year age category (e.g. age 7 for 5-9 year olds). The difference between that 5-year migration rate and the next higher age category was divided by five, with that amount being added from the midpoint age. For example, Figure 12 shows the 5-year migration rates for 75-79 and 80-84 year olds as 1.2 and 4.2 percent respectively. Divided by five, they are 0.24 and 0.84 respectively as annual rates. Their .60 difference divided by five is an equal interval factor of .12, so starting at the five year age group midpoint of 77 years old, 0.12 is added to the annual rate of 0.24 so that the rate equals 0.84 at the midpoint of the next five year age group (age 82 for 80-84 year olds). This process effectively smoothed the changes from one five-year age group to the next rather than having large spikes or gaps in the data.

The projections held migration rates for ages 90 and above at zero, since little migration occurs at this age. The projections also upwardly adjusted migration rates from age 82 by 0.1%, so that targeted projected migration in these older age categories more closely resembled actual changes seen during the 2000s (a relatively strong net inmigration of 4.1%). Applying a constant factor to the migration rates for single years of age adjusted the overall 4.9% decade rate from the 2000s into the 5.5% trend level of migration used in the projections.

A ratio analysis of how the 2010 Census total population at college ages changed from one year to the next aided the determination of migration rates for these key ages. The ratios established the level of migration needed to maintain the proper age structure for those of college age. Without targeting these specific age-based migration rates, the total number of persons flowing through the model would not have matched what actually occurs. These efforts, while difficult, improved the overall structure of the model for identifying how the college-age population changes from migration.

The total population and non-Hispanic White projection models used similar approaches for calculating migration by age. Figure 13 shows the migration rates by age for non-Hispanic Whites.

Overall, the population values for diverse population groups were equal to the difference between the projected total population and the projected non-Hispanic White population.

Age-Specific Fertility Rates (for age of the mother)

Compiling birth data over time, the models relied most heavily on births by single year of age of the mother between 2008 and 2012. Calculating an average of the annual births by single year of age over these five years smoothed yearly fluctuations. Dividing the average births by the 2010 Census count of Lancaster County women by single year of age created the fertility rates. Using a moving average of three specific years of age from the youngest to the oldest ages (13-49) further smoothed the age-specific fertility rates.

Comparing these Lancaster County fertility rates by single year of age to corresponding values for the United States showed local differences. Ratios of the Lancaster County rates to the U.S. rates indicated that Lancaster County has a lower birth rate than the U.S. for women age 25 and younger, while Lancaster County rates are higher for older age groups.

Applying these ratios to national fertility rates in Census Bureau population projections to 2050 localized the reproductive patterns and trends that the Census Bureau expects into the future. The models held the ratios constant throughout the 2010 to 2050 projection timeframe.

Beginning the population projection from the 2010 year allowed a comparison of the actual number of births that occurred in Lancaster County from 2010 to 2018 to those projected. This analysis showed the model projected too many births to mothers under age 30 while predicting too few for older mothers. National statistics as well as those in Nebraska indicate that fertility rates for women in their late teens and early 20s are currently at all-time lows. Thus, adjustments to fertility rates made the models more closely match actual local birth trends. The models adjusted fertility rates for each single year of age in the age categories below:

	Fertility Rate Adjustment	
Age Category	Total Population	Non-Hispanic White
Under 15	None	None
15-19	-25%	-30%
20-24	-20%	-25%
25-29	-10%	-5%
30-34	5%	10%
35-39	10%	15%
40-44	None	None
45-49	None	None

Age-Specific Survival Rates

The models used survival rates for single years of age to calculate the number of persons surviving from one year to the next. This provided the number of deaths by specific ages as well as the total number of deaths. The projections used survival rates from U.S. Census Bureau national projection models, specifically for the non-Hispanic White/non-Hispanic Asian category. They listed survival rates separately for males and females by single year of age and for each year out to 2050.

When comparing the initial projections of deaths to those that actually occurred in Lancaster County between 2010 and 2018, the models' number of deaths was too high for younger ages and too low for older ages. Thus, the models incorporated adjustments to the survival rates to change the number of deaths by age to replicate more accurately the local patterns since 2010 in Lancaster County. The table below shows the adjustments (note that lowering survival increases deaths).

	Survival Rate Adjustment	
Age Category	Total Population	Non-Hispanic White
Under 20	None	None
20 to 24	0.01%	0.01%
25 to 59	0.02%	0.02%
60 to 69	0.03%	0.03%
70 to 79	-0.10%	n/a
70 to 74	n/a	-0.10%
75 to 79	n/a	-0.20%
80 to 89	-1.00%	-1.00%
90 to 94	-5.00%	-5.00%
95 and older	-10.00%	-10.00%

Flow through of population along with components of change

In order to project the population into the future, the models started with the 2010 Census population distribution by single year of age. The models applied the age-specific survival rates and birth rates by age of mother to this data, as well as the migration rates by single-year of age, effectively transitioning the population forward from 2010 to 2011. The process repeated for each subsequent year to 2050.

Population estimates from the U.S. Census Bureau illustrated how the model's population values compared to those officially prepared by the bureau. Projected figures were similar to but slightly below the Census estimates (by about 3,000 people in 2015 for example). While the 2009 vintage population estimates suggested a 2010 population that was only 1,500 below the eventual 2010 Census count, a comparison of the 1999 vintage estimate to the final 2000 count indicated the Census Bureau underestimated the Lancaster County population by about 10,000 persons. Thus, the 2020 Census headcount may be up to 10,000 above or below the current 2019-based extrapolated estimate of about 321,000 in 2020.

The number of deaths in each annual period equaled the inverse of the survival rate multiplied by the corresponding number of persons in that age group. For example, when a survival rate of a male 70-year old is 0.975 then the death rate is one minus that value, or 1 – 0.975 or 0.025. This means that 2.5 percent of those 70 year olds pass away prior to achieving their 71st birthday. Thus, multiplying 0.025 times the number of person age 70 at that time gives the corresponding number of deaths for 70 year-olds. Simply summation of the deaths by each specific year of age showed the total level of deaths.

Similarly, multiplying the age-specific fertility rate by the number of women of that age provided age-specific births. Summing the number of births for women age 13 to 49 gave the total number of births.

In this analysis, net migration represented the residual value from subtracting natural change (births minus deaths) from the total population change. While the models applied age-specific migration rates leading in part to overall population change, the clearest calculation of net migration uses this residual method.

PHASE II – HOUSEHOLD PROJECTIONS

Household versus Group Quarters Population and Households by Age of the Householder

The projected total populations calculated in Phase I provided the basis for determining projected aspects of households. The population projection gave the total number of persons every 5 years from 2010 to 2050. To determine household statistics, the first calculation involved the percentage of population that actually lived in housing units, rather than group quarters housing (college dorms, nursing homes, prisons, etc.).

A compilation of historic information starting with the 1970 Census through the 2010 Census revealed the total population and the population in both households and group quarters. The 2010 Census provided figures for not only the total population by age but also the population living in households by age. Summing these values into relevant age categories (15-24, 25-34 ... 75-84, 85+) isolated the population in group quarters by age via subtraction.

The 2010 Census also had tables for the number of households headed by persons in various age groups. Dividing the population in households for the various age groups by the number of householders of each age determined the average household size for each age category. These values declined when comparing young householders (where many are in college with multiple roommates) to older households (where many people live alone after the death of a spouse). A replicated analysis using the 2013-2017 American Community Survey (ACS) Public Use Microdata Samples (PUMS), the latest available at the time of the analysis, showed very similar patterns, as listed below.

	2010 Census					2013-2017 ACS PUMS				
Age Category	**Total Population**	**Living in households**	**Percent in households**	**Head of households**	**Persons per unit**	**Total population**	**Living in households**	**Percent in households**	**Head of households**	**Persons per unit**
Under 15	55,797	55,662	99.8%	n/a	n/a	59,885	59,775	99.8%	n/a	n/a
15 to 24	52,026	42,705	82.1%	11,123	3.84	57,513	48,067	83.6%	12,366	3.89
25 to 34	43,940	42,726	97.2%	22,605	1.89	43,947	42,634	97.0%	22,912	1.86
35 to 44	34,313	33,408	97.4%	18,830	1.77	36,775	36,198	98.4%	19,903	1.82
45 to 54	36,970	36,195	97.9%	21,332	1.70	34,619	33,868	97.8%	19,695	1.72
55 to 64	31,260	30,917	98.9%	18,847	1.64	34,957	34,406	98.4%	20,970	1.64
65 to 74	15,981	15,741	98.5%	9,976	1.58	22,671	22,536	99.4%	14,394	1.57
75 to 84	10,317	9,950	96.4%	7,137	1.39	10,899	10,688	98.1%	6,954	1.54
85+	4,803	4,287	89.3%	3,523	1.22	5,295	4,735	89.4%	3,769	1.26
Totals	**285,407**	**271,591**	**95.2%**	**113,373**	**2.40**	**306,561**	**292,907**	**95.5%**	**120,963**	**2.42**

Taking the Phase I projected population and using the percentages for the portion of the total population that was in households by age (shown above) provided the projected population in households to 2050 as well as by age. The methodology applied the percentages from the 2010 Census to the 2010 year as well as the five years from 2011 to 2015. Then, to smooth the values over time, the model applied the average of the 2010 Census and 2013-2017 ACS PUMS percentages to the five years from 2016 to 2020 and then the 2013-2017 ACS PUMS percentages to all remaining years from 2021 to 2050. The sum of the age-specific data for the population in households provided the total projected population living in households, and when subtracted from the projected total population from Phase I, showed the number and percentage of the population expected to live in group quarters.

Having calculated the population living in households by age out to 2050, using the persons per unit by age (shown above) determined the number of households by age of the head of the household (also referred to as the householder). Dividing the projected population living in households by age by the persons per unit for each age category calculated the total number of households by age of the householder. The approach applied values in the same manner as described above (2010 Census values to the 2010 year and from 2011 to 2015; the average of the 2010 Census and 2013-2017 ACS PUMS values from 2016 to 2020, with the 2013-2017 ACS PUMS values applied to the remaining projection period of 2021 to 2050).

Total Number of Households and Average Household Size

Having calculated one of the pieces of information sought in the projections, namely the number of households by age of the householder, all that was required for determining the total number of households was simply to sum the age-specific data for households by age of the householder. Then, given the projections for the total population living in households based off the projection for the total overall population, finding the average household size over time simply required the division of the projected population in households by the projected number of households.

The calculated average household size steadily declined from the 2.40 persons per unit found in the 2010 Census, to 2.35 in 2025 and 2.30 in both 2045 and 2050. A declining household size made intuitive sense given that persons per unit declined as age increased (see table above) and the movement of the large "baby boom" segment of the population into older age groups over time.

It is worth noting that the methods for calculating the number of households and average household size described above differ substantially from those used in the projections completed in 2010. Ten years ago, the method focused on projecting the average household size into the future, and then dividing the population in households by that to determine the total number of households. This new approach took the sound population projections and reliable, consistent data from the 2010 Census and ACS to determine the population in households and number of households, with average household size being the last calculated figure.

This change should be viewed as an improvement in methods, as the projection of average household size ten years ago was difficult and had less of a statistical approach, following research from Wisconsin and Sacramento. The new methods incorporate a statistical calculation approach that should be sound and reliable. The model predicted the number of households within 200 of the ACS estimate for 2018, a 0.1% difference.

Number and Percentage of Households with 1-Person Living Alone

While historic data for Lancaster County was only available since 1990, it showed that the percentage of households that have only one resident has been increasing. The number of 1-person households by age of the householder was available from the 1990 and 2000 Censuses but not for all ages from the detailed tables of the 2010 Census. Thus, the model incorporated custom calculations for the portion of households living alone by age using the 2008-2012 and 2014-2018 Public Use Microdata Samples from the Census Bureau's American Community Survey.

The portion of one-person households is relatively high for younger ages (during college and early working years) and then declines as families form at middle age. The live alone percentage then rises as children move out of the household and is highest for the oldest age categories given mortality among spouses. The table below shows the Lancaster County figures. Averaging the two timeframes of ACS data provided better stability to the age-specific figures. Doing so also gave values in the model that were very similar to the actual 2010 Census overall living alone percentage as well as those from the 2014-2018 ACS detailed tables.

	Portion of Households Where 1-Person Lives Alone		
Age Category	**2008-2012**	**2014-2018**	**Average**
15 to 24	30.6%	30.1%	30.4%
25 to 34	26.2%	26.6%	26.4%
35 to 44	22.4%	17.6%	20.0%
45 to 54	26.1%	22.9%	24.5%
55 to 64	31.6%	32.9%	32.2%
65 to 74	35.5%	38.5%	37.0%
75 to 84	50.8%	49.2%	50.0%
85+	71.1%	68.5%	69.8%
All households	**30.5%**	**30.2%**	**30.3%**

Applying the averaged percentages of 1-person households by age of the householder to the projected number of households by age of the householder calculated the number of 1-person households. Simple division into the total number of households gave the projected percentage of 1-person households to 2050.

Nonfamily and Family Households along with Family Households with Children

With the number and percentage of 1-person households calculated as described above, the next step projected nonfamily and family households. Households that have only one resident are nonfamily households by definition. Historic data showed the prevalence of other nonfamily households (roommates, unmarried partners, etc.). The historic analysis indicated that other non-family households consistently represented 25% of all nonfamily households. Stated differently, the ratio of 1-person living alone households to other types of nonfamily households that had two or more people was three to one. This held true for the 2000 and 2010 Censuses as well as the 2014-2018 five-year and 2018 one-year ACS products. Thus, dividing the previously calculated number of nonfamily households where 1-person lived alone by three determined the number of nonfamily households with two or more residents. This maintained the three to one ratio, or nonfamily households with two or more members being 25% of all nonfamily households over time out to 2050, given the stability of these values in the recent past.

The simple sum of nonfamily households where 1-person lived alone and nonfamily households with two or more residents gave the total number of nonfamily households. Having already projected total households, the subtraction of nonfamily households from total households provided the projected number of family households to 2050.

2008-2012 PUMS calculations and birth trends aided the determination of households and families with children under 18 years of age. Historical data showed the percentage of Lancaster County family households that had children under 18 declined from 1970 to 1980, remained stable at around 50 percent from 1980 to 2000, and then declined from 2000 to 2010 (see Table 4). The 2008-2012 PUMS provided the portion of households that had an own child under age 18 for each household age category. Multiplying these percentages shown below by the previously calculated number of projected households in each age category determined the overall presence of children under age 18 in households.

Percent of households with own kids under age 18		
Age Category	**2008-2012 ACS PUMS**	**As adjusted**
15 to 24	13.2	12.7
25 to 34	48.9	48.9
35 to 44	61.3	61.3
45 to 54	32.6	32.6
55 to 64	5.7	5.7
65 to 74	0.0	0.0
75 to 84	1.0	0.0
85+	0.0	0.0
Total households	**28.4**	**28.3**

Making two small adjustments seemed appropriate. Births among teens and women in their early 20s have declined to all-time lows nationally and in Nebraska. The number of Lancaster County births for women age 15-24 declined by 4 percent per year between 2010 and 2016 (the center points of 5-year averages used to provide greater reliability). Thus, one adjustment decreased the portion of households with children under age 18 headed by a person age 15-24 by 4% from 13.2% to 12.7%. Moreover, the small portion of households age 75-84 with their own children appeared as a fluke in the data. While sometimes an older parent of this age could have one or more adult children living with them, this occurs only in rare circumstances. Given that those age 65-74 and 85+ did not have any of their own children living with them, the adjustment also made the age 75-84 category equal zero.

Multiplying these percentages by the total number of households by age provided the number of households projected to have children under 18 at future points in time. Simple division showed the portion of total households and family households projected to have their own children under age 18 out to 2050.

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