Demographic School Analysis: Population Projections for the Plum Borough School District

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The present analysis will consist of three parts: (1) an initial analysis of demographic and economic processes impacting student enrollments, (2) the ten-year projections of students by grade and level and (3) the ten-year projections of student enrollment for the five elementary schools. Student enrollment has declined 9% in the last ten years, -4% in 2002-2007 and -6% in 2007-2012. At the elementary level, the change in student enrollment has been –3% (2002-07), -6% (2007-12) and -9% (2002-12), at the Junior High the enrollment change has been -5%, +1% and -4% for the same time periods and at the High School, it has been -4%, -8% and -11%. What is most likely in the future? We find that the most likely case has the elementary level stable, with a slight increase (+1%), but with the Junior and Senior High School enrollments decreasing by 10% each.

To arrive at these projections, we take a in-depth look at shifts in births, levels of in-migration and rate of new housing construction. We examine the changes that have occurred, including whether there have been shifts in the last decade or longer, and for births, in particular, we probe into the processes and structures underlying these shifts, also revealing likely directions in the future. Migration, in conjunction with changes in both births and new housing, is shown to be quite important. We examine net-migration of *i)* families with preschool children, *ii)* students at each educational level and *iii)* the general population by age cohort. We also look at the change in the rate of new housing construction and the current status of major housing developments in terms of their build out—how many homes have been built and how many are still left to be built in the future. A brief overview of the three parts of the analysis is given below.

I. An initial analysis with five overall themes—

(1) *Births*: we find decreases in the number of births in the last 3 five-year time periods: 1990-94 → 1995-99, 1995-99 → 2000-04 and 2000-04 → 2005-09. Equally important, the decreases are at a decreasing rate: -12%, -8% and -5%, respectively. Moreover, the births are now expected to level out and very likely will increase in the near future—in the last years of the projections for this study and in the years immediately following. Shifts in births, past and future, are linked to two fundamental demographic variables: *I)* shifts in the number of key reproductive age females—due to the Baby Boom, Baby Bust and Echo Boom and *ii)* shifts in fertility behavior—the first and second waves of delayed childbearing. Such changes are taking place throughout the United States, , Pennsylvania, Allegheny County and the Borough of Plum, as will be shown;

(2) *Net-migration*: we find that net in-migration is an important process at three levels: *i)* families with preschool children moving in; *ii)* families with school-age

children moving in and muting the enrollment decrease by almost 1/2 –the 9% decrease would have been 17% without families with school-age children moving in; and *iii)* the migration in the general population in the key reproductive ages—affecting the number of births;

(3) *The K--G12 Exchange*: we find that a substantial amount of the enrollment changes in each of the last two five-year periods is driven by the difference in the number of Kindergarten entrants and the number of Seniors graduating, which is a function of both shifts in births and cumulative net migration; the impact is rather striking;

(4) *Alternate Schooling*: there were relatively steady increases in charter/cyber charter enrollments from 2001 to 2010, with a leveling off at a much lower level (50-55 students) in the last two years. A rather stable number of students being home schooled over the last 8 years (16-22); and an unknown, but important number of private/parochial students, many of whom enter the Plum Borough School District at the Junior and Senior High levels (grades 7 and 9); and

(5) *New Housing*: we find that construction of new single family houses was at its peak in Plum Borough in 1992-94, with an average of 111 single family dwellings (SFDs) built per year. The second highest "period" was 1997-99 (98/year) and, if we add housing for seniors, then 1992-94 and 1997-99 were virtually equal at 117 and 118 per year. Perhaps more pertinent is the level of new SFD construction this past decade. Between 2003 and 2007, the average number of new SFDs built per year was 72 and for 2008-11, it has been 43 per year, a drop of 40%. Thus, new home construction is currently at 60% of its prior level before the housing bubble burst. This is still a substantial level of construction and thus the next issue is the amount of unfinished construction remaining in current and approved major housing developments, which we will explore.

The assessment of the above set of changes and processes is important in determining the nature of demographic modeling to use, in the selection of parameters for such models and in the interpretation of the underlying processes and the results.

II. Development and analysis of grade specific school district projections for the ten-year period, 2013-2022.

All projections use the most current four-year retention ratios and Birth to Kindergarten ratios. Retention ratios in these scenarios have a baseline level of "growth" embedded in them. The alternative projections consider different levels of births from 2011-2017. Given the current level of housing construction, the uncertainty as to when it will rebound, as well as the uncertainty of the level of the rebound (it would have to increase above the levels of 2003-2007 to have a direct impact above that embedded in the retention ratios), no scenario at present adds any additional direct effects of growth due to new housing.

III. Development and analysis of areal specific district student projections for the five (5) elementary schools over the ten year period, 2013-2022.

These projections use the most recent four-year retention ratios, and the specific elementary attendance area's births, distributed across the six US census tracts, as well as indirectly taking into account net-migration. These disaggregate projections also map to the more aggregate projections in Section II.

I. Initial Analysis

Five (5) major demographic and economic processes are examined with respect to projecting the expected shifts in student population in the Plum Borough School District (SD) over the next ten (10) years. The first major factor is expected number of births per year—currently at about 270/year. We expect that this level will continue to hold for the remainder of the decade rather than to continue to decrease. This assumption is based on our analysis of the shifting age structure for key reproductive age females. This stability will affect entering cohorts at the Kindergarten level, changing their current trajectory. A second factor of importance is an increase in the Birth-to-Kindergarten ($B_{t-5} \rightarrow K_t$) ratio. From 2000 through 2007, the B→K ratio was about .98, meaning that for every 100 births to Plum Borough residents, 98 Kindergarten students would subsequently enroll 5 to 6 years later. The most current B→K ratio is 1.033; hence, we expect 103 Kindergarteners to enroll per 100 births. The observation of a B→K ratio greater than 1.00 indicates that the third major factor affecting the number of expected students is the net in-migration of families with preschool age children. A fourth factor affecting the student population is the relative size of the Kindergarten and Grade 12 (senior), classes. At an overall school district level, we may think of the seniors as exiting and the Kindergarten enrollments as "replacements." Thus, once overall net-migration from all grades is taken into account, this "replacement" factor is an additional component in determining the overall student population. Over the last ten years, the cumulative difference between the Kindergarten and Grade 12 senior classes (K - G12) has been a difference of -727 students. Since the student population declined by only 395 students in the last ten years, the 332 additional students were in-migrants, including parochial entrants. Which bring us to the sixth factor affecting the in-migration of families with school age children—new housing construction. The level of housing development has been considerable over the last twenty years, and most importantly, the rate of construction was considerable until 2008. However, due to the bursting of the financial and housing bubbles, new housing construction is now at 60% of the level before the bubbles burst. The continuation of such new housing remains important, however in another respect—in attracting families with preschool children. That is, even with lags in residency and enrollment in Kindergarten or Grade 1, the arrival of families with preschool children has yet to conclude in terms of additional students.

The analysis to follow, preceding the student population projections, is important both in terms of determining the nature of the demographic modeling to use and in the selection of parameters for such models. The analysis is also important in the interpretation of the underlying processes involved in the derived projected enrollment. We begin by taking an in-depth look at the demographic side of the process—fertility and migration.

Fertility

An End to the Decrease in the Number of Births

Table 1 provides the number of births by year over the last thirty-one years. In 1980-84 and 1985-89, the average number of births was 380 to 385 per year. However, since 1990, the number of births has continued to decrease every five years. In1990-94, the average number of births was 351 (-8%), decreasing to 310 in 1995-99--a decrease of 41 per year (-12%). Then, from 1995-99 to 2000-2004, the rate of decrease was less, averaging 25 per year or -8%. Similarly, the transition from 2000-04 to 2005-09 also showed an additional drop in the rate of decrease--now -14 per year or -5%. The continued decreases in the rate at which births are dropping and tending toward zero is one observation that we take into account. A second is the expected replacement of Baby Bust age cohorts with larger Echo Boom age cohorts in their twenties and subsequently in their thirties—both being key reproductive age cohorts responsible for most of the births in the United States. As we will show in the analysis to follow, there are fundamental reasons to expect a change in the trajectory of births—at a minimum to a rather stable number of births, no longer decreasing or to a total reversal, beginning to increase. Thus we will look more closely at the shifts in the number of births and the processes underlying these shifts.

Relative Impact of the Different Age Cohorts: Delayed Childbearing

Table 2 reveals part of the nature of the shift in births—delayed childbearing. Note that the "Total Birth" column is the same as in Table 1 and

Table 2A provides the number of births per age cohort for these 31 years. Here our concern is to address the relative impact of the different age cohorts. At the top of Table 2, in shaded color, one can see the dominance of the 25-29 age-cohort, having 40 to 50 percent of all births. This is followed by the 20-24 and 30-34 age cohorts, which are pretty comparable, at 20-25% of total births. Births to teenagers are roughly equal to those in their late thirties. Looking at the shading in the middle and bottom of Table 2, the age cohort 30-34 is about equal to the 25-29 age cohort by the early nineties and becomes the dominant age cohort by the late nineties and throughout the 2001 to 2010 decade (with the exception of one year. Equally significant, the proportion of births to the age cohorts in their late thirties is now no longer comparable simply to those in their teens, but the proportion of their births is now generally larger than that of both of the cohorts in their teens and early twenties (15-19 and 20-24). By 2000 in Plum Borough, there are now four key reproductive age cohorts, adding the 35-39 age-cohort to the three younger age cohorts. Births to the age cohorts in their early forties (40-45) are also now about equal to those in their teens (15-19). The initial shifting of the most births from 20-24 to 25-29 and the increases in the births of the 30-34 age cohort, partially displacing the cohort in their early twenties may be thought of as the first wave in delayed childbearing. The second wave corresponds to yet further increases in the proportion of births to cohorts in their late thirties (35-39) and early forties (40-44), with yet further decreases in the proportions of births to age cohorts in their teens and early twenties. Both the end of the first wave of delayed childbearing, and the emergence of the second wave are shown by the data in Table 2. We will see further evidence of the shifts in delayed childbearing as we examine the impacts of major shifts in the age structure.

Relative Size of the Different Age Cohorts: Baby Boom, Baby Bust and the Echo Boom

A second story emerges if we take a closer look into the nature of the shifts in the number of births by age in Table 2. More specifically, can we identify the structures or processes underlying the shifts in the number of births in Tables 1 and 2? To begin to do so, we need to take into account the number of reproductive age women in different age cohorts, since the baby boom and baby bust periods have resulted in considerable oscillations in the number of women in the prime childbearing years. To be more concrete, at the peak of the baby boom (1957) the Total Fertility Rate[a] was 3.8, while at the trough of the baby bust (1976) it was 1.7, less than 1/2 that of the baby boom peak. Thus, the number of reproductive age females is much larger if they were born in the baby boom years and reciprocally, much smaller if they were born in the baby bust years. If fertility rates of these cohorts of women were the same over time, then the number of expected births would vary considerably, with more births to baby boom mothers and fewer births to baby bust mothers. This is at least part of explanation for the shifts in births, in terms of where in the age distribution to expect increases or decreases in births. It is also pertinent for expectations regarding future levels of births since we are currently beginning to see Echo

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[a] The Total Fertility Rate (TFR) is the average expected total number of children that a woman will have under the current age-specific fertility rates.

Boom cohorts, which are larger than the baby bust cohorts, take center stage in the key reproductive ages. We will explore these points in more depth below.

To what extent are the decreases in births due to the shifting age structure of reproductive age females? We will initially examine this question in three parts, examining the shifts in each case. We first look at shifts in the reproductive age female population. We then compare the shifts in the number of births. And, finally, we juxtapose the two sets of shifts in terms percentage changes, enabling one to assess the extent to which the shifts in the number of reproductive females maps to the shifts in births. Table 3 provides the data for the shifts in the ***reproductive age female population*** between 1990 and 2000 for the overall school district. Table 4 does the same for the shifts between 2000 and 2010. Between 1990 and 2000, the only increases in the reproductive age female cohorts in the school district were for women in the late thirties and early forties. As may be seen in the percentage changes at the bottom of Table 3, all three of the key reproductive age cohorts (20-24, 25-29 and 30-34) had substantial decreases in the number of women, with percentage changes of -32%, -30% and -18% for the 20-24, 25-29 and 30-34 age cohorts, respectively. In Table 4, for shifts between 2000 and 2010, we find increases in only one cohort, that of women in their early twenties. As may be seen at the bottom of Table 4, the 20-24 age-cohort increased by 20%, but now there are large percentage decreases by women in their thirties—both the 30-34 and 35-39 age cohorts, with a drop of 31% each, and a drop in the number of women in their early forties (40-44) of 15%.

In Table 5, we summarize the percentage changes in the **number of reproductive age females (NRAF)** between 1990 and 2000 and between 2000 and 2010. The upper quadrant of Table 5A provides a summary of the changes in the number and percentage of ***births*** by age cohort between 1990-94 and 2000-04--pertinent for the 1990 and 2000 cohort populations in Table 5. The lower quadrant of Table 5A provides the data for the shifts in births for the 2000 and 2010 cohort comparisons. Technically, the births in each five-year interval are produced by two five-year age-cohorts—the one aging into the age group and the one starting at that age grouping and aging out of that age group as the five years unfold. For simplicity, here we utilize only one cohort. For the 1990 and 2000 cohort comparisons, we follow them forward and compare births from 1990-94 and 2000-04. Thus, it is the cohort aging out of the age bracket that is the pertinent age cohort. For the 2000 and 2010 cohort comparisons, this is not possible since the births from 2010-14 have not all yet occurred. Hence, we will trace them backward and compare births from 1995-99 and 2005-09. The pertinent age cohort in this case is the one aging into the age bracket. As may be seen in the upper quadrant of Table 5A (last column), there were large percentage decreases in births in all age cohorts below age 35 (-15% to -40%). In contrast, the two older cohorts, ages 35-39 and 40-44, experienced sizable percentage increases in the number of births. In the lower quadrant of Table 5A, there are percentage decreases in births for all of the age cohorts but one (35-39), with it having an increase less than 1%. The magnitude of the decreases in births is greatest for the 15-19, 25-29 and 30-34 age cohorts, ranging from 15% to 18%.

In Table 5B we juxtapose the two sets of percentage changes shown in Tables 5 and 5A. The point in question now is whether the direction and relative magnitude of the changes in the population of reproductive age women map to the changes in the number of births; if not, this indicates a change in fertility behavior--a behavioral change beyond the shift in numbers of women. Additionally, the sign of the percentage differential in column C indicates the direction of the fertility change—increased fertility or decreased fertility. When the signs and sizes of the percentage changes in columns A and B are similar in Table 5B, then the shift in the number of births is largely due to changes in the number of reproductive age women in that age cohort. This particularly appears to be the case in the upper quadrant of Table 5A for the 30-34 age cohort. Births dropped 15% and the number of women dropped by 18%. If we interpret column C as the relative magnitude and direction of a fertility change, then the change in NRAF and the change in fertility may be partitioned into their relative impacts and in this instance it is the change in the number of women that accounts for almost 90% of the observed drop in births for this cohort (Using absolute values for the proportions in columns B and C, the sum is .202 and the relative share is .178/.202 = .88 and .024/.202 = .12 for Δ in NRAF and Δ in fertility, respectively). Similarly, most of the drop in births for the 20-24 and 25-29 age cohorts in the upper panel of Table 5A is due to a Δ in NRAF--68% and 74%, respectively. In contrast, most of the shift in births in the older cohorts (35-39 and 40-44), as well as that for the teenage cohort is due to Δ in fertility—in the teen case a decrease in fertility (negative sign in column C) and in both older cohorts an increase in fertility, as indicated by the positive sign of the term in column C. In these three cases, the change in fertility behavior accounts for about 90% of the change in the number of births and the impact of delayed childbearing is evident in both bookends—the decreased fertility in the age cohort 15-19 and the increased fertility in the age cohorts 35-39 and 40-44.

In panel II of Table 5B (the lower quadrant), the main effects of the Δ in NRAF are for the oldest cohort (40-44) and the 30-34 cohort, where 70% to 80% of the shift in number of births is accounted for. For the teens and the 25-29 age cohorts the Δ in fertility is responsible for about 75% to 80% of the shift in births. For the two remaining cases—the age cohorts 20-24 and 35-39--the impacts for Δ in fertility and Δ in NRAF are about 50/50, or relatively equal. Thus, overall we conclude that both processes are operative—there are large drops in the number of women in three of the four key age cohorts in the upper panel of Table 5B accounting for most of the drop in the number of births by these women and there is delayed childbearing, including the second wave, into the late thirties and early forties. As shown in the lower panel of Table 5B, Increases in fertility in the both age cohorts in their thirties, substantially muted the large drops in the number of women at these ages between 2000 and 2010.

Here we note that the Baby Bust cohorts are important in both the 1990s and in the most recent decade. They were key cohorts in their twenties when births initially decreased from 1990-94 to 1995-99 and they are key cohorts in their thirties when the impact of delayed childbearing continued into the 2000-09 period and muted the large decreases in their number. We will now look more closely at the shifting age structure and how it relates to the discussion above and to likely shifts in births in the future.

Baby Boom, Baby Bust and the Echo Boom: United States, Pennsylvania, Allegheny County and the Borough of Plum

Before continuing, we will offer somewhat more context for the changes in the number of reproductive women. What is going on? Are the drops and increases in the population of the key reproductive age cohorts peculiar or specific to the Plum Borough School District? To Pennsylvania in general? Or is this a more general phenomenon in the United States? Table 6 provides data for the United States, Pennsylvania and Allegheny County for five-year age cohorts from ages 0 to 44. More detailed data on the age distributions for Pennsylvania, Allegheny County and Plum Borough, with explicit delineation of the Great Depression, Baby Boom, Baby Bust and Echo Boom cohorts is provided in Tables 6A, 6B and 6C. The data for Table 6 extend from 1990 to 2010. At the national level, there were drops in the 20-24, 25-29 and 30-34 female age cohorts between 1990 and 2000 (See Change by Age Cohort Across Time panel—lower quadrant of Table 6, page 1). This represents a shift from the baby boom to the baby bust due to changes in fertility levels as noted earlier--from total fertility rates, where on average, mothers had 3.8 children in 1957 to 1.7 children in 1976. The low point in fertility rates in the mid-1970s is referred to as the baby bust. To illustrate, there were 21.3 million children born between 1956 and 1960, at the height of the baby boom and 16.3 million births between 1971 and 1975 the onset of the baby bust, a decrease of 5.0 million births and a drop of 23%. Equally important, in 1990, the four five-year baby boom cohorts (born in 1946-1965) occupied three of the key reproductive age cohorts (25-29, 30-34 and 35-39, as well as the oldest reproductive cohort (40-44). In contrast, by 2000, the baby boom occupied only the two older reproductive cohorts and the two five-year baby bust cohorts (born in 1971-d80) were beginning to take center stage, occupying both key twenty-year-old cohorts. (See the shaded age cohorts in Table 6.) A third key reproductive cohort, age 30-34, was held by a medium sized cohort born between the baby boom and the baby bust (1966-1970). Three of the key reproductive age cohorts were smaller than their predecessors in 1995, as well as the prior age cohorts in these age ranges in 1990. Thus, a main key to understanding the declines in births from 1990-94 to 1995-99 and the continuation at the lower level of births from 1995-99 to 2000-04 is in recognizing the "age band" that the baby boom and baby bust cohorts occupied—nationally, in Pennsylvania and in Allegheny County, as well as in the Plum Borough School District. In short, much of what is being observed in the Plum Borough School District between 1990 and 2010 is a national process as well. We will attempt to delineate where the local (Plum) processes and age structures are similar and where they are distinct from those of the county, state and nation. The baby bust children have matured to key reproductive ages and they have far fewer numbers than the prior baby boom cohorts. Even with national level legal immigration of almost a million per year since 1990, the transition from the baby boom to baby bust process is still dominant and observable at the national level in the key reproductive age cohort shifts between 1990 and 2000. By 2010, the relatively small female baby bust age-cohorts 30-34 and 35-39 may still be observed in Table 6. For instance, in the upper quadrant of Table 6, the smallest age cohort between the ages of 10-14 and 40-44 is the 30-34 baby bust cohort, with 9 million 966 thousand persons. As the baby bust cohorts aged into the 30-34 and 35-39 age groups, we can see in the lower panel of Table 6 that there are population decreases of -2% and -11%. The same observations hold for Pennsylvania and for Allegheny County, when looking at the relative size of the age cohorts in the upper part of Table 6 and in terms of the population decreases in the lower panel of Table 6 (only the percentage changes are greater). The age cohort shifts in the Plum Borough School District most closely parallel those of Allegheny County, in terms of the direction of change in age-specific cohorts For example, compare the shifts between 1990 and 2000 in the 20-24 and 25-29 age cohorts in the lower panel of Table 6 to those in Table 5 for the school district: -20% and --28% for the county and -32% and -30% for the borough. The same type of observations can be made for one of the twenty year old cohorts (20-24) for 2010 and for the shifts between 2000 and 2010. That is, in this case we observe a larger 20-24 Echo Boom cohort in 2010, which has replaced the 20-24 baby bust cohort, resulting in an increase in population for the 20-24 age-cohort, as the population ages from 2000 to 2010. At the county level, the increase is 19% and at the borough level it is 20%. The 25-29 Echo Boom cohort is also a larger at all levels above the borough, but not for the borough. For example, at the county level the increase is 10%, but at the borough, there is a decrease of 3%. This is pertinent for the basis of any expected increase of births in the future. That is, in general (eg, county, state and national levels), the 2010 age cohorts in their twenties are the leading edge of an increase in the number of reproductive age women and are pivotal to a reversal in the number of births. They are not the only major factor, however. The other main factor is the impact from delayed childbearing of the cohorts age 30 or above. Here, for the shift between 2000 and 2010, the baby bust continues to carry an impact—a decrease in the number of women now in their thirties and here the county and borough are once again largely in sinc, with decreases of 16% and 30% for the county and decreases of 31% for both age cohorts in the borough. In the prior discussion above regarding delayed childbearing, we found that increased fertility in the thirties totally muted the drop in numbers of women in the 35-39 age cohorts and substantially reduced the impact of reduced numbers in the age cohort 30-34. Thus, we reiterate that both factors must continue to be considered when setting expectations for the level of the number of births in the future. A further note here regarding the Echo Boom is that it is expected to have an additional one to two age cohorts to follow. Thus, these increases are expected to continue, having longer term implications for the level of future births. In short, the decreases in births over the past twenty years in the borough are strongly related to the shifts in the number and specific ages of the reproductive age women. And, these shifts in demographic age structure are part of a national, as well as a regional and local, set of shifts tied to at least one familiar term—baby boom—and now, by two less familiar terms—baby bust and echo boom. All municipalities and schools in the United States are embedded in these demographic processes. The distinctions revolve around the extent to which migration modifies these basic population distributions at the particular geographical level.

Before pursuing migration, we will briefly take a look at the Total Fertility Rate (TFR) in the United States. We do so for two reasons. First, the shifts in these TFRs have been largely responsible for the oscillations in the population age structure that we have just discussed. Second, for white and, more recently for white, non-Hispanic women, the TFRs have been remarkably stable for the past 35 years. Such stability then enables one to focus on the shifts in the number of reproductive women by age to better understand the shifts in the number of births, and to potentially better incorporate such insights into forecasts of future births—at a minimum, in terms of direction, if not magnitude. The Total Fertility Rate for the United States from 1917 to 2007 is given in Table 7. The dark shaded years denote the baby boom (1946-1965) and the lighter shaded years denote the baby bust (1971 to 1980). In Table 7, we may also observe that the peak of the baby boom occurred in 1957 with a TFR of 3.77 and that the trough of the baby bust occurred in 1976 with a TFR of 1.74, as discussed earlier. Here, we may also note from Table 7 that the TFR of 1.74 is the lowest TFR between 1917 and 2008, including the TFRs of the Great Depression. Similarly, the highest TFR between 1917 and 2007 is the TFR of 3.77. Hence, these fertility measures denote the two most distinct fertility points of the past century. Additionally, they are embedded in the most distinct streams of fertility surrounding them, with an entire set of years of relative high fertility and relative low fertility. It is these pivotal streams that are impacting school enrollments nationally, as well as in Pennsylvania, and certainly Allegheny County today, half a century away. They will continue to do so, as well, into the future.

Total Fertility Rate

Table 8 provides the TFRs for white and white, non-Hispanic females from 1970 to 2007. One of the most striking aspects of these data is the range of the TFRs from 1972 to 2007 for the white, and where it is possible to discern, the white, non-Hispanic females. For 35 years these TFRs have been in the 1.7 to 1.9 range, meaning that they are, in fact, very stable. In effect, we can treat them as constant. Thus, even with delayed childbearing, the total number of children that a woman is expected to have is the same—only the age has shifted. The delayed childbearing effect is a one- or two-wave impact and will not recur unless there is a return to more births at lower ages. Thus, once the delayed childbearing effect is complete, the main driver for the number of births, given the stability in the total fertility rates, will be the number of reproductive age women. This can change in two ways—(1) from large scale shifts in the reproductive population, as, for example, the baby boom and baby bust and (2) from net migration—in this case largely from new jobs, new housing or the relative attractiveness of the area, including the quality of the school district, in the case of in-migration, and lack of jobs and/or quality of the schools, in the case of out-migration. It should be noted before continuing, that given the stability in the total fertility rate for whites, we may expect in both the short-term and the more long-term, future echo booms and echo busts, as the oscillation in the relative size of the birth cohorts already born dampens down. Certainly one of the mechanisms for change noted above is occurring in the Plum Borough School District—shifts in the number of reproductive age females, as shown in Tables 3 and 4 and as implied in the data for Allegheny County in Table 6.

Net-Migration

We now turn to the issue of migration, and in particular to its relative magnitude. For the net migration of students from Kindergarten through Grade 12, we use an accounting system based on a hypothetical or counterfactual case. What we refer to here as "net migration" pertains to all entries and exits. Thus, we are using the term "migration" in a very restricted sense—migration into or out of the Plum Borough School District student population. Actual migrants into the school from outside the school district—whether from other parts of either Allegheny County or other parts of Pennsylvania, or other states, or even from overseas, are in the count, but not distinguished from one another. From the numerical enrollment data alone, we have no information on source of origin of the mover. The same holds for actual migration out of the school district—we do not know the destination. Additionally, we do not know the type of move if it is a local one. For example, a dropout at the high school level is certainly an exit and a second grader who did not attend the first grade in the Plum Borough School District is an entrant. Both are counted as "migrating" out of or into the school. In short, "net migration," as used here refers to the difference of all exits and all entrants to the Plum Borough School District. This "net migration" can be obtained using only enrollment data. Below, we will briefly describe the method. Initially, we will illustrate the method with the total Plum Borough School District. We may also apply the method at each level—elementary, Junior and Senior High school levels. We will only discuss the summary outcomes of these more detailed results, but the tables are in the Appendix (Tables A1-A3). First, we momentarily assume the counterfactual case of "What if no one migrated?" Then, the change in the student population (C) would be totally determined by the difference in the sizes of the Grade 12 graduates exiting at the end of year t-1 and the size of the Kindergarten class entering in year t. That is, $C=K_t-G12_{t-1}$. Second, we compute the actual change in overall enrollment, denoted by E, where E=(Total Enrollment in t) - (Total Enrollment in t-1). Now, denote "net migration" as F. Then, E=C+F or F=E-C. Table 9 provides these data and outcomes for the Plum Borough School District from 2001-2012. We will first illustrate the process by describing a single year and then we will discuss the overall results. For 2009-10 (Table 9, columns A and B and row t=2009-10; see footnote to the table), 380 seniors from the 2008-09 year exited, while 294 new students entered Kindergarten (column A). Thus, with no migration the student population would decrease by 86 students. ($\otimes_1$ column C). The actual enrollment change was -29 (Column E--the $\otimes_2$ column is shown as the difference in the population at t minus the population at t-1). Therefore, "net-migration" here is positive (more entrants than exits), and is +57 (the Net Migration Column F, which is (E-C) or [-29 – (-86)] = +57). That is, 57 more students entered the school partially offsetting the decrease of the 86 students who were in the K-G12 Exchange. A summary of the net migration is given at the bottom of Table 9. In the last 5 years, without migration, enrollment would have declined by 399 students (last row, column C), but the actual decline was 241 (last row, column E) due to the net in-migration of 158 students (last row, column F). Migration was somewhat more important in the prior five-year period, 2000-2004 (See the next to last row, columns C, E and F, numbers in parentheses.). In this 5-year period, enrollment would have declined by 328 without the net in-migration of 174 students. Hence, the actual decrease in enrollment was cut by just over one half. Over the last decade, the total student enrollment has declined by 395 students (-9%). Without the net in-migration of 332 students, the decline would have been 727 or -17%. Net in-migration cut the decrease by 46%.

A summary of the impact on enrollment of both the net migration and the K-G12 replacement processes is provided in Table 9A. Also, a summary of the net migration by educational level is shown in Table 9B. The average yearly net migration by level is also indicated.

A second view into net-migration provides additional insight into what to expect in the next five years. By comparing the census count for children less than five years of age in 2010 to the births in the last five years (2005-09), we can ascertain the net-migration of families with preschoolers. These data are shown in the upper quadrant of Table10. Overall, for this five-year period, there is a net in-migration of 93 preschoolers or +19/year. Data for the prior decade and years 1995-99 indicate an even higher level of net in-migration—147 preschoolers or 29/year. Perhaps what is most important is that in both time frames, there is a considerable amount of net in-migration of families with preschoolers. A third look at net-migration involves retention ratios, to which we now turn.

Retention Ratios and Birth to Kindergarten Ratio

In this analysis we will use retention ratios as a baseline for projecting the changes in student population. The annual "retention ratios" shown in Table 11 are averaged over four years to increase the reliability of the estimates. "Retention ratios" have an element of growth embedded in them since they may be above one (1.0). Thus, for instance in Table 11 nine of the twelve retention ratios are greater than 1.0. At Grade 1 to Grade 2, the ratio is 1.014, and at Grade 5 to Grade 6, Grade 6 to Grade 7 and grade 8 to Grade 9, the ratios are 1.016, 1.025 and 1.038, respectively; the latter two, and possibly the later three, reflecting the movement of parochial students into the school. Retention ratios over 1.0 capture part of the growth stemming from housing construction, as well as net in-migration into the district, but they do so indirectly. That is, these ratios are not true "retention/survival rates" of the students in the origin grade or they would necessarily be less than or equal to 1.0. Rather these ratios capture retention of current students, replacements for any students who leave (if ≥1.0) and in-migration of students whose families move into the district, whether into new or existing housing. Thus, while they do not directly relate the specific underlying processes affecting the students, they reflect such processes indirectly. Hence, we refer to those retention ratios as entailing "embedded growth." Presently, we will denote such growth as a result of net in-migration, including movement into new housing, and, were that necessary, to separately treat any remaining direct effects of housing construction. Note also that in the last row of Table 11, we estimated an annual four-year average Birth-to-Kindergarten ratio. This B→K ratio has continued to increase from about .98 in 2000-03 and 2004-07 to 1.033 currently. That is for every 100 births to residents of Plum Borough, five to six years later 103 students enroll in Kindergarten in the Plum Borough School District. These results are also consistent with the prior discussion on net-migration.

The last look at migration involves the general Plum Borough population, with particular attention to age cohorts 0-4 to 40-44. We first return to Tables 6A, 6B and 6C, involving Pennsylvania, Allegheny County and the Borough of Plum. The data for the United States for ages 0-4 to 40-44 are in Table 6. Note, in each of the Tables 6A,B and C that the Great Depression cohorts, the Baby Boom cohorts, the Baby Bust cohorts and the Echo cohorts are specified. Additionally, the three largest Baby Boom cohorts have a darker shade and the two Baby Bust cohorts have a lighter shade. It is clear from comparing the relative sizes of these cohorts that the Baby Boom cohorts are much larger than the Baby Bust cohorts. For example, in 2000 in Table 6A for Pennsylvania, the Baby Boom cohorts number in the 900 thousands and the Baby Bust cohorts number in the 700 thousands. In Allegheny County, in Table 6B and 2000, the comparable populations are 96,000-105,000 and about 76,000. Similarly, in Table 6C in Plum Borough, for 2000 the Baby Boom cohorts have populations of

2,000 to 2.500 and the Baby Bust cohorts have 1,100 to 1,600. Finally, if we compare the Baby Bust cohorts to the cohorts of the Echo Boom, the Baby Bust cohorts are much smaller in 2000—at the state, county and borough level. The anomalies are the 20-24 and 25-29 age-cohorts in Plum Borough in 2010—for the cohorts of the Baby Bust and Echo Boom. The Echo Boom cohorts are not larger in the borough. This is not true at either the state or county level in 2010, nor is it true in Plum borough in 1990, as may be seen in Table 12. In each of these cases, the Echo boom cohorts are larger than the cohorts of the Baby Bust. It is important to emphasize that while the Echo cohorts at the larger geographical level is considerably larger than the Baby Bust cohorts, they are still not as large as the cohorts of the Baby boom. Rather, the Echo boom cohorts are in between—a more modest or moderate "boom". So, what's the story here? It is largely one of migration, notably out-migration. We take as our baseline the county and examine two processes—cohort replacement and net-migration, both of which may be obtained by comparisons of the age groups at two points in time; for instance 2000 and 2010. Think of the population in an age cohort as a plate with a given thickness (the same thickness for all plates), but having a width proportional to the number of people in that age cohort. Then, cohort replacement refers to the process where an age cohort of a given age (eg. 20-24) at time t is replaced by another cohort of the same age (eg. 20-24) by time t+10. For example, in Table 6C for Plum Borough in 2000, the population for ages 20-24 was 1,113 (a Baby Bust cohort). By 2010, the new cohort now 20-24 has a population of 1,366 (this is an Echo Boom cohort). The 20-24 Baby

Bust cohort in 2000 is replaced by the 20-24 Echo Boom cohort of 2010. The cohort replacement process involves replacing the 2000 20-24 age-cohort "plate" with the 2010 20-24 age-cohort "plate". In this case, the population 20-24 grew by 253 (1,366 – 1,113). Much of the discussion in prior subsections dealing with Baby Bust cohorts replacing Baby Boom cohorts involved this process, as a population ages and younger cohorts replace older ones in the age structure. From the same data with the age "plates" at two time points, we may also deduce the net migration by comparing an age cohort (eg 20-24) at time t with the age cohort (eg 30-34) x years older at time t + x; in this case comparing 20-24 year olds in 2000 with 30-34 year olds for the same population (eg. Plum Borough) in 2010. From Table 6C, we have the same initial population age 20-24 of 1,113, which as it ages 10 years, by 2010 now has a population of 1,497. Without migration, or other forms of attrition (eg. death—which at this age group is quite low and assumed for our purpose here to be zero), the population would remain 1,113 by simply aging 10 years. However, it grew by 384 due to net in-migration. The overall county data for 2000 to 2010 is shown in Table 12A. Net-migration is positive in three age cohorts: 15-19, 20-24 and 25-29; otherwise, it is negative. In Table 12A, one may also see a key cohort replacement as the Baby Bust cohorts move into the 30-34 and 35-39 age "plates", with decreases of 14% and 28%. In Table 12B, the data for Plum Borough for years 2000 and 2010 are given. The case of *cohort replacement*, involving the age-cohort 20-24 discussed above, may be observed here, with a net population gain of 253. In contrast to Allegheny County's age bands for *net in-migration*, in all three of the

15-19, 20-24 and 25-29 age cohorts in Plum Borough, there is *net out-migration*. For the 20-24 age-cohort, this out-migration is substantial (-31%). In this case, we are comparing the 10-14 age- cohort in 2000 to the 20-24 age cohort in 2010. The migration over this decade involves teens, including the late teens and young 20's and such out-migration accords with "moving out of the nest" and going to college or getting a job, or getting married. For almost a third of the population in this cohort, it means "moving out" of the borough—at least during this age band. Again, in contrast to Allegheny County, in Plum borough there is net in-migration by both cohorts in their thirties, with substantial in-migration for the 30-34 age cohort (+35%). These in-migrants are moving in during their twenties and early thirties. How stable are these patterns? For the cohort replacement process, the "pattern" is cyclical, meaning that it is a function of the underlying age structure with its oscillations involving the Baby Boom and Baby Bust and their "echos". This is a process that will dampen down each generation, but it will be with us for at least another generation or two. For net-migration, it is less analytically resolvable, so we will approach it empirically. We also have data for the prior decade. Is it comparable for the net-migration process? The data are shown in Table 12C in the next to last column. The "pattern" is remarkably stable. Though the percentages are by no means identical, they are reasonably close, within 5% in all but one case up through age 40-44 and even in the exception, the relative magnitude of the in-migration is in line with that in the subsequent decade, 2000 to 2010. Remarkably, comparing the amount of net-migration of the two tables for Plum Borough (Tables 12B and

12C),, both have net out-migration in the low 600's for ages 20-24 and net in-migration of nearly 400 for ages 30-34, in spite of the differing age structures involved. It would seem that, at least for now, the net migration patterns are fairly stable throughout the childbearing years, providing another element informing expectations as to the future level of births.

Alternative Schooling

We now turn to enrollment by children of Plum Borough residents in alternative schooling—charter/cyber charter schools and home schooling. Data for private/parochial schools is not available. The student enrollment in these alternative schools is given in Table 13. There were relatively steady increases in charter/cyber charter enrollments from 2001 to 2008, with a leveling off at a much lower level (50-55) in the last two years. Enrollment in charter/cyber charter schools peaked at 85 in 2008, decreased to 70 in 2009 and has been 54 and 53 in 2010 and 2011. There has been rather stable number of students being home schooled over the last 8 years (16-22). The combined enrollment in these three types of schooling peaked in 2008 at 101 students and in 2011 there was an enrollment of 74 students. These enrollments are equivalent to 2.4% (101/4207) and 1.8% (74/4048) of the corresponding Plum Borough School District enrollment—a quite small population of students. Additionally, perhaps the most important aspect here is the leveling of, and even decrease, in the charter/cyber charter student enrollment. Given the unknown private/parochial student enrollment, this subsection is necessarily incomplete. The importance of such students and the enrollment trajectories, particularly at the elementary level, may become more important if the pipeline for entry to the Plum Borough School District from private/parochial schools is decreasing, as has been observed in other school districts.

Housing Development

Lastly, we take a look at housing development over the last twenty-four years (1989-2012). The importance of this segment of the analysis is that, should we find sufficient housing development, then we can go beyond the indirect effects of retention ratios and also take into account the direct effects of housing. Data were collected from the Borough of Plum, once again with utmost cooperation. We have collected the building permits by year and major development, as well as for homes not in such housing plans. Table 14 provides the number of new home residential building permits by year from 1989-2012. We also show the total building permits with and without those for senior citizens. As may be seen in Table 14, the construction of new single-family housing was at its peak in Plum Borough in 1992-94, with an average of 111 single family dwellings (SFDs) built per year. The second highest "period" was 1997-99 (98/year) and, if we add housing for seniors, then 1992-94 and 1997-99 were virtually equal at 117 and 118 per year. Perhaps more pertinent is the level of new SFD construction this past decade. Between 2003 and 2007, the average number of new SFDs built per year was 72 and for 2008-11, it has been 43 per year, a drop of 40%. Thus, new home construction is currently at 60% of its prior level before the housing bubble burst. This is still a substantial level of construction and thus the next issue is the amount of construction that is "in the pipeline"—that is, number of housing units remaining in current and approved major housing developments.

Table 15 shows the major housing developments with homes remaining to be built. There are nine such major housing developments, but one (Briarwood), with 20-25 lots remaining, has been inactive for about 5 years. This leaves 8 major active plans. Four of these eight have only 11 homes left to be built, leaving four plans with over 5 homes to be built: Green Valley Estates (9 left), Chavelle Estates (14 left), Colonial Point, a new plan which has yet to begin construction, but is expected to do so shortly (36 lots) and The Highlands (63 housing units, not all SFDs). The total number of homes remaining to be built in these 8 plans is 133 housing units. Adding Briarwood makes the total 158. Without several other major housing developments coming on line, we do not expect to see an additional direct impact on student enrollment from housing. Recall that there is already an indirect effect taken into account in the retention ratios—when they are over 1.0; we do not know whether such new arrivals are in new homes or existing housing stock, but certainly some are in the newly built homes and new housing has played an important part in attracting families with children and young age cohorts, as evidenced in the net in-migration shown in Tables 12B and 12C. For there to be a direct housing impact on student enrollment beyond that already embedded in the retention ratios, new housing construction would certainly have to equal or surpass the 2000-2007 baseline of 71 homes per year and the direct impact would pertain to the additional homes above the 71 baseline.

Presently, that does not appear likely and therefore we conclude that at present there will not be an independent, direct housing impact.

In summary, we have examined several major demographic and economic effects to take into consideration in making our projections. We have looked rather deeply into the shifts in births and fundamental reasons for these shifts, including large changes in the female age structure in the childbearing years and changes in the timing if fertility, with two waves of delayed childbearing—into the early thirties and then into the late thirties and early forties. Given the extremely constant level of fertility, in terms of number of children per mother—at least for non-Hispanic white females the TFR has been stable within a very narrow range of 1.7-1.9 for the last 35 years—this places great weight on the number of reproductive age females. The impact of the Baby Bust cannot be overlooked in playing a major role in the decreases in the number of births, but it's impact is drawing to an end and it is being replaced by the Echo Boom—which should reverse the trajectory for the number of births. In our projections, we will consider an end to the decline in the number of births , as well as modest increases, reversing the trajectory from a negative one to a positive one—with this scenario linked directly to the Echo Boom. We will also consider the more unlikely case of a continuation of the decrease in births to set the lower limit on the projections, even if it is not as likely. We have also examined the level of net migration of families with preschool children and school age children. Migration is taken indirectly into account with the use of retention ratios and Birth-to-Kindergarten ratios over 1.0. Migration is expected to continue to play a role in how important the Echo boom will be in the school district—whether further depleting the large Echo Boom cohorts in their twenties or increasing their number in the thirties. Housing construction in the borough is continuing at a steady rate, but since 2007 it has decreased by 40% and is thus presently only operating at 60% of its prior level, meaning that it is not feasible to expect a direst impact from housing beyond that embedded in the retention ratios. Presently, such impacts are embedded in the retention ratios and the B→K ratio. We will incorporate such embedded effects in the projections and analysis to follow. Moreover, for the projections for the individual elementary schools, the factors must also be broken down geographically and mapped to the appropriate attendance areas. We will discuss these aspects as the details of the projections are presented.

II. Development and Analysis of Grade-Specific School District Projections for the Ten-Year Period 2013-2022

Scenario I: Projections with Fertility, Aging and Embedded Growth

The Scenario I projections use the following:

1. 2012 observed student populations per grade;
2. 2008-2011 four year retention ratios (Table 11) based on beginning of year school enrollment for 2008-2012;
3. Expected Kindergarten enrollment mapped to a four-year average weighted birth to kindergarten enrollment ratio of 1.033;
4. For years 2013-2015, the observed births in the Plum Borough SD were used; and
5. For 2016-2022, the expected number of births is based on the 2007-2010 four-year annual average (270).

As noted in the analysis in Section I, nine of the twelve retention ratios (Table 11) from Kindergarten to Grade 11 are above 1.0 and range from 1.001 to 1.038. The largest retention ratios are observed at Grade 1 to Grade 2, Grade 5 to Grade 6. Grade 6 to Grade 7 and Grade 8 to Grade 9. In this scenario the observed births in 2008-2010 (See Table 1.) were used to estimate the 2013-2015 Kindergarten enrollments (See Table 16 footnote) and the average number of births from 2007-2010 (270) was used to estimate Kindergarten enrollments for years 2016 to 2022 (279). In each case, these births are multiplied by a weighted birth to Kindergarten enrollment ratio [e.g. 270 x 1.033 = 279, with the 1.033 ratio a weighted four-year average of [(.75 x B_{t-5}) + (.25 x B_{t-6})]. Given that the level of births here is set to remain stable at the 2007-2010 level, the assumption in this scenario is that the level of births will plateau and remain at this level in the future. In Scenarios II and III, we will modify this assumption, but In this scenario, we treat the fifteen-year decrease in births as coming to an end. There are good reasons to expect this. First, the rate of the decreases in births has been falling—from -125 to -8% to -5%--it appears to be bottoming out. Secondly, the Baby Bust cohorts, now in their thirties, will be aging out of the key reproductive ages and their relatively small size has played a major role in the decreases in births in Plum Borough—as well as more generally throughout the United States. Third, the Echo Boom cohorts, larger than those of the Baby Bust, is moving into the key reproductive ages and, if not in the twenties in Plum Borough due to out-migration, then the strong in-migration in the thirties should turn the trajectory from decreases in births to increases in births, yielding a reversal in direction. In this scenario, we are essentially assuming that births will stabilize before turning positive and begin to increase.

Table 16 presents the results for this scenario. As shown in the lower quadrant of Table 16, in the first five years, a two per cent (2%) increase is expected at the elementary school level (+33), followed in the second five years by essentially no change (-5, -0.2%). At the junior high school, there is an expected decrease in the first five years of over 100 students (-104), a 16% decline. In the second five years, there is a reversal and the junior high school enrollment increases by 36 students (+6%). High school enrollment initially decreases by 4% in the 1st five years and the by 6% in the 2nd five years. After 10 tears, the elementary level is expected to change only slightly, with an additional 28 students or only by +1%. In contrast, both the junior and senior high school are expected to decrease by 10%--a decrease of 68 students and 134 students for the junior and senior high schools, respectively. This scenario, Scenario I, is viewed as the most likely.

Scenario II: Projections with Decreased Fertility

In this scenario, we assume that the fifteen-year decreases in births will continue. The decreases in births extending back to 1990-94 through 2005-09 will, in this scenario, continue through 2022. Such a scenario might occur given the depletions to the Echo Boom cohorts in their twenties and the movement into both age cohorts in their thirties by Baby Bust cohorts. The 248 births selected for years 2016 to 2022, was the actual number of births occurring in Plum Borough in 2010. This scenario simply assumes that this is a new fertility level--rather than it being an exception, here we assume that it is the new norm.

Given the dampening in the rate of decline in the number of births from 12% to 8% and more recently to 5%, as well as the Echo Boom's replacement of a Baby Bust much smaller when it was 20-24, and the fact that we have observed a substantial muting of the impact on fertility of decreased numbers of women in the their thirties, this scenario is viewed as extremely unlikely. It is included so as to simply not rule out such an extreme case, and more to the point, to set a lower bound on the projections, however unlikely. Other than this change, the parameters remain the same as in Scenario I. Since births in 2011 and thereafter will not show up in Kindergarten until 2016, the projections will only differ from 2016 onward and will not extend beyond Grade 6. Thus, any change will all be at the elementary level.

The results for this scenario are shown in Table 17. At the elementary level, there is virtually no change in the 1st five years, but a rather large decrease in the 2nd five years—a loss of 124 students and a 6% decline. The shifts in Junior and Senior High are the same as in Scenario I and by 2022, both have decreased by 10%. In the elementary schools, the expected decrease after ten years is 137 students (-7%). The elementary enrollment in 2022 in this scenario is 1,836 students and the total district enrollment is 3,641, a drop of 339 students (-8%).

Clearly, we cannot change the births that have already occurred and will affect the Kindergarten enrollment for the next three years. What is at issue in these two scenarios is what to expect after three years—from 2016 to 2022. The difference is not massive--a total of 155 students—with this scenario having a decrease of 137 students and Scenario I an increase of 28 students, but in terms of which is the more realistic, it is certainly Scenario I, with a virtual stationary level of elementary school enrollment versus the fairly rapid turndown in Scenario II after 7 years.

Scenario III: Projections with Increased Fertility

This scenario provides a case with a modest increase in births from 2011 to 2017—an additional 15 births per year above the most current four-year average (2007-2010) used in Scenario I. Given the findings from the analysis in Section I, there is reason to expect an increase in births over the next five years, as the Baby Bust cohorts age into their late thirties and early forties, and the Echo Boom cohorts take over the three key five-year age cohorts 20-34. First, continued delayed childbearing may keep births stable or even increasing in the 35-39 age cohorts, despite a decrease in the number of women due to the baby bust. A stable level of births was found in Table 5B (lower panel) for the 35-39 age cohort, in spite of a decrease of 31% in the number of women in this age niche due to the baby bust. Secondly, the Echo Boom cohorts, with increased numbers of women, will comprise the majority of the 20-24, 25-29 and 30-34 age cohorts. Given their current size, we expect them to increase as they cross the "age 30" barrier. Unlike the youth myth of being considered "old" once one reaches 30, here we point to the substantial net in-migration found in the 30-34 age cohorts. (See Tables 12B and 12C.) Thus, due to the expected increase in the numbers of women in these age cohorts—particularly as the reach 30, this scenario assumes a modest increase in the number of births. Note that the level assumed in this scenario is 285 and that in 2008 and 2009, actual births to Plum Borough residents were 289 and 280—an average of 285. The average for 2000-2004 was also 285. Thus, this assumption is by no means a reach, In fact, it seems far more grounded and more likely than Scenario II and it is a very close second to Scenario I.

The results for the Scenario III projections are shown in Table 18. As in Scenario II, births reaching Kindergarten through 2015 have already occurred. Thus, what we are assuming here will primarily impact the second five-year period projections, from 2017-2022. Moreover, as noted earlier, by 2022 these birth cohorts will only reach Grade 6. Therefore, as was also the case with Scenario II, the outcome from these projections will only differ from those in Scenario I for the elementary level. In this scenario, the elementary school enrollments increase by 3% (+63) in the1st five years and again by 4% (+73) in the 2nd five years, resulting in an increase in students of 135 by 2022. This is virtually the opposite of the outcome in Scenario II, where we found a decrease of 137 students. The actual difference is the absolute value—272 students, with an elementary enrollment in 2022 in Scenario II of 1,836 students and in this scenario (Scenario III) an enrollment of 2108 students.

Scenario IV: Projections with Additional Increased Fertility

This scenario makes a minor adjustment to that of Scenario III. Here, we increase the births at the same level (285) as in Scenario III for the first four years beginning with the 2016 Kindergarten class, and continuing from 2016 to 2019. Then, we increase births again for the Kindergarten classes of from 2020 to 2022—in this case to 291 per year. This is just slightly above the 285 number of births and is an increase from the 270 level (+21), comparable to the decrease from 270 assumed in Scenario II (-22). The additional increase is based on the assumption that the Echo boom cohorts are continuing to fill the two "age plates" 30-34 and 35-39, as well as the 25-29 cohort, replacing the Baby Bust cohorts as they age out of the key reproductive ages. Should there be a lag in these replacement processes where the Echo Boom cohorts is later than expected, then this Scenario provides an indication of what to expect in the future since it is extremely likely that impacts from the Echo Boom cohorts will be seen in the Plum Borough School District in the future—if not in the coming decade, then shortly after.

The results for this scenario are provided in Table 19. The only difference from Scenario III is in the last three years. Here we have the initial increase in the 1st five years of 63 additional students—as in Scenario III, but in the 2nd five years, here the student enrollment increases by 93 students (versus 72 in Scenario III). The total elementary enrollment in 2022 in this scenario is

2,129 students, an increase of 156 students above the current enrollment of 1,973 students.

Summary

Here we briefly summarize the main differences in the above scenarios. All scenarios use the most recent retention ratios and the most current B→K ratio, all of which have embedded growth from net-migration, including new housing. All three scenarios also include births for the three most recent years available. . What differs in the four scenarios is the assumed number of births from 2011 to 2017, which will affect the elementary enrollment in 2016 and in the second five years, 2017-2022. Scenario I assumes that births will remain at the 2007-10 level—270 per year. Scenario II assumes that births will fall by 22 to 248 per year and Scenario III assumes that there will be a modest increase in births—to 285 per year, the level of births in 2000-04. Scenario IV assumes that not only will births rise to 285 per year from 2011 to 2014, but that they will continue to rise in 2015-2017 to a level comparable to the decrease in Scenario II—an additional 6 per year to 291 or 21 above the level assumed in Scenario I. While it is conservative in assuming that births will stabilize or plateau at the 2007-10 level, there is, as yet, no strong evidence of an increase in births. Thus, we conclude that ***Scenario I is the most likely scenario for the Plum Borough School District***. Scenario II, with decreased births, is the least likely. There is certainly no basis for assuming a drop in births. The analysis in Section I, suggests that a decrease in births is most unlikely. In Section I, we found strong evidence for delayed childbearing and that it muted the impact of lower numbers of reproductive age females. Also, while the replacement of Baby Bust cohorts by Echo Boom cohorts is currently taking place in the twenty year old cohorts, we expect their main impact will be as the Echo Boom cohorts age into their thirties, where net in-migration will further increase their relative size or restore that attribute, thereby increasing the number of women in the key reproductive years. Scenario II then serves to set a lower bound on possible school enrollments, rather than as a somewhat likely case. Scenario III, with a modest increase in births above the 2007-10 level, is viewed as the second most likely case and almost as likely as Scenario I. Thus, while we are, in fact, expecting to see such increases in the future, given that the evidence is not yet there, we take Scenario I as the most likely case and Scenario II as almost as likely. Given this conclusion, it is Scenario I and its parameters that we will use in the areal specific projections for the five elementary school projections below. However, births must now be allocated within attendance boundaries and derived at the census tract level for years 2016 to 2022.

III. Development and Analysis of Areal Specific District Student Projections for the Five Elementary Schools by Grade: 2013-2022.

These scenarios cover the five elementary schools. All projections use the same four-year retention ratios (2007-2011) as in Scenario I. (See Table 11.)

Likewise, a B→K enrollment ratio of 1.033 is assumed for all schools here, as well as in the more aggregate case of Scenario I. What differs in this scenario is that the births must be disaggregated and melded to the specific elementary school attended. Thus, we start with the 2012 attendance boundaries. Initially, we had planned on using the three most current years to map births 5-6 years earlier by census tract and to assign the proportions within each tract to the appropriate elementary school. Then, these proportions are multiplied by the births per census tract and summed to obtain the Kindergarten enrollment. However, it became clear that the boundaries used for 2012 were not the same as for the prior two years—at least for all schools. As a result, the three year averaging idea was discarded and we used the single year 2012. The distributions assigned per census tract are not strictly attendance boundaries, since we are trying to match births 5-6 years earlier to the Kindergarten enrollment and clearly some of the families will move in this interval—some out of the district and some within the district, as well as new families with preschool children moving into the district—they need not be exact replacements in the same census tract as the births. Using the 2012 enrollment per school, we distribute the births within the census tract to the main schools that the students attend. We also used the specific year's B→K ratio for the 2012 fitting procedure. This ratio was 1.065, considerably higher than the four-year average of 1.033. We continued to adjust all proportions until a very close match to the 2012 K enrollment for all schools was obtained. This was as follows:

	Estimate	Actual
A. Stevenson	38	37
Center	51	50
Holiday Park	69	66
Pivik	97	100
Regency Park	25	25

The resulting allocation of births is as follows:

	Elementary School					
Census Tract	**Adlai Stevenson**	**Center**	**Holiday Park**	**Pivik**	**Regency Park**	**Σ**
5261.01		.10		.90		1.0
5261.02		.20		.80		1.0
5262.01		.25		.75		1.0
5262,02		.55	.05		.4	1.0
5263,91	.50		.50			1.0
5263.02	.30		.70			1.0

We take these distributions of births per school and aggregate them across census tracts to obtain the initial number of births per year that are expected to possibly enroll in each school five to six years later. These births are then multiplied by the Birth→Kindergarten ratio 1.033 to yield the expected Kindergarten enrollment per school. For the years for which there are no known births, 2011 to 2017 (and hence K for 2016-2022), we used the known births in the 6 census tracts for the last 3-4 years taking a.75 weight for t-5 births and a .25 weight for the t-6 births. We then multiplied these weighted births times the B→K ratio of 1.033 to get the expected K arrivals per census tract. Lastly. we added the three years and used the proportional distribution per tract to assign the expected K enrollments per census tract. The assumed total number of births is 270, as in Scenario I and the expected total K arrivals is 279 (that is, 270 x 1.033 = 279). Here we also had to distribute these 279 enrolling students to census tracts and then use the procedure and allocations specified above to derive the specific school's expected K enrollment per year. The percentage distribution per census tract is as follows:

Tract 5261.01: .228
Tract 5261.02: .076
Tract 5262.01: .107
Tract 5262.02: .215
Tract 5263.01: .137
Tract 5263.02: .238

The results are shown in Tables 20A to 20E. For the Adlai Stevenson Elementary School (Table 20A), a decrease of 75 students is expected in the 1st five years with virtually no change in the 2nd five years. Enrollment is expected to decrease from 353 students to 279 students (-21%). The Center Elementary School (Table 20B) is also expected to experience a decrease in students, though not as great. In the 1st five years it is expected to decrease by 33 students, followed in the 2nd five years by a drop of only 9 students. By 2022, enrollment is projected to be 360 students, a decrease of 42 students (-10%).

The Holiday Park Elementary School (Table 20C) is expected to initially increase by 46 students (+10%) in the first five years and then decrease by 5 students in the second five years. Thus, after ten years, Holiday Park's enrollment is expected to reach 491 students (+9%). The peak is actually slightly higher, at 496 students in 2017, but then it is expected to decrease slightly to 491 students. There is very little change in the 2nd five years.

The Pivik Elementary School is expected to change the most (Table 20D), with a gain of 147 additional students in the 1st five years (+28%), followed in the 2nd five years by a much more modest increase (+26; +4%). By 2022, the projected enrollment at Pivik is 702 students, an increase of 33% and an enrollment near its capacity. The other school that is projected to experience a rather large change is the Regency Park Elementary School. In the 1st five year period, it is projected to decrease by 48 students (-20%) and in the 2nd five years to decrease by 23 students (-12%). By 2022, the enrollment at Regency Park is expected to be 168 students, 71 fewer students and a decrease of 30%.

It is important to emphasize that attendance boundaries are not set in stone and may be adjusted. Thus, while the projections for the elementary schools assume fixed boundaries, they obviously can be changed where appropriate. These projections are heavily dependent on the 2012 allocation of students.

A summary of the expected changes in Scenario IV is given below

Elementary	2012 Population	Change 2012→2017	Change 2017→2022	2022 Population.	% Change
Stevenson	353	-75	+1	279 (-74)	-21%
Center	402	-33	-9	360 (-42)	-10%
Holiday Pk	450	+46	-5	491 (+41)	+9%
Pivik	529	+147	+26	702 (+176)	+33%
Regency Pk	239	-48	-23	168 (-71)	-30%
Total	1,973	+37	-10	2000 (+27)	+1%

The student projections in Scenario IV map very closely to those at the elementary level in Scenario I. For instance in 2017, there is a difference of 4 and in 2022 the difference is 1. These small differences are due to multiple multiplication round offs and are less than one per cent. In short, the two levels of projections in terms of the aggregate and disaggregate results are extremely consistent. The Scenario I results are as follows:

Educational Level	2012 Population	Change 2012→2017	Change 2017→2022	2022 Population.	% Change
K→G6	1,973	+33	-5	2,001 (+28)	+1%
G7→G8	670	-104	+36	602 (-68)	-10%
G9→G12	1,337	-60	-74	1,203 (-134)	-10%
Total	3,980	-131	-43	3,806 (-174)	-4%

Table 1

Annual Number of Births to Plum Borough School District Residents by Year[1ǂ]

Year	Number of Births	Period	No. of Births	Annual Average	Change
		Average Number of Births per Five Year Period			
1980	340	1980-84	1,925	385	----
1981	383	1985-89	1,898	380	-5
1982	393	1990-94	1,755	351	-29
1983	429	1995-99	1,549	310	-41
1984	380	2000-04	1,424	285	-25
1985	402	2005-09	1,353	271	-14
1986	405				
1987	391				
1988	334				
1989	366				
1990	400				
1991	333				
1992	346				
1993	340				
1994	336				
1995	318				
1996	300				
1997	305				
1998	308				
1999	318				
2000	301				
2001	277				
2002	279				
2003	304				
2004	263				
2005	268				
2006	254				
2007	262				
2008	289				
2009	280				
2010	248				

[1ǂ] Source: Allegheny County Health Dept.

Table 2

Annual Distribution of Births to Plum Borough
School District Residents by Year and Age of Mother[1ǂ]

Year	Number of Births	15-19	20-24	25-29	30-34	35-39	40-44
1980	340	.07	.24	.42	.24	.02	.01
1981	383	.07	.20	.43	.25	.05	.01
1982	393	.05	.23	.42	.26	.04	--
1983	429	.05	.21	.47	.21	.05	.01
1984	380	.02	.16	.44	.31	.06	.01
1985	402	.04	.19	.45	.25	.06	--
1986	405	.03	.17	.48	.23	.09	--
1987	391	.03	.16	.41	.32	.08	.01
1988	334	.03	.17	.43	.26	.10	--
1989	366	.04	.15	.41	.31	.08	.01
1990	400	.03	.13	.40	.36	.08	.01
1991	333	.05	.09	.40	.36	.10	.01
1992	346	.03	.10	.38	.37	.10	.01
1993	340	.04	.12	.38	.34	.11	.01
1994	336	.03	.11	.35	.36	.13	.01
1995	318	.04	.12	.34	.34	.13	.03
1996	300	.04	.11	.35	.35	.12	.02
1997	305	.02	.10	.34	.36	.14	.-3
1998	308	.03	.08	.34	.37	.15	.03
1999	318	.03	.11	.28	.39	.17	.03
2000	301	.03	.10	.32	.35	.19	.02
2001	277	.02	.11	.26	.38	.19	.04
2002	279	.02	.09	.25	.46	.15	.04
2003	304	.03	.13	.29	.37	.17	.01
2004	263	.03	.13	.30	.32	.20	.02
2005	268	.02	.09	.31	.37	.18	.03
2006	254	.04	.12	.34	.28	.18	.04
2007	262	.02	.09	.33	.38	.16	.02
2008	289	.02	.10	.32	.36	.16	.04
2009	280	.04	.16	.31	.33	.15	.02
2010	248	.05	.12	.25	.34	.20	.02

[1ǂ] Source: Allegheny County Health Dept. In 2001, 2003, 2005 and 2008, there was one birth to a mother over age 44 and in 2010 there were three such births, All are included in the age 40-44 percentages.

Table 2A

Annual Number of Births to Plum Borough School District Residents by Year and Age of Mother[1ǂ]

Year	Number of Births	Age of Mother 15-19	20-24	25-29	30-34	35-39	40-44
1980	340	24	81	144	80	8	6
1981	383	27	78	163	94	18	3
1982	393	19	89	166	102	15	1
1983	429	21	91	201	90	21	5
1984	380	8	61	168	116	23	4
1985	402	16	78	179	102	26	1
1986	405	12	68	193	95	36	1
1987	391	12	63	159	124	31	2
1988	334	10	57	144	88	34	1
1989	366	16	54	150	113	30	3
1990	400	12	51	160	144	30	3
1991	333	15	29	132	120	33	4
1992	346	10	34	131	129	36	5
1993	340	12	40	130	114	39	5
1994	336	11	38	117	122	43	5
1995	318	12	37	109	109	42	8
1996	300	12	33	106	106	36	7
1997	305	7	29	105	111	43	10
1998	308	8	25	105	113	47	10
1999	318	10	34	89	123	53	9
2000	301	8	31	95	105	57	5
2001	277	5	30	72	105	53	12
2002	279	5	24	70	127	42	11
2003	304	10	39	87	111	52	5
2004	263	8	35	79	84	52	5
2005	268	4	25	84	98	48	9
2006	254	11	31	86	72	45	9
2007	262	6	23	87	99	43	4
2008	289	7	30	92	103	45	12
2009	280	12	44	86	91	42	5
2010	248	13	29	63	85	49	8

[1ǂ] Source: Allegheny County Health Dept. In 2001, 2003, 2005 and 2008, there was one birth to a mother over age 44 and in 2010 there were three such births, All are included in the age 40-44 percentages. In addition, in 2010 there was one birth whose mother's age was unknown-; it is counted in the total but is not in the numbers by age.

Table 3

Shift in Reproductive Age Female Population by Census Tract And Overall School District: 1990-2000

Census Tract	Five Year Age Groups											
	1990						2000					
	15-19	20-24	25-29	30-34	35-39	40-44	15-19	20-24	25-29	30-34	35-39	40-44
5261.01	124	112	216	297	263	198	196	132	138	246	290	295
5261.02	58	57	66	83	65	81	72	48	32	65	84	99
5262.01	101	89	110	168	168	157	120	71	88	102	129	197
5262.02	157	194	191	204	173	170	139	107	187	209	234	210
5263.01	184	156	169	231	178	216	135	59	95	181	201	188
5262.02	221	236	357	324	291	293	160	157	240	271	214	225
TOTAL	845	844	1,109	1,307	1,138	1,115	822	574	780	1,074	1,152	1,214

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Change from 1990	15-19	20-24	25-29	30-34	35-39	40-44
5261.01	+72	+20	-78	-51	+27	+97
5261.02	+14	-9	-34	-18	+19	+18
5262.01	+19	-18	-22	-66	-39	+40
5262.02	-18	-87	-4	+5	+61	+40
5263.01	-49	-97	-74	-50	+23	-28
5262.02	-61	-79	-117	-53	-77	-68
Total	-23	-270	-329	-233	+14	+99
Percent Change						
5261.01	+58%	+18%	-36%	-17%	+10%	+49%
5261.02	+24%	-16%	-52%	-22%	+29%	+22%
5262.01	+19%	-20%	-20%	-39%	-23%	+25%
5262.02	-11%	-45%	-2%	+2%	+35%	+24%
5263.01	-27%	-62%	-44%	-22%	+13%	-13%
5262.02	-28%	-33%	-33%	-16%	-26%	-23%
Total	-3%	-32%	-30%	-18%	+1%	+9%

Table 4

Shift in Reproductive Age Female Population by Census Tract And Overall School District: 2000-2010

Census Tract	2000						2010					
	15-19	20-24	25-29	30-34	35-39	40-44	15-19	20-24	25-29	30-34	35-39	40-44
5261.01	196	132	138	246	290	295	225	163	173	176	214	293
5261.02	72	48	32	65	84	99	61	54	55	42	48	73
5262.01	120	71	88	102	129	197	108	84	79	74	104	137
5262.02	139	107	187	209	234	210	164	139	143	166	171	183
5263.01	135	59	95	181	201	188	104	78	98	103	103	147
5262.02	160	157	240	271	214	225	121	173	207	182	152	201
TOTAL	822	574	780	1,074	1,152	1,214	783	691	755	743	792	1,034

FIVE YEAR AGE GROUPS

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Change from 2000	15-19	20-24	25-29	30-34	35-39	40-44
5261.01	+29	+31	+35	-70	-76	-2
5261.02	-11	+6	+23	-23	-36	-26
5262.01	-12	+13	=9	-28	-25	-60
5262.02	+25	+32	-44	-43	-63	-27
5263.01	-31	+19	+3	-78	-98	-41
5262.02	-39	+16	-33	-89	-62	-24
Total	-39	+117	-25	-331	-360	-180
Percent Change						
5261.01	+15%	+23%	+25%	-13%	-26%	-1%
5261.02	-15%	+13%	+72%	-35%	-43%	-26%
5262.01	-10%	+18%	-10%	-27%	-19%	-30%
5262.02	+18%	+30%	-24%	-21%	-27%	-13%
5263.01	-23%	+32%	+3%	-43%	-49%	-22%
5262.02	-24%	+10%	-14%	-33%	-29%	-11%
Total	-5%	+20%	-3%	-31%	-31%	-15%

Table 5

Percentage Change in the Number of Reproductive Females in the Plum Borough School District by Age Cohort: 1990, 2000 and 2010

Age Cohort	1990	2000	Δ	Percentage Δ
15-19	845	822	-23	-.027
20-24	844	574	-270	-.320
25-29	1,109	780	-329	-.297
30-34	1,307	1074	-233	-.178
35-39	1,138	1152	+14	+.012
40-44	1,115	1214	+99	+.089

Age Cohort	2000	2010	Δ	Percentage Δ
15-19	822	783	-39	-.047
20-24	574	691	+117	+.204
25-29	780	755	-25	-.032
30-34	1074	743	-331	-.308
35-39	1152	792	-360	-.313
40-44	1214	1,034	-180	-.148

Table 5A

I. Summary of Births and Change in Births by Age Cohort 1990-1994 and 2000-2004

	1990-1994	2000-2004	Δ	Percentage Δ
15-19	60	36	-24	-.400
20-24	192	159	-33	-.172
25-29	670	403	-267	-.399
30-34	629	532	-97	-.154
35-39	181	256	+75	+.414
40-44	22	38	+16	+.727

II. Summary of Births and Change in Births by Age Cohort 1995-1999 and 2005-2009

	1995-1999	2005-2009	Δ	Percentage Δ
15-19	49	40	-9	-.184
20-24	158	150	-8	-.051
25-29	514	435	-79	-.154
30-34	562	463	-99	-.176
35-39	221	223	+2	+.009
40-44	44	39	-5	-.114

Table 5B

I. Age-Specific Shifts in Births Relative to Age-Specific Shifts in Number of Reproductive Age Females (NRAF) (Forward, 1990→2000)

	A	B	C
	Shifts in Births (1990-94)-(2000-2004)	Shifts in NRAF (1990-2000)	Δ (A-B)
15-19	-.400	-.027	-.373
20-24	-.172	-.320	+.148
25-29	-.399	-.297	+.102
30-34	-.154	-.178	+.024
35-39	+.414	+.012	+.402
40-44	+.727	+.089	+.640

II. Age-Specific Shifts in Births Relative to Age-Specific Shifts in Number of Reproductive Age Females (NRAF) (Backward, 2000→2010)

	A	B	C
	Shifts in Births (1995-99)-(2005-2009)	Shifts in NRAF (2000-2010)	Δ (A-B)
15-19	-.184	-.047	-.137
20-24	-.051	+.204	-.255
25-29	-.154	-.032	-.122
30-34	-.176	-.308	+.132
35-39	+.009	-.313	+.322
40-44	-.114	-.148	+.034

Table 6[β]

Shifts in Age Cohorts of Females in the United States, Pennsylvania and Allegheny County: 1990-2010

	United States			Pennsylvania			Allegheny County		
	1990[α]	2000	2010	1990	2000	2010	1990	2000	2010
0-4	8962	9365	9882	387926	355356	356322	41156	34721	31110
5-9	8837	10026	9959	383947	403701	369276	39193	38610	31588
10-14	8347	10008	10097	368709	420247	385924	36073	40548	33460
15-19	8651	9829	10737	402320	417294	442601	40160	39916	39221
20-24	9345	9276	10572	432692	373203	432260	47352	37861	45020
25-29	10617	9583	10466	503220	366399	388958	53801	38593	42309
30-34	10986	10189	9966	466320	417281	364911	59283	43097	36047
35-39	10061	11388	10138	418201	482595	384115	54269	49714	34921
40-44	8924	11313	10497	337594	504367	429693	47016	54439	39203

Change by Age Cohort Across Time[β]

	United States		Pennsylvania		Allegheny County	
	x(1990)-x(2000)	x(2000)-x(2010)	x(1990)-x(2000)	x(2000)-x(2010)	x(1990)-x(2000)	x(2000)-x(2010)
0-4	+403k(+4.5%)	+517k(+5.5%)	-32570(-8.4%)	+966(+0.3%)	-6435(-15.6%)	-3611(-10.4%)
5-9	+1189k(+13.5%)	-67k(-0.7%)	+19754(+5.1%)	-34425(-8.5%)	-583(-1.5%)	-7022(-18.2%)
10-14	+1661k(+19.9%)	+89k(+0.9%)	+51538(+14.0%)	-34323(-8.2%)	+4475(+12.4%)	-7088(-17.5%)
15-19	+1178k(+13.6%)	+908k(+9.2%)	+14974(+3.7%)	+25307(+6.1%)	-244(-0.6%)	-695(-1.7%)
20-24	-69k(-0.7%)	+1296k(+14.0%)	-59489(-13.7%)	+59057(+15.8%)	-9491(-20.0%)	+7159(+18.9%)
25-29	-1034k(-9.7%)	+883k(+9.2%)	-136821(-27.2%)	+22559(+6.2%)	-15208(-28.3%)	+3716(+9.6%)
30-34	-797k(-7.3%)	-223k(-2.2%)	-49039(-10.5%)	-52370(-12.6%)	-16186(-27.3%)	-7050(-16.4%)
35-39	+1327k(+13.2%)	-1250kk (-11,0%)	+64394(+15.4%)	-98480(-20.4%)	-4555(-8.4%)	-14793(-29.8%)

[β] Sources: (1) 1990, 2000 and 2010 Data: U.S Census Bureau, Decennial Census.

[α] In thousands e.g., 8,962 is 8962000 or 8.962 million

Cross-Sectionally by Period; in other words, change (Δ) in age group x in 1990 vs. 2000 for the same age group x.

40-44	+2389k(+26.8%)	-816k(-7.2%)	+166773(+49.4%)	-74674(-14.8%)	+7423(+15.8%)	-15236(-28.0%)

CHANGE WITHIN AGE COHORT ACROSS TIME [NET MIGRATION][a]

	United States		Pennsylvania		Allegheny County	
	1990→2000	2000→2010	1990→2000	2000→2010	1990→2000	2000→2010
	x→x+10[b]	x→x+10	x→x+10	x→x+10	x→x+10	x→x+10
0-4	+1046K(+11.7%)	+732K(+7.8%)	+32321(+8.3%)	+30568(+8.6%)	-608(-1.5%)	-1261(-3.6%)
5-9	+992K(+11.2%)	+711K(+7.1%)	+33347(+8.9%)	+38900(+9.6%)	+723(+1.8%)	+611(+1.6%)
10-14	+929K(+11.1%)	+564K(+5.6%)	-4494(-1.2%)	+12013(+2.9%)	+1788(+5.0%)	+4472(+11.0%)
15-19	+932K(+10.8%)	+637K(+6.5%)	-35921(-8.9%)	-28336(-6.8%)	-1567(-3.9%)	+2393(+6.0%)
20-24	+844K(+9.0%)	+690K(+7.4%)	-15411(-3.6%)	-8292(-2.2%)	-4275(-9.0%)	-1814(-4.8%)
25-29	+771K(+7.3%)	+555K(+5.8%)	-20625(-4.1%)	+17716(+4.8%)	-4087(-7.6%)	-3672(-9.5%)
30-34	+327K(+3.0%)	+308K(+3.0%)	-38047(-8.2%)	+12412(+3.0%)	-4844(-8.2%)	-3894(-9.0%)
35-39						
40-44						

[a] Longitudinally following an age cohort over time, including net migration; in other words change (Δ) in age cohort x in 1990 vs. age cohort x+10 in 2000 and for age cohort x in 2000 vs. age cohort x+10 in 2010. The age cohorts include net migration.

[b] For example, A) the female age cohort 0-4 in 1990 (8,962) compared to B) the female age cohort 10-14 in 2000 (10,008) that is, B-A.

Table 6A·

Population Age Distribution for Pennsylvania
2000 and 2010

Age	2000	Birth Years		2010	Birth Years	
<5	727,804	1996-2000		729,538	2006-2010	
5-9	827,945	1991-95	Echo Boom	753,635	2001-2005	
10-14	863,849	1986-90	Echo Boom	791,151	1996-2000	
15-19	850,986	1981-85	Echo Boom	905,066	1991-95	Echo Boom
20-24	746,086	1976-80	Baby Bust	874.146	1986-90	Echo Boom
25-29	732,701	1971-75	Baby Bust	781,527	1981-85	Echo Boom
30-34	827,785	1966-70		729,592	1976-80	Baby Bust
35-39	951,400	1961-65	End of Baby Boom	764,287	1971-75	Baby Bust
40-44	996,676	1956-60	Peak of Baby Boom	851,382	1966-70	
45-49	908,650	1951-55		955,763	1961-65	End of Baby Boom
50-54	796,382	1946-50	Start of Baby Boom	984,641	1956-60	Peak of Baby Boom
55-59	619,969	1941-45		879,048	1951-55	
60-64	511,656	1936-40	Great Depression	743,296	1946-50	Start of Baby Boom
65-69	480,656	1931-35	Great Depression	553,002	1941-45	
70-74	488,616	1926-30		426,536	1936-40	Depression Cohort
75-79	488,616	1921-25		362,332	1931-35	Depression Cohort
80-84	422,311	1916-20		311,761	1926-30	
85+	290,015	Pre 1916		305,676	Pre 1926	
Total	12,281,054			12,702,379		

· Sources: 2000 and 2010 Data – U.S. Census Bureau, Decennial Census

Table 6B·

Population Age Distribution for Allegheny County: 2000 and 2010

	2000	Birth Years		2010	Birth Years	
<5	71,081	1996-2000		63,640		
5-9	79,385	1991-95	Echo Boom	64,343		
10-14	82,688	1986-90	Echo Boom	68,396		
15-19	81,721	1981-85	Echo Boom	79,935	1991-95	Echo Boom
20-24	75,792	1976-80	Baby Bust	88,962	1986-90	Echo Boom
25-29	76,718	1971-75	Baby Bust	84,969	1981-85	Echo Boom
30-34	84,559	1966-70		72,580	1976-80	Baby Bust
35-39	96,281	1961-65	End of Baby Boom	69,476	1971-75	Baby Bust
40-44	105,693	1956-60	Peak of Baby Boom	76,418	1966-70	
45-49	98,284	1951-55		88,566	1961-65	End of Baby Boom
50-54	83,258	1946-50	Start of Baby Boom	98,299	1956-60	Peak of Baby Boom
55-59	63,512	1941-45		89,867	1951-55	
60-64	54,278	1936-40	Great Depression	72,838	1946-50	Start of Baby Boom
65-69	53,251	1931-35	Great Depression	52,968	1941-45	
70-74	59,298	1926-30		42,716	1936-40	Depression Cohort
75-79	51,853	1921-25		38,100	1931-35	Depression Cohort
80-84	35,871	1916-20		36,159		
85+	28,143	pre 1916		35,116		
Total	1,281,666			1,223,348		

· Sources: (1) 2000 Data – U.S. Census Bureau, Decennial Census
(2) 2010 Data – U.S. Census Bureau, Decennial Census

Table 6C·

Population Age Distribution for Plum Borough: 2000 and 2010

	2000	Birth Years		2010	Birth Years	
<5	1,696	1996-2000		1,446	2006-10	
5-9	1,870	1991-95	Echo Boom	1,600	2001-05	
10-14	1,966	1986-90	Echo Boom	1,831	1996-2000	
15-19	1,694	1981-85	Echo Boom	1,713	1991-95	Echo Boom
20-24	1,113	1976-80	Baby Bust	1,366	1986-90	Echo Boom
25-29	1,551	1971-75	Baby Bust	1,510	1981-85	Echo Boom
30-34	2,070	1966-70		1,497	1976-80	Baby Bust
35-39	2,293	1961-65	End of Baby Boom	1,592	1971-75	Baby Bust
40-44	2,452	1956-60	Peak of Baby Boom	2,002	1966-70	
45-49	2,070	1951-55		2,144	1961-65	End of Baby Boom
50-54	1,819	1946-50	Start of Baby Boom	2,320	1956-60	Peak of Baby Boom
55-59	1,580	1941-45		1,928	1951-55	
60-64	1,215	1936-40	Great Depression	1,620	1946-50	Start of Baby Boom
65-69	1,033	1931-35	Great Depression	1,415	1941-45	
70-74	893	1926-30		1,001	1936-40	Depression Cohort
75-79	690	1921-25		836	1931-35	Depression Cohort
80-84	510	1916-20		662	1926-30	
85+	425	pre 1916		643	pre 1926	
Total	26,940			27,126		

· Sources: (1) 2000 Data – U.S. Census Bureau, Decennial Census
(2) 2010 Data – U.S. Census Bureau, Decennial Census

Table 7

Total Fertility Rate for the United States: 1917-2007*

1917	3.33	1942	2.63	1967	2.56	1992	2.05
1918	3.31	1943	2.72	1968	2.46	1993	2.02
1919	3.07	1944	2.57	1969	2.46	1994	2.00
1920	3.26	1945	2.49	1970	2.48	1995	1.98
1921	3.33	1946	2.94	1971	2.27	1996	1.98
1922	3.11	1947	3.27	1972	2.01	1997	1.97
1923	3.10	1948	3.11	1973	1.88	1998	2.00
1924	3.12	1949	3.11	1974	1.84	1999	2.01
1925	3.01	1950	3.09	1975	1.77	2000	2.06
1926	2.90	1951	3.27	1976	1.74	2001	2.03
1927	2.82	1952	3.36	1977	1.79	2002	2.01
1928	2.66	1953	3.42	1978	1.76	2003	2.04
1929	2.53	1954	3.54	1979	1.81	2004	2.05
1930	2.53	1955	3.58	1980	1.84	2005	2.05
1931	2.40	1956	3.69	1981	1.81	2006	2.10
1932	2.32	1957	3.77	1982	1.83	2007	2.12
1933	2.17	1958	3.70	1983	1.80		
1934	2.23	1959	3.71	1984	1.81		
1935	2.19	1960	3.65	1985	1.84		
1936	2.15	1961	3.62	1986	1.84		
1937	2.17	1962	3.46	1987	1.87		
1938	2.22	1963	3.32	1988	1.93		
1939	2.17	1964	3.19	1989	2.01		
1940	2.30	1965	2.91	1990	2.08		
1941	2.40	1966	2.72	1991	2.06		

* Data Sources: (1) 1917-39 "Trends in Fertility in the United States," U.S. Dept. of Health, Education and Welfare, 1977, Table 13, DHEW Pub #78-1906;

(2) 1940-1980 Vital Statistics of the United States, Vol. 1, Natality, 2003. Table 1-7.

(3) 1980-2007 "Births: Final Data for 2007" National Vital Statistics Reports, Vol. 58, No. 24, August 2010, Table 4 (Department of Health and Human Services).

Table 8

Total Fertility Rate for the United States—White and White (non-Hispanic): 1970-2007

	ALL	White (including Hispanic)	White (non-Hispanic)	Hispanic		ALL	White (including Hispanic)	White (non-Hispanic)	Hispanic
1970	2.5	2.4			1990	2.1	2.0	1.9	3.0
1971	2.3	2.2			1991	2.1	2.0	1.8	3.0
1972	2.0	1.9			1992	2.1	2.0	1.8	3.0
1973	1.9	1.8			1993	2.0	2.0	1.8	2.9
1974	1.8	1.7			1994	2.0	2.0	1.8	2.8
1975	1.7	1.7			1995	2.0	2.0	1.8	2.8
1976	1.7	1.7			1996	2.0	2.0	1.8	2.8
1977	1.8	1.7			1997	2.0	2.0	1.8	2.7
1978	1.7	1.7			1998	2.1	2.0	1.8	2.7
1979	1.8	1.7			1999	2.1	2.1	1.8	2.6
1980	1.8	1.8			2000	2.1	2.1	1.9	2.7
1981	1.8	1.7			2001	2.0	2.0	1.8	2.7
1982	1.8	1.8			2002	2.0	2.0	1.8	2.7
1983	1.8	1.7			2003	2.0	2.1	1.9	2.8
1984	1.8	1.7			2004	2.0	2.1	1.8	2.8
1985	1.8	1.8			2005	2.1	2.1	1.8	2.9
1986	1.8	1.8			2006	2.1	2.1	1.9	3.0
1987	1.9	1.9			2007	2.1		1.9	3.0
1988	1.9	1.9							
1989	2.0	1.9							

Table 9

Overall Net Migration for the Plum Borough School District Using Baseline “Replacement” of Grade 12 Students in Year t-1 by Kindergarten Students in Year t: 2001-2012

	A	B	C	D	E	F
	K_t	$G12_{t-1}$	Δ_1 without migration[§]	Total Student $Population_t$	Δ_2[‡]	Net Migration[^]
t = 2001-02	295	344	-49	4299	-40	+9
2002-03	279	338	-59	4375	+76	+135
2003-04	311	362	-51	4421	+46	+97
2004-05	326	375	-49	4378	-43	+6
2005-06	310	358	-48	4370	-8	+40
2006-07	271	368	-97	4302	-68	+29
2007-08	274	357	-83	4221	-81	+2
2008-09	284	371	-87	4207	-14	+73
2009-10	294	380	-86	4178	-29	+57
2010-11	243	342	-99	4105	-73	+26
2011-12	279	356	-77	4048	-57	+20
2012-13	278	328	-50	3980	-68	-18
Last 10 years: ∑ 2003-2012			-727 (-328)		-395 (-154)	+332 (+174)
Last 5 years: ∑ 2008-2012			-399		-241	+158

[§] $\Delta_1 = K_t - G12_{t-1}$, i.e., assuming the counterfactual case of “what if” no one migrated; rather there was only G12 students exiting via graduation and K students entering. Thus the “net migration” pertains to year t-1.

[‡] Δ_2=Student $Population_t$ – Student $Population_{t-1}$; in 2000 the total student population was 4,339. Total student enrollment includes Special Ed in the grade counts.

[^] Net migration is $(\Delta_2-\Delta_1)$ where Δ_2 is the change in actual or observed total students and Δ_1 is the counterfactual “what if” case depicting would happen to the total student population with no migration—in or out. Thus, the difference $(\Delta_2 - \Delta_1)$ is net migration.

Table 9A

School Enrollment Change Including Both Net Migration and Replacement of Senior by Kindergarten Students

		A	B	A+B
Year	Enrollment	Net Migration	K_t - $G12_{t-1}$ Exchange*	Enrollment Δ (t-1)→t
t= 2001-02	4299	+9	-49	+40
2002-03	4375	+135	-59	+76
2003-04	4421	+97	-51	+46
2004-05	4378	+6	-49	-43
2005-06	4370	+40	-48	-8
2006-07	4302	+29	-97	-68
2007-08	4221	+2	-83	-81
2008-09	4207	+73	-87	-14
2009-10	4178	+57	-86	-29
2010-11	4105	+26	-99	-73
2011-12	4048	+20	-77	-57
2012-13	3980	-18	-50	-68
∑ 2003-2008		+194 ↑ (+4%)	-328 ↓ (-7%)	-154 ↓ (-4%)
∑ 2008-2012		+158 ↑ (+4%)	-399 ↓ (-9%)	-241 ↓ (-6%)
Δ 2002-2012	-395 ↓ (-9%)	+352 ↑ (+8%)	-727 ↓ (-17%)	-395 ↓ (-9%)

* The K_t - $G12_{t-1}$ Exchange is equivalent to what would have been the enrollment change in the absence of migration.

Table 9B

Summary of "Net Migration" by Year And Level: 2001-2012

Year	Elementary School	Junior High	High School	Overall
2001-02	+7	+16	-14	+9
2002-03	+80	+19	+36	+135
2003-04	+56	+30	+11	+97
2004-05	+13	0	-7	+6
2005-06	+9	+31	0	+40
2006-07	+6	+23	0	+29
2007-08	+9	+20	-27	+2
2008-09	+28	+25	+20	+73
2009-10	+28	+11	+18	+57
2010-11	+32	+7	-13	+26
2011-12	+7	+8	+5	+20
2012-13	-3	+9	-24	-18
Σ2003-2008	+93	+104	-23	+174
Σ2008-2012	+92	+60	+6	+158
Σ2003-2012	+185	+164	-17	+332
Avg/Yr				
Σ2003-2008	+18.6	+20.8	-4.6	+34.8
Σ2008-2012	+18.4	+12.0	+1.2	+31.6
Σ2003-2012	+18.5	+16.4	-1.7	+33.2

Table 10

Evidence of Net Migration of Families with Preschool Children by Census Tract and Overall School District: 1995-2000 and 2005-2009[1]

2005-09			
3	Column A 2010 Census Children < 5 Yrs. Of Age	Column B Births 2005-09	Column C Net Migration (Preschoolers) Δ (A-B)
5261.01	363	312	+51 (+16%; +10.2 ave./yr.)
5261.02	98	84	+14 (+17%; +2.8 ave./yr.)
5262.01	168	153	+15 (+10%; +3.0 ave./yr.)
5262.02	329	287	+42 (+15%; +8.4 ave./yr.)
5263.01	194	182	+12 (+7%; +2.4 ave./yr.)
5263.02	294	335	-41 (-12%; -8.2 ave./yr.)
TOTAL	**1,446**	**1,353**	**+93 (+7%; 18.6 ave./yr.**

1995-99			
Census Tract	Column A 2000 Census Children < 5 Yrs. Of Age	Column B Births 1995-99	Column C Net Migration (Preschoolers) Δ (A-B)
5261.01	432	366	+66 (+18%; +13.2 ave./yr.)
5261.02	83	98	-15 (-15%; -3.0 ave./yr.)
5262.01	195	175	+20 (+11%; +4.0 ave./yr.)
5262.02	341	277	+64 (+23%; 12.8 ave./yr.)
5263.01	270	267	+3 (+1%; +0.6 ave./yr.)
5263.02	375	366	+9 (+2%; +1.8 ave./yr.)
TOTAL	**1,696**	**1,549**	**+147 (+9%; +29.4 ave./yr.**

[1] Data Sources: (1) Column A: 2000 and 2010 US Census, (2) Column B: Allegheny County Health Department.

Table 11

Plum Borough School District
Retention Ratios 2001-2008[§]
Four Year Averages

	2000-2003	2004-2007	2008-2011
K→G1	1.024	.999	1.001
G1→G2	1.011	1.002	1.014
G2→G3	1.024	.988	1.010
G3→G4	1.011	1.015	1.009
G4→G5	1.025	1.024	1.005
G5→G6	1.031	1.009	1.016
G6→G7	1.031	1.057	1.025
G7→G8	1.016	1.019	1.002
G8→G9	1.066	1.026	1.038
G9→G10	.996	.981	.994
G10→G11	.967	.998	.977
G11→G12	.992	.991	.974
B_{t-5}→K_t[·]	.983	.978	1.033

[§] Data for the retention ratios for 2008-2011 included student populations for 2008-2012—the beginning of school year enrollment; data for the retention ratios for 2004-2007 included student populations for 2004-2008—the beginning of school year enrollment; and data for the retention ratios for 2000-2003 included student populations for 2000-2004—the beginning of school year enrollment.

[·] Four year averages for (.75 x Birth at t-5) + (.25 x Birth at t-6) and Kindergarten enrollment at t; eg., the 2008-2011 header for B→K here refers to K in 2009-2012 and births from 2003-2007.

Table 12[·]

Population Age Distribution for Plum Borough: 1990 and 2000

	1990	Birth Years		2000	Birth Years	
<5	1,900	1986-90	Echo Boom	1,696	1996-2000	
5-9	1,879	1981-85	Echo Boom	1,870	1991-95	Echo Boom
10-14	1,732	1976-80	Baby Bust	1,966	1986-90	Echo Boom
15-19	1,778	1971-75	Baby Bust	1,694	1981-85	Echo Boom
20-24	1,681	1966-70		1,113	1976-80	Baby Bust
25-29	2,185	1961-65	End of Baby Boom	1,551	1971-75	Baby Bust
30-34	2,622	1956-60	Peak of Baby Boom	2,070	1966-70	
35-39	2,284	1951-55		2,293	1961-65	End of Baby Boom
40-44	2,088	1946-50	Start of Baby Boom	2,452	1956-60	Peak of Baby Boom
45-49	1,781	1941-45		2,070	1951-55	
50-54	1,376	1936-40	Great Depression	1,819	1946-50	Start of Baby Boom
55-59	1,213	1931-35	Great Depression	1,580	1941-45	
60-64	1,054	1926-30		1,215	1936-40	Depression Cohort
65-69	754	1921-25		1,033	1931-35	Depression Cohort
70-74	597	1916-20		893	1926-30	
75-79	385	1911-15		690	1921-25	
80-84	173	1906-10		510	1916-20	
85+	127	pre 1906		425	pre 1916	
Total	25,609			26,940		

[·] Sources: (1) 2000 Data – U.S. Census Bureau, Decennial Census
(2) 2010 Data – U.S. Census Bureau, Decennial Census

Table 12A

Changes in Population Age Distribution for Allegheny County Over the Past Decade Due to Migration vs Cohort Replacement[1]: 2000 and 2010

	2000	Birth Years		2010	Birth Years		Δ Net Migration & Aging	Δ Cohort Replacement
<5	71,081	1996-2000		63,640	2006-2010			-7,441 (-10%)
5-9	79,385	1991-95	EB[2]	64,343	2001-2005			-15,042 (-19%)
10-14	82,688	1986-90	EB	68,396	1996-2000		-2,685 (-4%)	-14,292 (-17%)
15-19	81,721	1981-85	EB	79,935	1991-95	EB	+550 (+1%)	-1,786 (-2%)
20-24	75,792	1976-80	bb	88,962	1986-90	EB	+6,274 (+8%)	+13,170 (+17%)
25-29	76,718	1971-75	bb	84,969	1981-85	EB	+3,248 (+4%)	+8,251 (+11`%)
30-34	84,559	1966-70		72,580	1976-80	bb	-3,212 (-4%)	-11,979 (-14%)
35-39	96,281	1961-65	BB	69,476	1971-75	bb	-7,242 (-9%)	-26,805 (-28%)
40-44	105,693	1956-60	BB	76,418	1966-70		-8,141 (-10%)	-29,275 (-28%)
45-49	98,284	1951-55	BB	88,566	1961-65	BB	-7,715 (-8%)	-9,718 (-10%)
50-54	83,258	1946-50	BB	98,299	1956-60	BB	-7,394 (-7%)	+15,041 (+18%)
55-59	63,512	1941-45		89,867	1951-55	BB	-8,417 (-9%)	+26,355 (+41%)
60-64	54,278	1936-40	De	72,838	1946-50	BB	-10,420 (-13%)	+18,560 (+34%)
65-69	53,251	1931-35	De	52,968	1941-45		-10,544 (-17%)	-283 (-1%)
70-74	59,298	1926-30		42,716	1936-40	De	-11,562 (- 21%)	-16,582 (-28%)
75-79	51,853	1921-25		38,100	1931-35	De	-15,151 (-28%)	-13,753 (-27%)
80-84	35,871	1916-20		36,159	1926-30		-23,139 (-39%)	+288 (+1%)
85+	28,143	Pre-1916		35,116	Pre-1926			+6,973 (+25%)
Total	1,281,666			1,223,348				-58,318 (-5%)

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[1] Data Sources:
(1) 2000 and 2010: US Decennial Census

[2] EB: Echo Boom Cohort; BB: Baby Boom Cohort; bb: Baby Bust Cohort; De: Great Depression Cohort

Table 12B

Changes in Population Age Distribution for Plum Borough Over the Past Decade Due to Migration vs Cohort Replacement[1]: 2000 and 2010

	2000	Birth Years		2010	Birth Years		Δ Net Migration & Aging	Δ Cohort Replacement
<5	1,696	1996-2000		1,446	2006-2010			-250 (-15%)
5-9	1,870	1991-95	EB[2]	1,600	2001-2005			-270 (-14%)
10-14	1,966	1986-90	EB	1,831	1996-2000		+135 (+8%)	-135 (-7%)
15-19	1,694	1981-85	EB	1,713	1991-95	EB	-157 (-8%)	+19 (+1%)
20-24	1,113	1976-80	bb	1,366	1986-90	EB	-600 (-31%)	+253 (+23%)
25-29	1,551	1971-75	bb	1,510	1981-85	EB	-184 (-11%)	-41 (-3`%)
30-34	2,070	1966-70		1,497	1976-80	bb	+384 (+35%)	-573 (-28%)
35-39	2,293	1961-65	BB	1,592	1971-75	bb	+41 (+3%)	-701 (-31%)
40-44	2,452	1956-60	BB	2,002	1966-70		-68 (-3%)	-450 (-18%)
45-49	2,070	1951-55	BB	2,144	1961-65	BB	-149 (-6%)	+74 (+4%)
50-54	1,819	1946-50	BB	2,320	1956-60	BB	-132 (-5%)	+501 (+28%)
55-59	1,580	1941-45		1,928	1951-55	BB	-142 (-5%)	+348 (+22%)
60-64	1,215	1936-40	De	1,620	1946-50	BB	-199 (-11%)	+405 (+33%)
65-69	1,033	1931-35	De	1,415	1941-45		-165 (-10%)	+382 (+37%)
70-74	893	1926-30		1,001	1936-40	De	-214 (-18%)	+108 (+12%)
75-79	690	1921-25		836	1931-35	De	-197 (-19%)	+146 (+21%)
80-84	510	1916-20		662	1926-30		-231 (- 26%)	+152 (+30%)
85+	425	Pre-1916		643	Pre-1926			+218 (+51%)
Total	26,940			27,126				+186 (+1%)

[1] Data Sources:
(1) 2000 and 2010: US Decennial Census

[2] EB: Echo Boom Cohort; BB: Baby Boom Cohort; bb: Baby Bust Cohort; De: Great Depression Cohort

Table 12C

Changes in Population Age Distribution for Plum Borough Between 1990 and 2000 Due to Migration vs Cohort Replacement[1]: 1990 and 2000

	1990	Birth Years		2000	Birth Years		Δ Net Migration & Aging	Δ Cohort Replacement
<5	1,900	1986-90	EB[2]	1,696	1996-2000			-204 (-11`%)
5-9	1,879	1981-85	EB	1,870	1991-95	EB		-9 (-0.4%)
10-14	1,732	1976-80	bb	1,966	1986-90	EB	+66 (+3%)	+234 (+14%)
15-19	1,778	1971-75	bb	1,694	1981-85	EB	-185 (-10%)	-84 (-5%)
20-24	1,681	1966-70		1,113	1976-80	bb	-619 (-36%)	-568 (-34%)
25-29	2,185	1961-65	BB	1,551	1971-75	bb	-227 (-13%)	-634 (-29%)
30-34	2,622	1956-60	BB	2,070	1966-70		+389 (+23%)	-552 (-21%)
35-39	2,284	1951-55	BB	2,293	1961-65	BB	+108 (+5%)	+9 (+0.3%)
40-44	2,088	1946-50	BB	2,452	1956-60	BB	-170 (-6%)	+364 (-17%)
45-49	1,781	1941-45		2,070	1951-55	BB	-214 (-9%)	+289 (+16%)
50-54	1,376	1936-40	De	1,819	1946-50	BB	-269 (-13%)	-443 (-32%)
55-59	1,213	1931-35	De	1,580	1941-45		-201 (-11%)	+367 (+30%)
60-64	1,054	1926-30		1,215	1936-40	De	-161 (-12%)	+161 (+15%)
65-69	754	1921-25		1,033	1931-35	De	-180 (-15%)	+279 (+37%)
70-74	597	1916-20		893	1926-30		-161 (-15%)	+296 (+50%)
75-79	385	1911-15		690	1921-25		-64 (-8%)	+305 (+79%)
80-84	173	1906-10		510	1916-20		-87 (-15%)	+337 (+195%)
85+	127	pre 1906		425	pre 1916			+298 (+235%)
Total	25,609			26,940				+1,331 (+5%)

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1 Data Sources:
(1) 2000 and 2010: US Decennial Census

2 EB: Echo Boom Cohort; BB: Baby Boom Cohort; bb: Baby Bust Cohort; De: Great Depression Cohort

Table 13

Overall Alternative Schooling by Type of Alternative and Year: 2001-2011

Year	Chater/Cyber Charter	Home School	Σ
2001-02	0	10	10
2002-03	7	12	19
2003-04	9	12	21
2004-05	16	20	35
2005-06	36	16	52
2006-07	54	17	71
2007-08	40	17	57
2008-09	85	16	101
2009-10	70	20	90
2010-11	54	22	76
2011-12	53	21	74

Table 14[1]

New Housing – Plum Borough: 1989-2012

Year	No. of Housing Permits	
1989	50	
1990	70	
1991	75	
1992	130	
1993	114 (131)	
1994	90	
1995	72	
1996	72 (113)	
1997	96 (117)	
1998	101 (114)	
1999	98 (124)	
2000	70 (86)	
2001	74 (98)	
2002	59 (75)	
2003	74	
2004	79	
2005	86	
2006	46	
2007	72	
2008	36	
2009	45	
2010	**48**	
2011	**44**	.
2012[2]	**33**	
		Avg./Yr
∑ 2000-2007		70.6
∑ 2003-2007		72.4
∑ 2008-2011		43.3

[1] The numbers in parentheses include senior housing: Clover Commons (157 homes) and Longwood at Oakmont (17 units)
[u]Jan. 1, 2012-Aug. 31, 2012

Table 15

Major Housing Developments in Plum Borough: 2012

Housing Development	No. of Units	No. Built	No. Left
1. Chavelle Estates	19	5	14
2. Cherry Springs	72	70	2
3. Colonial Point	36	0	36
4. Green Valley Estates	53	44	9
5. Meadow HIll	31	27	4
6. Rustic Ridge	232	230	2
7. The Highlands	192	129	63
8. Wimbledon	63	60	3
9. Briarwood[1]	90	65-70	20-25
$\sum$	788	630-635	153-158

[1] Briarwood has not been active for about 5 years

Table 16

Plum Borough School District Forecasts per Grade: 2013-2022 Fertility/Aging/Embedded Growth Scenario with Current Retention and Birth to Kindergarten Ratios and Current Fertility Levels [Scenario I]·

Year	K	G1	G2	G3	G4	%)	G6	Total K-G6	G7	G8	Total Jr. High	G9	G10	G11	G12	Total Sr. High	Sr. High Alt. Sch	Total K → G12
2012	278	275	238	295	302	291	294	1973	322	348	670	326	336	342	321	1325	12	3980
2013	292	278	279	240	298	304	296	1987	301	323	624	361	324	328	33	1346	12	3969
2014	291	292	282	282	242	299	309	1997	303	302	605	335	359	317	319	1330	12	3944
2015	264	291	296	285	285	243	304	1968	317	304	621	313	333	351	309	1306	12	3907
2016	279	264	295	299	288	286	247	1958	312	318	630	316	311	325	342	1294	12	3894
2017	279	279	268	298	302	289	291	2006	253	313	566	330	314	304	317	1265	12	3849
2018	279	279	283	271	301	304	294	2011	298	254	552	325	328	307	296	1256	12	3831
2019	279	279	283	286	273	303	309	2012	301	299	600	264	323	320	299	1206	12	3830
2020	279	279	283	286	289	274	308	1998	317	302	619	310	262	316	312	1200	12	3829
2021	279	279	283	286	289	290	278	1984	316	318	634	313	308	256	308	1185	12	3815
2022	279	279	283	286	289	290	295	2001	285	317	602	330	311	301	249	1191	12	3806

	2012	**2017**	**2022**	**Δ2017-2012**	**Δ2022-2017**	**Δ2022-2012**
K→G6	1973	2006	2001	+33 (+2%)	-5 (-.2%)	+28 (+1%)
G7→G8	670	566	602	-104 (-16%)	+36 (+6%)	-68 (-10%)
G9→G12	1337	1277	1203	-60 (-4%)	-74 (-6%)	-134 (-10%)
Total	3980	3849	3806	-131 (-3%)	-43 (-1%)	-174 (-4%)

· This scenario uses the following parameters: (1) Baseline four-year retention ratios (2008-2011), as shown in Table11; (2) Birth at t-5 to K enrollment ratio of 1.033; this is derived as follows: (a) a baseline .75(t-5 Births) + .25(t-6 Births) for births in years 2003-2007 and 2009-2012 K enrollments. For years 2013-2015, observed births in 2008-2010 in the Plum Borough School District were used. We calculate the eligible birth cohorts for Kindergarten as (B_{t-6} x .25)+(B_{t-5} x .75), using Oct 1 as the cutoff for entry at age 5. For years 2016-2022, the four-year average number of births from 2007-2010 was used (270); see Table 1 for births per year.

Table 17

Plum Borough School District Forecasts per Grade: 2013-2022 Fertility/Aging/Embedded Growth Scenario with Current Retention and Birth to Kindergarten Ratios and Lower Fertility Levels [Scenario II]·

Year	K	G1	G2	G3	G4	G5	G6	Total K-G6	G7	G8	Total Jr. High	G9	G10	G11	G12	Total Sr. High	Sr. High Alt. Sch	Total K → G12
2012	278	275	238	295	302	291	294	1973	322	348	670	326	336	342	321	1325	12	3980
2013	292	278	279	240	298	304	296	1987	301	323	624	361	324	328	33	1346	12	3969
2014	291	292	282	282	242	299	309	1997	303	302	605	335	359	317	319	1330	12	3944
2015	264	291	296	285	285	243	304	1968	317	304	621	313	333	351	309	1306	12	3907
2016	256	264	295	299	288	286	247	1935	312	318	630	316	311	325	342	1294	12	3871
2017	256	256	268	298	302	289	291	1960	253	313	566	330	314	304	317	1265	12	3803
2018	256	256	260	271	301	304	294	1942	298	254	552	325	328	307	296	1256	12	3762
2019	256	256	260	263	273	303	309	1920	301	299	600	264	323	320	299	1206	12	3738
2020	256	256	260	263	265	274	308	1882	317	302	619	310	262	316	312	1200	12	3713
2021	256	256	260	263	265	266	278	1844	316	318	634	313	308	256	308	1185	12	3675
2022	256	256	260	263	265	266	270	1836	285	317	602	330	311	301	249	1191	12	3641

	2012	2017	2022	Δ2017-2012	Δ2022-2017	Δ2022-2012
K→G6	1973	1960	1836	-13 (-0.6%)	-124 (-6%)	-137 (-7%)
G7→G8	670	566	602	-104 (-16%)	+36 (+6%)	-68 (-10%)
G9→G12	1337	1277	1203	-60 (-4%)	-74 (-6%)	-134 (-10%)
Total	3980	3803	3641	-177 (-4%)	-162 (-4%)	-339 (-8%)

· This scenario uses the following parameters: (1) Baseline four-year retention ratios (2008-2011), as shown in Table11; (2) Birth at t-5 to K enrollment ratio of 1.033; this is derived as follows: (a) a baseline .75(t-5 Births) + .25(t-6 Births) for births in years 2003-2007 and 2009-2012 K enrollments. For years 2013-2015, observed births in 2008-2010 in the Plum Borough School District were used. We calculate the eligible birth cohorts for Kindergarten as (B_{t-6} x .25)+(B_{t-5} x .75), using Oct 1 as the cutoff for entry at age 5. For years 2016-2022, the number of births for the most current year available, 2010, was used (248); see Table 1 for births per year. This is the lowest number of births in any year over the last three decades.

Table 18

Plum Borough School District Forecasts per Grade: 2013-2022 Fertility/Aging/Embedded Growth Scenario with Current Retention and Birth to Kindergarten Ratios and Higher Fertility Levels [Scenario III]·

Year	K	G1	G2	G3	G4	G5	G6	Total K-G6	G7	G8	Total Jr. High	G9	G10	G11	G12	Total Sr. High	Sr. High Alt. Sch	Total K → G12
2012	278	275	238	295	302	291	294	1973	322	348	670	326	336	342	321	1325	12	3980
2013	292	278	279	240	298	304	296	1987	301	323	624	361	324	328	33	1346	12	3969
2014	291	292	282	282	242	299	309	1997	303	302	605	335	359	317	319	1330	12	3944
2015	264	291	296	285	285	243	304	1968	317	304	621	313	333	351	309	1306	12	3907
2016	294	264	295	299	288	286	247	1973	312	318	630	316	311	325	342	1294	12	3909
2017	294	294	268	298	302	289	291	2036	253	313	566	330	314	304	317	1265	12	3879
2018	294	294	298	271	301	304	294	2056	298	254	552	325	328	307	296	1256	12	3876
2019	294	294	298	301	273	303	309	2072	301	299	600	264	323	320	299	1206	12	3890
2020	294	294	298	301	304	274	308	2073	317	302	619	310	262	316	312	1200	12	3904
2021	294	294	298	301	304	306	278	2075	316	318	634	313	308	256	308	1185	12	3906
2022	294	294	298	301	304	306	311	2108	285	317	602	330	311	301	249	1191	12	3913

	2012	2017	2022	Δ2017-2012	Δ2022-2017	Δ2022-2012
K→G6	1973	2036	2108	+63 (+3%)	+72 (+4%)	+135 (+7%)
G7→G8	670	566	602	-104 (-16%)	+36 (+6%)	-68 (-10%)
G9→G12	1337	1277	1203	-60 (-4%)	-74 (-6%)	-134 (-10%)
Total	3980	3879	3913	-101 (-3%)	+34 (+0.9%)	-67 (-2%)

· This scenario uses the following parameters: (1) Baseline four-year retention ratios (2008-2011), as shown in Table11; (2) Birth at t-5 to K enrollment ratio of 1.033; this is derived as follows: (a) a baseline .75(t-5 Births) + .25(t-6 Births) for births in years 2003-2007 and 2009-2012 K enrollments. For years 2013-2015, observed births in 2008-2010 in the Plum Borough School District were used. We calculate the eligible birth cohorts for Kindergarten as (B_{t-6} x .25)+(B_{t-5} x .75), using Oct 1 as the cutoff for entry at age 5. For years 2016-2022, a return to the number of births from 2000 -2004 was used (285); see Table 1 for births per year.

Table 19

Plum Borough School District Forecasts per Grade: 2013-2022 Fertility/Aging/Embedded Growth Scenario with Current Retention and Birth to Kindergarten Ratios and Higher Fertility Levels [Scenario IV]·

Year	K	G1	G2	G3	G4	G5	G6	Total K-G6	G7	G8	Total Jr. High	G9	G10	G11	G12	Total Sr. High	Sr. High Alt. Sch	Total K → G12
2012	278	275	238	295	302	291	294	1973	322	348	670	326	336	342	321	1325	12	3980
2013	292	278	279	240	298	304	296	1987	301	323	624	361	324	328	33	1346	12	3969
2014	291	292	282	282	242	299	309	1997	303	302	605	335	359	317	319	1330	12	3944
2015	264	291	296	285	285	243	304	1968	317	304	621	313	333	351	309	1306	12	3907
2016	294	264	295	299	288	286	247	1973	312	318	630	316	311	325	342	1294	12	3909
2017	294	294	268	298	302	289	291	2036	253	313	566	330	314	304	317	1265	12	3879
2018	294	294	298	271	301	304	294	2056	298	254	552	325	328	307	296	1256	12	3876
2019	294	294	298	301	273	303	309	2072	301	299	600	264	323	320	299	1206	12	3890
2020	301	294	298	301	304	274	308	2080	317	302	619	310	262	316	312	1200	12	3911
2021	301	301	298	301	304	306	278	2089	316	318	634	313	308	256	308	1185	12	3920
2022	301	301	305	301	304	306	311	2129	285	317	602	330	311	301	249	1191	12	3934

	2012	2017	2022	Δ2017-2012	Δ2022-2017	Δ2022-2012
K→G6	1973	2036	2129	+63 (+3%)	+93 (+5%)	+156 (+8%)
G7→G8	670	566	602	-104 (-16%)	+36 (+6%)	-68 (-10%)
G9→G12	1337	1277	1203	-60 (-4%)	-74 (-6%)	-134 (-10%)
Total	3980	3879	3934	-101 (-3%)	+55 (+1%)	-46 (-1%)

· This scenario uses the following parameters: (1) Baseline four-year retention ratios (2008-2011), as shown in Table11; (2) Birth at t-5 to K enrollment ratio of 1.033; this is derived as follows: (a) a baseline .75(t-5 Births) + .25(t-6 Births) for births in years 2003-2007 and 2009-2012 K enrollments. For years 2013-2015, observed births in 2008-2010 in the Plum Borough School District were used. We calculate the eligible birth cohorts for Kindergarten as (B_{t-6} x .25)+(B_{t-5} x .75), using Oct 1 as the cutoff for entry at age 5. For years 2016-2019, a return to the number of births from 2000 -2004 was used (285); for years 2020-2022, births were assumed to increase to 291 per year. This is a comparable increase (+21) from the 270 four-year average in 2007-2010, to the decrease of 22 births assumed in Scenario II. See Table 1 for births per year.

Table 20A

Adlai Stevenson Elementary School
Forecasts per Grade: 2013-2022
[Scenario Va]·

	K	G1	G2	G3	G4	G5	G6	Total K→G5
2012	37	40	44	64	57	55	56	353
2013	39	37	41	44	65	57	56	339
2014	41	39	38	41	44	65	58	326
2015	39	39	40	38	41	44	66	307
2016	39	39	40	40	38	41	45	282
2017	39	39	40	40	40	38	42	278
2018	39	39	40	40	40	40	39	277
2019	39	39	40	40	40	40	41	279
2020	39	39	40	40	40	40	41	279
2021	39	39	40	40	40	40	41	279
2022	39	39	40	40	40	40	41	279

	2012	2017	2022	Δ2017-2012	Δ2022-2017	Δ2022-2012	ΔPeak	Peak Size
Overall	353	278	279	-75	+1	-74	-74	353

· This scenario uses the following parameters: (1) Baseline four-year retention ratios (2008-2011), as shown in Table 16; (2) Birth at t-5 to K enrollment ratio of 1.033; this is derived as follows: (a) a baseline birth to K enrollment ratio was estimated using a weighted average for prior births, with the following weights: (.75) for births at t-5 and (.25) for births at t-6, corresponding to the age 5 cut-off for Kindergarten enrollment. Data for this baseline B→K estimate included 2003-2007 births and 2009-2012 K enrollments. For years 2013-2015, observed births were used in each census tract. For the distribution per tract, see the discussion in the text. For years 2016-2022, the 3-year proportion of births in each tract was used and then the distribution per school attendance area was estimated per tract to derive each K enrollment per year. (See text).

Table 20B

Center Elementary School
Forecasts per Grade: 2013-2022
[Scenario Vb]·

	K	G1	G2	G3	G4	G5	G6	Total K→G5
2012	50	50	41	71	65	65	60	402
2013	57	50	51	41	72	65	66	402
2014	55	57	51	52	41	72	66	394
2015	46	55	58	52	52	41	73	377
2016	50	46	56	59	52	52	42	357
2017	50	50	47	57	60	52	53	369
2018	50	50	51	47	58	60	53	369
2019	50	50	51	52	47	58	61	369
2020	50	50	51	52	52	47	59	361
2021	50	50	51	52	52	52	48	355
2022	50	50	51	52	52	52	53	360

52
52

	2012	2017	2022	Δ2017-2012	Δ2022-2017	Δ2022-2012	ΔPeak	Peak Size
Overall	402	369	360	-33	-9	-42	-47	402

· This scenario uses the following parameters: (1) Baseline four-year retention ratios (2008-2011), as shown in Table 16; (2) Birth at t-5 to K enrollment ratio of 1.033; this is derived as follows: (a) a baseline birth to K enrollment ratio was estimated using a weighted average for prior births, with the following weights: (.75) for births at t-5 and (.25) for births at t-6, corresponding to the age 5 cut-off for Kindergarten enrollment. Data for this baseline B→K estimate included 2003-2007 births and 2009-2012 K enrollments. For years 2013-2015, observed births were used in each census tract. For the distribution per tract, see the discussion in the text. For years 2016-2022, the 3-year proportion of births in each tract was used and then the distribution per school attendance area was estimated per tract to derive each K enrollment per year. (See text).

Table 20C

Holiday Park Elementary School Forecasts per Grade: 2013-2022 [Scenario Vc]·

	K	G1	G2	G3	G4	G5	G6	Total K→G5
2012	66	71	56	65	74	63	55	450
2013	68	66	72	57	66	75	64	468
2014	72	68	67	73	58	67	76	481
2015	68	72	69	68	74	59	68	478
2016	68	68	73	70	69	75	60	483
2017	68	68	69	74	71	70	76	496
2018	68	68	69	70	75	72	71	493
2019	68	68	69	70	71	76	73	495
2020	68	68	69	70	71	72	77	495
2021	68	68	69	70	71	72	73	491
2022	68	68	69	70	71	72	73	491

	2012	2017	2022	Δ2017-2012	Δ2022-2017	Δ2022-2012	ΔPeak	Peak Size
Overall	450	496	491	+46	-5	+41	+46	496

· This scenario uses the following parameters: (1) Baseline four-year retention ratios (2008-2011), as shown in Table 16; (2) Birth at t-5 to K enrollment ratio of 1.033; this is derived as follows: (a) a baseline birth to K enrollment ratio was estimated using a weighted average for prior births, with the following weights: (.75) for births at t-5 and (.25) for births at t-6, corresponding to the age 5 cut-off for Kindergarten enrollment. Data for this baseline B→K estimate included 2003-2007 births and 2009-2012 K enrollments. For years 2013-2015, observed births were used in each census tract. For the distribution per tract, see the discussion in the text. For years 2016-2022, the 3-year proportion of births in each tract was used and then the distribution per school attendance area was estimated per tract to derive each K enrollment per year. (See text).

Table 20D

Pivik Elementary School
Forecasts per Grade: 2013-2022
[Scenario Vd]·

	K	G1	G2	G3	G4	G5	G6	Total K→G5
2012	100	71	73	71	69	69	76	529
2013	101	100	72	74	72	69	70	558
2014	102	101	101	73	75	72	70	594
2015	92	102	102	102	74	75	73	620
2016	98	92	103	103	103	74	76	649
2017	98	98	93	104	104	104	75	676
2018	98	98	99	94	105	105	106	705
2019	98	98	99	100	95	106	107	703
2020	98	98	99	100	101	95	108	699
2021	98	98	99	100	101	102	97	695
2022	98	98	99	100	101	102	104	702

	2012	2017	2022	Δ2017-2012	Δ2022-2017	Δ2022-2012	ΔPeak	Peak Size
Overall	529	676	702	+147	+26	+173	+176	705

· This scenario uses the following parameters: (1) Baseline four-year retention ratios (2008-2011), as shown in Table 16; (2) Birth at t-5 to K enrollment ratio of 1.033; this is derived as follows: (a) a baseline birth to K enrollment ratio was estimated using a weighted average for prior births, with the following weights: (.75) for births at t-5 and (.25) for births at t-6, corresponding to the age 5 cut-off for Kindergarten enrollment. Data for this baseline B→K estimate included 2003-2007 births and 2009-2012 K enrollments. For years 2013-2015, observed births were used in each census tract. For the distribution per tract, see the discussion in the text. For years 2016-2022, the 3-year proportion of births in each tract was used and then the distribution per school attendance area was estimated per tract to derive each K enrollment per year. (See text).

Table 20E

Regency Park Elementary School
Forecasts per Grade: 2013-2022
[Scenario Ve]·

	K	G1	G2	G3	G4	G5	G6	Total K→G5
2012	25	43	24	24	37	39	47	239
2013	27	25	44	24	24	37	40	221
2014	25	27	25	44	24	24	38	207
2015	21	25	27	25	44	24	24	190
2016	24	21	25	27	25	44	24	190
2017	24	24	21	25	27	25	45	191
2018	24	24	24	21	25	27	25	170
2019	24	24	24	24	21	25	27	169
2020	24	24	24	24	24	21	25	166
2021	24	24	24	24	24	24	21	165
2022	24	24	24	24	24	24	24	168

	2012	2017	2022	Δ2017-2012	Δ2022-2017	Δ2022-2012	ΔPeak	Peak Size
Overall	239	191	168	-48	-23	-71	-74	239

· This scenario uses the following parameters: (1) Baseline four-year retention ratios (2008-2011), as shown in Table 16; (2) Birth at t-5 to K enrollment ratio of 1.033; this is derived as follows: (a) a baseline birth to K enrollment ratio was estimated using a weighted average for prior births, with the following weights: (.75) for births at t-5 and (.25) for births at t-6, corresponding to the age 5 cut-off for Kindergarten enrollment. Data for this baseline B→K estimate included 2003-2007 births and 2009-2012 K enrollments. For years 2013-2015, observed births were used in each census tract. For the distribution per tract, see the discussion in the text. For years 2016-2022, the 3-year proportion of births in each tract was used and then the distribution per school attendance area was estimated per tract to derive each K enrollment per year. (See text).