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ABSTRACT

Achievement test scores and measures of district and pupil characteristics were analyzed for all California school districts. Achievement test scores were found to be highly correlated among each other. The best single predictor of achievement scores was a measure of family poverty. Scholastic aptitude scores were not used as predictors. Regression equations which were developed to predict achievement scores on the basis of district characteristics accounted for about half of the variance in achievement scores among districts. (Author)

# California State Testing Program 1970-71

## Profiles of School District Performance

## Technical Supplement

Prepared by the Office of Program Evaluation

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Achievement test scores and measures of district and pupil characteristics were analyzed for all California school districts. Achievement test scores were found to be highly correlated among each other. The best single predictor of achievement scores was a measure of family poverty. Scholastic aptitude scores were not used as predictors. Regression equations developed to predict achievement scores on the basis of district characteristics accounted for about half of the variance in achievement scores among districts.

CONTENTS

## INTRODUCTION

The purposes of this technical supplement are (1) to describe the procedures used in computing the converted and predicted scores presented in the report, California State Testing Program, 1970-71, Profiles of School District Performance, and (2) to present more complete statistical details resulting from the analyses performed.

The purposes of the analyses were (1) to gain a better understanding of the relationships among achievement test scores and measures of district characteristics and resources and (2) to apply this knowledge to the technique of predicting test scores for a district by using those predicted scores as a basis for setting expectancies. This method of evaluating test results in the light of other information about a school district was first used in the publication, California State Testing Program, 1969-70, a District by District Analysis of Test Scores and Other School Factors. Changes have been made in the report for 1970-71 in order to make it more understandable and useful.

## DATA TRANSFORMATIONS

District median test scores and other factors were first converted to statewide percentile ranks, and then to statewide normalized z-scores. These z-scores indicate the number of standard deviation units above or below the mean to which each percentile rank would correspond in a normal distribution. The z-scores were used to calculate a correlation matrix for each type of district. When data were missing, the correlations among the avail-

able data were used as the best estimate of the corresponding correlation coefficients. This procedure yielded results which must be considered approximate, since it assumes that the missing data are not different in kind from the available data. The missing information on any one variable generally involved data from less than 3 percent of the districts. All subsequent analyses were based on the normalized z-scores.

## CORRELATIONAL ANALYSIS

Eleven achievement test scores and 22 district descriptors were available for all unified districts. The number of variables was correspondingly lower for elementary and high school districts. Tables 1-9 present the correlation coefficients among these scores and descriptors for unified, elementary, and high school districts.

A correlation coefficient is a measure of the relationship between two variables. This statistic can assume values ranging from -1.0 through zero to +1.0. A positive correlation coefficient indicates that as the value of one variable increases, the value of the other increases; that is, high values on one tend to be accompanied by high values on the other. For example, from Table 3, it can be seen that scholastic ability scores for 6th-grade pupils correlated .92 with reading scores in the 6th grade. This indicates a strong relationship between these variables. A correlation of zero indicates that there is no tendency for high or low scores on one variable to occur, or to correlate with high or low scores on the other. A further example from Table 3 shows that average class size correlated .00 with 12th-grade language, indicating there was essentially no relationship or agreement between the ordering of these two measures. A negative correlation coefficient indicates that as the value of one variable increases, the value

of the other variable decreases. Again from Table 3 it can be seen that Index of Family Poverty correlated -.60 with 12th-grade mathematics scores. This indicates that higher levels of poverty tend to be associated with lower mathematics achievement scores.

Unified School Districts

Tables 1, 2, and 3 present intercorrelation matrices for the measures for all California unified school districts.

The tables provide for an easy examination of the relationships among the 11 achievement test scores (output measures) (Table 1), the 22 input measures (Table 2), and the correlations between the test scores and the predictor measures (Table 3).

By examining Table 1, one can see that the median test scores are highly intercorrelated. The correlation coefficients range from .23 to .90 with many in the .70's and .80's. This is not unexpected since districts tend to be fairly homogeneous. Factors affecting pupil achievement in one grade level or curricular area may be expected to have a similar impact in other areas. At a given grade level the measures would be expected to correlate highly because they measure similar cognitive skills of the same children.

The coefficients presented in Table 2 for the predictor or input variables range from -.69 to +.86. Most of the high positive coefficients are among measures which one would expect to be highly related; e.g., general fund tax rate and general purpose tax rate (.86), class size in grades one through three and pupil-teacher ratio in grades four through eight (.58), median teacher salary and maximum teacher salary (.75), and corresponding measures of pupil ability at grade 6 and 12 (.79). These positive correlations indicate that high values in one member of the pair tend to be associ-

ated with high values in the other member of the pair, and low values tend to be associated with low values.

The highest negative correlations in Table 2 are between measures of scholastic ability and the social-financial descriptors: percent total minority enrollment (-.61, -.61); percent Spanish surnamed (-.61, -.51); and index of family poverty (-.69, -.67). In other words, the larger the percent of minority enrollment or the higher the index of family poverty, the lower the values of scholastic ability. Other negative relationships were apparent between assessed valuation and the variables of: average daily attendance; class size (-.61); pupil-teacher ratio (-.52); and general fund tax rate (-.64).

Expenditures for instruction per pupil was negatively correlated with average class size (-.53) and pupil-teacher ratio (-.45). Expenditures for instruction per pupil was not related to percent total minority pupils (-.03), but was positively related to percentage of Black students (.11) and negatively related to percentage of Spanish surnamed students (-.24), indicating a very slight tendency for more resources to be available for school districts with a high percentage of Black students; and a tendency to have fewer resources for school districts with larger Spanish surnamed populations.

Table 3 presents correlations observed between the 22 predictor measures and the 11 test scores. Scholastic ability scores are very closely related to achievement test scores. The coefficients range from .44 to .92 with many in the 70's and 80's. This is to be expected since scholastic ability tests involve the use of basic skills which also underlie achievement in many areas. They also tend to be similar to achievement tests because of format and other constraints imposed by the nature of multiple-choice tests.

Several hypotheses can be offered to account for these high correlations among achievement scores and scholastic ability measures. First, it is logical to expect pupils with higher scholastic abilities to do better on achievement tests than pupils with lower scholastic abilities. Also, the scholastic ability tests used here and the achievement tests are quite similar in many ways. They not only are alike in format and design, but the test content in terms of the skills and concepts which the tests measure are also similar. In some ways, the scholastic ability tests may be considered to be achievement tests of general academic skills as well as measures of application and reasoning with those skills. The scholastic ability tests used here are not culture-free. These tests use the concepts and experiences common to a culture to estimate the relative degree to which pupils may be expected to profit from instruction. This means that a child with a background of rich educational experiences is likely to score well on ability tests as well as on achievement tests. It also means that a child with a less rich experience, especially if he has a different language background, is likely to do poorly on both ability tests and achievement tests for the same reason.

The next highest coefficients are negative ones. Percent of minority enrollment and index of family poverty are inversely related to school achievement. Most of the coefficients range in the -.50's and -.60's, which indicate relatively strong inverse relationships among these input measures and school achievement.

Other variables which correlated moderately positively with achievement were teacher salaries and size of district. Expenditures for instruction and ratio of nonteaching certificated personnel to full-time equivalent teachers bore very low, positive relationships with achievement.

Other variables which were slightly negatively related to achievement were pupil mobility and to a lesser degree, rate of staff turnover, class size, and pupil-teacher ratio. Tax rates and levels of assessed valuation per pupil were unrelated to school achievement.

Elementary School Districts

Tables 4, 5, and 6 present the intercorrelation matrices for elementary school districts. Relationships among the test scores are presented in Table 4. Relationships are similar to those for unified school districts, i.e., all are positive and generally moderate to high, indicating that achievement in one area tends to be associated with achievement in another area.

Relationships among predictor variables, as presented in Table 5, were also similar to those found for unified districts.

The relationships between the test variables and the predictor variables, as shown on Table 6, are also so similar to those for unified districts that it is unnecessary to describe them. The positive relationship between non-teaching certificated personnel and the achievement test scores is somewhat lower for elementary districts, as are the negative coefficients between class size and school achievement and between pupil-teacher ratio and school achievement.

High School Districts

Tables 7, 8, and 9 present the intercorrelation matrices for high school districts. As displayed in Table 7, the relationships among the four test variables are all quite high. The correlations among the predictor variables are presented on Table 8. The pattern of relationships is very similar to that observed for the unified and elementary districts. Slight differences in

degree of relationship appear between certain variables; e.g., the positive relationship between expenditures for instruction and teachers' salaries is weaker for high school districts than for unified or elementary districts.

From Table 9 it can be seen that the pattern of relationships between the test variables and the predictor variables is similar to that observed for other types of districts with one exception; for elementary and unified school districts a low, positive relationship was found between test scores and non-teaching certificated personnel, whereas for high school districts the relationship is low and negative.

## REGRESSION ANALYSIS

### Purpose

It is desirable to have a single number which summarizes the effectiveness of a district on particular achievement dimensions. A raw test score is less accurate than desired for this purpose because it does not take into account differences in available resources among districts. This section describes an attempt to meet this need by preparing a prediction for a district on the basis of the achievement of districts with similar resources. A deviation from this prediction, beyond certain confidence intervals, indicates the relative effectiveness or ineffectiveness of the programs in the district.

### Plan for Developing Regression Equations

Multiple regression equations were developed for predicting each achievement variable from the district input variables. Predictor variables were selected from among available measures with the intention that they represent the resources available to the district. The general procedure for developing the prediction equations was to select and use a single set of predictor

variables for all dependent variables, but to calculate separate weights for these predictors for each of three sub-groups of districts. For each of the three district types: elementary, secondary, and unified, all 11 selected district characteristics were used to develop separate equations for predicting the achievement test scores.

Formation of Sub-groups

Because the school districts in California are quite varied, it might be argued that they should not be put into the same group for the regression analysis. An extreme view is that each district is so unique that comparisons are not useful at all. The purpose of this study was to select a small number of groups, which were reasonably homogeneous, through logical and to some degree empirical evidence.

The breakdown of districts into unified, elementary, and high school was retained from last year's report. This categorization is widely used, and the equations developed on last year's data support the inference of differences. The educational processes involved in these groups are thought to be different. Therefore, it is reasonable to use different equations to predict outcomes.

Four other measures were used to further subdivide the districts: expenditures per pupil, percent minority enrollment, index of family poverty, and total enrollment of the district. All unified districts were divided into three groups of approximately equal numbers on the basis of each of the four measures. Multiple regression equations were then computed to predict sixth-grade reading scores and twelfth-grade reading scores for each subgroup. If the precision of prediction for one of these breakdowns was better than the precision for the unified districts as a group, such a breakdown

may be considered an improvement. It was found that only school district enrollment made an improvement, and further examination revealed that this difference was essentially eliminated when the prediction equations considered sample size. Therefore, the prediction equations were developed for the three types of districts without further subdivision. However, as described later, district size was used as a factor in estimating the precision of the predictions.

Selection of Predictor Variables

There is no single widely agreed upon method for deciding which measures should be included as predictors in regression equations (Draper and Smith, 1966). In this study a number of criteria have been used for this selection. First, measures were included if they were found to be important predictors in the 1969-70 report. Secondly, measures which had wide interest (e.g., expenditures per pupil) were included. Thirdly, some other measures were included on the basis of some exploratory stepwise regression analyses. The 11 predictors are listed below.

1. Assessed valuation per unit of average daily attendance
2. Percent minority pupils
3. Percent Indian pupils
4. Percent Black pupils
5. Percent Oriental pupils
6. Percent Spanish surnamed pupils
7. Index of family poverty
8. Pupil mobility
9. Rate of staff turnover
10. Expenditures for instruction per unit of a.d.a.
11. Regular a.d.a. for grades one through twelve

The input measures available are described in detail in Part I of the report of profiles. The measures studied were classified into three groups: (1) pupil characteristics; (2) school resources and characteristics; and

(3) school allocation of resources. Only the measures in groups 1 and 2 were included in the prediction equations. The reasons for including these and for excluding those in group 3 are given below.

1. Pupil characteristic variables:

   - Index of family poverty was included in the predictor set because it was an important predictor (i.e., had a high correlation with test scores) in the 1969-70 data analysis.
   - Percent total minority was included in the predictor set because it also was an important predictor in the 1969-70 data.
   - Percent Spanish surnamed, Black, Oriental, and American Indian pupils were not used in the 1969-70 report but were included here because they were expected to further refine the percent minority measure.
   - Pupil mobility index was included in the predictor set because it was a mildly important predictor in the 1969-70 study.

2. School resources and characteristic variables:

   - Expenditures for instruction per pupil, though not a powerful predictor in the 1969-70 analysis, was included in the predictor set because it is commonly thought to be related to achievement and because it serves as a useful summary of available school resources.
   - Staff turnover was included as a predictor variable because it was found to be a mildly useful predictor in the 1969-70 data.
   - Assessed valuation per pupil was included because it is widely thought to be related to achievement.

- Size of school district (total regular a.d.a.) was included because it is commonly considered to be an important variable in comparing districts, although it actually added very little precision to the predictions.

NOTE: Some measures were not included in the regression analyses for various reasons. Some were excluded because they were thought to reflect alternative allocation patterns or use of resources by the schools. The purpose of the regression analysis is to compensate, in part, for different input to the schools in terms of resources and student characteristics over which the schools have no control If some of these allocation measures were effective predictors of achievement, it would tend to increase the predicted scores for districts which used these factors extensively. Such districts would be unfairly penalized because of their resource allocation choices. The following variables were excluded for this reason.

3. Resource allocation variables:

- Minimum, maximum, and median teachers' salaries.
- Average class size, grades 1-3.
- Pupil-teacher ratio, grades 4-8.
- Percent non-teaching personnel.

NOTE: Two other variables were not included in the equations because their contribution to the precision of the equations was essentially zero. These were the two tax rate variables: total general fund tax rate and total general purpose tax rate.

Pupil scholastic ability scores (IQ) were also excluded, although they were included in the 1969-70 report and are very good predictors of achievement test scores. There is very little evidence, if any, to indicate that ability test scores are subject to change due to a very high or a very low quality instructional program as are achievement test scores. If this is true and if IQ scores were included in the equations, then districts with good programs would be penalized since the high ability scores of their pupils would lead to a high predicted score and, therefore, a depressed residual. Conversely, districts with poor programs would be unfairly rewarded.

Development of the Equations

Multiple linear regression equations were calculated with the use of BMD program 02R (stepwise regression) for all dependent variables for each type of district using the eleven predictor variables for each district. All calculations were based upon the predictors converted to normalized z-scores.

Table 10 provides a summary of the multiple correlations obtained. All multiple correlations were statistically significant at alpha equal to .001. The multiple coefficients of determination ($R^2$) are also given in Table 10. These indicate the proportions of variance in the predicted variable accounted for by the predictors. They range from .18 to .60, with a median of .45. This indicates that about half of the variance among districts' scores is being predicted successfully.

It can be observed that at the elementary school level, the equations are more effective for the unified districts than the elementary districts, whereas at the secondary level the equations are more effective for the high school districts. It is also true that within the elementary level, the

accuracy of the equations is progressively better at higher grade levels.

Cross Validation

Regression equations tend to overestimate the amount of variance accounted for by the equations developed. This is due to the tendency to "take advantage" of chance relationships in the observed scores, relationships which are characteristic of the particular sample rather than the population which the sample represents. This tendency decreases as the number of observations increases.

The best way to assess the validity of a regression equation is to use the equation developed on one sample of data to predict scores in a second sample of data. The effectiveness of these predictions is a measure of the validity of the regression equation.

Another way of assessing the validity of regression equations is to use cross validation within the sample available. The sample is divided in half, prediction equations are developed independently for each half, and these equations are then tried out on the opposite halves. If these equations tend to predict effectively for the half on which their validity is tested, we conclude that some stable relationship is represented by the equations developed. This procedure was conducted for all achievement areas.

Tables 11, 12, and 13 give the cross validation results for the three types of districts. In each case, the total sample was divided into two groups on an odd-even basis, prediction equations were developed for each sub-sample, and these were used to predict scores in the other sub-sample. The tables present the proportion of variance accounted for by each equation for the total sample in the first column. The second column presents the average

$R^2$ for the two halves when the weights were applied to the samples from which they were derived. The third column presents the average $R^2$ for the two halves when the weights were used to predict within the opposite halves. The difference between the latter two figures is also presented to aid the reader in judging the stability of the equations.

It can be seen that the equations for the elementary districts were most stable and those for high school districts were least stable. The loss in terms of $R^2$ was generally less than 5 percent for elementary districts but went as high as 33 percent for high school districts. The loss for unified districts varied from 5 to 20 percent. These trends are consistent with the logical expectation that the largest sample (elementary districts) would be the most stable and that the smallest sample (high school districts) would be the least stable. Generally, the results show a satisfactory level of stability of the equations.

Relative Contribution of Predictor Variables

The question is frequently asked, "Which district characteristics are the most effective predictors of achievement?"

Tables 14, 15, and 16 summarize the regression weights for each predictor for each of the sub-groups. Since the predictor variables are in approximately standard form (they were standardized across the total sample, though regression weights were estimated separately for each type of district), the absolute value of each regression weight reflects to some degree the contribution of a given predictor to the predictions of a criterion variable. This relationship is complex, however, due to the high intercorrelations among predictor variables. In the data studied here, the predictor variables are so

highly intercorrelated that it is not possible to determine the unique contribution made by each predictor. If some variables had been omitted or if other variables had been added, the regression weights could have differed considerably.

The proportion of variance accounted for is another measure frequently used in assessing the contribution of particular measures to the predictions, but it should be kept in mind that the proportion of variance accounted for is to some extent a reflection of the particular equations used (and therefore of the methods of selecting and ordering the variables used in those equations) and also of the intercorrelations among the selected predictors.

Despite the limitations discussed above, it is useful to seek to compare the relative effectiveness of the predictor variables. For this purpose, each predictor measure was rank ordered in terms of its contribution to the explained variance ($R^2$) using a stepwise regression procedure (BMD02R; Dixon). These rankings, given in Tables 17 through 19, when compared across the prediction equations for a number of achievement scores, give some idea of the relative effectiveness of predictors. For example, index of family poverty was usually the most effective predictor of achievement for all three types of districts, while rate of staff turnover was one of the least effective.

Within the context of the precautions mentioned above, the relative predictive power of district characteristics may be summarized as follows:

1. Assessed valuation per pupil tends to be a relatively poor predictor of achievement scores, although it increases slightly for the later grades in unified districts.
2. Percent total minority pupils tends to be the most powerful predictor

for elementary districts, especially at the lower grades. Otherwise, it is quite weak, except for math in grade 12.

3. The percentages of pupils in each of several ethnic groups were only sporadically good predictors of achievement, except for percent Oriental, which was a moderately good predictor for elementary and unified districts, and percent Spanish surnamed in unified districts.
4. Index of family poverty was highly predictive of achievement test scores, especially for unified and high school districts. Overall, poverty is a more effective predictor of achievement than racial composition of districts.
5. Pupil mobility was a moderate to weak predictor of achievement.
6. Rate of staff turnover was a weak predictor.
7. Expenditures for instruction was a weak predictor, except for the early grades where it was moderately effective.
8. Regular average daily attendance was a relatively weak predictor.

In summary, index of family poverty was the most effective predictor, followed by the percent Oriental students and percent total minority pupils. It should also be said that the actual improvement to the precision of the equations made by the addition of all the predictors after the first two or three was generally quite small.

Computation of Confidence Bands

The development of regression equations, the estimation of regression weights, and the calculation of predicted scores were based upon observed scores transformed into normalized z-scores. Prediction equations were developed for each achievement measure for each of the three types of district organization.

The districts of each type of organization (unified, elementary, and high school) were subdivided into ten size groupings. Means and standard deviations of the residuals were calculated for each of these sub-groups. As expected, the variance of the residuals was negatively correlated with district size, i.e., the scores for large districts can be predicted more accurately than those for smaller districts. It was essential, therefore, that size of district be considered in determining the width of the confidence bands. Based upon an inspection of these variances, sub-groups with similar variance were combined by collapsing sub-groups similar in size and residual variance to form three to five larger sub-groups for each type of district. The variance of the residuals was then calculated for each of these new sub-groups.

Setting a confidence level is somewhat arbitrary. If it were to be set very high, only a few districts would appear to have achieved differently than expected. Setting it low would result in the exaggeration of slight differences between observed and predicted scores. The purpose of the confidence intervals was to supply a simple but meaningful guide to interpreting the achievement test results in the light of the resources available to the district. Fifty percent confidence intervals were selected as yielding an adequate but not overwhelming number of districts which actually achieved above or below the predicted score range. For 50 percent confidence intervals, about one-fourth of the districts fall above and about one-fourth fall below the predicted scores.

For each of the sub-groups, the standard deviation of the residuals was multiplied by .67. Tables 20, 21, and 22 present the results of this operation. Fifty percent confidence intervals were calculated for each grade level and content area for every district by adding and subtracting these computed

values to the predicted scores. The resulting upper and lower boundaries, stated in terms of z-scores, were then converted to percentile ranks. These percentile bands for each district can be found on Table 9 in Part II of the report, California State Testing Program, 1970-71, Profiles of School District Performance, under the column headed, "Percentile Ranks of Predicted Score Range." The precision of the predictions, and therefore the width of the confidence intervals, will vary according to the size of the district and the effectiveness of the equation for that particular dependent variable. The calculation of the Performance Index ("A" for achievement above the predicted level; "B" for achievement below predicted level; and "W" for achievement within the expected range) was done as the last step, i.e., after the bands had been converted to percentile ranks.

How to Calculate a Predicted Score Range

To understand more clearly how the predicted score ranges were derived, the reader may wish to calculate one by hand. This can easily be accomplished by following the six steps outlined below.

Step 1. Convert the percentile ranks for the eleven predictors for a given district into unit normal deviates (z-scores). This can be done by consulting the z-tables which can be found in most standard statistical textbooks. For example, a percentile rank of 16 would convert to a z-score of -1.0; a percentile rank of 50 would convert to 0.0; 84 to +1.0; etc.

Step 2. Place these z-scores into the standard equation which reads as follows:

$$Y = C + (X_1)(b_1) + (X_2)(b_2) + (X_3)(b_3) + \ldots + (X_{11})(b_{11})$$

Where

Y = the predicted score in z-score terms

C = the constant

$X_{1-11}$ = the z-score values for a district for each predictor variable (from Part I of California State Testing Program, 1970-71, Profiles of School District Performance).

$b_{1-11}$ = the partial regression weights for each predictor.

The constants and the regression weights are to be found on Tables 10 to 12. These values are listed separately for each test score variable according to type of district.

Step 3. Complete the equation by multiplying each predictor variable z-score by the corresponding weight. Sum these products and add the constant to this total. This calculated value is the predicted score in z-score terms.

Step 4. By consulting Tables 20 to 22, locate the confidence band value appropriate for this test score variable for districts of this size and type.

Step 5. Compute the lower end of the predicted score range by subtracting the confidence band value from the predicted score obtained in Step 3. Find the upper le l of the predicted score range by adding the confidence band value to the predicted score.

Step 6. Convert the lower and upper values of the predicted score obtained in Step 5 (now in z-score terms) into percentile ranks by using the same tables mentioned in Step 1.

These calculations will result in a predicted score range for a given test variable for a given district which is the same or very similar to that found in Table 9 of the publication entitled, California State Testing Program, 1970-71, Profiles of School District Performance. The two values may not be exactly the same since all values found on Table 9 were based on predictor values and regression weights carried to four decimal places.

## NON-LINEAR ANALYSIS

The regression equations developed in this paper have been based upon linear relationships, that is, a unit of increase in a predictor variable is associated with a corresponding increase in the predicted variable.

There are many other possible relationships, including non-linear relationships, such as a quadratic relationship in which high and low values of the independent variable are associated with low values in the dependent measure while medium values of the independent measure are associated with high values of the dependent measure.

It may be hypothesized that such non-linear relationships exist in the present data and their use in the prediction equations would result in more effective prediction. A series of exploratory analyses were undertaken to examine this question.

In one exploration, linear, quadratic, and cubic components of the predictor variables were examined as bivariate predictors of median sixth-grade reading scores. The results indicated no significant improvement in prediction by the use of the non-linear components. Correlations were usually only improved by .01 (e.g., .58 to .59) by the inclusion of quadratic and cubic components.

In another examination of this question, the quadratic components (in the form of the variables squared) were included with the original variables in multiple regression equations to predict 6th-grade reading scores and 12th-grade reading scores. The increase in variance accounted for ($R^2$) was 3 percent for both grade levels; .56 to .59 for grade six; and .45 to .48 for grade twelve. Such increments do not warrant the inclusion of quadratic components in the equations.

## FACTOR ANALYSIS

Considering the correlation matrices presented in Tables 1 to 9 and what is known about the measures involved, it seems likely that a simpler dimensional structure is possible. In this regard, some exploratory steps were taken to factor analyze the correlation matrices in order to find a simpler structure for the scores. Some conclusions based upon these analyses are summarized below.

The factor analysis (principal component solution, number of factors equal to the number of eigenvalues greater than one, varimax orthogonal rotation, using the BMD03M program) of the predictor variables for elementary districts (Table 5) yielded five factors.

Factor one (expenditure): minimum salary, maximum salary, median salary, expenditure/a.d.a.

Factor two (minority enrollment): percent minority, Spanish surnamed.

Factor three (class size): class size, pupil-teacher ratio.

Factor four (tax rate): general fund tax rate, general purpose tax rate.

Factor five (poverty): non-teaching personnel, index of family poverty, percent Black students.

For unified districts, a similar analysis also yielded five factors.

Factor one (expenditure-class size): expenditure per a.d.a., regular a.d.a., class size (negative), pupil-teacher ratio (negative).

Factor two (salaries): number non-teaching personnel, minimum teacher salary, maximum teacher salary, median teacher salary.

Factor three (poverty-minority): index of family poverty, percent total minority, percent Spanish surnamed pupils, percent Black pupils.

Factor four (tax): general fund tax rate, general purpose tax rate.

Factor five (size): a.d.a., turnover (negative).

These results suggest a five-dimensional structure of the predictors used. These five dimensions may be described as expenditure, percent minority, poverty, tax rate, and class size.

## EPILOGUE

It is to be understood that the technique of minimizing district dissimilarities by focusing on residuals between actual and predicted performance is still in the formative stage. Any comments or suggestions regarding the techniques and discussions described in this supplement or the book of profiles are most welcome.

Future reports will be modified, as this one differs from previous reports. The input variables will undoubtedly be changed, since AB 665 of 1972 deleted the specific list of factors. New predictor variables will be added, especially some from the 1970 census. The new entry-level test to be introduced in grade one will be a prime predictor of reading scores at grades two and three. Indeed, that is its central purpose. A similar approach that is being considered is the use of achievement scores at one grade level as predictors of achievement at higher grade levels. However, further experimentation and consideration with this approach are needed before its possible adoption.

## APPENDIX

Table 1

Intercorrelation Matrix for the Eleven Test Score Variables for Unified Districts*

| Test Score Variable | Correlation Coefficients, by Test Score Variable | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 1. Grade 1 Reading | 1.00 | | | | | | | | | | |
| 2. Grade 2 Reading | .74 | 1.00 | | | | | | | | | |
| 3. Grade 3 Reading | .69 | .81 | 1.00 | | | | | | | | |
| 4. Grade 6 Reading | .53 | .71 | .78 | 1.00 | | | | | | | |
| 5. Grade 6 Language | .55 | .70 | .74 | .88 | 1.00 | | | | | | |
| 6. Grade 6 Spelling | .55 | .69 | .75 | .88 | .89 | 1.00 | | | | | |
| 7. Grade 6 Mathematics | .54 | .69 | .76 | .90 | .87 | .84 | 1.00 | | | | |
| 8. Grade 12 Reading | .30 | .44 | .47 | .63 | .58 | .53 | .59 | 1.00 | | | |
| 9. Grade 12 Language | .34 | .48 | .55 | .64 | .59 | .62 | .59 | .73 | 1.00 | | |
| 10. Grade 12 Spelling | .23 | .37 | .41 | .54 | .50 | .55 | .47 | .63 | .82 | 1.00 | |
| 11. Grade 12 Mathematics | .35 | .51 | .59 | .63 | .59 | .63 | .64 | .74 | .82 | .71 | 1.00 |

* Coefficients exceeding .13 are significant at the .05 level. Those exceeding .17 are significant at the .01 level.

Table 2

Intercorrelation Matrix for the 22 Predictor Variables for Unified School Districts*

| Predictor Variable | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12. Minimum Teacher Salary | 1.00 | | | | | | | | | | | | | | | | | | | | | |
| 13. Maximum Teacher Salary | .35 | 1.00 | | | | | | | | | | | | | | | | | | | | |
| 14. Median Teacher Salary | .47 | .75 | 1.00 | | | | | | | | | | | | | | | | | | | |
| 15. Average Class Size 1-3 | -.21 | .25 | .02 | 1.00 | | | | | | | | | | | | | | | | | | |
| 16. Pupil-Teacher Ratio 4-8 | -.08 | .16 | -.02 | .58 | 1.00 | | | | | | | | | | | | | | | | | |
| 17. Non-Teaching Personnel | .12 | .54 | .48 | .15 | .09 | 1.00 | | | | | | | | | | | | | | | | |
| 18. General Fund Tax Rate | -.08 | .44 | .28 | .45 | .32 | .27 | 1.00 | | | | | | | | | | | | | | | |
| 19. General Purpose Tax Rate | .02 | .39 | .29 | .29 | .16 | .23 | .86 | 1.00 | | | | | | | | | | | | | | |
| 20. Assessed Valuation/ADA | .29 | -.14 | .17 | -.61 | -.52 | -.02 | -.64 | -.41 | 1.00 | | | | | | | | | | | | | |
| 21. Percent Total Minority Pupils | -.10 | .00 | -.05 | .13 | .21 | .06 | .15 | .04 | -.25 | 1.00 | | | | | | | | | | | | |
| 22. Percent American Indian | -.03 | -.28 | -.20 | -.17 | -.06 | -.21 | -.26 | -.24 | .15 | .01 | 1.00 | | | | | | | | | | | |
| 23. Percent Negro | .08 | .35 | .25 | .19 | .17 | .38 | .27 | .18 | -.22 | .43 | -.13 | 1.00 | | | | | | | | | | |
| 24. Percent Oriental | -.03 | .34 | .26 | .23 | .21 | .33 | .35 | .27 | -.28 | .37 | -.30 | .37 | 1.00 | | | | | | | | | |
| 25. Percent Spanish Surnamed | -.19 | .02 | -.06 | .21 | .23 | -.04 | .24 | .15 | -.30 | .80 | -.24 | .17 | .28 | 1.00 | | | | | | | | |
| 26. Index of Family Poverty | -.31 | -.37 | -.32 | -.01 | .03 | -.14 | -.09 | -.15 | -.05 | .67 | .12 | .22 | .01 | .51 | 1.00 | | | | | | | |
| 27. Scholastic Ability Grade 6 | .26 | .33 | .35 | -.04 | -.12 | .18 | -.04 | .06 | .19 | -.61 | -.11 | -.13 | .10 | -.61 | -.69 | 1.00 | | | | | | |
| 28. Scholastic Ability Grade 12 | .20 | .33 | .31 | .05 | -.04 | .19 | .07 | .14 | .08 | -.61 | -.25 | -.06 | .16 | -.51 | -.67 | .79 | 1.00 | | | | | |
| 29. Pupil Mobility Grades 1-8 | -.16 | -.17 | -.18 | -.04 | .00 | -.05 | -.18 | -.16 | .00 | .16 | .07 | .13 | -.06 | .14 | .37 | -.40 | -.23 | 1.00 | | | | |
| 30. Pupil Mobility Grades 9-12 | -.03 | -.01 | -.01 | .02 | .07 | .03 | -.07 | -.08 | .03 | .24 | .11 | .25 | -.01 | .12 | .34 | -.35 | -.21 | .59 | 1.00 | | | |
| 31. Rate of Staff Turnover | -.17 | -.30 | -.39 | .02 | .03 | -.17 | -.12 | -.11 | -.02 | .07 | -.01 | -.02 | -.15 | .12 | .14 | -.21 | -.10 | .15 | .04 | 1.00 | | |
| 32. Expenditures per ADA | .47 | .24 | .54 | -.53 | -.45 | .24 | -.17 | -.04 | .62 | -.03 | .10 | .11 | -.05 | -.24 | -.06 | .20 | .06 | -.04 | .07 | -.19 | 1.00 | |
| 33. Regular ADA Grades 1-12 | .01 | .65 | .46 | .60 | .46 | .40 | .59 | .42 | -.50 | .19 | -.33 | .46 | .53 | .17 | -.12 | .17 | .25 | -.12 | .00 | -.28 | -.16 | 1.00 |

* Coefficients exceeding .13 are significant at the .05 level. Those exceeding .17 are significant at the .01 level.

Table 3

Intercorrelation Matrix for Eleven Test Score Variables and 22 Predictor Variables for Unified School Districts*

| Predictor Variable | Correlation Coefficients Between Test Score and Predictor Variables, by Grade and Instructional Area | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Grade 1 | Grade 2 | Grade 3 | Grade 6 | | | | Grade 12 | | | |
| | Reading | Reading | Reading | Reading | Language | Spelling | Mathematics | Reading | Language | Spelling | Mathematics |
| 12. Minimum Teacher Salary | .19 | .23 | .24 | .19 | .22 | .25 | .19 | .12 | .24 | .23 | .20 |
| 13. Maximum Teacher Salary | .19 | .27 | .30 | .29 | .35 | .32 | .26 | .11 | .26 | .28 | .21 |
| 14. Median Teacher Salary | .24 | .33 | .35 | .33 | .39 | .37 | .32 | .07 | .23 | .25 | .21 |
| 15. Average Class Size 1-3 | -.05 | -.07 | -.08 | -.04 | -.01 | -.02 | -.10 | -.01 | .00 | .06 | -.11 |
| 16. Pupil-Teacher Ratio 4-8 | -.15 | -.11 | -.13 | -.12 | -.11 | -.09 | -.15 | -.08 | .01 | .05 | -.14 |
| 17. Non-Teaching Personnel | .17 | .19 | .25 | .18 | .20 | .17 | .14 | .02 | .05 | .08 | .07 |
| 18. General Fund Tax Rate | -.03 | -.07 | .02 | -.08 | .00 | -.05 | -.03 | -.11 | .04 | .02 | -.05 |
| 19. General Purpose Tax Rate | .01 | -.01 | .07 | .02 | .10 | .02 | .08 | -.01 | .09 | .03 | .04 |
| 20. Assessed Valuation/ADA | .13 | .18 | .16 | .20 | .16 | .15 | .19 | .19 | .10 | .06 | .18 |
| 21. Percent Total Minority Pupils | -.41 | -.46 | -.54 | -.58 | -.48 | -.39 | -.55 | -.57 | -.44 | -.28 | -.53 |
| 22. Percent American Indian | -.09 | -.11 | -.13 | -.14 | -.18 | -.12 | -.16 | -.11 | -.25 | -.32 | -.22 |
| 23. Percent Negro | -.01 | -.04 | -.09 | -.15 | -.09 | -.05 | -.14 | -.23 | -.03 | .06 | -.10 |
| 24. Percent Oriental | .08 | .09 | .13 | .11 | .24 | .23 | .15 | -.02 | .16 | .22 | .12 |
| 25. Percent Spanish Surnamed | -.43 | -.44 | -.50 | -.55 | -.49 | -.43 | -.52 | -.48 | -.36 | -.21 | -.43 |
| 26. Index of Family Poverty | -.44 | -.57 | -.62 | -.60 | -.60 | -.55 | -.58 | -.57 | -.56 | -.45 | -.59 |
| 27. Scholastic Ability Grade 6 | .56 | .71 | .78 | .92 | .87 | .88 | .88 | .69 | .67 | .57 | .68 |
| 28. Scholastic Ability Grade 12 | .44 | .57 | .68 | .77 | .69 | .69 | .71 | .77 | .83 | .74 | .83 |
| 29. Pupil Mobility Grades 1-8 | -.25 | -.32 | -.34 | -.31 | -.37 | -.38 | -.37 | -.28 | -.27 | -.23 | -.26 |
| 30. Pupil Mobility Grades 9-12 | -.32 | -.34 | -.37 | -.30 | -.38 | -.37 | -.36 | -.30 | -.32 | -.23 | -.32 |
| 31. Rate of Staff Turnover | -.05 | -.07 | -.09 | -.16 | -.15 | -.21 | -.12 | -.03 | -.10 | -.11 | -.10 |
| 32. Expenditures per ADA | .19 | .24 | .23 | .17 | .19 | .20 | .18 | .02 | .04 | .01 | .08 |
| 33. Regular ADA Grades 1-12 | .10 | .13 | .12 | .14 | .21 | .21 | .14 | .01 | .20 | .29 | .10 |

* Coefficients exceeding .13 are significant at the .05 level. Those exceeding .17 are significant at the .01 level.

Table 4

Intercorrelation Matrix for Seven Test Score Variables
for Elementary School Districts*

| Test Score Variable | Correlation Coefficients, by Test Score Variable | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1. Grade 1 Reading | 1.00 | | | | | | |
| 2. Grade 2 Reading | .53 | 1.00 | | | | | |
| 3. Grade 3 Reading | .47 | .60 | 1.00 | | | | |
| 4. Grade 6 Reading | .37 | .48 | .56 | 1.00 | | | |
| 5. Grade 6 Language | .37 | .45 | .50 | .82 | 1.00 | | |
| 6. Grade 6 Spelling | .37 | .44 | .47 | .73 | .83 | 1.00 | |
| 7. Grade 6 Mathematics | .33 | .44 | .48 | .77 | .77 | .67 | 1.00 |

* Coefficients exceeding .08 are significant at the .05 level. Those exceeding .10 are significant at the .01 level.

Table 5

Intercorrelation Matrix for the 20 Predictor Variables
for Elementary School Districts

| Predictor Variable | Correlation Coefficients, by Predictor Variable | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 29 | 31 | 32 | 33 |
| 12. Minimum Teacher Salary | 1.00 | | | | | | | | | | | | | | | | | | | |
| 13. Maximum Teacher Salary | .32 | 1.00 | | | | | | | | | | | | | | | | | | |
| 14. Median Teacher Salary | .55 | .82 | 1.00 | | | | | | | | | | | | | | | | | |
| 15. Average Class Size 1-3 | -.13 | .13 | -.01 | 1.00 | | | | | | | | | | | | | | | | |
| 16. Pupil-Teacher Ratio 4-8 | -.19 | -.05 | -.19 | .50 | 1.00 | | | | | | | | | | | | | | | |
| 17. Non-Teaching Personnel | .06 | .32 | .31 | .07 | -.02 | 1.00 | | | | | | | | | | | | | | |
| 18. General Fund Tax Rate | -.09 | .55 | .39 | .24 | .13 | .25 | 1.00 | | | | | | | | | | | | | |
| 19. General Purpose Tax Rate | .04 | .51 | .41 | .07 | -.03 | .17 | .86 | 1.00 | | | | | | | | | | | | |
| 20. Assessed Valuation/ADA | .42 | -.18 | .06 | -.48 | -.50 | -.02 | -.56 | -.31 | 1.00 | | | | | | | | | | | |
| 21. Percent Total Minority Pupils | -.12 | .12 | .03 | .06 | -.02 | .05 | .15 | .09 | -.19 | 1.00 | | | | | | | | | | |
| 22. Percent American Indian | -.13 | -.09 | -.08 | .04 | .03 | .05 | -.08 | -.12 | -.11 | .08 | 1.00 | | | | | | | | | |
| 23. Percent Negro | -.20 | .28 | .15 | .15 | .01 | .21 | .35 | .24 | -.35 | .35 | .01 | 1.00 | | | | | | | | |
| 24. Percent Oriental | -.06 | .43 | .31 | .11 | .10 | .22 | .40 | .33 | -.32 | .29 | -.07 | .30 | 1.00 | | | | | | | |
| 25. Percent Spanish Surnamed | -.08 | .19 | .08 | .08 | -.01 | -.02 | .21 | .16 | -.17 | .86 | -.23 | .24 | .29 | 1.00 | | | | | | |
| 26. Index of Family Poverty | -.27 | -.11 | -.16 | .11 | .15 | -.03 | .08 | -.03 | -.26 | .32 | .14 | .25 | .00 | .22 | 1.00 | | | | | |
| 27. Scholastic Ability Grade 6 | .20 | .27 | .29 | -.05 | -.06 | .13 | .18 | .24 | .04 | -.45 | -.05 | -.07 | .19 | -.41 | -.46 | 1.00 | | | | |
| 29. Pupil Mobility Grades 1-8 | -.01 | -.14 | -.11 | .02 | -.01 | -.07 | -.16 | -.13 | .09 | .19 | .04 | .04 | -.13 | .17 | .21 | -.32 | 1.00 | | | |
| 31. Rate of Staff Turnover | -.20 | -.10 | -.17 | .06 | .07 | -.01 | -.02 | -.06 | -.12 | .16 | .05 | .13 | .04 | .11 | .10 | -.08 | .06 | 1.00 | | |
| 32. Expenditures per ADA | .51 | .35 | .51 | -.31 | -.53 | .38 | -.04 | .09 | .49 | -.04 | -.04 | -.02 | -.05 | -.11 | -.22 | .17 | -.06 | -.22 | 1.00 | |
| 33. Regular ADA Grades 1-12 | -.16 | .72 | .47 | .45 | .26 | .33 | .70 | .52 | -.61 | .20 | .01 | .44 | .54 | .28 | .10 | .16 | -.14 | .04 | -.14 | 1.00 |

* Coefficients exceeding .08 are significant at the .05 level. Those exceeding .10 are significant at the .01 level.

Table 6

Intercorrelation Matrix for Seven Test Score Variables and Twenty Predictor Variables for Elementary School Districts*

| Predictor Variable | Correlation Coefficients Between Test Score and Predictor | | | | | | |
|---|---|---|---|---|---|---|---|
| | Grade 1 | Grade 2 | Grade 3 | Grade 6 | | | |
| | Reading | Reading | Reading | Reading | Language | Spelling | Mathematics |
| 12. Minimum Teacher Salary | .12 | .17 | .24 | .20 | .21 | .17 | .21 |
| 13. Maximum Teacher Salary | .21 | .26 | .33 | .28 | .29 | .24 | .28 |
| 14. Median Teacher Salary | .25 | .31 | .36 | .29 | .29 | .26 | .29 |
| 15. Average Class Size 1-3 | -.01 | -.08 | -.08 | -.12 | -.11 | -.10 | -.12 |
| 16. Pupil-Teacher Ratio 4-8 | -.05 | -.08 | -.10 | -.12 | -.13 | -.11 | -.09 |
| 17. Non-Teaching Personnel | .06 | .07 | .16 | .07 | .10 | .11 | .04 |
| 18. General Fund Tax Rate | .08 | .15 | .13 | .14 | .16 | .15 | .16 |
| 19. General Purpose Tax Rate | .10 | .19 | .18 | .21 | .21 | .18 | .20 |
| 20. Assessed Valuation/ADA | .00 | .03 | .06 | .07 | .05 | .04 | .02 |
| 21. Percent Total Minority Pupils | -.26 | -.33 | -.37 | -.41 | -.28 | -.19 | -.28 |
| 22. Percent American Indian | -.04 | -.04 | -.01 | -.05 | -.06 | -.04 | -.11 |
| 23. Percent Negro | -.03 | -.12 | -.05 | -.09 | -.04 | -.03 | -.06 |
| 24. Percent Oriental | .13 | .13 | .18 | .17 | .24 | .28 | .19 |
| 25. Percent Spanish Surnamed | -.23 | -.28 | -.35 | -.36 | -.23 | -.17 | -.20 |
| 26. Index of Family Poverty | -.25 | -.32 | -.32 | -.40 | -.35 | -.34 | -.37 |
| 27. Scholastic Ability Grade 6 | .41 | .47 | .53 | .80 | .78 | .71 | .73 |
| 29. Pupil Mobility Grades 1-8 | -.19 | -.26 | -.25 | -.29 | -.26 | -.28 | -.27 |
| 31. Rate of Staff Turnover | -.10 | -.14 | -.08 | -.08 | -.08 | -.07 | -.10 |
| 32. Expenditures per ADA | .11 | .14 | .23 | .19 | .19 | .16 | .14 |
| 33. Regular ADA Grades 1-12 | .18 | .15 | .18 | .13 | .18 | .16 | .16 |

* Coefficients exceeding .08 are significant at the .05 level. Those exceeding .10 are significant at the .01 level.

Table 7

Intercorrelation Matrix for Four Test Score Variables for High School Districts

| Predictor Variable | Correlation Coefficients, by Test Score Variable Grade Twelve | | | |
|---|---|---|---|---|
| | Reading | Language | Spelling | Mathematics |
| 8. Grade 12 Reading | 1.00 | | | |
| 9. Grade 12 Language | .69 | 1.00 | | |
| 10. Grade 12 Spelling | .58 | .81 | 1.00 | |
| 11. Grade 12 Mathematics | .83 | .81 | .65 | 1.00 |

*Coefficients exceeding .18 are significant at the .05 level. Those exceeding .23 are significant at the .01 level.

Table 8

Intercorrelation Matrix for 18 Input Predictor Variables
for High School Districts*

| Predictor Variable | Correlation Coefficients, by Predictor Variable | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 12 | 13 | 14 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 28 | 30 | 31 | 32 | 33 |
| 12. Minimum Teacher Salary | 1.00 | | | | | | | | | | | | | | | | | |
| 13. Maximum Teacher Salary | .45 | 1.00 | | | | | | | | | | | | | | | | |
| 14. Median Teacher Salary | .44 | .77 | 1.00 | | | | | | | | | | | | | | | |
| 17. Non-Teaching Personnel | .12 | .36 | .33 | 1.00 | | | | | | | | | | | | | | |
| 18. General Fund Tax Rate | -.07 | .28 | .25 | .20 | 1.00 | | | | | | | | | | | | | |
| 19. General Purpose Tax Rate | .08 | .19 | .18 | .21 | .74 | 1.00 | | | | | | | | | | | | |
| 20. Assessed Valuation/ADA | .29 | .03 | .15 | .12 | -.60 | -.44 | 1.00 | | | | | | | | | | | |
| 21. Percent Total Minority Pupils | -.08 | .00 | -.11 | .08 | .02 | .06 | -.06 | 1.00 | | | | | | | | | | |
| 22. Percent American Indian | -.05 | -.08 | -.01 | .01 | -.17 | -.16 | .12 | -.20 | 1.00 | | | | | | | | | |
| 23. Percent Negro | -.16 | .08 | .00 | .11 | .22 | .14 | -.19 | .44 | -.14 | 1.00 | | | | | | | | |
| 24. Percent Oriental | -.08 | .23 | .15 | .27 | .28 | .23 | -.26 | .35 | -.25 | .26 | 1.00 | | | | | | | |
| 25. Percent Spanish Surnamed | -.02 | .06 | -.06 | .07 | .10 | .14 | -.10 | .93 | -.35 | .29 | .32 | 1.00 | | | | | | |
| 26. Index of Family Poverty | -.26 | -.31 | -.33 | -.06 | -.12 | -.10 | -.04 | .58 | -.11 | .28 | .06 | .55 | 1.00 | | | | | |
| 28. Scholastic Ability Grade 12 | .17 | .29 | .36 | .03 | .13 | .08 | .00 | -.68 | .10 | -.19 | .02 | -.66 | -.76 | 1.00 | | | | |
| 30. Pupil Mobility Grades 9-12 | -.05 | -.05 | .01 | .17 | .00 | -.05 | .02 | .17 | .02 | .12 | .10 | .14 | .36 | -.21 | 1.00 | | | |
| 31. Rate of Staff Turnover | -.07 | -.38 | -.51 | -.19 | -.16 | -.04 | .03 | .06 | -.18 | -.03 | -.10 | .05 | .17 | -.28 | .04 | 1.00 | | |
| 32. Expenditures per ADA | .52 | .15 | .32 | .24 | -.27 | -.02 | .69 | -.07 | .17 | -.12 | -.09 | -.16 | -.24 | .16 | .01 | -.06 | 1.00 | |
| 33. Regular ADA Grades 1-12 | .14 | .69 | .56 | .35 | .60 | .35 | -.39 | -.04 | -.12 | .22 | .39 | .02 | -.32 | .36 | -.03 | -.37 | -.21 | 1.00 |

* Coefficients exceeding .18 are significant at the .05 level. Those exceeding .23 are significant at the .01 level.

Table 9

Intercorrelation Matrix for Four Test Score Variables and 18 Predictor Variables for High School Districts*

| Predictor Variable | Correlation Coefficients Between Test Score and Predictor Variables, Grade Twelve | | | |
|---|---|---|---|---|
| | Reading | Language | Spelling | Mathematics |
| 12. Minimum Teacher Salary | .13 | .10 | .19 | .10 |
| 13. Maximum Teacher Salary | .09 | .30 | .30 | .16 |
| 14. Median Teacher Salary | .12 | .34 | .27 | .21 |
| 17. Non-Teaching Personnel | -.19 | .04 | -.03 | -.04 |
| 18. General Fund Tax Rate | -.11 | .23 | .17 | .12 |
| 19. General Purpose Tax Rate | -.11 | .19 | .15 | .08 |
| 20. Assessed Valuation/ADA | .17 | -.08 | -.10 | .04 |
| 21. Percent Total Minority Pupils | -.65 | -.49 | -.29 | -.63 |
| 22. Percent American Indian | .16 | .00 | -.13 | .03 |
| 23. Percent Negro | -.20 | -.05 | .11 | -.15 |
| 24. Percent Oriental | -.15 | .13 | .17 | .00 |
| 25. Percent Spanish Surnamed | -.69 | -.47 | -.28 | -.61 |
| 26. Index of Family Poverty | -.65 | -.62 | -.50 | -.66 |
| 28. Scholastic Ability Grade 12 | .82 | .81 | .66 | .88 |
| 30. Pupil Mobility Grades 9-12 | -.28 | -.21 | -.17 | -.29 |
| 31. Rate of Staff Turnover | -.10 | -.24 | -.11 | -.16 |
| 32. Expenditures per ADA | .25 | .09 | .08 | .19 |
| 33. Regular ADA Grades 1-12 | .05 | .37 | .36 | .23 |

* Coefficients exceeding .18 are significant at the .05 level. Those exceeding .23 are significant at the .01 level.

Table 10

Summary of Multiple Regression Analyses for Each Test Variable by Type of District

| Criterion Variable | Results of Multiple Regression Analysis, by Type of School District | | | | | |
|---|---|---|---|---|---|---|
| | Unified | | Elementary | | High School | |
| | R | $R^2$ | R | $R^2$ | R | $R^2$ |
| 1. Grade 1 Reading | .57* | .33 | .42 | .18 | | |
| 2. Grade 2 Reading | .68 | .46 | .51 | .26 | | |
| 3. Grade 3 Reading | .75 | .56 | .58 | .33 | | |
| 4. Grade 6 Reading | .75 | .56 | .60 | .36 | | |
| 5. Grade 6 Language | .77 | .59 | .54 | .29 | | |
| 6. Grade 6 Spelling | .70 | .49 | .51 | .26 | | |
| 7. Grade 6 Mathematics | .75 | .56 | .51 | .26 | | |
| 8. Grade 12 Reading | .67 | .45 | | | .77 | .60 |
| 9. Grade 12 Language | .67 | .45 | | | .71 | .51 |
| 10. Grade 12 Spelling | .61 | .37 | | | .61 | .37 |
| 11. Grade 12 Mathematics | .70 | .50 | | | .76 | .58 |

*All multiple correlations were significant beyond the .001 level of confidence.

Table 11

Results of Cross-Validation Study
Unified Districts

| Dependent Variable | Proportion of Variance Accounted for ($R^2$) | | | |
|---|---|---|---|---|
| | Total Sample | (A) Average $R^2$ for Odd-Even Subsamples | (B) Average $R^2$ from Cross-Validation | Difference (A-B) |
| 1 Reading | .3262 | .3623 | .2095 | .1528 |
| 2 Reading | .4615 | .4797 | .4199 | .0598 |
| 3 Reading | .5609 | .6000 | .4754 | .1246 |
| 6 Reading | .5559 | .6051 | .4397 | .1654 |
| 6 Language | .5895 | .6015 | .5254 | .0761 |
| 6 Spelling | .4947 | .5358 | .3363 | .1995 |
| 6 Mathematics | .5636 | .5880 | .4467 | .1413 |
| 12 Reading | .4462 | .4832 | .3153 | .1679 |
| 12 Language | .4505 | .4616 | .3512 | .1104 |
| 12 Spelling | .3661 | .3837 | .3101 | .0736 |
| 12 Mathematics | .4965 | .4932 | .4481 | .0451 |

Table 12

Results of Cross-Validation Study
Elementary Districts

| Dependent Variable | Proportion of Variance Accounted for ($R^2$) | | | |
|---|---|---|---|---|
| | Total Sample | (A) Average $R^2$ for Odd-Even Subsamples | (B) Average $R^2$ from Cross-Validation | Difference (A-B) |
| 1 Reading | .1801 | .1859 | .1615 | .0244 |
| 2 Reading | .2550 | .2742 | .2093 | .0649 |
| 3 Reading | .3343 | .3690 | .3071 | .0619 |
| 6 Reading | .3584 | .3944 | .3772 | .0172 |
| 6 Language | .2891 | .3204 | .2838 | .0366 |
| 6 Spelling | .2589 | .2889 | .2631 | .0258 |
| 6 Mathematics | .2554 | .2879 | .2608 | .0271 |

Table 13

Results of Cross-Validation Study
High School Districts

| Dependent Variable | Proportion of Variance Accounted for ($R^2$) | | | |
|---|---|---|---|---|
| | Total Sample | (A) Average $R^2$ for Odd-Even Subsamples | (B) Average $R^2$ from Cross-Validation | Difference (A-B) |
| 12 Reading | .6005 | .6647 | .4296 | .2351 |
| 12 Language | .5086 | .5364 | .4155 | .1209 |
| 12 Spelling | .3694 | .4695 | .1387 | .3308 |
| 12 Mathematics | .5822 | .6168 | .4705 | .1463 |

Table 14

Standard Score Regression Weights for Predicting Median Achievement Test Scores from Eleven School District Characteristics

Unified Districts

| | Standard Score Regression Weights, by Grade and Test | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 6 | | | | 12 | | | |
| | Reading | | | Reading | Language | Spelling | Mathematics | Reading | Language | Spelling | Mathematics |
| Constant | -.01 | -.13 | -.14 | -.01 | -.07 | .01 | -.06 | .15 | -.04 | -.03 | -.08 |
| 20. Assessed Valuation/ADA | .01 | .11 | .02 | .18 | .16 | .17 | .13 | .31 | .28 | .40 | .30 |
| 21. Percent Total Minority Pupils | -.26 | -.23 | -.36 | -.28 | -.12 | .04 | -.36 | -.21 | -.35 | -.08 | -.45 |
| 22. Percent American Indian | -.03 | -.03 | -.04 | -.08 | -.10 | -.04 | -.08 | -.11 | -.18 | -.27 | -.18 |
| 23. Percent Negro | .06 | .03 | -.02 | -.06 | -.09 | -.05 | -.05 | -.09 | .12 | .11 | .10 |
| 24. Percent Oriental | .17 | .16 | .28 | .24 | .34 | .25 | .29 | .12 | .23 | .16 | .29 |
| 25. Percent Spanish Surnamed | -.19 | -.13 | -.14 | -.28 | -.34 | -.33 | -.20 | -.26 | -.03 | -.08 | -.05 |
| 26. Index of Family Poverty | -.11 | -.30 | -.26 | -.20 | -.27 | -.29 | -.14 | -.37 | -.41 | -.42 | -.38 |
| 29. Pupil Mobility Grades 1-8 | -.13 | -.15 | -.15 | -.11 | -.15 | -.17 | -.19 | --- | --- | --- | --- |
| 30. Pupil Mobility Grades 9-12 | --- | --- | --- | --- | --- | --- | --- | -.09 | -.16 | -.10 | -.13 |
| 31. Rate of Staff Turnover | .13 | .16 | .15 | .04 | .10 | -.01 | .11 | .13 | .09 | .04 | .06 |
| 32. Expenditures per ADA | .18 | .22 | .27 | .06 | .11 | .04 | .12 | -.22 | -.12 | -.24 | -.11 |
| 33. Regular ADA Grades 1-12 | .07 | .16 | .11 | .18 | .19 | .15 | .14 | .17 | .21 | .32 | .08 |

Table 15

Standard Score Regression Weights for Predicting Median Achievement Test Scores from Eleven School District Characteristics

Elementary School Districts

| Predictor Variable | Standard Score Regression Weights by Grade and Test | | | | | | |
|---|---|---|---|---|---|---|---|
| | Grade 1 | Grade 2 | Grade 3 | Grade 6 | | | |
| | Reading | Reading | Reading | Reading | Language | Spelling | Mathematics |
| Constant | .06 | .07 | .12 | .08 | .09 | .05 | .06 |
| 20. Assessed Valuation/ADA | .08 | .03 | .09 | .07 | .09 | .09 | .03 |
| 21. Percent Total Minority Pupils | -.07 | -.22 | -.17 | -.28 | -.19 | -.05 | -.24 |
| 22. Percent American Indian | -.05 | .00 | .00 | .00 | .00 | .00 | -.04 |
| 23. Percent Negro | -.04 | -.10 | -.04 | -.02 | -.02 | -.03 | -.01 |
| 24. Percent Oriental | .10 | .16 | .23 | .24 | .26 | .32 | .20 |
| 25. Percent Spanish Surnamed | -.20 | -.08 | -.24 | -.13 | -.09 | -.14 | --- |
| 26. Index of Family Poverty | -.15 | -.17 | -.15 | -.21 | -.19 | -.23 | -.23 |
| 29. Pupil Mobility, Grades 1-8 | -.06 | -.10 | -.07 | -.12 | -.11 | -.16 | -.13 |
| 31. Rate of Staff Turnover | -.04 | -.06 | .02 | .02 | .00 | -.01 | -.03 |
| 32. Expenditures per ADA | .04 | .08 | .16 | .11 | .12 | .06 | .07 |
| 33. Regular ADA, Grades 1-12 | .32 | .25 | .31 | .20 | .22 | .14 | .17 |

Table 16

Standard Score Regression Weights for Predicting Median Achievement Test Scores from Eleven School District Characteristics

High School Districts

| Predictor Variable | Standard Score Regression Weights for Grade Twelve, by Test | | | |
|---|---|---|---|---|
| | Reading | Language | Spelling | Mathematics |
| Constant | .00 | -.12 | -.13 | -.17 |
| 20. Assessed Valuation/ADA | .18 | -.05 | -.11 | -.02 |
| 21. Percent Total Minority Pupils | -.02 | -.41 | -.15 | -.48 |
| 22. Percent American Indian | -.10 | -.06 | -.30 | -.16 |
| 23. Percent Negro | .12 | .16 | .28 | .13 |
| 24. Percent Oriental | .10 | .22 | .18 | .21 |
| 25. Percent Spanish Surnamed | -.60 | -.02 | .02 | -.16 |
| 26. Index of Family Poverty | -.51 | -.47 | -.47 | -.40 |
| 30. Pupil Mobility Grades 9-12 | -.08 | -.04 | -.03 | -.10 |
| 31. Rate of Staff Turnover | -.10 | -.15 | --- | -.09 |
| 32. Expenditures per ADA | .04 | .04 | .13 | .21 |
| 33. Regular ADA Grades 1-12 | -.20 | .13 | .10 | -.01 |

Table 17

Ranks of Predictor Variables in Terms of Order of Entry
in Stepwise Regression Program

Unified Districts

| Predictor Variable | Order of Entry by Grade Level and Output Variable | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Grades | | | Grade 6 | | | | Grade 12 | | | |
| | 1 | 2 | 3 | | | | | | | | |
| | Reading | | | Reading | Language | Spelling | Mathematics | Reading | Language | Spelling | Mathematics |
| 20. Assessed Valuation/A.D.A. | 11 | 9 | 11 | 5 | 5 | 5 | 8 | 4 | 6 | 4 | 4 |
| 21. Percent Total Minority Pupils | 6 | 6 | 5 | 4 | 11 | 10 | 5 | 2 | 8 | 11 | 2 |
| 22. Percent American Indian | 10 | 11 | 9 | 8 | 6 | 9 | 7 | 10 | 2 | 2 | 5 |
| 23. Percent Black | 7 | 10 | 10 | 9 | 8 | 7 | 11 | 11 | 9 | 9 | 7 |
| 24. Percent Oriental | 3 | 4 | 3 | 3 | 2 | 2 | 3 | 3 | 4 | 5 | 3 |
| 25. Percent Spanish Surnamed | 2 | 3 | 2 | 2 | 3 | 3 | 2 | 9 | 3 | 7 | 11 |
| 26. Index of Family Poverty | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 29. Pupil Mobility Grades 1-8 | 4 | 5 | 6 | 7 | 4 | 4 | 4 | -- | -- | -- | -- |
| 30. Pupil Mobility Grades 9-12 | -- | -- | -- | -- | -- | -- | -- | 6 | 5 | 8 | 6 |
| 31. Rate of Staff Turnover | 8 | 7 | 7 | 11 | 9 | 11 | 10 | 8 | 11 | 10 | 10 |
| 32. Expenditures/A.D.A. | 5 | 2 | 4 | 10 | 10 | 8 | 6 | 5 | 10 | 6 | 8 |
| 33. Regular A.D.A. Grades 1-12 | 9 | 8 | 8 | 6 | 7 | 6 | 9 | 7 | 7 | 3 | 9 |

Table 18

Ranks of Predictor Variables in Terms of Order of Entry
in Stepwise Regression Program

Elementary Districts

| Predictor Variable | Order of Entry by Grade Level and Output Variable | | | | | | |
|---|---|---|---|---|---|---|---|
| | Grades | | | Grade 6 | | | |
| | 1 | 2 | 3 | | | | |
| | Reading | | | Reading | Language | Spelling | Mathematics |
| 20. Assessed Valuation/ADA | 8 | 10 | 8 | 8 | 7 | 7 | 9 |
| 21. Percent Total Minority Pupils | 1 | 1 | 1 | 1 | 3 | 8 | 4 |
| 22. Percent American Indian | 10 | 11 | 11 | 11 | 10 | 11 | 7 |
| 23. Percent Negro | 11 | 7 | 9 | 10 | 9 | 9 | 10 |
| 24. Percent Oriental | 5 | 2 | 2 | 2 | 2 | 2 | 3 |
| 25. Percent Spanish Surnamed | 7 | 9 | 6 | 7 | 8 | 3 | --- |
| 26. Index of Family Poverty | 3 | 3 | 5 | 3 | 1 | 1 | 1 |
| 29. Pupil Mobility Grades 1-8 | 6 | 5 | 7 | 5 | 6 | 4 | 2 |
| 30. Pupil Mobility Grades 9-12 | --- | --- | --- | --- | --- | --- | --- |
| 31. Rate of Staff Turnover | 9 | 8 | 10 | 9 | 11 | 10 | 8 |
| 32. Expenditures per ADA | 4 | 6 | 3 | 4 | 4 | 5 | 6 |
| 33. Regular ADA Grades 1-12 | 2 | 4 | 4 | 6 | 5 | 6 | 5 |

Table 19

Ranks of Predictor Variables in Terms of Order of Entry in Stepwise Regression Program

High School Districts

| Predictor Variable | Order of Entry by Grade Level and Output Variable, Grade 12 | | | |
|---|---|---|---|---|
| | Reading | Language | Spelling | Mathematics |
| 20. Assessed Valuation/ADA | 3 | 10 | 8 | 10 |
| 21. Percent Total Minority Pupils | 11 | 8 | 4 | 2 |
| 22. Percent American Indian | 8 | 5 | 3 | 7 |
| 23. Percent Negro | 4 | 7 | 2 | 4 |
| 24. Percent Oriental | 7 | 4 | 5 | 3 |
| 25. Percent Spanish Surnamed | 1 | 3 | 10 | 9 |
| 26. Index of Family Poverty | 2 | 1 | 1 | 1 |
| 29. Pupil Mobility Grades 1-8 | - | - | - | - |
| 30. Pupil Mobility Grades 9-12 | 5 | 9 | 9 | 5 |
| 31. Rate of Staff Turnover | 9 | 6 | - | 8 |
| 32. Expenditures per ADA | 10 | 11 | 7 | 6 |
| 33. Regular ADA Grades 1-12 | 6 | 2 | 6 | 11 |

Table 20

Probable Error of Estimate in Predicting Median Achievement Test Scores by Average Daily Attendance of District

Unified District

| Output Variable by Grade | Error of Estimate by ADA Range | | | |
|---|---|---|---|---|
| | 0-462 | 463-2370 | 2371-7434 | 7435+ |
| 1 | 0.6188 | 0.4420 | 0.3332 | 0.2652 |
| 2 | 0.6256 | 0.3876 | 0.3604 | 0.2380 |
| 3 | 0.5644 | 0.3536 | 0.2924 | 0.2380 |

| Output Variable by Grade | Error of Estimate by ADA Range | | | |
|---|---|---|---|---|
| | 0-462 | 463-2370 | 2371-4242 | 4243+ |
| 6 Reading | 0.5916 | 0.4216 | 0.2856 | 0.2652 |
| 6 Language | 0.5100 | 0.4216 | 0.3060 | 0.2788 |
| 6 Spelling | 0.5372 | 0.4284 | 0.2788 | 0.2856 |
| 12 Reading | 0.7752 | 0.5168 | 0.4352 | 0.4148 |
| 12 Language | 0.7684 | 0.4420 | 0.5440 | 0.4216 |
| 12 Spelling | 0.8228 | 0.5644 | 0.5916 | 0.4216 |

| Output Variable by Grade | Error of Estimate by ADA Range | | | |
|---|---|---|---|---|
| | 0-2370 | 2371-7433 | 7434-16028 | 16029+ |
| 6 Mathematics | 0.4760 | 0.3332 | 0.2516 | 0.2924 |
| 12 Mathematics | 0.8160 | 0.4012 | 0.4692 | 0.3468 |

Table 21

Probable Error of Estimate in Predicting Median Achievement Test Scores by Average Daily Attendance of District

Elementary Districts

| Output Variable by Grade | Error of Estimate by ADA Range | | | | | |
|---|---|---|---|---|---|---|
| | 0-37 | 38-80 | 81-208 | 209-492 | 493-1290 | 1291+ |
| 1 | 0.9724 | 0.7684 | 0.7888 | 0.6800 | 0.4896 | 0.3332 |
| 2 | 0.9792 | 0.7616 | 0.7480 | 0.5848 | 0.3876 | 0.3060 |
| 3 | 0.9112 | 0.7752 | 0.6732 | 0.5168 | 0.4896 | 0.2856 |
| 6 Reading | 1.0132 | 0.7072 | 0.6392 | 0.4420 | 0.3604 | 0.2720 |
| 6 Language | 0.9384 | 0.8024 | 0.6664 | 0.4760 | 0.3740 | 0.3264 |
| 6 Spelling | 1.0472 | 0.8364 | 0.6936 | 0.5100 | 0.4012 | 0.3060 |
| 6 Mathematics | 1.0132 | 0.8704 | 0.6324 | 0.5100 | 0.3468 | 0.3332 |

Table 22

Probable Error of Estimate in Predicting Median Achievement Test Scores by Average Daily Attendance of District

High School Districts

| Output Variable by Grade | Error of Estimate by ADA Range | | | | |
|---|---|---|---|---|---|
| | 0-524 | 525-1854 | 1855-8770 | 8771-21957 | 21958+ |
| 12 Spelling | 0.7004 | 0.4896 | 0.4080 | 0.3332 | 0.1904 |

| Output Variable by Grade | Error of Estimate by ADA Range | | | |
|---|---|---|---|---|
| | 0-524 | 525-3525 | 3526-8771 | 8772+ |
| 12 Reading | 0.5440 | 0.3468 | 0.4624 | 0.1972 |
| 12 Language | 0.6120 | 0.3604 | 0.4760 | 0.1768 |

| Output Variable by Grade | Error of Estimate by ADA Range | | |
|---|---|---|---|
| | 0-1854 | 1855-12448 | 12449+ |
| 12 Mathematics | 0.4488 | 0.3604 | 0.1224 |



73-24 DE 4671 8-73 300