Does Projecting School District Enrollments by Race Produce More Accurate Results?

By

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Abstract

Since different races have unique fertility rates and migration patterns, performing school district enrollment projections by race and aggregating to a total may be more accurate than performing enrollment projections with all races combined. Twelve school districts in New Jersey of varying overall size and majority race percentages were used in this study. Using historical enrollment data for a five-year period, the Cohort-Survival Ratio method was employed to project enrollment for a four-year period, 2003-04 through 2006-07. Separate projections were completed both by race and with all races combined. Projected enrollments were compared to actual enrollments in each district for both methods used. Absolute Mean Error Rates (AMER) were calculated for each district for the prediction time period. The results showed that the projections with all races combined had lower AMER for both larger and smaller districts as compared to the projections that were performed by race.

Keywords

Enrollment Projections; Projections by Race; School Demography; School Districts; Research Methodology; Comparative Analysis

Does Projecting School District Enrollments by Race Produce More Accurate Results?

In school facility planning for K-12 districts, accurate student enrollment projections are essential. Changes in enrollment may lead to new staff hires or layoffs, different transportation needs, increased capital improvement planning, or changes to the internal grade configuration from facility to facility within the district (Weldon, Hurwitz, and Menacker 1989; Glass and Fulmer 1991; Schellenberg and Stephens 1987; Sweeney and Middleton 2005). School demographers, those individuals entrusted to project school enrollments, are faced with a dilemma in projecting enrollment. Should school district enrollment projections be performed by race and aggregated to a total? This would require all historical enrollment and community birth data to also be collected by race. Given the extra time and effort needed to categorize the data in this fashion and the additional sets of projections that must be computed, does projecting enrollment by race produce more accurate results than simply projecting the enrollment of the entire student population with all races combined?

The merits of projecting enrollment by race are that the rates of growth or decline of the student population may be very different among the races. Student mobility patterns, migration rates into or out of the district, and mother fertility rates are different for various races. Since racial subgroups of the school population can grow at different rates, it would make sense to perform enrollment projections at this smaller unit of analysis. In some instances, the total population of the school district can be declining while one or more races are rising within the total population (National Council of La Raza 1987).

In this study, it is hypothesized that projecting enrollment by race might prove to be more accurate when the majority race percentage is low, for example, in the 50%-60% range, with the theory that each race's enrollment trends would be otherwise masked if the enrollment were

simply combined. Majority race percentages that approach 80% may provide similar results when projecting with and without race, since the large majority race essentially "drives" the overall projections when computing with all races combined. A caveat of projecting enrollments with a large majority race percentage is that the potential for having small racial subgroups increases and thereby becomes more difficult to accurately project enrollment in these subgroups. For instance, if a district with 5,000 students was 50% Non-Hispanic White (n = 2,500), 20% Asian (n = 1,000), 15% Hispanic (n = 750), and 15% Non-Hispanic Black (n = 750), the size of each subgroup would be significantly large to capture each of the individual growth trends. However, if the same school district was 80% Non-Hispanic White (n= 4,000), 10% Asian (n = 500), 5% Hispanic (n = 250), and 5% Non-Hispanic Black (n = 250), it may be difficult to accurately project by race since some of the racial subgroups are too small, ranging from 250-500 students (20-40 students per grade level).

Since the number of births in a community helps to project the number of kindergarten students five years later, fertility rates by race may be helpful in producing more accurate enrollment projections, particularly when the number of births needs to be projected for long-range projections, those exceeding five years. Due to the differences in fertility rates among races, it would appear that projecting enrollment by race would capture trends unique to each race and therefore provide more accurate projections.

One particular advantage of projecting enrollment by race is to provide adequate educational services for minority populations, such as ESL programs. In one study, Hispanic children did not receive adequate educational programs (National Council of La Raza 1987). By projecting enrollment by race, school district administrators may be adequately prepared to offer the necessary educational programs for particular racial subgroups.

Enrollment projections by race have also been completed in the Los Angeles Unified School District as part of a desegregation plan and litigation that occurred in the late 1970's (Hamilton, Rabinovitz and Szanton, Inc. 1979) and for facility planning in Dade County Florida (Guerrero and Kerr 1987). Projecting enrollment by race has also been utilized at the postsecondary level in California (Knutsen 1989). While it is clear that projecting enrollment by race does occur and is necessary to identify growth trends in certain racial subgroups, it has not been established whether it does provide more accurate enrollment projections than simply projecting enrollment with all races combined, particularly when it is not necessary to project the population of a specific racial subgroup. In most cases, the interest of the school demographer is in facility planning and of school capacities. There is usually no reason to project enrollment by race, other than to achieve more accurate enrollment projections. The research is very limited to the efficacy of projecting enrollment by race as compared to projecting enrollment with all races combined. A review of the literature did not yield any studies in which the accuracy of performing enrollment projections by race was analyzed. The purpose of this investigation is to compare the enrollment projections completed for twelve New Jersey school districts both by race, and with all races combined, for the purposes of facility planning; that is, to ensure that school districts have adequate capacity independent of the racial makeup of their student population. Three specific questions guided this inquiry:

1. Is there any added benefit in improved accuracy to performing enrollment projections by race?
2. Does the size of the district have an effect on the accuracy of the projections that are performed by race as compared to those projections performed with all races combined?

3. Does the size of the majority race (50%, 60%, etc.) and size of the racial subgroups within the school district affect the accuracy of the enrollment projections?

Methodology

All enrollments projections in this study were computed using the Cohort-Survival Ratio (CSR) method. While there are a multitude of other enrollment projection methods available, the CSR method is used by the New Jersey Department of Education as part of their Long Range Facilities Plan, which is completed by school districts in the state every five years, and therefore was employed in this study. In the CSR method, a survival ratio is computed for each grade, which essentially compares the number of students in a particular grade to the number of students in the previous grade during the previous year. If, for example, a school district had 100 first graders and the next year had 103 second graders, the survival ratio would be 1.03. A survival ratio of 1.00 indicates stable enrollment, less than 1.00 indicates declining enrollment, while greater than 1.00 indicates increasing enrollment.

The main assumption of the CSR method is that past trends are assumed to also occur in the future (Caffarella 1983). The technique essentially provides a linear projection of the population (Castaldi 1989). Since this inquiry is not considering the strengths and weaknesses of the CSR method, they will not be discussed here. However, the predictive validity of the CSR method has been discussed at length elsewhere (Bernhardt, Pullum, and Graham 1983; Glass and Fulmer 1991; Colombo, Dekker, and Petronis 1990; Shaw 1984; Grip and Young 1999).

One difficulty in using the CSR method in projecting enrollment by race is if one or more of the racial subgroups is small in size. Previous studies (Caffarella 1983; Grip 2004) discuss the difficulty in projecting enrollments accurately in districts with fewer than 600 students. Since

projecting enrollment by race decreases the size of the grade-level cohorts which are used to project enrollment, the projections are more prone to inaccuracies, as the survival ratio can vary extensively with the slightest movement of students into or out of a school district. For instance, if a hypothetical K-12 district had 20 students per grade level (260 students total) and five additional students entered a particular grade in the following year, the resulting survival ratio would be 1.25. However, if a single student was added to a particular grade level, the resulting survival ratio would be 1.05. In comparison, if a district had 100 students per grade level in a K-12 district for a total of 1,300 students, a gain of five students in a grade level would result in a survival ratio of 1.05, yet a gain of a single student in a grade level would result in a survival ratio of 1.01. As this example demonstrates, there is greater variation in the survival ratio in districts with small grade levels, which can result in less reliable enrollment projections, since the CSR method is most accurate when the ratios are less variable. Therefore, it is anticipated that districts with a greater number of racial subgroups containing fewer than 300 students, which is a lower threshold than that reported in the literature, will have less accurate projections in this study than those districts having larger racial subgroups.

Historical enrollment data were downloaded from the New Jersey Department of Education website for the five-year period from the 1998-99 school year to the 2002-03 school year. Survival ratios were computed for each grade progression (e.g., K-1, 1-2, 2-3, etc.) and for birth to kindergarten, in which birth counts are lagged five years behind the kindergarten class. Due to the fluctuation in survival ratios from year to year, it is appropriate to calculate an average survival ratio, which is then used to calculate future grade enrollments five years into the future. In this investigation, an average of the last four survival ratios was consistently used in an effort to control this variable.

In selecting the districts, quota sampling was employed, which is a non-random selection process to fill quotas of specified sub-groups of the total population. To complete this process, the 2006-07 total enrollments of more than 600 school districts in New Jersey were downloaded from the New Jersey Department of Education website and rank-ordered by enrollment. The database also contains enrollments by race, which the New Jersey Department of Education categorizes by Non-Hispanic White, Non-Hispanic Black, Hispanic, Asian, Native American, Hawaiian Native, and Two or More Races. Although Hispanics are not a race but an ethnicity, the New Jersey Department of Education removed all persons having Hispanic origin from the other races (as Hispanics can be part of the White or Black populations, for example) so that this racial category was mutually exclusive. Only the Non-Hispanic White, Non-Hispanic Black, Hispanic, and Asian enrollment data were considered in this study, mainly to coincide with the available birth data by race. In addition, the student counts of Native Americans, Hawaiian Natives, and Two or More Races were typically very small for the districts under consideration. Birth counts were obtained for Non-Hispanic Whites, Non-Hispanic Blacks, Hispanics, and Asians from the New Jersey Center for Health Statistics for 1993-2001 for the twelve communities in this analysis.

Twelve school districts in New Jersey were selected using quota sampling on three criteria: size, geographic region, and racial heterogeneity. Six districts were selected that ranged in enrollment from 6,600 to 9,000, which would approximately rank amongst the 50 largest districts in New Jersey. While there are larger districts in the state, there are only four districts above 20,000 pupils and thirteen districts between 10,000 and 20,000 students. Unfortunately, many of these districts are located in urban areas and lack the necessary racial diversity desired in this analysis. A second set of six smaller districts with enrollment ranging from 2,600-3,400

students was also selected to determine whether the size of the district had an impact on the accuracy of the projections. Geographic representation of the districts was also considered as four districts each were selected from the northern, central, and southern areas of the state. Finally, since the majority race typically influences the overall enrollment projections in a district, an attempt was made to select districts that had a varying majority race percentage that would approximate 50%, 60%, 70%, or 80% of the overall student population. It is expected that districts that have a low racial majority and have a small number of racial subgroups with fewer than 300 students will be most accurate when projecting enrollment by race as compared to projecting enrollment with all races combined. Since the survival ratios in the CSR method tend to have greater variability in smaller grade sizes, it is expected that there will be greater error in projecting by race in districts with a larger number of racial subgroups with fewer than 300 students.

All but one of the districts (Gloucester Township, K-8) was a K-12 district. The selected districts are shown in Tables 1 and 2 and include the racial percentages of the student population in the 2006-07 school year and the district's geographic location. In addition, the number of racial subgroups that have fewer than 300 students are identified. In the larger set of school districts, Non-Hispanic Whites were the majority race in five of the six districts. In the smaller group of districts, Non-Hispanic Whites were the majority race in four of the six districts. Districts having a lower majority race percentage are more diverse than those having a higher majority race percentage.

Insert Table 1 about here

Insert Table 2 about here

Since pre-kindergarten classes for grade-level students were offered in only some of the districts, this grade level was removed from all historical grade enrollments. In addition, the number of self-contained special education students was also removed since the methodology used to compute the number of future students is based on historical proportions with respect to the general education subtotals and does not use the CSR method. Since computing special education students would introduce another variable and another projection methodology that could affect the accuracy of the projections, they were not included in the forthcoming projections.

Enrollment Projections

K-12 projections were performed (and K-8 for Gloucester Township) for each of the four major ethnic races (Non-Hispanic White, Non-Hispanic Black, Hispanic, and Asian) for each of the 12 school districts for the four-year period from the 2003-04 school year through the 2006-07 school year. Typically, a five-year projection is performed but only nine years of historical data were available from the New Jersey Department of Education website, of which five historical years were needed to compute the survival ratios. A total of 48 projections were completed by race for the twelve districts. Projections by race were then aggregated at the grade level to determine the total number of students by grade for each projection year. The grade-level projections were then compared to the actual grade counts from 2003-04 to 2006-07 by computing Absolute Mean Error Rates (AMER). This is computed by taking the absolute value

of the percent errors in each of the 13 grade levels (K-12), and then calculating the average of these percent errors. Computing the absolute value shows the total deviation from the true enrollment, which otherwise may be negated when taking an average of positive and negative percent errors. Computing AMER across the grade levels as compared to solely computing a single percent error on district-wide total enrollments also provides a richer analysis of the accuracy of the projection models.

K-12 projections were also performed (and K-8 for Gloucester Township) for each of the 12 school districts with all races combined for the four-year period from the 2003-04 school year through the 2006-07 school year. A total of 12 projections, one for each school district, were computed. The grade-level projections were then compared to the actual grade counts from 2003-04 to 2006-07 by computing AMER as discussed above.

Results

Larger School Districts

When comparing the AMER for the two enrollment projection methods, the AMER were lower for the projections computed with all races combined in 16 of the 24 comparisons (66.7%) for the larger school districts as shown in Table 3. The AMER typically increased with time for both methods. AMER were computed for a total of 24 projection years, four for each of the six districts. In one instance, the error rates were equal for the two projection methods. Of the 16 instances where the projections with all races combined had lower AMER than the projections by race, the percent difference in the AMER between the two methods was less than 1.0% in nine of the cases.

The enrollment projections that were performed by race had lower AMER in at least three of the four projection years for Gloucester Township and two of the four years in both Egg Harbor Township and North Bergen. On the other hand, there were lower AMER in Montclair and Hillsborough Township for all four projection years when projecting enrollment with all races combined while East Brunswick had lower AMER in three of the four projection years using this same method.

Insert Table 3 about here

Size of Majority Race

As shown previously in Table 1, the size of the majority race in the larger school districts ranged from 49.7% in Montclair to 78.5% in North Bergen. While the two districts with the largest racial majorities, North Bergen and Hillsborough respectively, had AMER that were among the highest of the six districts, the AMER for the two enrollment projection methods were quite similar. North Bergen had lower AMER when projecting enrollment with all races combined for two of the four projection years while Hillsborough Township had lower AMER when projecting enrollment with all races combined for all four projection years. The AMER in Hillsborough Township when projecting enrollment by race ranged from 3.2%-9.9% as compared to 3.1%-7.8% when projecting enrollment with all races combined. The differences in error rates were small, ranging between 0.1%-2.1%. North Bergen also had some of the highest AMER when projecting enrollment by race, ranging from 6.0%-8.7%. This was similar to the

AMER of 6.2%-7.6% computed when projecting enrollment with all races combined, resulting in small error rate differences of 0.1%-1.7%.

For the two districts with the third and fourth largest racial majorities, Gloucester Township and East Brunswick Township respectively, their AMER were among the lowest of the six districts. In Gloucester Township, the AMER were lower when projecting enrollment by race in three of the four projection years. On the other hand, East Brunswick Township had lower AMER in three of the four projection years when projecting enrollment with all races combined. The AMER in Gloucester Township when projecting enrollment by race ranged from 3.4%-5.7% as compared to 3.2%-9.2% when projecting enrollment with all races combined. The differences in error rates were small, ranging between 0.2%-3.6%, with the larger differences occurring in the third and fourth projection years. East Brunswick Township had one of the lowest AMER when projecting enrollment by race, ranging from 1.5%-7.2%. This compares to the AMER of 1.5%-3.0% computed when projecting enrollment with all races combined, resulting in error rate differences of 0.0%-4.2%.

The two districts with the smallest racial majorities were Montclair (49.7%) and Egg Harbor Township (58.4%) respectively. Montclair had the lowest error rates of the six districts and had consistently lower AMER when projecting with all races combined. The AMER ranged from 2.1%-4.2% in Montclair when projecting enrollment by race as compared to 1.7%-3.7% when projecting enrollment with all races combined. The differences in error rates were very small, ranging between 0.3%-0.5%. In Egg Harbor Township, the AMER were lower when projecting enrollment by race in two of the four projection years. The AMER in Egg Harbor Township ranged from 4.2%-8.6% when projecting enrollment by race. This was similar to the AMER of 3.9%-6.6% computed when projecting enrollment with all races combined, resulting

in error rate differences of 0.2%-2.3%. While it had been anticipated that districts with low majority race percentages would have the lowest AMER when projecting by race, this was not the case. Lower AMER were observed in only two of eight comparisons for Montclair and Egg Harbor Township when projecting enrollment by race.

Number of Racial Subgroups

East Brunswick Township, Gloucester Township, Montclair, and Hillsborough Township each had two racial subgroups with fewer than 300 students while North Bergen had one and Egg Harbor Township had none. Both North Bergen and Egg Harbor Township each had lower AMER when projecting enrollment by race in two of the four projection years. On the other hand, the other four school districts had lower AMER when projecting by race in only three of 16 comparisons.

Smaller School Districts

When comparing the AMER for the smaller districts, the projections performed with all races combined had consistently lower AMER for each of the six districts as shown in Table 4. AMER were computed for a total of 24 projection years, four for each of the six districts. The AMER were lower for the projections computed with all races combined in 21 of the 24 comparisons (87.5%). Like the larger districts, there was also one instance where the AMER were equal for each of the two projection methods. In Hillside Township, Dumont, Manchester Township, and North Plainfield, the enrollments that were projected with all races combined had lower AMER in each of the four projection years. In each of these four districts, the percent difference between the AMER computed in both methods increased over time. For instance, the

Dumont projections that were projected with all races combined had lower AMER than the projections performed by race by 0.3% in the first year and 3.1% in the fourth projection year.

Delran had lower AMER in the third and fourth projection years when projecting enrollment with all races combined. The enrollment projections that were performed by race had a lower AMER in the second projection year and had an identical AMER in the first projection year. In Tenafly, the enrollments that were projected with all races combined had lower AMER in the last three projection years.

Insert Table 4 about here

Size of Majority Race

In the smaller districts, the size of the majority race ranged from 53.0% in North Plainfield to 79.3% in Delran. For the two districts with the largest racial majorities, Delran and Manchester Township respectively, their AMER were in the middle range of the six districts. The AMER for the projections by race were greater than the AMER for the projections with all races combined in six of the eight years. The AMER in Manchester Township when projecting enrollment by race ranged from 5.2%-13.7% as compared to 4.7%-9.8% when projecting enrollment with all races combined. The differences in error rates ranged from 0.5%-5.9%, with the greatest difference occurring in the final projection year. In Delran, the AMER ranged from 3.8%-11.7% when projecting enrollment by race, which was similar to the AMER of 3.8%-9.0% computed when projecting enrollment with all races combined. The differences in error rates were small, ranging between 0.0%-2.7%.

The three districts with racial majorities ranging between 65.7%-70.6% were Tenafly, Dumont, and Hillside Township. The AMER in Hillside Township were among the highest of the six districts. The AMER when projecting with all races combined were lower in eleven of twelve years for the three districts. The AMER in Dumont when projecting enrollment by race ranged from 3.4%-8.7% as compared to 3.1%-5.6% when projecting enrollment with all races combined. The differences in error rates were small, ranging between 0.3%-3.1%, with the larger differences occurring in the third and fourth projection years. The AMER in Hillside Township ranged from 6.3%-21.4% when projecting enrollment by race. This was quite different compared to the AMER of 4.8%-11.1% when projecting enrollment with all races combined, resulting in error rate differences of 1.5%-11.3%. Tenafly had the lowest error rates of the six districts. When projecting enrollment by race, AMER ranged from 3.5%-5.7% as compared to 3.8%-5.4% when projecting enrollment with all races combined, resulting in small error rate differences of 0.3%-1.1%.

The district with the smallest racial majority, North Plainfield, had the highest AMER of the six districts. The AMER ranged from 9.5%-36.9% when projecting enrollment by race as compared to 6.8%-17.5% when projecting enrollment with all races combined. Projected enrollment with all races combined resulted in lower AMER in North Plainfield for all four projection years than when projecting by race. The error rate differences were large, ranging between 2.7%-19.4%. As in the case with the larger districts, the district with the low majority race percentage did not have the lowest AMER when projecting by race.

Number of Racial Subgroups

Three of the six districts, Delran, Manchester Township, and Dumont, had three racial subgroups with fewer than 300 students. Tenafly and Hillside Township each had two racial

subgroups with fewer than 300 students while North Plainfield had only one. Only Tenafly and Delran each had lower AMER when projecting enrollment by race in one of the four projection years. Since many of the districts analyzed had small racial subgroups, this may have had an effect on the accuracy of the projections performed by race.

Discussion

In the first documented analysis of its kind, this investigation explored the efficacy of projecting school district enrollment by race as compared to projecting enrollment with all races combined. The intent of the paper was to determine whether the extra time and resources needed to project enrollments by race produce more accurate results than simply projecting enrollments with all races combined. The analysis also looked at the effect of district size, size of the racial majority, and number of racial subgroups with fewer than 300 students when projecting enrollment by race. Absolute Mean Error Rates (AMER) were computed for a total of 48 projection years, four for each of the twelve districts, for the projections by race and for the projections with all races combined.

Projecting enrollment with all races combined had lower AMER than projecting enrollment by race in 37 of the 48 comparisons (77.1%) for both the large and small school districts. For the six larger districts analyzed, the results showed that the AMER were lower for the projections performed with all races combined in 16 of the 24 comparisons. In nine of these 16 instances, the differences in the AMER were less than 1.0%. In the seven instances where the projections by race had lower AMER than the projections with all races combined, five of the AMER differences were less than 1.0%. In the six smaller districts, projecting enrollment with all races combined produced lower AMER in 21 of 24 comparisons. In six of these 21 instances,

the AMER differences were small, less than 1.0%. However, in another six of these instances, the AMER differences were greater than 5.0%, three of which occurred in the final projection year.

There does not appear to be a discernible relationship between the accuracy of the projections and the size of the majority race. It was hypothesized that projecting enrollment by race might prove to be more accurate when the majority race percentage was low, for example, in the 50%-60% range. The district with the lowest majority race percentage of the larger school districts, Montclair (49.7%), had lower AMER when projecting with all races combined for all four projection years, which refutes the initial hypothesis. The district with the second lowest majority race percentage in this group, Egg Harbor Township, had the lowest AMER when projecting by race in two of the four projection years, which is inconclusive. As the majority race percentage increased for the remaining four districts, there was no clear pattern of the efficacy of either enrollment projection method. In the smaller school districts, the district with the smallest majority race percentage, North Plainfield, had lower AMER when projecting enrollment with all races combined for all four projection years, which also does not support the initial hypothesis. There was also no clear pattern of the efficacy of either enrollment projection method as the majority race percentage increased for the remaining five districts.

It was also initially believed that districts having a small number of racial subgroups with fewer than 300 students would be the best performers when projecting enrollment by race, since the CSR method becomes ineffective for small grade cohorts. Of the larger districts, North Bergen had one racial subgroup with fewer than 300 students while Egg Harbor Township had none. Both of these districts each had lower AMER when projecting enrollment by race for two of the four projection years. The remaining four larger districts, which each had two racial

subgroups with fewer than 300 students, had lower AMER when projecting by race in only three of 16 comparisons. Although the sample size is small, it appears that a greater number of small racial subgroups had a negative effect in accurately projecting enrollment by race. In the smaller districts, North Plainfield had one racial subgroup with fewer than 300 students yet had higher AMER when projecting enrollment by race for all four projection years. In general, it appears that the grade cohorts in these districts were too small to accurately project by race.

The findings from this research certainly have implications for school demographers. Given the extra time needed to separate enrollment and birth data by race, and the additional projections which are then aggregated to a total, it does not appear that there is much added benefit to projecting enrollment by race, particularly for smaller districts.

While this investigation has yielded results that may assist school demographers in performing more accurate enrollment projections, the study is not without its limitations. One limitation of this study is the small sample size of twelve districts, which restricts the use of making broad-based conclusions. A second limitation of this study was that the sizes of both the large and small school districts were too similar. Much of the research in this study was limited to districts with fewer than 9,000 pupils. Additional research is needed to determine the accuracy for both enrollment projection methods for districts with greater than 10,000 students and whether there are any incremental gains in accuracy as the district's size gets larger. Most importantly, additional analyses are needed in districts where there are no racial subgroups with fewer than 300 students, thereby increasing the effectiveness of the CSR method. Performing a large-scale study with a greater sample size would allow for a more expansive investigation on the effects of district size and majority race percentages and would control the variable of racial subgroups with fewer than 300 students.

REFERENCES

Bernhardt, V. L., Pullum, T. W., Graham, S. N. (1983). *Seattle's small-area approach to forecasting enrollments at the school level*. Paper presented at the Annual Meeting of the American Educational Research Association, Montreal, Quebec, Canada. (ERIC Document Reproduction Service No. ED 239 378)

Caffarella, E. P. (1983). Determining the accuracy of enrollment projection for school districts. *CEFP Journal*, 21(4), 14-16.

Castaldi, B. (1989). *Educational facilities, planning, remodeling and management*. New York: Allyn and Bacon.

Colombo, L. J., Dekker, D. R., & Petronis, J. (1990). Counting Heads. *The American School Board Journal*, 177(8), 20-21, 30.

Glass, T. E., & Fulmer, C. L. (1991). Enrollment projections- factors and methods. *CEFPI's Educational Facility Planner*, 29(6), 25-30.

Grip, R.S. (2004). Projecting enrollment in rural schools: A study of three Vermont school districts. *Journal of Research in Rural Education*, 19(3), 1-6.

Grip, R. S., & Young, J. W. (1999). The modified regression technique: A new method for public school enrollment projections. *Planning and Changing*, 30(3 & 4), 232-248.

Guerrero, E. S., & Kerr, O. (1987). *Enrollment Projections by Race/Ethnic Origin, Grade Level, and Administrative Area 1985-2000.* Dade County Public Schools, Miami, FL: Office of Educational Accountability.

Hamilton, Rabinovitz and Szanton, Inc. (1979, November). *Desegregating the Los Angeles Unified School District: First Simulation Series. Volume I.* Los Angeles, CA.

Knutsen, K. L. (1989). *Planning Our Future. A Staff Background Paper on Long-Range Enrollment and Facilities Planning in California Public Higher Education (Commission Report 89-15).* Sacramento, CA: California Postsecondary Education Commission.

National Council of La Raza. (1987, July). *School Enrollment Trends: 1981-1985. Perspectivas Publicas* (Issue Brief). Washington, DC: Office of Research Advocacy and Legislation.

Schellenberg, S. J., & Stephens, C. E. (1987). *Enrollment projection: variations on a theme.* Paper presented at the Annual Meeting of the American Educational Research Association, Washington D.C., (ERIC Document Reproduction Service No. ED 283 879)

Shaw, R. C. (1984). Enrollment forecasting: What methods work best? *NASSP Bulletin*, 68(468), 52-58.

Sweeney, S. H., & Middleton E. J. (2005). Multiregional cohort enrollment projections: Matching methods to enrollment policies. *Population, Space and Place* 11(5), 361-380.

Weldon W., Hurwitz, E., & Menacker J. (1989). Enrollment projections: techniques and financial implications. *School Business Affairs,* 55(10), 28-31.

Table 1

Larger New Jersey School Districts Selected by Quota Sampling

District	Non-Hispanic White[1,2]	Non-Hispanic Black[1,2]	Hispanic[1,2]	Asian[1,2]	Total Enrollment	Region	Number of Racial Subgroups with Fewer than 300 Students
East Brunswick	**63.1%**	4.0%	5.7%	27.2%	8,965	Central	2
Gloucester Township	**68.9%**	21.9%	4.8%	4.2%	7,773	South	2
Hillsborough Township	**78.2%**	4.5%	6.4%	10.6%	7,558	Central	2
North Bergen	14.9%	1.3%	**78.5%**	5.3%	7,508	North	1
Egg Harbor Township	**58.4%**	12.6%	16.0%	12.9%	7,483	South	0
Montclair	**49.7%**	38.9%	6.6%	4.7%	6,620	North	2

Notes: [1]Racial percentages will not add up to 100.0% as Native Americans, Hawaiian Natives, and Two or More Races were not considered.

[2]Number is bolded if the value is the majority race.

Table 2

Smaller New Jersey School Districts Selected by Quota Sampling

District	Non-Hispanic White[1,2]	Non-Hispanic Black[1,2]	Hispanic[1,2]	Asian[1,2]	Total Enrollment	Region	Number of Racial Subgroups with Fewer than 300 Students
Tenafly	**65.7%**	1.3%	3.9%	29.1%	3,394	North	2
Manchester Township	**74.0%**	12.8%	9.9%	3.0%	3,361	South	3
Hillside Township	10.4%	**68.5%**	19.7%	1.3%	3,206	Central	2
North Plainfield	18.1%	23.4%	**53.0%**	5.4%	3,127	Central	1
Delran	**79.3%**	9.1%	7.4%	4.1%	2,817	South	3
Dumont	**70.6%**	1.7%	14.9%	12.3%	2,678	North	3

Notes: [1]Racial percentages will not add up to 100.0% as Native Americans, Hawaiian Natives, and Two or More Races were not considered.

[2]Number is bolded if the value is the majority race.

Table 3

Comparison of Absolute Mean Error Rates for Larger New Jersey School Districts

Projection Year	District	AMER Race Model	AMER No Race Model	Percent Difference
2003-04	East Brunswick	1.5%	1.5%	0.0%
2004-05		2.8%	**2.3%**	0.5%
2005-06		4.9%	**3.2%**	1.7%
2006-07		7.2%	**3.0%**	4.2%
2003-04	Montclair	2.2%	**1.9%**	0.3%
2004-05		2.1%	**1.7%**	0.4%
2005-06		3.4%	**3.0%**	0.4%
2006-07		4.2%	**3.7%**	0.5%
2003-04	Gloucester Township	3.4%	**3.2%**	0.2%
2004-05		**4.9%**	5.6%	0.7%
2005-06		**5.7%**	8.2%	2.5%
2006-07		**5.6%**	9.2%	3.6%
2003-04	Hillsborough Township	3.2%	**3.1%**	0.1%
2004-05		6.6%	**6.0%**	0.6%
2005-06		7.7%	**6.6%**	1.1%
2006-07		9.9%	**7.8%**	2.1%
2003-04	North Bergen	**6.0%**	6.2%	0.2%
2004-05		**6.5%**	6.6%	0.1%
2005-06		8.7%	**7.6%**	1.1%
2006-07		8.4%	**6.7%**	1.7%
2003-04	Egg Harbor Township	4.2%	**3.9%**	0.3%
2004-05		**4.6%**	5.8%	1.2%
2005-06		**6.4%**	6.6%	0.2%
2006-07		8.6%	**6.3%**	2.3%

Note: Lowest AMER of the two projection techniques is bolded for each projection year.

Table 4
Comparison of Absolute Mean Error Rates for Smaller New Jersey School Districts

Projection Year	District	AMER Race Model	AMER No Race Model	Percent Difference
2003-04	Tenafly	**3.5%**	3.8%	0.3%
2004-05		4.2%	**3.6%**	0.6%
2005-06		5.6%	**4.5%**	1.1%
2006-07		5.7%	**5.4%**	0.3%
2003-04	Manchester Township	5.2%	**4.7%**	0.5%
2004-05		7.7%	**6.8%**	0.9%
2005-06		11.1%	**9.4%**	1.7%
2006-07		13.7%	**9.8%**	5.9%
2003-04	North Plainfield	9.5%	**6.8%**	2.7%
2004-05		16.0%	**10.9%**	5.1%
2005-06		23.8%	**11.9%**	11.9%
2006-07		36.9%	**17.5%**	19.4%
2003-04	Delran	3.8%	3.8%	0.0%
2004-05		**6.2%**	6.7%	0.5%
2005-06		7.6%	**7.2%**	0.4%
2006-07		11.7%	**9.0%**	2.7%
2003-04	Dumont	3.4%	**3.1%**	0.3%
2004-05		5.5%	**4.4%**	1.1%
2005-06		7.3%	**4.6%**	2.7%
2006-07		8.7%	**5.6%**	3.1%
2003-04	Hillside Township	6.3%	**4.8%**	1.5%
2004-05		10.5%	**6.2%**	4.3%
2005-06		15.9%	**9.0%**	6.9%
2006-07		21.4%	**11.1%**	10.3%

Note: Lowest AMER of the two projection techniques is bolded for each projection year.