Richmond Public Schools, VA

Population and Enrollment Forecasts, 2011-2021

Prepared by:
Jerome N. McKibben, Ph.D.

McKibben Demographic Research
Rock Hill, South Carolina

McKibben Demographics

Cropper GIS

Table of Contents

Executive Summary

1. Richmond City's fertility rates over the life of the forecasts are below replacement levels. (TFR=1.78 for the district vs. 2.1 for replacement level) This low fertility rate is primarily due to the presence of large numbers of college students in the district.

2. Most of the non-college in-migration to the district occurs in the 20-to-29 age group.

3. A large proportion of the locally born 18-to-22 year old population continues to leave the district, going to college or moving to other urban areas.

4. The primary factors causing the district's enrollment to slowly decline is the continued rate of out-migration of locally born 18-to-24 year old age group and the slowing in-migration of younger families.

5. Changes in year-to-year enrollment (particularly after 2013) largely will be due to smaller cohorts entering and moving through the system in conjunction with larger cohorts leaving the system.

6. As in-migration of young families non-college singles continues to slow and smaller grade cohorts enter into the school system, total enrollment will continue to decline. After 2016 the district's elementary enrollment will begin a steady decline.

7. As the district continues to have less new home construction, the rate and magnitude of existing home sales rental occupancy rates will become the increasingly dominant factor affecting the amount of population and enrollment change.

8. Total enrollment is forecasted to decrease by 112 students, or -0.5%, between 2011-12 and 2016-17. Total enrollment will decline 48 students, or -0.2%, from 2016-17 to 2022.

Introduction

By demographic principle, distinctions are made between projections and forecasts. A projection extrapolates the past (and present) into the future with little or no attempt to take into account any factors that may impact the extrapolation (e.g., changes in fertility rates, housing patterns or migration patterns) while a forecast results when a projection is modified by reasoning to take into account the aforementioned factors.

To maximize the use of this study as a planning tool, the ultimate goal is not simply to project the past into the future, but rather to assess various factors' impact on the future. The future population and enrollment growth of each school district is influenced by a variety of factors. Not all factors will influence the entire school district at the same level. Some may affect different areas at dissimilar magnitudes and rates causing changes at varying points of time within the same district. Forecaster's judgment based on a thorough and intimate study of the district has been used to modify the demographic trends and factors to more accurately predict likely changes. Therefore, strictly speaking, this study is a forecast, not a projection; and the amount of modification of the demographic trends varies between different areas of the district as well as within the timeframe of the forecast.

The calculation of population forecasts of any type, and particularly for smaller populations such as a school district or its attendance areas, realistic suppositions must be made as to what the future will bring in terms of age specific fertility rates and residents' demographic behavior at certain points of the life course. The demographic history of the school district and its interplay with the social and economic history of the area is the starting point and basis of most of these suppositions particularly on key factors such as the age structure of the area. The unique nature of each district's and attendance area's demographic composition and rate of change over time must be assessed and understood to be factors throughout the life of the forecast series. Moreover, no two populations, particularly at the school district and attendance area level, have exactly the same characteristics.

The manifest purpose of these forecasts is to ascertain the demographic factors that will ultimately influence the enrollment levels in the district's schools. There are of course, other non-demographic factors that affect enrollment levels over time. These factors include, but are not limited to, transfer policies within the district, student transfers to and from neighboring districts, placement of "special programs" within school facilities that may serve students from outside the attendance area, state or federal mandates that dictate the movement of students from one facility to another (No Child Left Behind is an excellent example of the factor), the development of charter schools in the district, the prevalence of home schooling in the area and the dynamics of local private schools.

Unless the district specifically requests the calculation of forecasts that reflect the effects of changes in these non-demographic factors, their influences are held constant for the life of the forecasts. Again, the main function of these forecasts is to determine what impact demographic changes will have on future enrollment. It is quite possible to calculate special "scenario" forecasts to measure the impact of school policy modifications as well as planned economic and financial changes. However, in this case the results of these population and enrollment forecast are meant to represent the most likely scenario for changes over the next 10 years in the district and its attendance areas.

The first part of the report will examine the assumptions made in calculating the population forecasts for Richmond Public Schools. Since the results of the population forecasts drive the subsequent enrollment forecasts, the assumptions listed in this section are paramount to understanding the area's demographic dynamics. The remainder of the report is an explanation and analysis of the district's population forecasts and how they will affect the district's grade level enrollment forecasts.

Data

The data used for the forecasts come from a variety of sources. Enrollments by grade and attendance center were provided by the Richmond Public Schools for school years 2007-2008 to 2012-13. Birth and death data were obtained from the Virginia Department of Health for the years 2000 through 2009. The net migration values were calculated using Internal Revenue Service migration reports for the years 2003 through 2009. The data used for the calculation of migration models came from the United States Bureau of the Census, 2000 to 2010, and the models were assigned using an economic-

demographic system. The base age-sex population counts used are from the results of the 2010 Census.

Due to the methodological problems the Census Bureau is experiencing with their estimates derived from data using the American Community Survey, (particularly in areas with less that 60,000 population) the results of the ACS are not used in these forecasts. Given the sampling framework used by the Census Bureau, only 2,700 of the over 87,000 current households in the Richmond Public Schools District would have been included. For comparison, 13,000 households in the Richmond Public Schools District were included in the sample for the long form questionnaire in the 2000 Census.

To develop the population forecast models, past migration patterns, current age specific fertility patterns, the magnitude and dynamics of the gross migration, the age specific mortality trends, the distribution of the population by age and sex, the rate and type of existing housing unit sales, and future housing unit construction are considered to be primary variables. In addition, the change in household size relative to the age structure of the forecast area was addressed. While there was a drop in the average household size in the city of Richmond, as well as most other areas of the state, during the previous 20 years, the rate of this decline has been forecasted to slow over the next ten years.

Assumptions

For these forecasts, the age specific mortality rates are held constant at the levels calculated for the year 2010. While the number of deaths in an area are impacted by and will change given the proportion of the local population over age 65, in the absence of an extraordinary event such as a natural disaster or a breakthrough in the treatment of heart disease, death rates rarely move rapidly in any direction, particularly at the school district or attendance area level. Thus, significant changes are not foreseen in district's mortality rates between now and the year 2021. Any increases forecasted in the number of deaths will be due primarily to the general ageing of the district's population and specifically to the increase in the number of residents aged 65 and older.

Similarly, fertility rates are assumed to stay fairly constant for the life of the forecasts. Like mortality rates, age specific fertility rates rarely change quickly or dramatically. Even with the recently reported rise in the fertility rates of the United States, overall fertility rates have stayed within a 10% range for most of the last 40 years. In fact the vast majority of year to year change in an area's number of births is due to changes in the number of women in child bearing ages (particularly ages 20-29) rather than any fluctuation in an area's fertility rate.

The total fertility rate (TFR), the average number of births a woman will have in her lifetime, is estimated to be 1.38 for the total district for the ten years of the population forecasts. The age specific fertility rates are also held constant for all areas for the life of the projection. A TFR of 2.1 births per woman is considered to be the theoretical "replacement level" of fertility necessary for a population to remain constant in the absence of in-migration. Therefore, over the course of the forecast period, fertility will not be sufficient, in the absence of migration, to maintain the current level of population within Richmond Public Schools. This low fertility rate is primarily due to the presence of large numbers of college students in the district.

A close examination of data for Richmond Public Schools has shown the age specific pattern of net migration will be nearly constant throughout the life of the forecasts. While the number of in and out migrants has changed in past years for the Richmond Public Schools District (and will change again over the next 10 years), the basic age pattern of the migrants has stayed nearly the same over the last 30 years. Based on the analysis of data it is safe to assume this age specific migration trend will remain unchanged into the future. This pattern of migration shows most of the local (non-college) out-migration occurring in the 25-to-39 year old age group, as young adults and families leave the area to go to suburban areas. The second group of out-migrants is those householders aged 65 and older who are downsizing and moving to smaller homes. Most of the non-college in-migration occurs in the 20-to-29 age groups, primarily consisting of younger single adults

As the city of Richmond is not currently contemplating any drastic changes to their inherent structures, the forecasts also assume the current economic, political, transportation and public works infrastructure (with a few notable exceptions), social, and environmental factors of Richmond Public Schools and its attendance areas will remain the same through the year 2021.
Below is a list of assumptions and issues that are specific to Richmond Public Schools. These issues have been

used to modify the population forecast models to more accurately predict the impact of these factors on each area's population change. Specifically, the forecasts for Richmond Public Schools assume that throughout the study period:

a. There will be no short term economic recovery in the next 18 months and the national, state or regional economy does not go into deep recession at anytime during the 10 years of the forecasts; (Deep recession is defined as four consecutive quarters where the GDP contracts greater than 1% per quarter)

b. Interest rates have reached a historic low and will not fluctuate more than one percentage point in the short term; the interest rate for a 30 year fixed home mortgage stays below 6%;

c. The rate of mortgage approval stays at 1999-2002 levels and lenders do not return to "sub-prime" mortgage practices;

d. There are no additional restrictions placed on home mortgage lenders or additional bankruptcies of major credit providers;

e. The rate of housing foreclosures does not exceed 125% of the 2005-2007 average of Richmond City for any year in the forecasts;

f. All currently planned, platted, and approved housing developments are built out and completed by 2020. All housing units constructed are occupied by 2021;

g. The unemployment rates for the Richmond Metropolitan Area will remain below 7.5% for the 10 years of the forecasts;

h. The rate of students transferring into and out of the Richmond City Schools will remain at the 2005-06 to 2009-10 average;

i. The inflation rate for gasoline will stay below 5% per year for the 10 years of the forecasts;

j. There will be no building moratorium within the district;

k. Businesses within the district and the Greater Richmond Metropolitan Area will remain viable;

l. The number of existing home sales in the district that are a result of "distress sales" (homes worth less than the current mortgage value) will not exceed 20% of total homes sales in the district for any given year;

m. Housing turnover rates (sale of existing homes in the district) will remain at their current levels. The majority of existing home sales are made by home owners over the age of 55;

n. Private school and home school attendance rates will remain constant;

o. The recent decline in new home construction has ended and building rates have stabilized;

p. The rate of foreclosures for commercial property remains at the 2004-2007 average for the Richmond Metropolitan area;

If a major employer in the district closes, reduces or expands its operations, the population forecasts would need to be adjusted to reflect the changes brought about by the change in economic and employment conditions. The same holds true for any type of natural disaster, major change in the local infrastructure (e.g., highway construction, water and sewer expansion, changes in zoning regulations etc.), a further economic downturn, any additional weakness in the housing market or any instance or situation that causes rapid and dramatic population changes that could not be foreseen at the time that the forecasts were calculated.

The high proportion of high school graduates from the Richmond Public Schools that continue on to college or move to urban areas outside of the district for employment is a significant demographic factor. Their departure is a major reason for the extremely high out-migration in the 18-to-24 age group and was taken into account when calculating these forecasts. The out-migration of graduating high school seniors is expected to continue over the period of the forecasts, and the rate of out-migration has been forecasted to remain the same over the life of the forecast series.

Finally, all demographic trends (i.e., births, deaths, and migration) are assumed to be linear in nature and

annualized over the forecast period. For example, if 1,000 births are forecasted for a 5-year period, an equal number, or proportion of the births are assumed to occur every year, 200 per year. Actual year-to-year variations do and will occur, but overall year to year trends are expected to be constant.

Methodology

The population forecasts presented in this report are the result of using the Cohort-Component Method of population forecasting (Siegel, and Swanson, 2004: 561-601) (Smith et. al. 2004). As stated in the Introduction, the difference between a projection and a forecast is in the use of explicit judgment based upon the unique features of the area under study. Strictly speaking, a cohort-component projection refers to the future population that would result if a mathematical extrapolation of historical trends were applied to the components of change (i.e., births, deaths, and migration). Conversely, a cohort-component forecast refers to the future population that is expected because of a studied and purposeful selection of the components of change believed to be critical factors of influence in each specific area.

Five sets of data are required to generate population and enrollment forecasts. These five data sets are:

a. a base-year population (here, the 2010 Census population for Richmond Public Schools and their attendance areas);
b. a set of age-specific fertility rates for each attendance area to be used over the forecast period;
c. a set of age-specific survival (mortality) rates for each attendance area;
d. a set of age-specific migration rates for each attendance area; and
e. the historical enrollment figures by grade.

The most significant and difficult aspect of producing enrollment forecasts is the generation of the population forecasts in which the school age population (and enrollment) is embedded. In turn, the most difficult aspect of generating the population forecasts is found in deriving the rates of change in fertility, mortality, and migration. From the standpoint of demographic analysis, the Richmond Public Schools and its twenty seven elementary attendance center districts are classified as "small area" populations (as compared to the population of the state of Virginia or to that of the United States). Small area population forecasts are more difficult to calculate because local variations in fertility, mortality, and migration may be more irregular than those at the state or national scale. Especially challenging to project are migration rates for local areas, because changes in the area's socioeconomic characteristics can quickly change from past and current patterns (Peters and Larkin, 2002.)

The population forecasts for Richmond Public Schools and its attendance areas were calculated using a cohort-component method with the populations divided into male and female groups by five-year age cohorts that range from 0-to-4 years of age to 85 years of age and older (85+). Age- and sex-specific fertility, mortality, and migration models were constructed to specifically reflect the demographic characteristics of the Richmond Public Schools attendance center districts and the total school district.

The enrollment forecasts were calculated using a modified average survivorship method. Average survivor rates (i.e., the proportion of students who progress from one grade level to the next given the average amount of net migration for that grade level) over the previous five years of year-to-year enrollment data were calculated for grades two through twelve.

The survivorship rates were modified, or adjusted, to reflect the average rate of forecasted in and out migration of 5-to-9, 10-to-14 and 15-to-17 year olds cohorts to each of the attendance centers in the district for the period 2005 to 2011. These survivorship rates then were adjusted to reflect the forecasted changes in age-specific migration the district should experience over the next five years. These modified survivorship rates were used to project the enrollment of grades 2 through 12 for the period 2012 to 2015. The survivorship rates were adjusted again for the period 2015 to 2020 to reflect the predicted changes in the amount of age-specific migration in the districts for the period.

The forecasted enrollments for kindergarten and first grade are derived from the 5-to-9 year old population of the age-sex population forecast at the elementary attendance center district level. This procedure allows the changes in the incoming grade sizes to be factors of forecasted population change and not an extrapolation of previous class sizes. Given the potentially large amount of variation in kindergarten enrollment due to parental choice, changes in the state's minimum age

requirement, and differing district policies on allowing children to start kindergarten early, first grade enrollment is deemed to be a more accurate and reliable starting point for the forecasts. (McKibben, 1996) The level of the accuracy for both the population and enrollment forecasts at the school district level is estimated to be ±2.0% for the life of the forecasts.

Results and Analysis of the Population Forecasts

From 2010 to 2020, the populations of Richmond Public Schools, the City of Richmond, the state of Virginia, and the United States are forecasted to change as follows; the City of Richmond will grow by 2.4 %, Virginia will increase by 10.1%; and the United States increase by 8.4% (see Table 1).

Table 1: Forecasted Population Change, 2010 to 2020

	2010	2015	2020	10-Year Change
U.S. (in millions)	308	322	334	8.4%
Virginia	8,001,024	8,426,000	8,811,000	10.1%
Richmond City	204,208	206,960	209,090	2.4%

A number of general demographic factors will influence the growth rate of the Richmond Public Schools District during this period, and include the following:

a. The reduced rates of mobility will result in fewer household moving out of the district and fewer single person households moving in;

b. The remaining population in childbearing ages (women ages 15-45) will have fewer children;

c. The locally born 18-to-24 year old population, in prime childbearing ages, will continue to leave the area to go to college or to other urban areas, with the magnitude of this out-migration flow slowly increasing;

The Richmond Public Schools district will continue to experience a slow decline of net in-migration (movement of new young single households into the district) over the next 10 years. However, the negative effect of this trend on population growth will be greatly offset by the continued decline in out-migration of young families to the suburban areas.

From 2010 to 2015, the City of Richmond population is forecasted to increase by 2,752 or 1.3%, to 206,960. From 2015 to 2020, the population is forecasted to continue to increase by an additional 2,150 persons or 1.0% to 209,090. During the ten years of the forecasts, 20 of the 27 elementary attendance areas are forecasted to increase in population with the growth rates ranging from 0.1% in the Cary area to 19.5% in the Fairfield Court area (See Table 2 for population forecast results of each elementary attendance area). However it is important to note that most attendance areas will experience a slowing in their growth rates after 2015. Seven of the elementary areas will experience a population loss over the next 10 years, ranging from areas -0.2% in the Stuart and Clark Springs Areas to -8.8% in the Fisher area.

While all elementary areas will see some amount of gross in-migration, (primarily in the 20-to-29 age groups,) all areas also will continue to see gross out-migration. This out-migration primarily will be locally born young adults, 18-to-24 years old, as graduating

Table 2: Forecasted Elementary Area Population Change, 2010 to 2020

	2010	2015	2010-2015 Change	2020	2015-2020 Change	2010-2020 Change
Bellevue	4,449	4,460	0.2%	4,470	0.2%	0.5%
Blackwell	8,013	8,350	4.0%	8,620	3.2%	7.6%
Broad Rock	4,650	4,840	3.9%	4,970	2.7%	6.9%
Carver	4,670	4,950	5.7%	5,210	5.3%	11.6%
Cary	10,691	10,730	0.4%	10,700	-0.3%	0.1%
Chimborazo	9,028	9,100	0.8%	9,170	0.8%	1.6%
Clark Springs	19,317	19,370	0.3%	19,280	-0.5%	-0.2%
Elizabeth D Redd	7,986	8,180	2.4%	8,350	2.1%	4.6%
Fairfield Court	3,306	3,630	8.9%	3,950	8.8%	19.5%
Fisher Model	4,706	4,490	-4.8%	4,290	-4.5%	-8.8%
Fox	14,087	13,990	-0.7%	13,840	-1.1%	-1.8%
Francis	6,123	6,320	3.1%	6,530	3.3%	6.6%
George Mason	4,316	4,650	7.2%	4,980	7.1%	15.4%
GH Reid	7,786	8,070	3.5%	8,330	3.2%	7.0%
Ginter Park	6,184	6,160	-0.4%	6,070	-1.5%	-1.8%
Greene	6,129	6,320	3.0%	6,520	3.2%	6.4%
Linwood Holton	12,774	12,280	-4.0%	11,950	-2.7%	-6.5%
Mary Munford	17,316	17,590	1.6%	17,780	1.1%	2.7%
Miles Jerome Jones	4,243	4,360	2.7%	4,410	1.1%	3.9%
Oak Grove	4,011	4,160	3.6%	4,260	2.4%	6.2%
Overby Sheppard	3,925	3,930	0.1%	3,940	0.3%	0.4%
Southampton	12,203	12,230	0.2%	12,210	-0.2%	0.1%
Stuart	4,107	4,120	0.3%	4,100	-0.5%	-0.2%
Summer Hill	5,668	5,980	5.2%	6,260	4.7%	10.4%
Swansboro	3,344	3,440	2.8%	3,500	1.7%	4.7%
Westover Hills	8,920	8,950	0.3%	8,890	-0.7%	-0.3%
Woodville	6,256	6,310	0.9%	6,510	3.2%	4.1%
Richmond total	**204,208**	**206,960**	**1.3%**	**209,090**	**1.0%**	**2.4%**

seniors continue to leave the district to go to college or seek employment in larger urban areas and some young families move to the suburbs. Consequently, all of the attendance areas will experience a modest reduction in their average household size.

As stated in the Assumptions and emphasized above, the impact of the high proportion of high school graduates that leave the district to continue on to college or to seek employment in large urban areas is significant to the size and structure of the future population of the district. Up to 70% of all births occur to women between the ages of 20 and 29. As the graduating seniors continue to leave the district, the number of women at risk of childbirth during the next decade declines. Consequently, even though the district's fertility rate is just slightly below the state average, the small number of women in the district in prime child bearing ages will keep the number of births declining at a modest rate despite the district having a growing population (see the population pyramids in the appendix of this report for a graphic representation of the age distributions of the district and all of the attendance areas). This will require the district to become quite dependant on the in-migration of children just to maintain current grade cohort sizes, let alone experience enrollment growth rates similar to those seen the last 10 years.

Table 3: Household Characteristics by Elementary Districts, 2010 Census

	HH w/ Pop Under 18	% HH w/ Pop Under 18	Total Households	Household Population	Persons Per Household
Bellevue	168	5.9%	2,839	4,434	1.56
Blackwell	993	28.1%	3,538	7,776	2.20
Broad Rock	606	33.2%	1,828	4,650	2.54
Carver	676	36.3%	1,863	4,569	2.45
Cary	538	8.9%	6,016	10,623	1.77
Chimborazo	1,054	28.2%	3,742	8,906	2.38
Clark Springs	784	11.1%	7,086	14,040	1.98
Elizabeth D Redd	1,070	29.5%	3,627	7,820	2.16
Fairfield Court	685	57.0%	1,202	3,306	2.75
Fisher Model	386	16.9%	2,280	4,695	2.06
Fox	567	7.5%	7,530	13,938	1.85
Francis	904	38.7%	2,336	6,113	2.62
George Mason	671	41.7%	1,608	4,316	2.68
GH Reid	1,154	38.2%	3,024	7,781	2.57
Ginter Park	733	28.8%	2,550	6,176	2.42
Greene	776	37.5%	2,067	5,870	2.84
Linwood Holton	1,054	17.7%	5,958	11,374	1.91
Mary Munford	1,628	24.0%	6,792	14,567	2.14
Miles Jerome Jones	597	37.1%	1,612	4,242	2.63
Oak Grove	575	39.5%	1,457	3,974	2.73
Overby Sheppard	483	34.8%	1,389	3,806	2.74
Southampton	1,264	21.0%	6,017	11,982	1.99
Stuart	464	30.5%	1,519	4,049	2.67
Summer Hill	771	39.2%	1,967	5,665	2.88
Swansboro	447	33.9%	1,320	3,302	2.50
Westover Hills	1,023	24.8%	4,122	8,729	2.12
Woodville	739	39.7%	1,859	4,780	2.57
Richmond total	**20,810**	**23.9%**	**87,148**	**191,483**	**2.20**

As a general rule of thumb, for every two seniors that leave the district, one new household must move into the district to replace the young adults that have left and to replace their lost potential fertility. Over the course of the forecast period, the average number of graduating seniors will be approximately 1,160 per year and at least 75% of them will move out of the district within three years of graduation. Using the general rule, approximately 450 new families will be required to move into the district every year or 4,500 new families for the ten-year study period to replace the graduating seniors and their lost fertility. It is forecasted that the impact of the steadily increasing out-migration of young adults will continue to be mostly, (but not completely) offset by young singles (20-29 year old householders) in-migration and that the total number of births will be remain fairly constant throughout the forecast period.

Another factor that needs to be considered is the birth dynamics of the last twenty years. An examination of national birth trends shows there was a large "Baby Boomlet" born between 1980 and 1995 and a second boomlet between 2000 and 2007. Both of these Boomlets produced annual birth cohorts nearly as large as during the Baby Boom of the 1950s and 1960s. However, unlike the Baby Boom, the Boomlet was a regional and not a national phenomenon (McKibben, et. al. 1999). Because Virginia experienced only a modest Baby Boomlet, most

Table 4: Householder Characteristics by Elementary Districts, 2010 Census			
	Percentage of Householders aged 35-54	Percentage of Householders aged 65+	Percentage of Householders Who Own Homes
Bellevue	22.4%	8.4%	17.6%
Blackwell	35.7%	13.2%	36.0%
Broad Rock	40.5%	16.1%	52.6%
Carver	26.5%	14.8%	19.7%
Cary	26.0%	13.3%	37.1%
Chimborazo	36.4%	17.3%	49.6%
Clark Springs	22.0%	12.2%	25.6%
Elizabeth D Redd	31.7%	18.4%	22.3%
Fairfield Court	33.3%	15.1%	14.4%
Fisher Model	30.3%	32.5%	76.2%
Fox	19.3%	11.1%	27.7%
Francis	39.9%	16.1%	55.5%
George Mason	37.6%	16.4%	30.6%
GH Reid	39.9%	12.9%	48.9%
Ginter Park	36.7%	29.2%	50.8%
Greene	37.9%	11.7%	27.8%
Linwood Holton	36.1%	28.3%	50.5%
Mary Munford	35.1%	22.6%	76.2%
Miles Jerome Jones	40.1%	15.6%	49.2%
Oak Grove	37.8%	19.6%	41.0%
Overby Sheppard	37.7%	26.7%	49.9%
Southampton	33.0%	22.9%	55.1%
Stuart	35.9%	29.8%	61.6%
Summer Hill	39.5%	16.7%	44.6%
Swansboro	40.2%	20.7%	41.8%
Westover Hills	38.7%	18.9%	51.9%
Woodville	32.3%	25.7%	29.9%
Richmond total	**32.2%**	**18.2%**	**43.1%**

of the expected enrollment growth in Richmond will have to result from continued in-migration (as well as a reduction in out migration) and not from an increase in the incoming grade cohort size.

Clearly, the dominant factor that has affected the population growth rates of the Richmond Public Schools District over the last 20 years has been the number, pace and cost of new homes constructed in the greater metropolitan area. This expansion of suburban housing stock greatly increased the out migration flows out of the center city area. However, the dynamics of this out migration flow are more complex than many realize. There is a common misconception that any changes in the economy, housing market or transportation system will have an immediate impact on the size of an area's population and the total impact of that change will be experienced immediately. For example, the city of Richmond has long experienced a higher birth rate than the suburban counties. As many of these households moved to the suburbs, they provided preschool age children that helped fuel suburban enrollment growth. Now that the out-migration rate has slowed greatly over the last five years these preschool age children will now age into the Richmond schools.

An additional factor affecting the Richmond demographic dynamics are the issues of the district's aging population and the growing number of "empty nest" households, particularly in the Broad Rock and Swansboro attendance areas. For example, after the last school age child leaves high school, the household becomes an "empty nest" and most likely will not send any more children to the school system. In most cases, it takes 20 to 30 years before all original (or first time) occupants of a housing area move out and are replaced by new, young families with children. This principle also applies to children leaving elementary school and moving on the middle school. Households can still have school age children in the district's school, but also in effect be "empty nest" of elementary age children.

Note as well the steady increase in the median age of the population in The Richmond Public Schools District and all of its attendance areas (see population forecasts in the appendix for the median age for each forecast year). The Richmond Public Schools District as a whole will see the median age of its population increase from 32.3 in 2010 to 33.2 in 2020 (this is a large increase given the large college populations in Richmond. This rise in median age is due to two factors, locally born 18-24 years leaving the district and a higher proportion of their parents staying in their existing households.

As a result of the "empty nest" syndrome, all attendance areas in the Richmond Public Schools District will see a steady rise in the median age of their populations, even while the district as a whole continues to attract some new young families. It should be noted that many of these "childless" households are single persons and/or elderly. Consequently, even if many of these housing units "turnover" and attract households of similar characteristics, they will add little to the number of school age children in the district. Furthermore, many of the empty nest households will "down size" to smaller households within the district. In these cases new

Table 5: Single Person Households and Single Person Households over age 65 by Elementary Districts, 2010 Census		
	Percentage of Single Person Households	Percentage of Households single person and 65+
Bellevue	60.2%	6.0%
Blackwell	39.3%	7.9%
Broad Rock	29.8%	6.1%
Carver	33.0%	9.9%
Cary	47.7%	7.9%
Chimborazo	33.1%	7.3%
Clark Springs	43.5%	7.1%
Elizabeth D Redd	40.9%	12.6%
Fairfield Court	22.3%	6.7%
Fisher Model	34.3%	13.6%
Fox	44.7%	7.4%
Francis	26.1%	6.9%
George Mason	27.3%	7.0%
GH Reid	28.8%	5.8%
Ginter Park	32.4%	12.3%
Greene	24.9%	4.7%
Linwood Holton	47.0%	19.0%
Mary Munford	35.6%	11.3%
Miles Jerome Jones	28.2%	7.7%
Oak Grove	25.5%	6.3%
Overby Sheppard	25.6%	8.6%
Southampton	41.0%	12.0%
Stuart	27.8%	10.9%
Summer Hill	24.7%	6.7%
Swansboro	30.7%	9.2%
Westover Hills	39.4%	10.7%
Woodville	33.1%	13.1%
Richmond Total	**37.9%**	**9.5%**

housing units may be built in an area, yet there is no corresponding increase in school enrollment.

There are several additional factors that are responsible for the difference between growth in population and growth in housing stock. Included among these factors are: people building new "move up" homes in the same area or district, (an important point since the children in move up homes tend to be of middle or high school age); children moving out of their parents homes and establishing residence in the same area; the increase in single-individual households; and divorce, with both parents remaining in the same area.

Results and Analysis of Enrollment Forecasts

Elementary Enrollment

The total elementary enrollment of the district is forecasted to increase from 12,941 in 2011 to 13,028 in 2016, a rise of 87 students or 0.7%. From 2016 to 2021, elementary enrollment is expected to decline by 594 students to 12,434. This would represent a -3.9% decrease over the five-year period. Nineteen of the 27 elementary attendance areas will experience a net decline in enrollment over the next ten years, while 7 others will see modest enrollment increases.

However, examining the amount of enrollment change over the 10 year period tends to mask a significant amount of variation in the enrollment trends during this time span. From 2011 to 2016, 12 of the 27 attendance areas will see an increase in student enrollments. After 2016 this trend completely reverses as all but one of the elementary attendance areas show a net decline in students for the period 2016 to 2021.

The reason for this turnaround in the elementary enrollment patterns (and a marked departure from the elementary trends the district has been experiencing over the last 10 years) is the convergence of the effects of

Table 6: Total Elementary Enrollment, 2011, 2016, 2021						
	2011	2016	*2011-2016 Change*	2021	*2016-2021 Change*	***2011-2021 Change***
Bellevue	295	260	*-11.9%*	256	*-1.5%*	*-13.2%*
Blackwell	798	851	*6.6%*	838	*-1.5%*	*5.0%*
Broad Rock	280	300	*7.1%*	292	*-2.7%*	*4.3%*
Carver	479	478	*-0.2%*	474	*-0.8%*	*-1.0%*
Cary	199	205	*3.0%*	200	*-2.4%*	*0.5%*
Chimborazo	552	545	*-1.3%*	510	*-6.4%*	*-7.6%*
Clark Springs	311	295	*-5.1%*	287	*-2.7%*	*-7.7%*
Elizabeth D Redd	462	486	*5.2%*	476	*-2.1%*	*3.0%*
Fairfield Court	474	449	*-5.3%*	434	*-3.3%*	*-8.4%*
Fisher Model	319	266	*-16.6%*	260	*-2.3%*	*-18.5%*
Fox	500	475	*-5.0%*	432	*-9.1%*	*-13.6%*
Francis	473	455	*-3.8%*	437	*-4.0%*	*-7.6%*
George Mason	412	356	*-13.6%*	349	*-2.0%*	*-15.3%*
GH Reid	600	601	*0.2%*	563	*-6.3%*	*-6.2%*
Ginter Park	529	547	*3.4%*	515	*-5.9%*	*-2.6%*
Greene	479	496	*3.5%*	466	*-6.0%*	*-2.7%*
Linwood Holton	628	633	*0.8%*	585	*-7.6%*	*-6.8%*
Mary Munford	548	534	*-2.6%*	502	*-6.0%*	*-8.4%*
Miles Jerome Jones	520	506	*-2.7%*	471	*-6.9%*	*-9.4%*
Oak Grove	361	346	*-4.2%*	351	*1.4%*	*-2.8%*
Overby Sheppard	308	307	*-0.3%*	267	*-13.0%*	*-13.3%*
Southampton	505	567	*12.3%*	536	*-5.5%*	*6.1%*
Stuart	319	358	*12.2%*	329	*-8.1%*	*3.1%*
Summer Hill	495	557	*12.5%*	529	*-5.0%*	*6.9%*
Swansboro	329	320	*-2.7%*	297	*-7.2%*	*-9.7%*
Westover Hills	368	363	*-1.4%*	327	*-9.9%*	*-11.1%*
Woodville	471	545	*15.7%*	524	*-3.9%*	*11.3%*
Richmond Total	**12,941**	**13,028**	*0.7%*	**12,434**	*-4.6%*	***-3.9%***

three factors, all occurring roughly after 2012. These factors are; the decline in the number of new and existing homes sold in the district, the rise in the number of empty nest households and the change in the size of the cohorts entering the elementary grades. Each of these factors will contribute in part to the rise and subsequent decline in elementary enrollment.

The first factor is the slowdown in the home sales and housing construction industries. While it is true that the Metropolitan Richmond housing market has performed somewhat better than the national trends the last three years, it is not immune to the effects of a tightening on the mortgage market and in increasingly restrictive lending practices. The Richmond area, like most areas of the county, saw the number of new and existing home sales jump significantly in 2001 to 2007 as the expansion of sub-prime mortgage practices allowed many people to purchase new homes. Given the turmoil the collapse of the subprime market has caused, it can be assumed that there will not be a return to these lending practices anytime in the near future.

The second factor is the rise in the number of empty nest households in the district. In 2010 the district had 32.2% of their households headed by people ages 35-54 (The ages most people have school aged children). The district's proportion of households in these age groups has decreased over the last five years (and will continue to decline over the next five years) as people aged and the households became empty nest. Unfortunately, the large bubble of now empty nest households, (particularity empty of elementary age students) will not reach their 70s during the life of these forecasts. Post 70 year old households are the stage of life when most downsize, allowing new young families with children to move in.

The third factor is the current large bubble of pre-school cohorts that will be entering 1st grade over the next 5 years. The size of the incoming grade cohorts over the next five years will be larger than those leaving elementary school after 5th grade. This will result in enrollment increases.

An example of this phenomenon is the single year of age counts by attendance area from the 2010 Census **(See Table 7 below**). The population at age six is closely related to the combined 1st grade enrollment of the public and private students in the district (as it is for all elementary grades). However, note the increase in the number of residents from age five to under one. This means that there will be an increase in enrollment even if there is not net in migration of students.

Table 7: Age Under One to Age Ten Population Counts, by Year of Age, by Elementary Attendance Area: 2010 Census

	Under 1 year	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years
Bellevue	31	24	18	15	18	12	11	16	15	9	16
Blackwell	122	119	111	137	99	119	125	71	85	99	105
Broad Rock	60	51	63	67	59	55	54	58	66	61	77
Carver	91	118	110	107	98	83	85	74	86	65	80
Cary	82	78	62	58	59	38	38	39	29	34	32
Chimborazo	133	127	123	122	120	108	127	107	106	100	102
Clark Springs	121	87	83	72	74	104	82	62	85	77	74
Elizabeth D Redd	119	133	154	137	126	94	92	88	78	79	92
Fairfield Court	109	100	107	92	113	95	85	71	79	67	59
Fisher Model	39	45	43	32	37	40	28	48	27	36	36
Fox	85	71	66	60	39	72	53	46	40	64	39
Francis	114	97	123	82	97	85	96	88	87	85	86
George Mason	104	114	104	86	76	76	102	77	78	77	75
GH Reid	141	140	137	133	145	114	117	114	104	98	94
Ginter Park	79	44	55	74	71	49	64	60	82	67	84
Greene	160	139	145	103	89	82	80	66	76	55	68
Linwood Holton	132	118	114	122	112	101	90	89	82	99	85
Mary Munford	216	214	211	178	192	199	194	181	176	158	164
Miles Jerome Jones	91	71	84	70	58	62	55	70	67	63	73
Oak Grove	75	77	67	68	70	64	69	52	49	68	63
Overby Sheppard	35	42	40	37	59	41	43	49	52	59	49
Southampton	173	160	160	167	127	115	111	92	72	112	87
Stuart	55	45	43	42	49	34	49	56	44	58	51
Summer Hill	108	101	107	113	105	99	98	86	64	101	75
Swansboro	50	44	45	57	46	34	46	40	50	40	45
Westover Hills	160	141	145	130	99	108	78	93	77	71	68
Woodville	91	98	109	91	106	107	94	83	83	96	79
Richmond Total	**2,776**	**2,598**	**2,629**	**2,452**	**2,343**	**2,189**	**2,166**	**1,975**	**1,939**	**1,997**	**1,957**

After 2016, this trend will reverse. Given the district's fertility rate, there are currently an insufficient number of non-college women in the district in prime child bearing age to produce enough births to keep the elementary enrollment at the 2012-2016 levels. Without substantial and sustained in migration of young families, the sizes of the pre-school age cohorts after 2016 will be much smaller than those in the elementary grades.

The demographic factors that will become the most influential over the next ten years are the growth rate of empty nest households in the attendance areas, the number of sales of new homes (particularly in the

suburban areas), the rate and magnitude of existing housing unit "turn over," the relative size of the elementary and pre-school age cohorts and each area's fertility rate. Each of these factors will vary in the scale of their influence and timing of impact on the enrollment trends of any particular elementary area.

As more elementary attendance areas become completely dependent upon existing home sales to attract new families, the overall elementary enrollment trend of the district will decline. Areas such as Greene will see their elementary enrollments peak by the end of the decade and then slowly decline. Thus, the best primary short- and long-term indicator for enrollment change in most of the attendance area will be the year-to-year rate of housing turnover. If the Total Fertility Rates of all the attendance areas remain at their current low levels (and they are forecasted to do so) they will insure that enrollments will continue to see slowing growth (or outright declines) even if the level of net out-migration is greatly reduced.

Yet, equally important are the factors of housing turn-over and "family formation." Areas with existing homes that have a large proportion of housing units owned by their residents and have a large proportion of their homeowners age 65 or older are prime candidates to experience a growing amount of housing turn-over. In The Richmond Public Schools District, an area such as Ginter Park is an excellent example of this trend. This area, which would normally see a dramatic drop in their enrollment numbers as the number of households with school age children decline, will see moderate changes and long term stability in their student populations as young families move into formerly empty nest housing units.

Additionally, areas that are characterized by the relatively high percentage of rental housing units and large concentrations of young adult serve as family formation or "feeder" areas for the rest of the district. In these cases, young adults or the newly married, move to these areas and establish households. Because the population is in prime child bearing ages, these areas also have both a high absolute number of births and a higher than the district average birth rate. Later, as family size increases, these families often move to single family homes--usually moderately priced single family homes in other parts of the school district.

Consequently, the Carver, Elizabeth Redd and other sub-attendance areas with similar characteristics, serve as feeder areas for outlying attendance areas in the district. This internal migration flow is far more important in determining future enrollment trends than the construction of new single family homes since an average of five existing homes are sold for every new home built. Indeed, a close examination of the year to year trends in the family formation areas will serve as an excellent bellwether for short and medium term changes in areas that depend on in-migration for enrollment growth.

Middle School Enrollment

The total middle school enrollment for the district is forecasted to decline from 4,687 in 2011 to 4,469 in 2016, a 218 student or a -4.7% decrease. Between 2016 and 2021 middle school enrollment is forecasted to grow to 4,678, an increase of 209 students or 4.7%. The difference in the size of the individual grade cohorts and the aging of students through the school system are the primary reasons why the middle school enrollment trends deviate from those of the elementary grades.

Table 8: Total Middle School Enrollment, 2011, 2016, 2021

	2011	2016	*2011-2016 Change*	2021	*2016-2021 Change*	***2011-2021 Change***
Albert Hill	498	532	*6.8%*	523	*-1.7%*	*5.0%*
Binford	345	360	*4.3%*	360	*0.0%*	*4.3%*
Boushall	419	427	*1.9%*	467	*9.4%*	*11.5%*
Elkhardt	404	442	*9.4%*	460	*4.1%*	*13.9%*
Brown	810	732	*-9.6%*	786	*7.4%*	*-3.0%*
King	735	694	*-5.6%*	718	*3.5%*	*-2.3%*
Henderson	568	495	*-12.9%*	557	*12.5%*	*-1.9%*
Thompson	593	472	*-20.4%*	492	*4.2%*	*-17.0%*
Richmond Total	**4,687**	**4,469**	*-4.7%*	**4,678**	*4.7%*	***-0.2%***

There are currently smaller grade cohorts enrolled in the elementary school grades compared to those in the middle schools' grade cohorts. As these elementary school cohorts "age" into middle school and larger middle school cohorts age into high school, they decrease the overall middle school enrollment level.

Note how the size of the incoming 6th grade class is usually smaller than the previous year's 8th grade class, which has now moved on the high school. As long as this "dearth" in the enrollment pattern exists, there will be to some degree, a decrease in middle school enrollment, at least until the 2016-2017 school year.

After the 2016-2017 school year, this cohort trend reverses. There will then be larger grade cohorts entering the middle school grades compared to those leaving. The result is a modest level of increased middle school enrollment until 2020.

These enrollment trends will not be consistent between the eight middle schools. Thompson Middle School will see an enrollment pattern that shows somewhat weaker enrollment trends compared to the overall district middle school enrollment. There is some enrollment growth in its elementary feeder area, but there will be a much larger decline in the 2011 to 2016 period. As this growth bubble enters middle school, enrollments will rise, but the net results will be a substantial decline in 10 year enrollment.

The Boushall Middle School on the other hand, will experience an increase in students in a much greater magnitude than the district average. This area has large elementary grade cohorts aging into the middle school that will continue for the life of the forecasts. Consequently, this area as well as Elkhardt Middle School will see an immediate increase in enrollment due to the building of higher priced homes and then subsequently see its enrollment continue to increase as the children in the young family households age through the school system.

High School Enrollment

Enrollment at the high school level is forecasted to rise from 5,471 in 2011 to 5,490 in 2016, an increase of 19 students or 0.3%. After 2016, the high school enrollment begins to increase 6.7% from 5,490 to 5,827 students.

The aforementioned effects of changes in cohort size on middle school enrollment are also affecting the growth patterns of the high school population. The difference here is that for the next 5 years the cohorts graduating out of high school are not that much larger than those of the rising 8th grade cohorts entering grade 9.

After 2018, the larger grade cohorts that will affect the middle school enrollment begin to enter high school. Until the current bubble of students (now in the elementary grades) passes through the high school grades, there will be continued growth at the district's high school. The main difference is that the growth in the high school enrollment will continue throughout the life of the forecasts, peaking sometime around the year 2025.

Table 9: Total High School Enrollment, 2011, 2016, 2021

	2011	2016	*2011-2016 Change*	2021	*2016-2021 Change*	***2011-2021 Change***
Armstrong	912	943	*3.4%*	1,001	*6.2%*	*9.8%*
Wythe	860	824	*-4.2%*	885	*7.4%*	*2.9%*
Huguenot	1,047	1,011	*-3.4%*	1,072	*6.0%*	*2.4%*
Marshall	766	840	*9.7%*	893	*6.3%*	*16.6%*
Open	182	226	*24.2%*	235	*4.0%*	*29.1%*
Richmond Comm.	245	248	*1.2%*	271	*9.3%*	*10.6%*
Jefferson	809	748	*-7.5%*	820	*9.6%*	*1.4%*
Richmond Total	**5,471**	**5,490**	***0.3%***	**5,827**	***6.1%***	***6.5%***

It is important to note that the vast majority of this future high school enrollment growth will be a result of students aging into those grades. Specifically, students who already live in the district (and not in- migration of students ages 14 to 18) will be the primary cause of the forecasted increase in high school enrollment. Additionally, as was mentioned earlier, these forecasts represent the demographic changes that will affect high school enrollment. Any changes in the district's student transfer policy will need to be added or subtracted from the forecast result.

High school enrollment is the most difficult of all the grade levels to project. The reason for this is the varying and constantly changing dropout rates, particularly in grades 10 and 11. For these forecasts the dropout rates at the high school were calculated for each grade over the last five years. These five-year averages were then held constant for the life of the forecast. The effects of any policy changes dealing with any school's drop out rates, program placement or reassignment of former students to new grade levels will need to be added or subtracted from the forecast results.

References

McKibben, J.
The Impact of Policy Changes on Forecasting for School Districts. Population Research and Policy Review, Vol. 15, No. 5-6, December 1996

McKibben, J., M. Gann, and K. Faust.
The Baby Boomlet's Role in Future College Enrollment. American Demographics, June 1999.

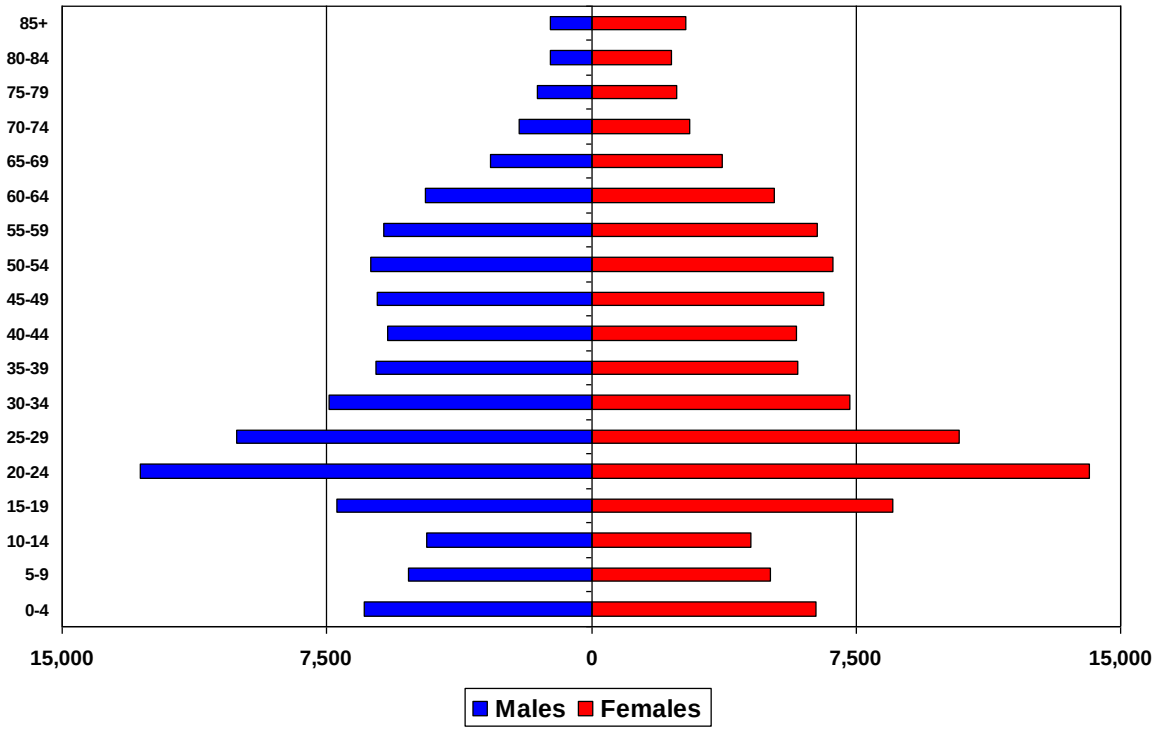
Peters, G. and R. Larkin
Population Geography. 7th Edition. Dubuque, IA: Kendall Hunt Publishing. 2002.

Siegel, J. and D. Swanson
The Methods and Materials of Demography: Second Edition, Academic Press: New York, New York. 2004.

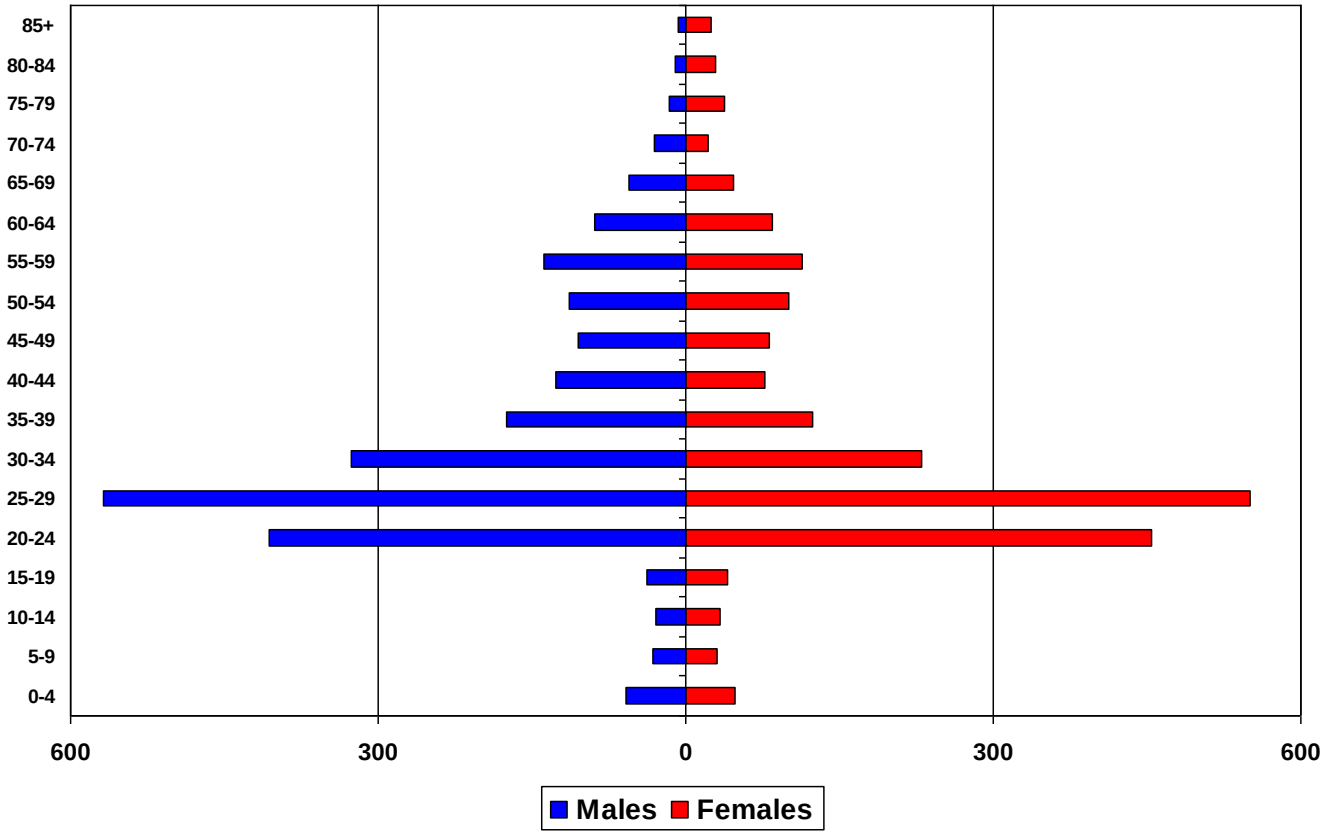
Smith, S., J. Tayman and D. Swanson
State and Local Population Projections, Academic Press, New York, New York. 2001.

Appendix A: Population Pyramids by Attendance Zone (Age/Sex)
Prepared by:

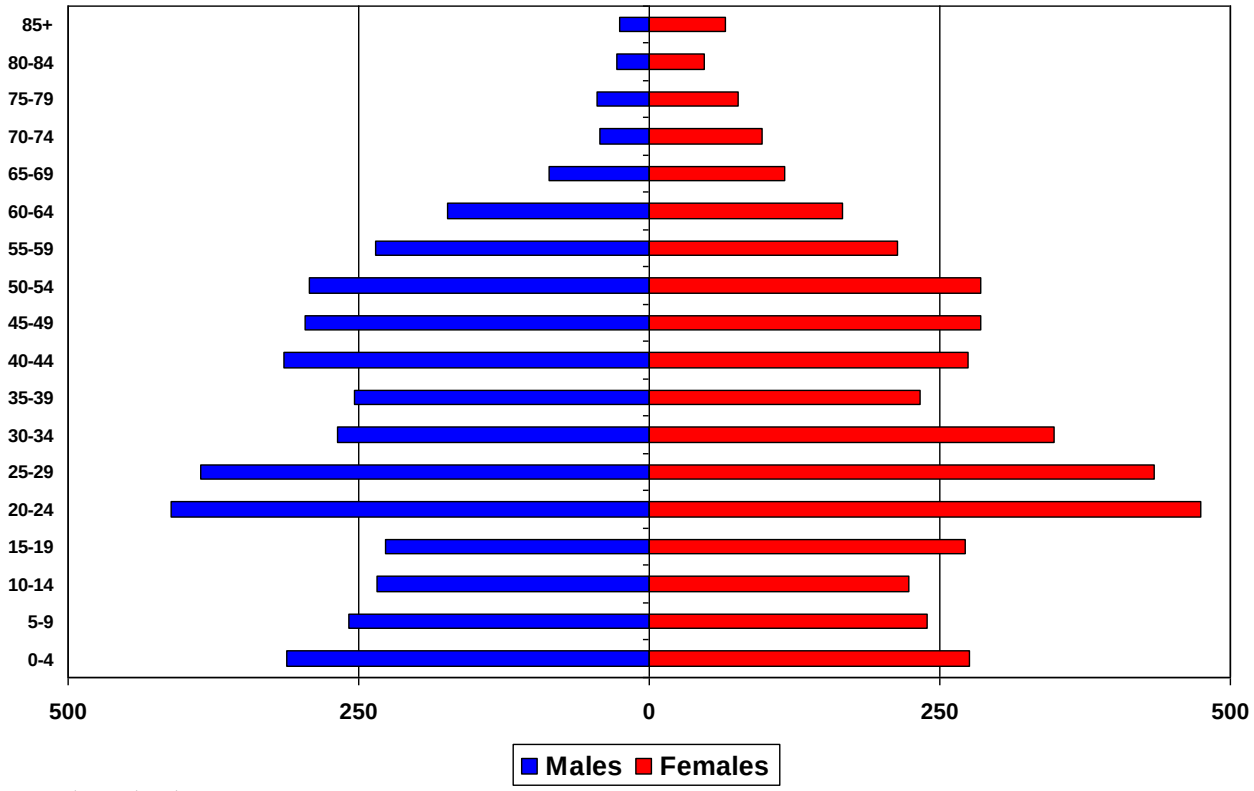
Richmond School District 2010 Census



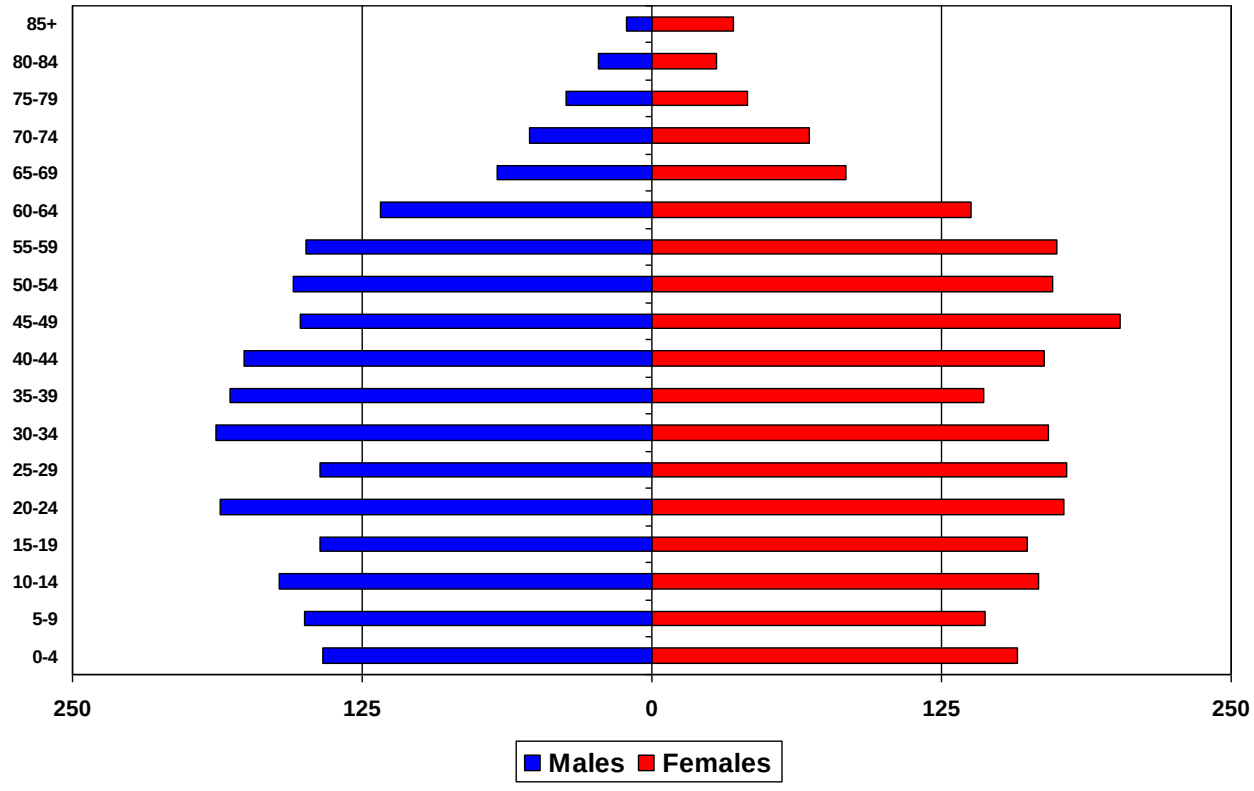
Bellevue Elementary 2010 Census



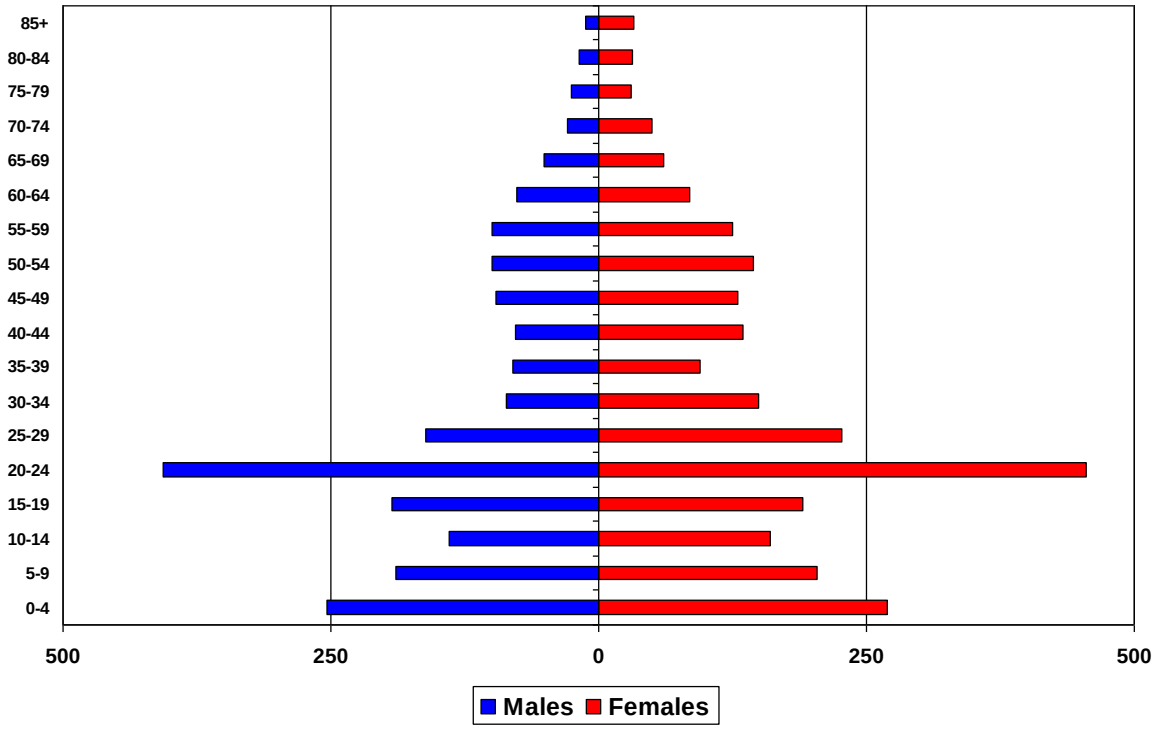
Blackwell Elementary 2010 Census



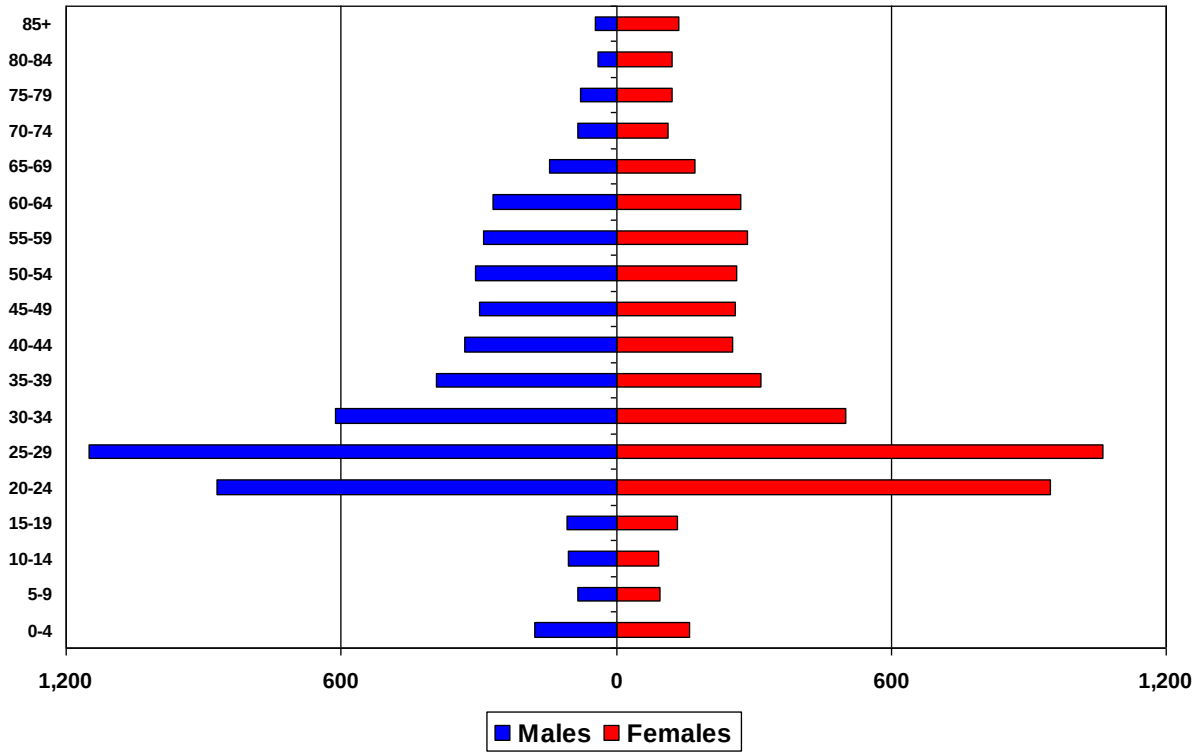
Broad Rock Elementary 2010 Census



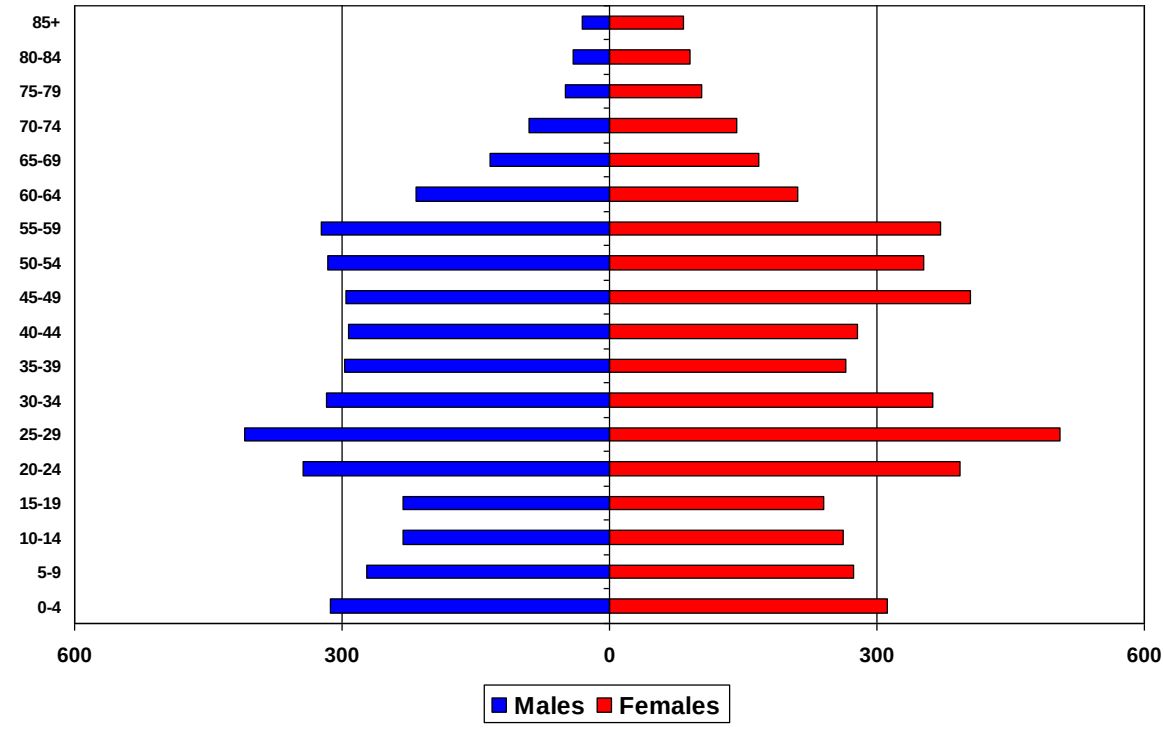
Carver Elementary 2010 Census



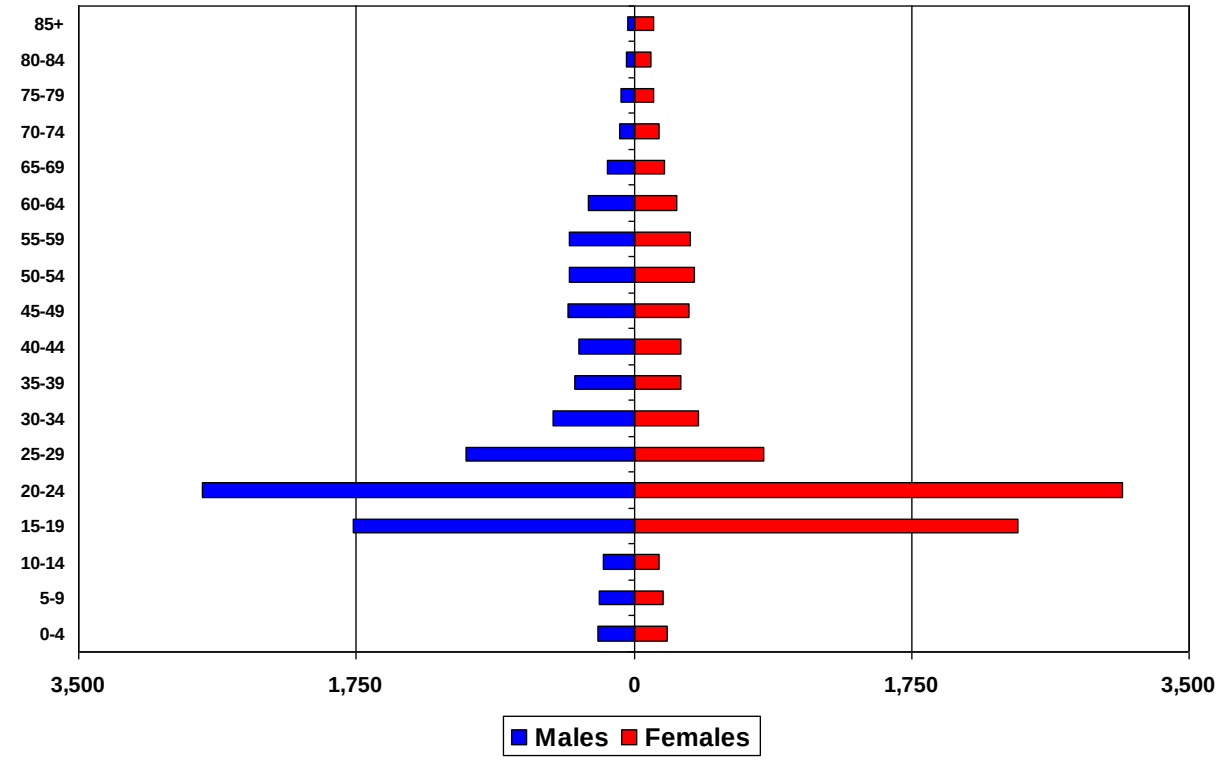
Cary Elementary 2010 Census



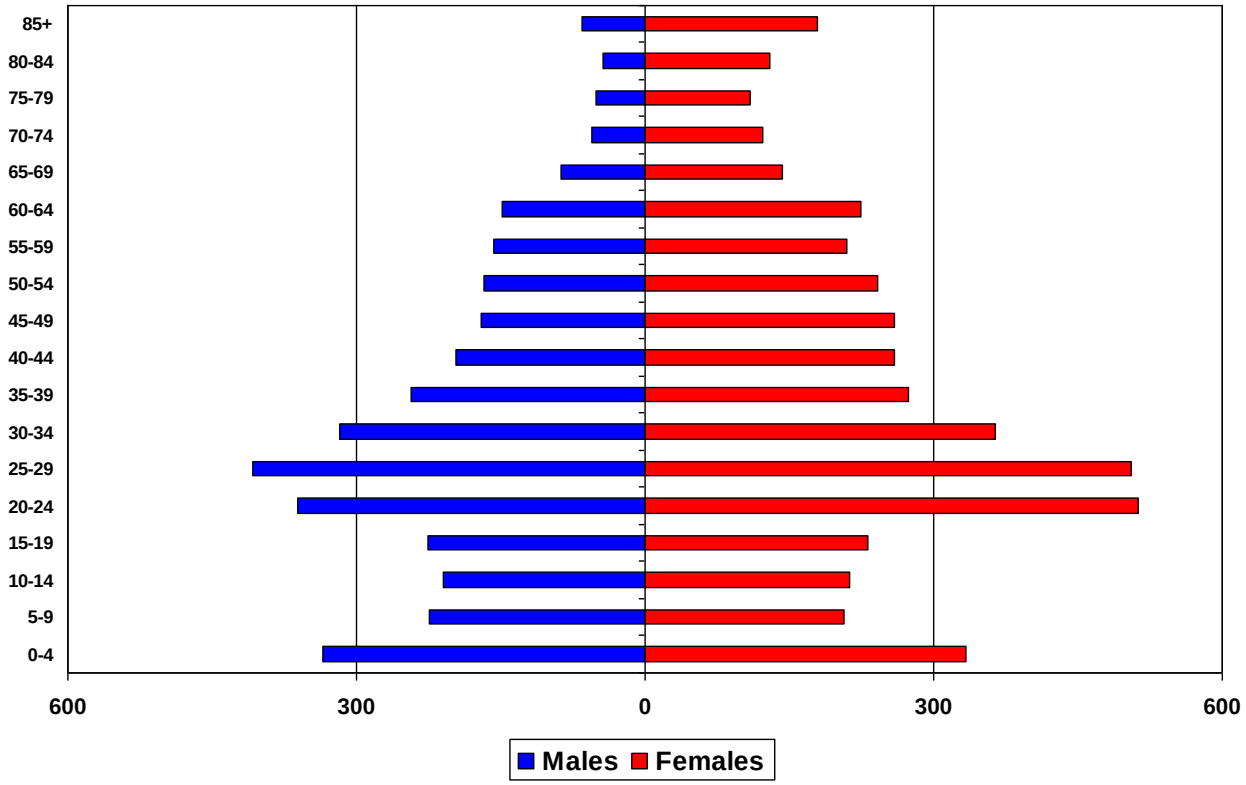
Chimborazo Elementary 2010 Census



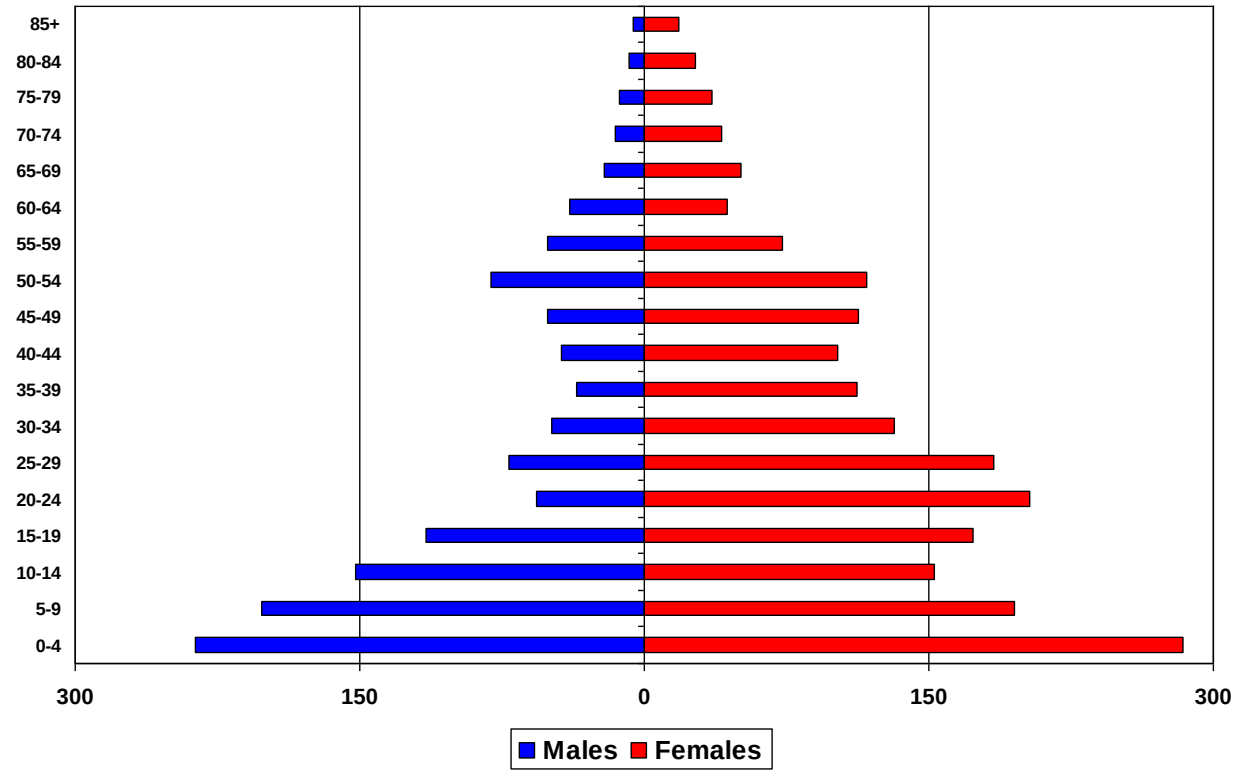
Clark Springs Elementary 2010 Census



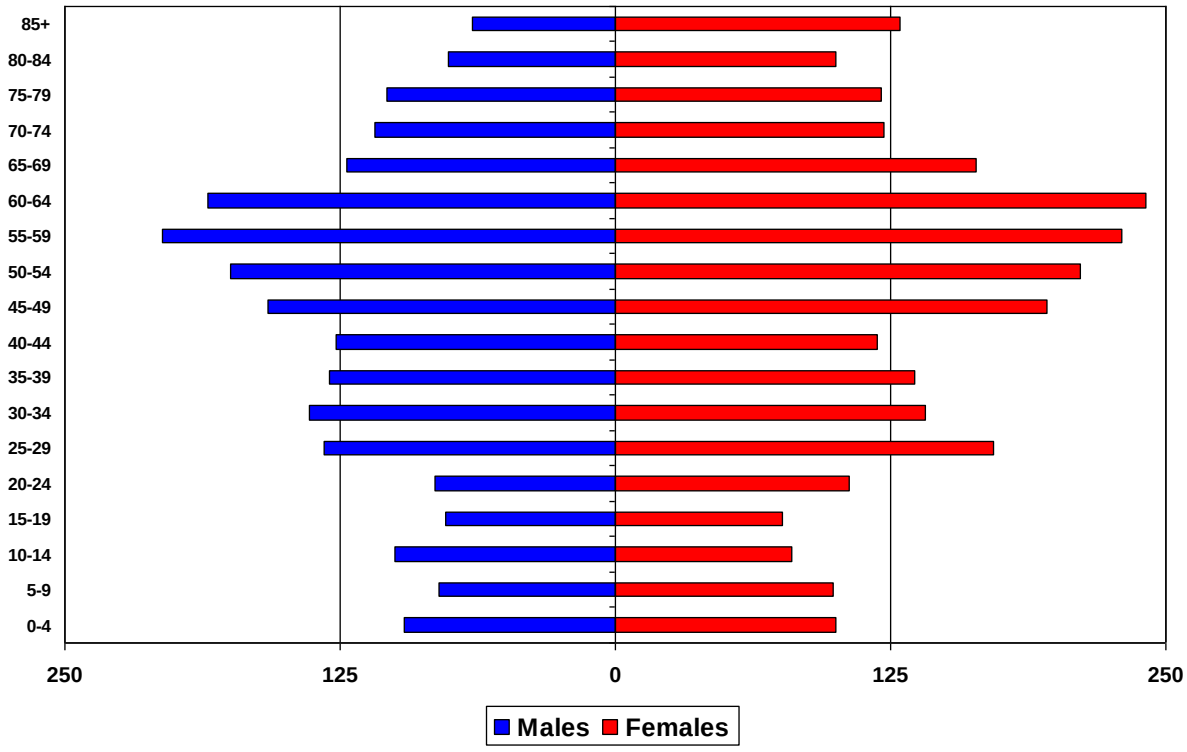
Elizabeth D. Redd Elementary 2010 Census



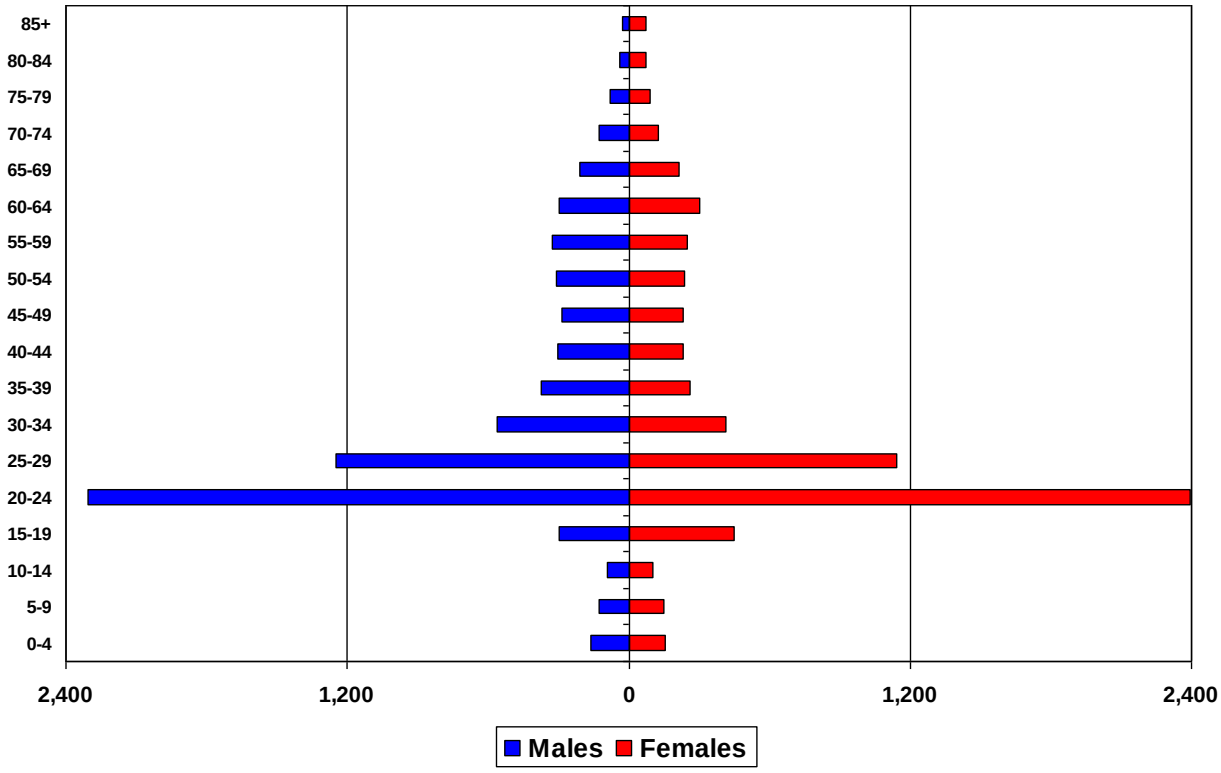
Fairfield Court Elementary 2010 Census



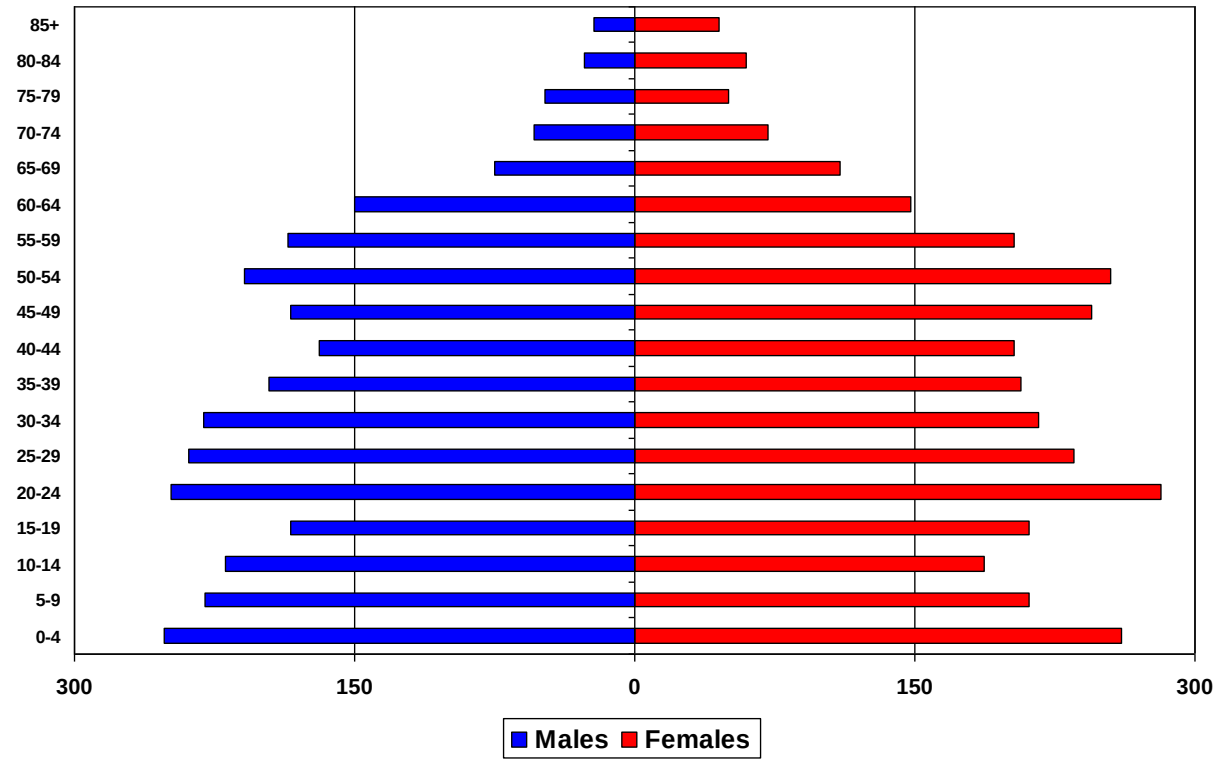
Fisher Model Elementary 2010 Census



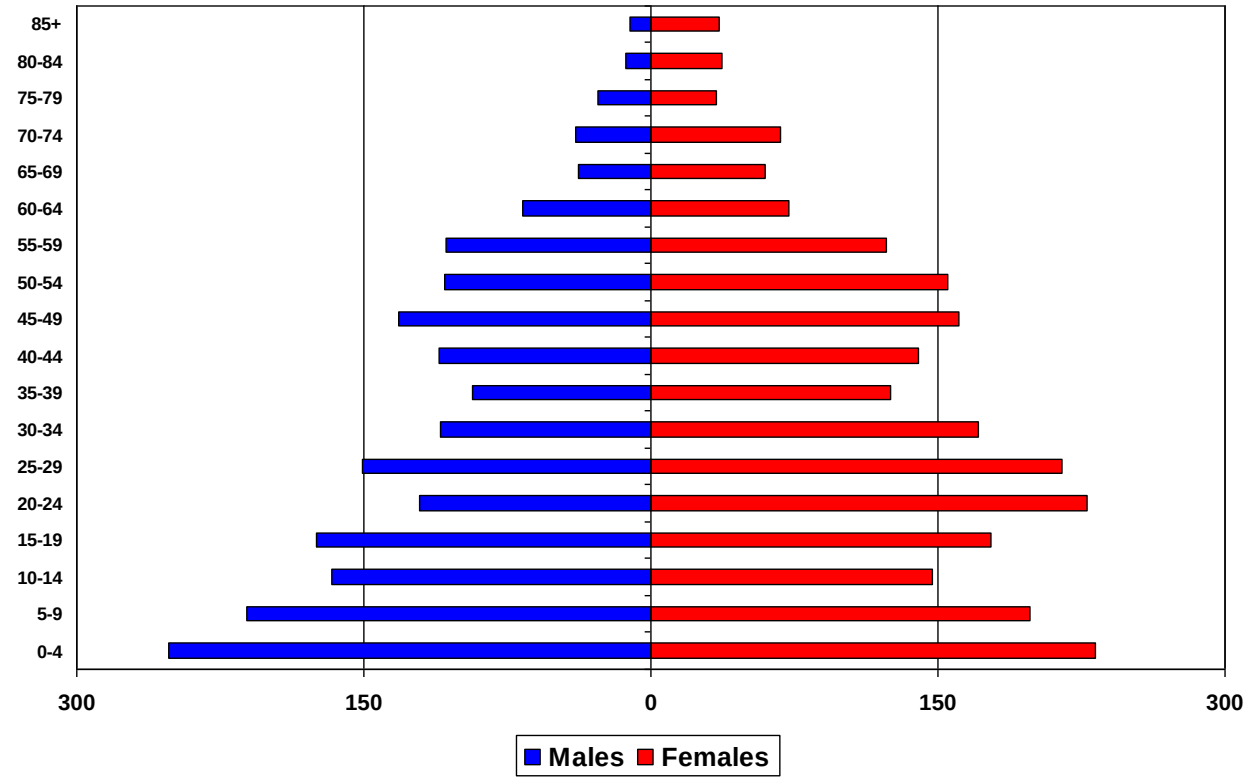
Fox Elementary 2010 Census



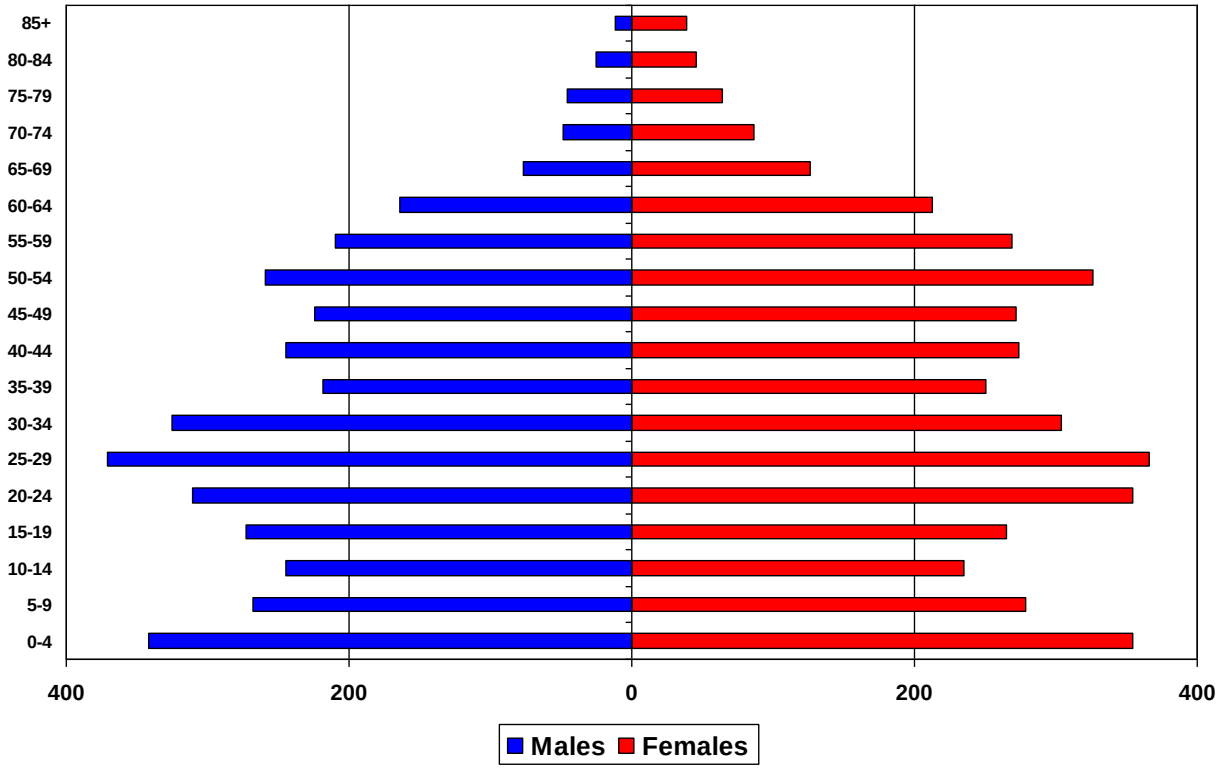
Francis Elementary 2010 Census



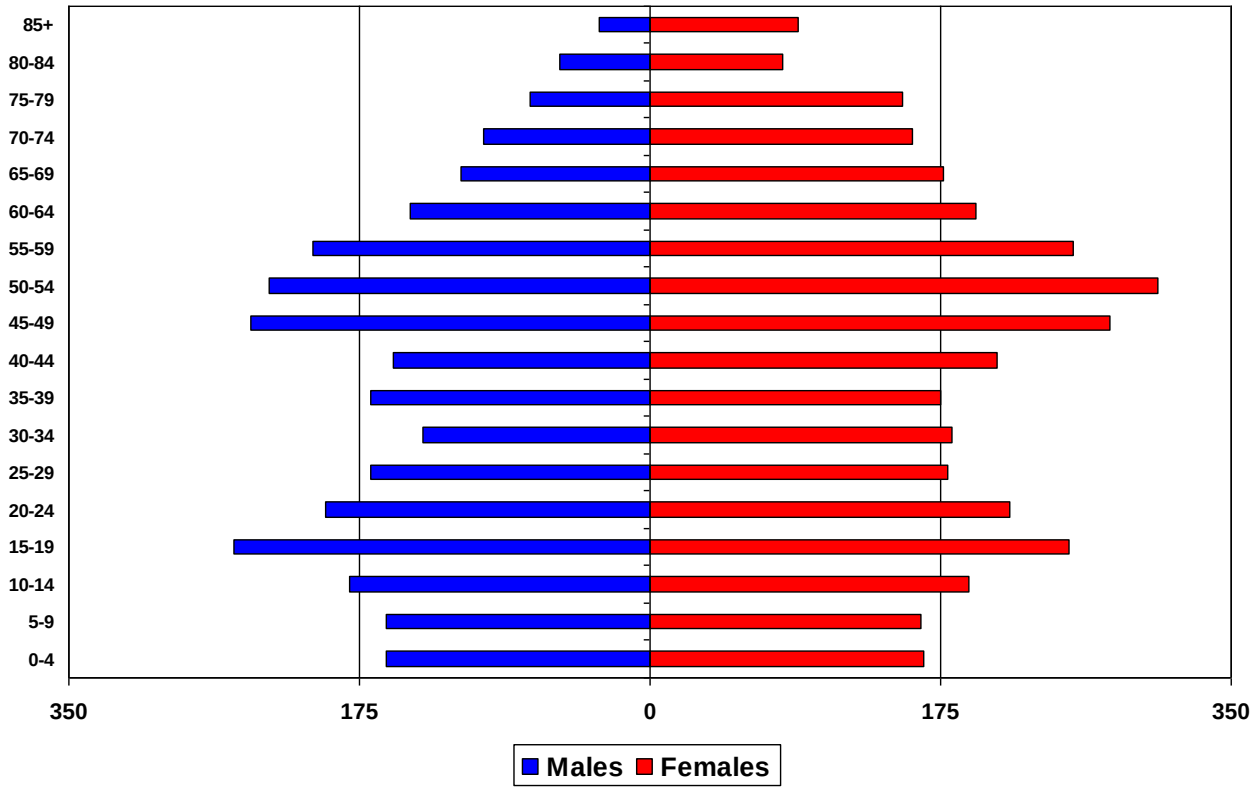
George Mason Elementary 2010 Census



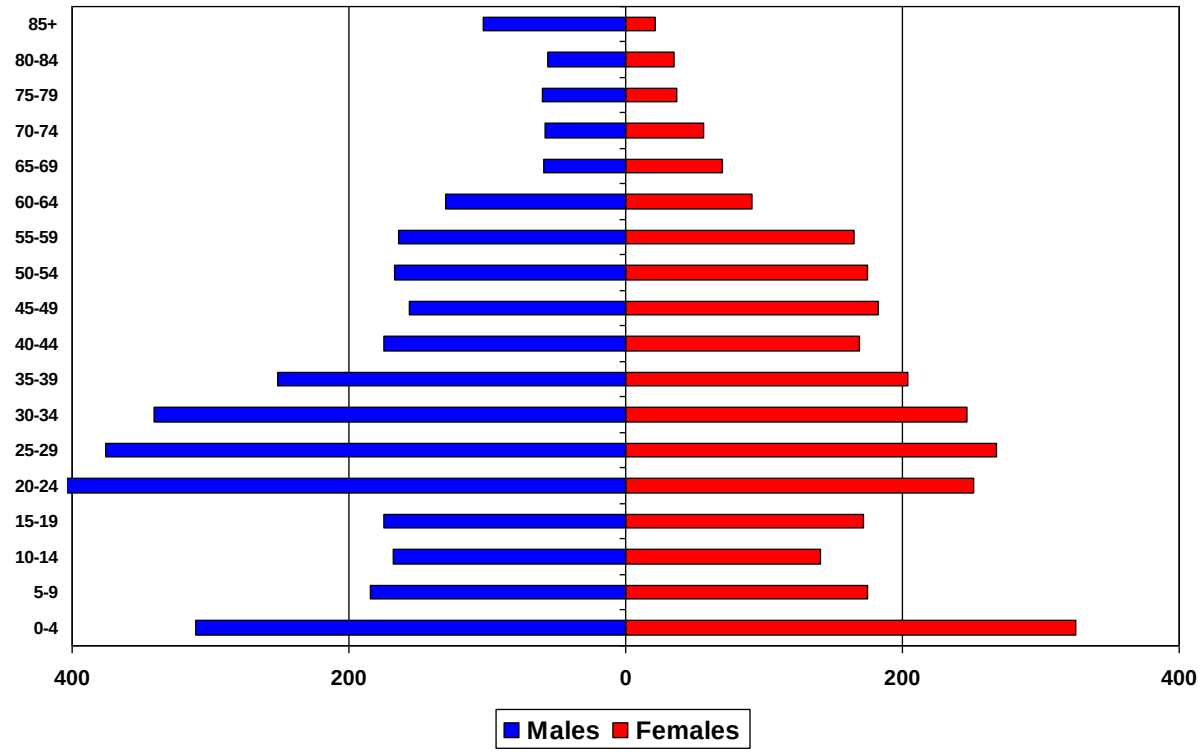
G.H. Reid Elementary 2010 Census



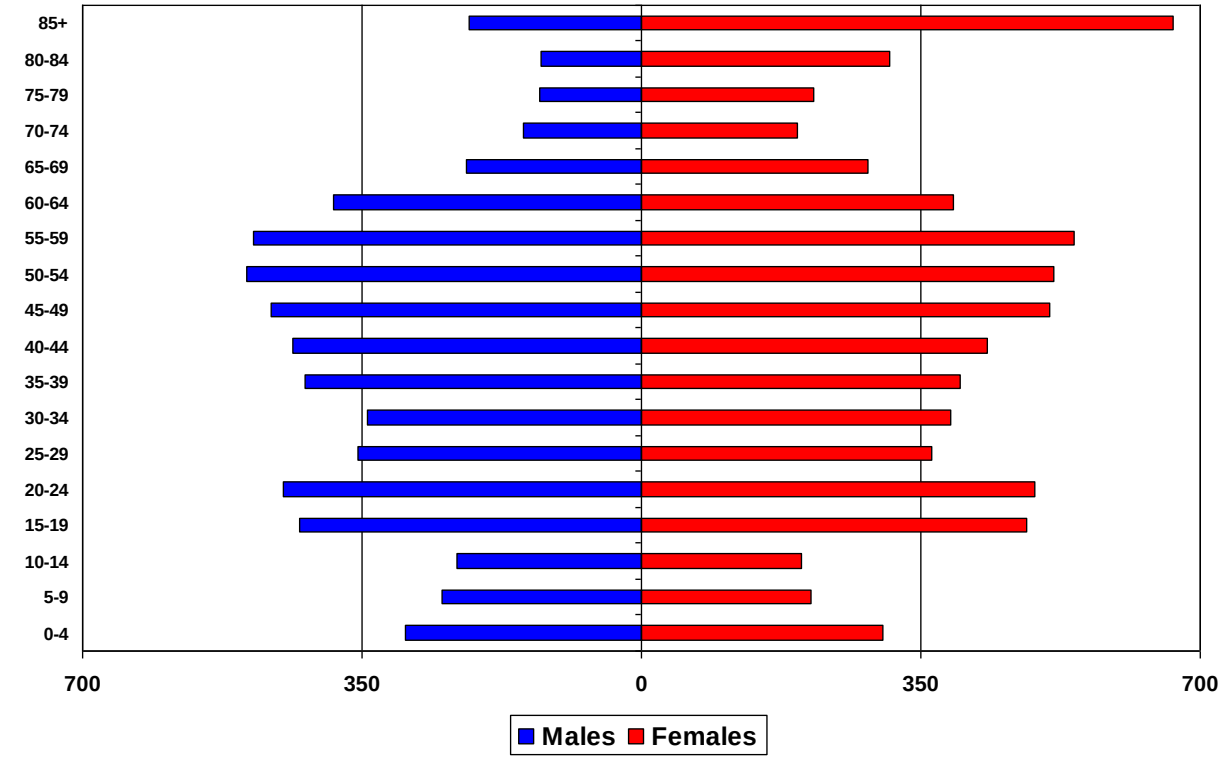
Ginter Park Elementary 2010 Census



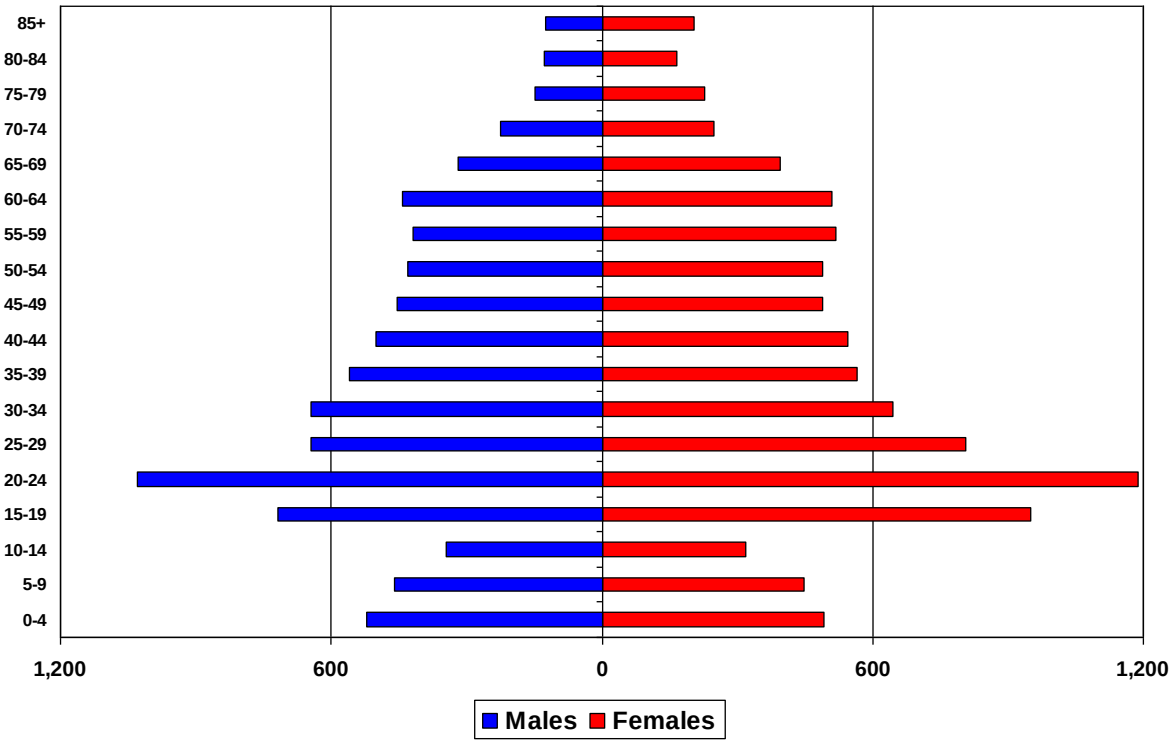
Greene Elementary 2010 Census



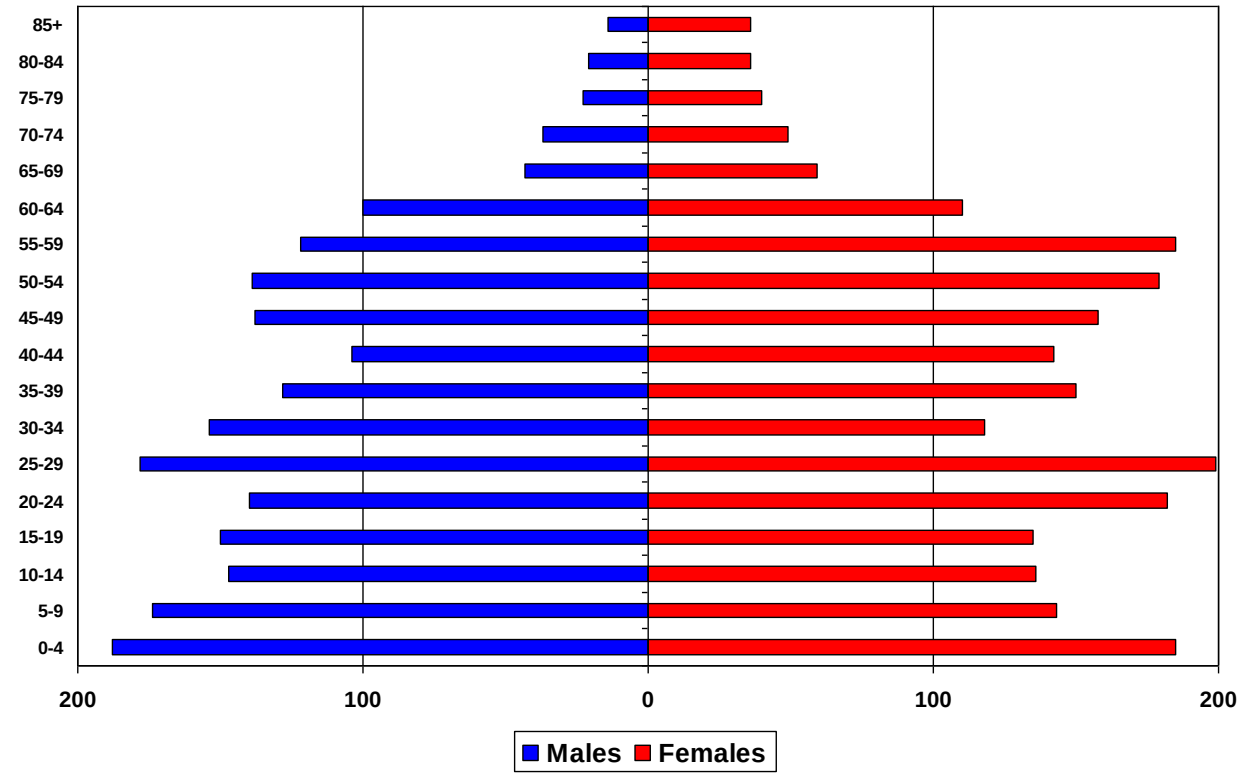
Linwood Holton Elementary 2010 Census



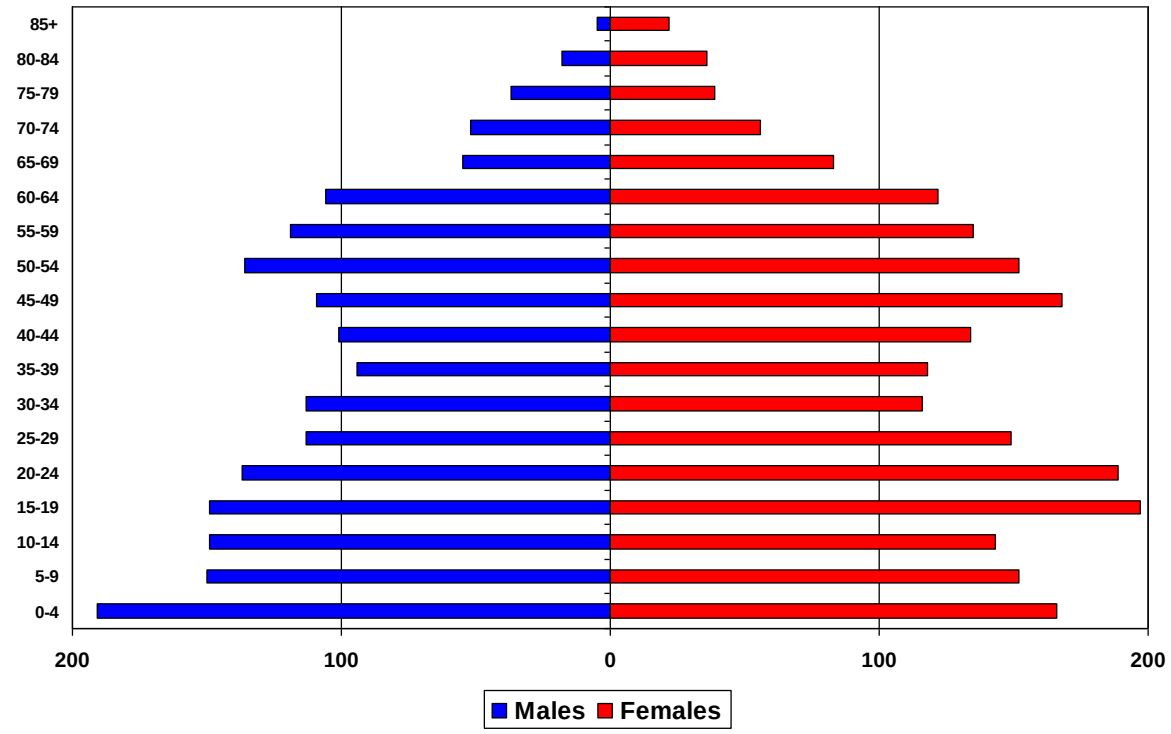
Mary Munford Elementary 2010 Census



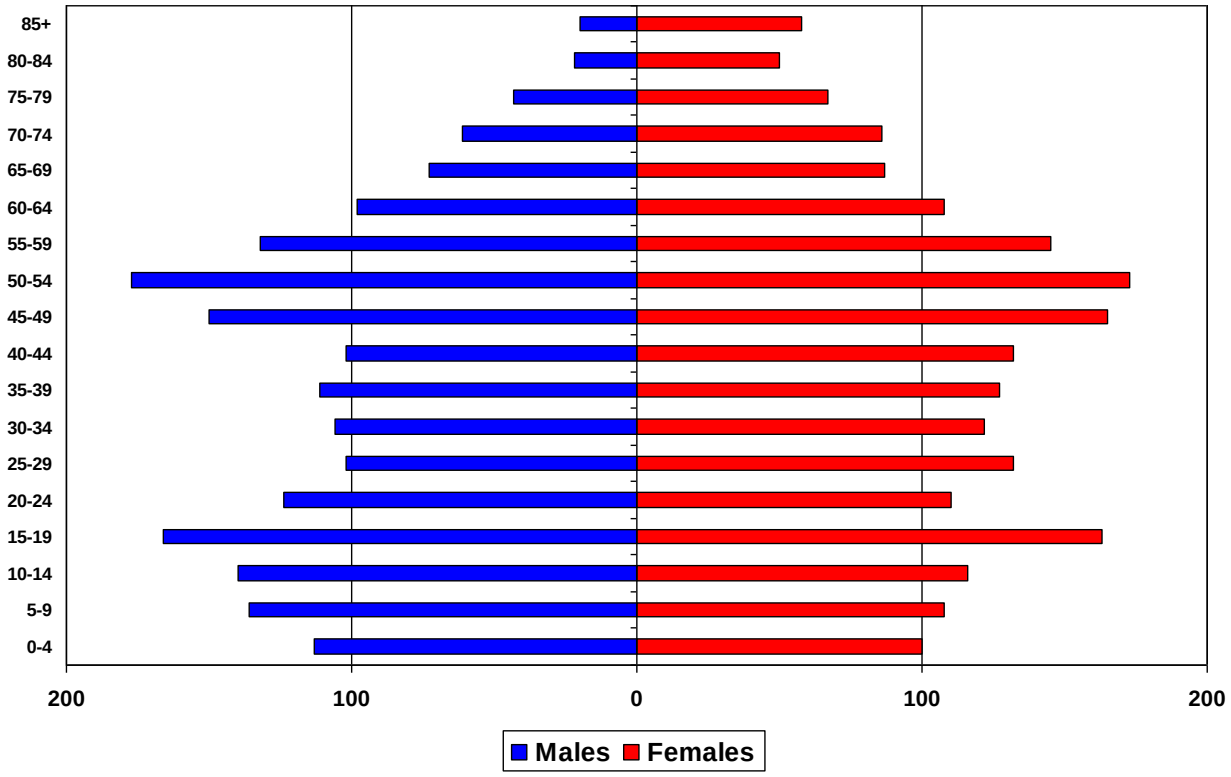
Miles Jerome Jones Elementary 2010 Census



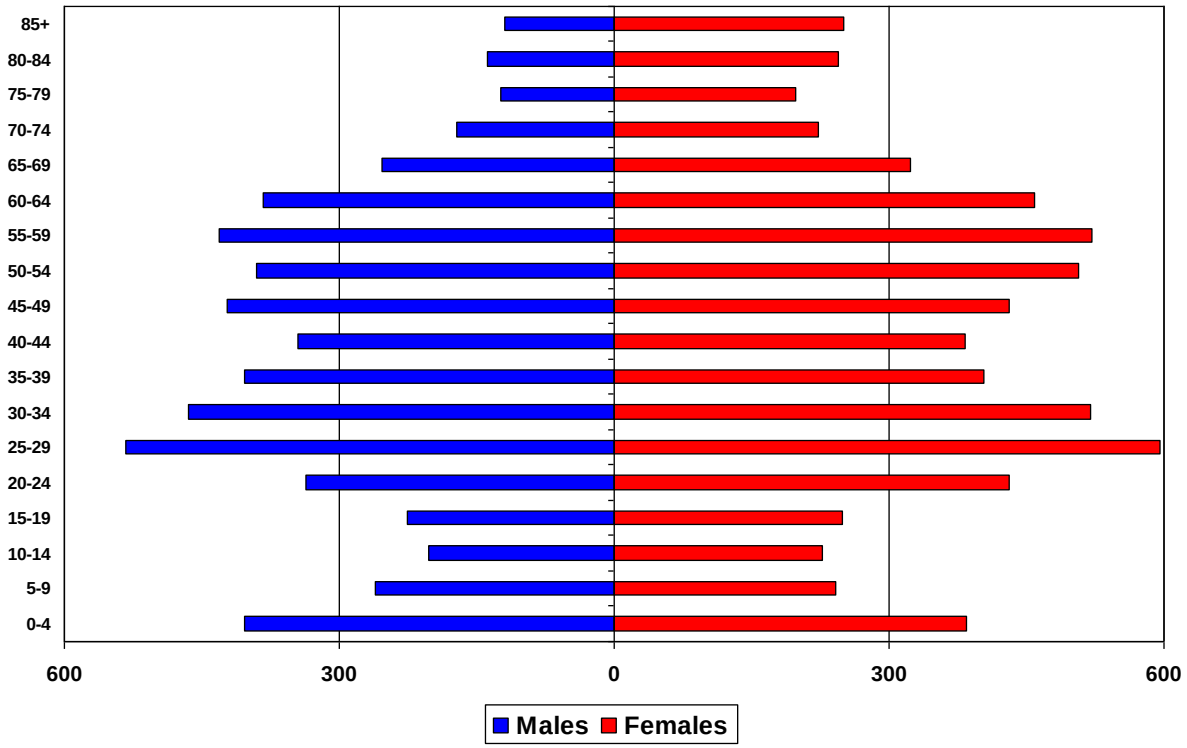
Oakgrove Elementary 2010 Census



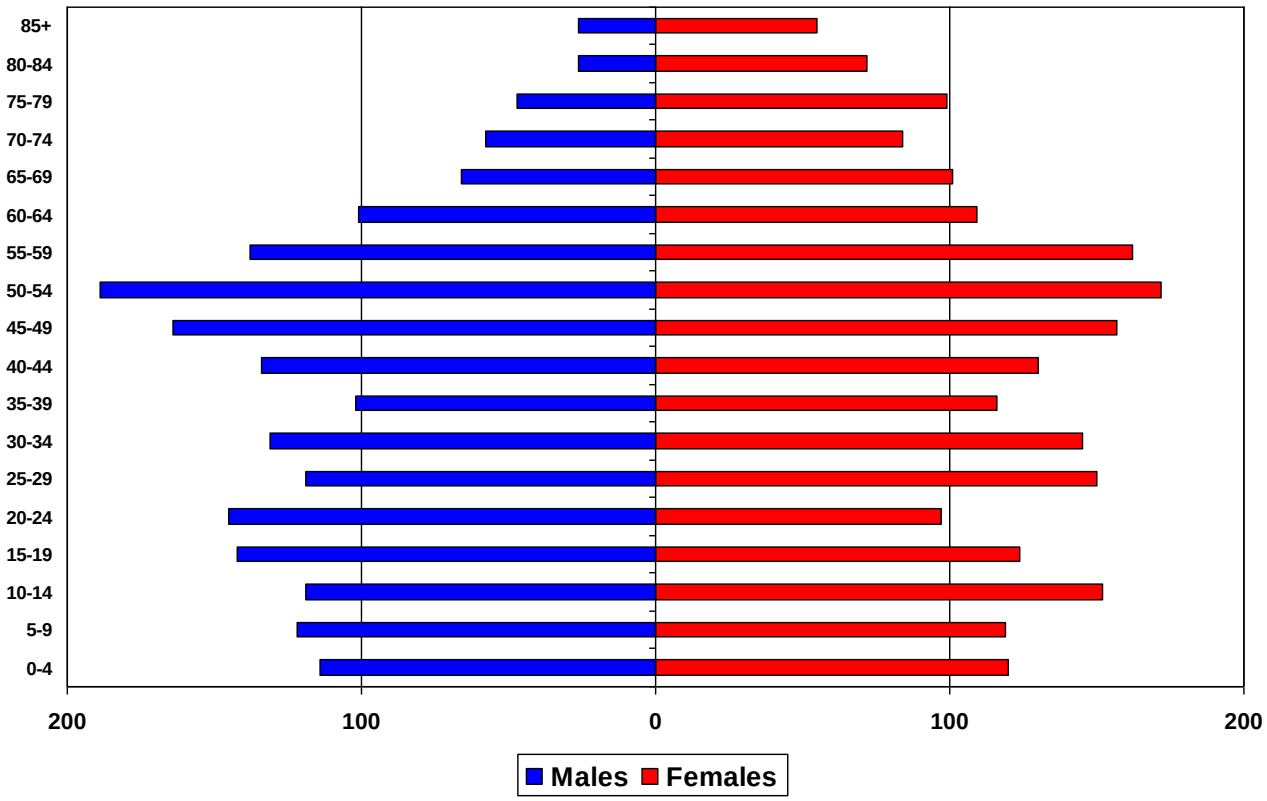
Overby Sheppard Elementary 2010 Census



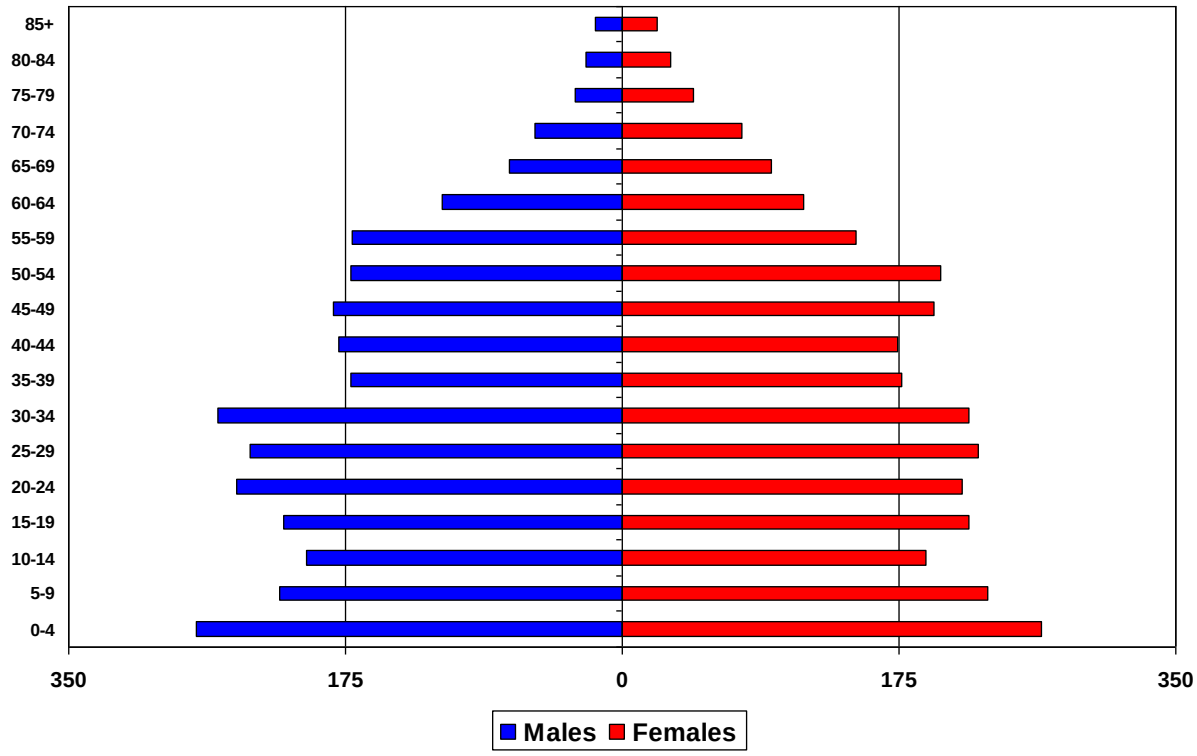
Southampton Elementary 2010 Census



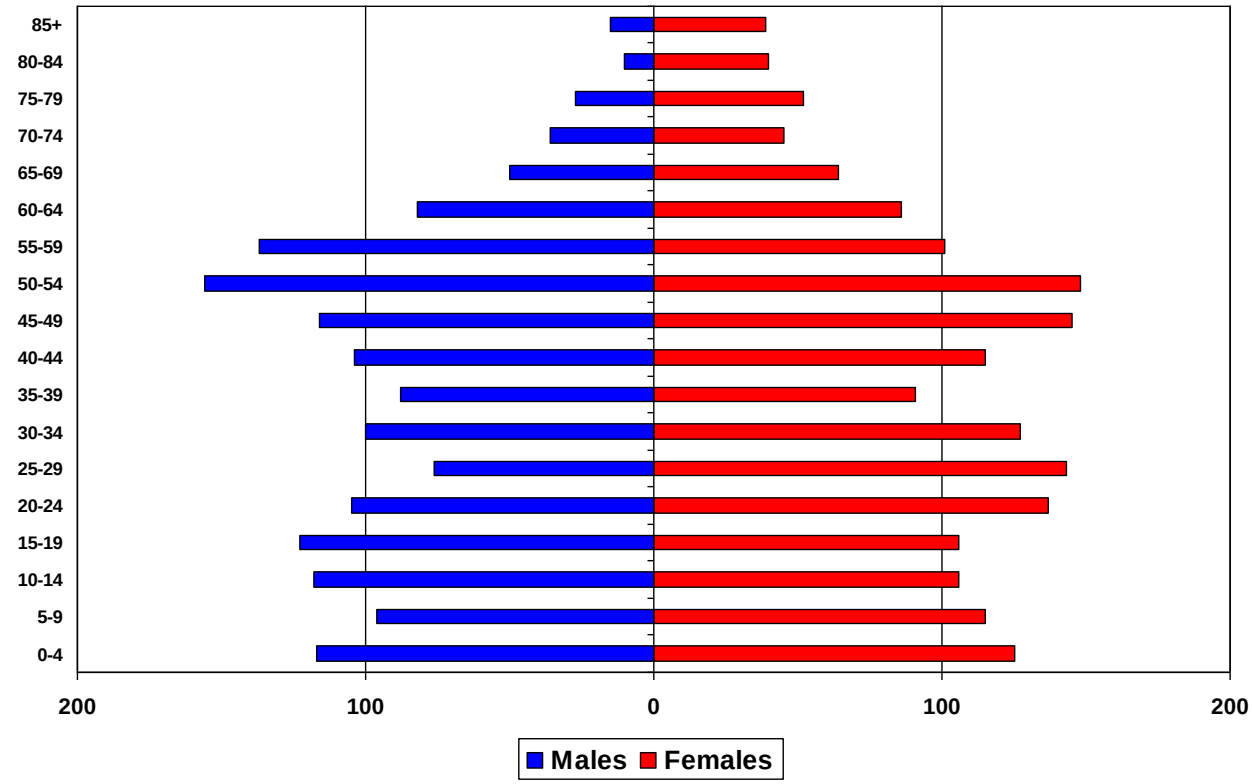
Stuart Elementary 2010 Census



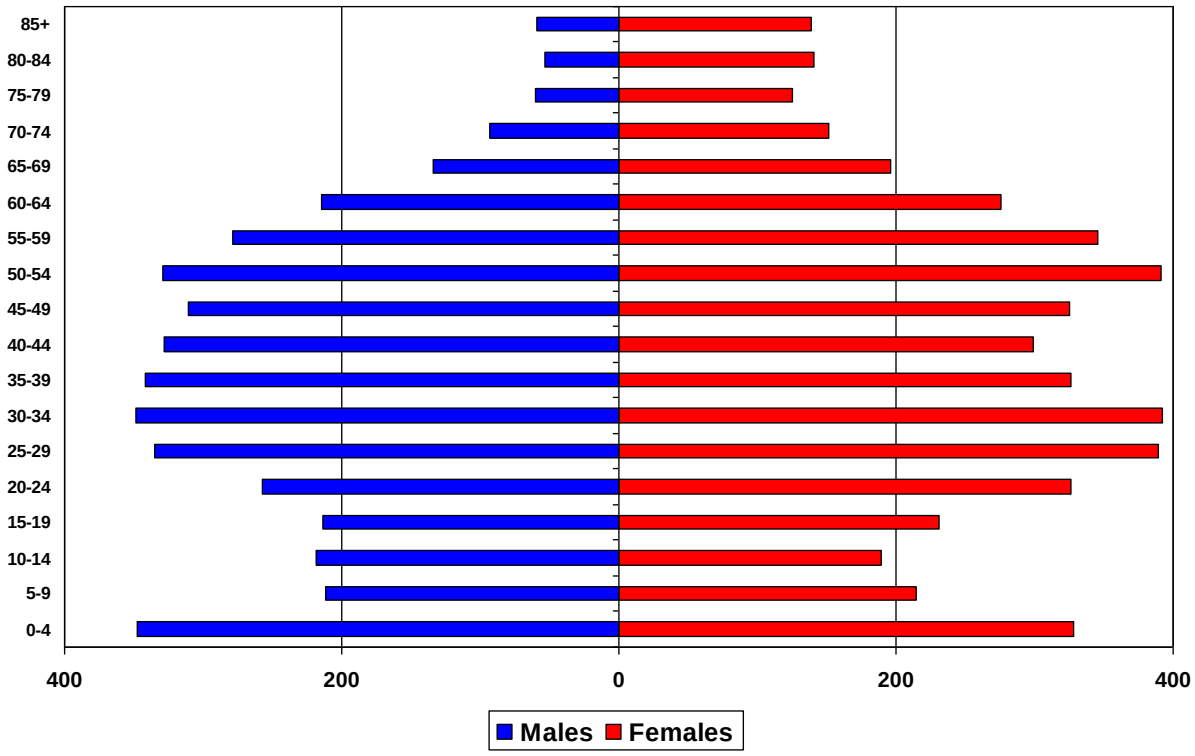
Summer Hill Elementary 2010 Census



Swansboro Elementary 2010 Census



Westover Hills Elementary 2010 Census



Woodville Elementary 2010 Census