DOCUMENT RESUME

ED 076 662 TM 002 670

AUTHOR McRae, Douglas J.
TITLE The Relationship of Aptitude Test School Means and School Socioeconomic Characteristics to Achievement Test School Means.
INSTITUTION Texas Christian Univ., Fort Worth. Inst. of Behavioral Research.
SPONS AGENCY CTB/McGraw Hill, Monterey, Calif.
REPORT NO IBR-TR-73-1
PUB DATE Feb 73
NOTE 37p.; Paper presented at American Educational Research Association Meeting (New Orleans, Louisiana, February 25-March 1, 1973)

EDRS PRICE MF-$0.65 HC-$3.29
DESCRIPTORS *Academic Aptitude; *Achievement Tests; Comparative Analysis; Elementary Grades; *Multiple Regression Analysis; Questionnaires; Secondary Grades; *Socioeconomic Background; Speeches; *Test Results
IDENTIFIERS California Achievement Tests; Short Form Test Academic Aptitude

ABSTRACT

When interpreting the results of a norm-referenced testing program, the availability of several expectations of test scores is desirable. Toward this objective, academic aptitude test data (the Short Form Test of Academic Aptitude) and school socioeconomic data were collected from the participants in the 1970 standardization of the California Achievement Tests. Multiple regression analyses were performed to relate (1) the SFTAA school means, and (2) the school socioeconomic data to the CAT school means. Comparative results were presented. The conclusion was that achievement test school means may be predicted quite accurately from both aptitude test school means and school socioeconomic data. (Author)

The Relationship of Aptitude Test School Means and School Socioeconomic Characteristics to Achievement Test School Means[1]

Douglas J. McRae[2]

February 1973

IBR Technical Report #73-1

1
This research was supported primarily by CTB/McGraw-Hill, Del Monte Research Park, Monterey, California

2
On leave of absence from CTB/McGraw-Hill.

TEXAS CHRISTIAN UNIVERSITY
INSTITUTE OF BEHAVIORAL RESEARCH

The Relationship of Aptitude Test School Means and School Socioeconomic Characteristics to Achievement Test School Means[1]

Douglas J. McRae[2]

February 1973

IBR Technical Report #73-1

1
This research was supported primarily by CTB/McGraw-Hill, Del Monte Research Park, Monterey, California

2
On leave of absence from CTB/McGraw-Hill.

The Relationship of Aptitude Test School Means and School Socioeconomic Characteristics to Achievement Test School Means.

Douglas J. McRae [1], CTB/McGraw-Hill [2]

Abstract

When interpreting the results from a norm-referenced testing program, the availability of several expectations of test scores is desirable. Toward this objective, academic aptitude test data (the Short Form Test of Academic Aptitude) and school socioeconomic data were collected from the participants in the 1970 standardization of the California Achievement Tests. Multiple regression analyses were performed to relate 1) the SFTAA school means, and 2) the school socioeconomic data to the CAT school means. Comparative results are presented. The conclusion is that achievement test school means may be predicted quite accurately from both aptitude test school means and school socioeconomic data.

---

[1] The author would like to thank Mr. Daniel Shovlin for performing the computer work necessary for results presented in this paper, and Dr. George Burket for his many helpful comments and criticisms throughout the duration of this work. The work presented in this paper was supported primarily by CTB/McGraw-Hill, Del Monte Research Park, Monterey, California, 93940.

[2] On leave of absence to the Institute of Behavioral Research, Texas Christian University, September 1, 1972, to March 1, 1973.

Academic aptitude test scores have been used as indicators of achievement test score expectations both formally and informally for many years. On a formal basis, the empirical relationship between specified aptitude test batteries and achievement test batteries has been ascertained, and point or interval estimates of achievement test scores derived. At CTB/McGraw-Hill, a multiple regression model is employed with scores from the Short Form Test of Academic Aptitude, in conjunction with age and sex, as predictors and scores from the California Achievement Tests - 1970 Edition and the Comprehensive Tests of Basic Skills as criteria. Harcourt Brace Janovovich publishes dual stanine charts, relating scores from the Otis-Lennon Mental Ability Test to the Metropolitan Achievement Tests. On an informal basis, test users frequently adjust their evaluation of obtained achievement test scores based on the obtained aptitude test scores, using the rationale that students or groups with below (above) average aptitude scores should have somewhat below (above) average achievement scores.

On a generally more informal basis, socioeconomic characteristics of schools and school districts have also been used to establish expectations of achievement battery test scores. Quite often, this takes the form of a desire for special norms, so that the achievement test scores may be compared to populations of students bearing a similar socioeconomic pattern to the students being evaluated. Formal study of the relationship between school socioeconomic characteristics and achievement battery test scores has also taken place (Thorndike, 1951; Lennon, 1952; Flanagan, 1962; Hogan, 1971), but to date the knowledge derived from these studies has not received large scale use in the interpretation of achievement battery test scores.

This paper presents rather extensive empirical results on the relationship between 1) academic aptitude test score school means and achievement battery test score school means, and 2) school socioeconomic characteristics and achievement battery test score school means. The purpose of the research reported in this paper is the development of two sets of variables that may be used to establish expected levels of performance on a standardized achievement battery. These expected levels of performance may then be used, in conjunction with national norms and special group norms, to evaluate a particular school's actual performance on the achievement battery.

DATA SOURCE and METHODOLOGY

The data for this research are taken from the 1970 joint standardization of the Short Form Test of Academic Aptitude (SFTAA) and the California Achievement Tests (CAT). The standardization of these two instruments involved administration of the two instruments to a nationwide stratified random sample of approximately 200,000 students, Grades 1 through 12. Four stratification factors were used: public vs. non-public, geographic region, average enrollment per grade, and community type. The 200,000 students were drawn from approximately 400 schools. The number of schools per grade ranged from approximately 240 at the elementary grades to approximately 100 at the secondary level. A more complete description of the standardization design is given in the Bulletin of Technical Data Number 1 for the California Achievement Tests (CTB/McGraw-Hill, 1970).

The SFTAA consists of four subtests from which seven scores are derived. The four subtests are Vocabulary, Analogies, Sequences, and Memory. Each of these subtests yields a score. In addition, the Vocabulary and Memory subtest scores may be combined to form a "Language" score. The Analogies and Sequences subtest scores may be combined to form a "Non-Language" score, and all four subtest scores may be combined to form a "Total" score. The CAT consists of seven subtests (eight at Level 1) from which eleven (twelve at Level 1) scores are derived. The subtests are Reading Vocabulary, Reading Comprehension, Mathematics Computation, Mathematics Concepts and Problems, Language Mechanics, and Language Usage and Structure, and Spelling. In addition, there is a Language Auding subtest at Level 1. In addition to the seven (eight) subtest scores, scores may be derived for Reading Total (Vocabulary

plus Comprehension), Mathematics (Computation plus Concepts and Problems), Language Total (Mechanics plus Usage and Structure plus, at Level 1, Auding), and Total Battery (sum of all subtest scores).

A number of derived scores are available for both the SFTAA and the CAT. For the SFTAA, Intelligence Quotients, Age Percentiles, Grade Percentiles, and Reference Scale Scores, in addition to raw scores, are available. For the CAT, Grade Equivalents, National Percentiles, and Achievement Development Scale Scores, in addition to raw scores, are available. For this research, Reference Scale Scores (RSS) from the SFTAA and Achievement Development Scale Scores (ADSS) from the CAT were used. These two score scales were derived in an identical manner, based on Thurstone's absolute scaling procedure (Gulliksen, 1950). The result of this procedure is an equal interval scale that covers all grades and levels of the tests. A more complete description of the procedure used to develop the scale scores is given in the Bulletin of Technical Data Number 1 for the California Achievement Tests (CTB/McGraw-Hill, 1970).

Using the individual student scale scores (Reference Scale Scores for SFTAA and Achievement Development Scale Scores for CAT), school means were obtained for each of the seven scores from SFTAA and each of the eleven (twelve at Level 1) scores from CAT for each of the 12 grades. Average scores for each school at each grade were also obtained for age and sex (average percent males and average percent females). These 22 average scores for schools at each grade level were then related to a school socioeconomic characteristic data set, which is now described.

Concurrent with the SFTAA/CAT standardization, the principal from each participating school was asked to fill in a two page questionnaire containing items on socioeconomic characteristics of his school. A copy of this questionnaire

is given as Appendix A. An analysis of the content of the questionnaire reveals there are three types of items included: 1) items on student demographic characteristics, such as the percent of students attending the school who are white, or the percent of students attending the school whose parents come from various occupational categories, 2) items concerning administrative and physical characteristics of the school, such as the length of time required to implement new programs, or the age of the school building, and 3) items concerning staff characteristics, such as average experience of the teaching staff, or average number of hours per week for various support personnel. An analysis of the actual responses to each questionnaire item, completed shortly before the final questionnaires were returned, is given as Appendix B.

Completed questionnaires were received from over 97% of the schools participating in the standardization. The questionnaire yielded 58 distinct variables. The standardization design permitted categorization of each school on each of the four stratification factors. These categorizations permitted definition of 14 additional variables. The 58 questionnaire variables were pooled with the 14 standardization design variables to form a set of "school socioeconomic characteristic" measures. A listing of these 72 measures is given in Table 1.

For each of the 12 grades, correlations were obtained between each of the school socioeconomic characteristic measures and each of the SFTAA and CAT school means. In all, 12 (one for each grade) 94 by 94 correlation matrices were generated. The 94 variables entering into each matrix could be partitioned into three sets: 1) the CAT variable set, consisting of 12 variables, 2) the SFTAA variable set, consisting of the 7 SFTAA variables, average age,

Table 1

SCHOOL SOCIOECONOMIC CHARACTERISTIC MEASURES

Variable Number	Description
1	# students in Kindergarten at the school
2	# students in Grade 1 at the school
3	# students in Grade 2 at the school
4	# students in Grade 3 at the school
5	# students in Grade 4 at the school
6	# students in Grade 5 at the school
7	# students in Grade 6 at the school
8	# students in Grade 7 at the school
9	# students in Grade 8 at the school
10	# students in Grade 9 at the school
11	# students in Grade 10 at the school
12	# students in Grade 11 at the school
13	# students in Grade 12 at the school
14	% students who attended the school last year who are no longer attending the school
15	building age (in years)
16	% of families represented at PTA meeting
17	neighborhood served: rural area (0-1)
18	neighborhood served: residential suburb (0-1)
19	neighborhood served: industrial suburb (0-1)
20	neighborhood served: small town (0-1)
21	neighborhood served: medium city (0-1)
22	neighborhood served: residential area of a large city (0-1)
23	neighborhood served: inner city (0-1)
24	% students with employed mothers
25	Approval for new programs: Board of Education (0-1)
26	Approval for new programs: Superintendent (0-1)
27	Approval for new programs: District Admin. (0-1)
28	Approval for new programs: Parents (0-1)
29	Approval for new programs: Teachers (0-1)
30	Approval for new programs: None (0-1)
31	Time required to implement new programs (in months)
32	Copyright date for 3rd Grade Reading Text
33	Copyright date for American History Text
34	% of students who are White
35	Annual salary of principal
36	Annual salary of beginning teacher
37	% students in Grade 1 who attended kindergarden
38	% of students in homes with only one parent
39	% students with English as the second language
40	Occupational category: % Professional
41	Occupational category: % White Collar

Table 1, continued

42	Occupational category: % Skilled Worker
43	Occupational category: % Unskilled Worker
44	# volumes in library
45	Average experience of teachers (in years)
46	Average annual salary of teachers
47	Support personnel: Guidance Counselor (hrs/wk)
48	Support personnel: Psychologist (hrs/wk)
49	Support personnel: Child Welfare and Attendance Officer (hrs/wk)
50	Support personnel: Nurse (hrs/wk)
51	Support personnel: Speech Therapist (hrs/wk)
52	Support personnel: Remedial Reading (hrs/wk)
53	Support personnel: English Second Language (hrs/wk)
54	Support personnel: Art Teacher (hrs/wk)
55	Support personnel: Music Teacher (hrs/wk)
56	Support personnel: Sex Education (hrs/wk)
57	Support personnel: Librarian (hrs/wk)
58	Support personnel: Teacher Aides (hrs/wk)
59	Stratification: Public (0-1)
60	Stratification: Non-public (0-1)
61	Geographic region: New England (0-1)
62	Geographic region: Mideast (0-1)
63	Geographic region: Great Lakes (0-1)
64	Geographic region: Plains (0-1)
65	Geographic region: Southeast (0-1)
66	Geographic region: Southwest (0-1)
67	Geographic region: West (0-1)
68	Community type: Urban (0-1)
69	Community type: Rural (0-1)
70	Community type: Town (0-1)
71	Community type: Other (0-1)
72	District size: Small, Medium, Large (1-2-3)

and two average sex variables, and 3) the school socioeconomic characteristic variable set, consisting of the 72 measures listed in Table 1.

The technique chosen to analyze the above data was multiple regression. The criteria used for the multiple regression runs were the 12 CAT scores. Two sets of predictor variables were employed, the SFTAA variable set and the school socioeconomic characteristic variable set.

With respect to the SFTAA set, a multiple regression solution was found for each criterion variable at each grade using as predictors six variables from the SFTAA set: the Vocabulary RSS, the Analogies RSS, and Sequences RSS, the Memory RSS, the average percent male, and the average age. Output from these analyses included multiple correlation coefficients, regression weights for each of the variables, and standard errors of estimate. The three SFTAA scores formed by combining SFTAA subtests are not technically linear combinations of the subtest scores, but it was felt that they would add essentially redundant information and hence they should not be included in the regression analyses. The average percent female variable is, of course, redundant information.

With respect to the school socioeconomic characteristic set, a series of analyses was employed to reduce the data set to a manageable size. First, the data set was partitioned into three subsets: 1) questionnaire measures over which a school has no effective control (for instance, the occupational category measures), 2) questionnaire measures over which a school does have some effective control (for instance, average experience for the teaching staff), and 3) the standardization stratification categorical measures. The division of questionnaire variables into controllable and non-controllable sets was done due to the overall goal of this study. Recall that the purpose

of this research was the development of a set of variables that could be used to establish expected scores for a standardized achievement battery. These expected scores could then be used as a standard against which to evaluate actual obtained scores. In this context, the rationale of using variables controllable by a school to establish expectations is rather tenuous. The expected scores should be based on situational or community variables, such that school administrative personnel would not be able to manipulate their expectations. The school controllable variables should be used to manipulate obtained scores, not expected; that manipulation of school controllable variables does affect obtained scores on standardized achievement batteries is a rather complex question, one that this paper does not address.

Nevertheless, a supplementary analysis was carried out on the controllable variables. Using the Grade 4 data, a stepwise predictor selection algorithm (Burket, 1969) was applied to the set of non-controllable questionnaire variables, with each of the 11 CAT scores serving as criteria. This predictor selection algorithm operates in a forward selection manner. After each selection is made, however, the algorithm is capable of deleting a variable previously selected if some other variable, by replacing the previously selected variable, enhances the prediction. Hence, the algorithm will move in a forward selection manner, with occasional deletions of previously selected variables. The result of the algorithm is that after each selection the best subset of predictors from the predictor set tends to have been chosen.

For the Grade 4 data, the stepwise predictor selection algorithm was also applied to a set of empirically selected variables from both the controllable and the non-controllable sets. The empirical selection of variables for the second analysis was accomplished by randomly dividing the 58 questionnaire

variables into two sets, running the predictor selection algorithm on both of the se sets for each of the 11 criteria, and taking the best 28 predictors from these 22 [illegible].

The multiple correlation coefficients from the two analyses (e.g., using the non-controllable set and using the empirically selected variables from both the controllable and the non-controllable sets) showed no substantial differences. All of the multiple correlations were in the .70's or low .80's. For eight of the eleven scores, the multiple correlations were higher for the non-controllable only set. The differences between the multiple correlations for the two analyses were never greater than .01. From this supplementary analysis, this author concluded that non-controllable school socioeconomic data provides approximately the same level of predictive accuracy as does school socioeconomic data irrespective of control by the school.

The major results reported in this paper used the non-controllable school socioeconomic characteristic variables together with the standardization design categorical measures. Eliminating redundant measures, a total of 27 variables comprised this set. A list of these 27 variables is given in Table 2.

At each grade level, using each of the eleven (twelve at Level 1) CAT scores as criteria, the predictor selection algorithm was applied to the set of non-controllable school socioeconomic characteristic measures. The output from these analyses included multiple correlation coefficients, regression weights for each of the selected variables, and standard errors of estimate. These statistics were available after each selection or deletion of a variable for the predictor set.

One of the 27 potential predictor variables, namely the percent of the

Table 2

NON-CONTROLLABLE SCHOOL SOCIOECONOMIC CHARACTERISTIC MEASURES

Variable Number	Description
1	# students at grade level
2	% students who attended the school last year who are no longer attending the school
3	Neighborhood served: Rural area (0-1)
4	Neighborhood served: Residential suburb (0-1)
5	Neighborhood served: Industrial suburb (0-1)
6	Neighborhood served: Small town (0-1)
7	Neighborhood served: Medium city (0-1)
8	Neighborhood served: Residential area of a large city (0-1)
9	Neighborhood served: Inner city (0-1)
10	% students with employed mothers
11	% students who are White
12	% students in homes with only one parent
13	% students with English as a second language
14	Occupational category: % Professional
15	Occupational category: % White Collar
16	Occupational category: % Unskilled
17	Stratification: Public (0-1)
18	Geographic region: New England (0-1)
19	Geographic region: Mideast (0-1)
20	Geographic region: Great Lakes (0-1)
21	Geographic region: Plains (0-1)
22	Geographic region: Southeast (0-1)
23	Geographic region: Southwest (0-1)
24	Community type: Urban (0-1)
25	Community type: Rural (0-1)
26	Community type: Town (0-1)
27	District size: Small, Medium, Large (1-2-3)

students attending the school who are white, could in some senses be taken as controllable or non-controllable. For this reason, the above analyses were repeated for each grade and for each of the eleven (twelve at Level 1) CAT variables eliminating the percent white predictor. Output from these analyses again included multiple correlation coefficients, regression weights, and standard errors of estimate for each iteration in the predictor selection process.

RESULTS

The results of this study will be presented in three sections: 1) results relating the CAT variables to the SFTAA predictor set; 2) results relating the CAT variables to the school socioeconomic characteristic predictor sets; and 3) results indicating which of the socioeconomic characteristics contribute most heavily to the predictions.

The multiple correlation coefficients and associated standard errors of estimate for the SFTAA set for each grade level and each CAT variable are given in Table 3. The multiple correlations are primarily in the .80's and .90's. A close look at the table reveals that the multiple correlations tend to increase as grade increases. The multiple correlations for Grades 8 through 12 tend to be quite high, with the extreme case being the multiple correlation of .998 for Reading Vocabulary at Grade 8.6. Because the number of schools entering into the analyses decreases sharply at Grade 7.6, it is probable that the multiple regression solutions for the secondary grades are unduly capitalizing on error in the data, and this author would speculate that these results would not hold up under cross-validation.

TABLE 3

MULTIPLE CORRELATIONS AND STANDARD ERRORS OF ESTIMATE FOR THE SFTAA PREDICTOR SET

	1.6		2.6		3.6		4.6		5.6		6.6	
	MultR	SE	MultR	SE	MultR	SE	MultR	SE	MultR	SE	MultR	SE
Vocabulary	.834	13.44	.795	16.88	.856	14.84	.911	12.50	.869	18.44	.875	19.6
Comprehension	.653	17.58	.762	18.91	.852	16.88	.881	15.55	.837	20.70	.875	20.0
Reading Total	.836	14.22	.809	17.81	.869	16.09	.899	15.08	.860	20.23	.882	20.6
Computation	.732	8.83	.664	10.08	.733	14.53	.850	12.19	.671	24.30	.769	27.2
Concepts/Pbs	.815	13.52	.808	13.59	.824	15.47	.867	14.22	.816	19.45	.826	22.1
Math Total	.809	9.45	.769	10.86	.805	13.91	.867	12.66	.746	21.80	.814	23.8
Auding	.760	10.63	.553	12.34	-	-	-	-	-	-	-	-
Mechanics	.759	18.05	.747	20.86	.817	20.94	.823	23.52	.773	27.81	.812	26.4
Usage/Struct.	.843	20.16	.803	20.63	.840	18.98	.853	16.48	.767	20.31	.790	21.0
Lang.Total	.849	16.64	.785	19.92	.839	19.45	.850	20.23	.782	24.61	.846	22.5
Spelling	.695	16.17	.663	20.63	.815	17.73	.856	16.72	.778	20.70	.841	18.6
Total Battery	.857	11.25	.819	14.14	.864	14.92	.886	15.55	.818	21.80	.910	17.1

	7.6		8.6		9.6		10.6		11.6		12.6	
	MultR	SE	MultR	SE	MultR	SE	MultR	SE	MultR	SE	MultR	SE
Vocabulary	.886	20.94	.998	3.28	.942	16.41	.983	9.45	.981	9.84	.977	11.4
Comprehension	.869	20.31	.962	12.27	.934	15.23	.972	10.55	.970	10.63	.951	14.2
Reading Total	.887	21.17	.987	8.13	.945	15.86	.986	8.52	.982	9.38	.976	11.2
Computation	.786	29.61	.910	24.14	.808	20.30	.880	23.28	.873	22.73	.886	20.8
Concepts/Pbs	.834	26.02	.935	19.14	.872	24.77	.940	17.73	.929	18.98	.926	19.5
Math Total	.822	27.19	.919	21.48	.852	27.03	.924	20.16	.916	20.63	.923	19.7
Auding	-	-	-	-	-	-	-	-	-	-	-	-
Mechanics	.824	24.39	.881	22.81	.875	21.17	.919	18.05	.909	18.59	.897	19.4
Usage/Struct.	.838	19.22	.877	20.39	.823	22.11	.838	21.48	.791	24.22	.743	27.5
Lang. Total	.839	24.61	.921	19.45	.878	21.88	.919	18.44	.890	20.63	.865	22.6
Spelling	.843	20.55	.918	17.50	.877	18.67	.929	14.22	.907	14.77	.879	19.0
Total Battery	.869	24.06	.952	16.80	.922	19.69	.965	13.67	.958	14.38	.941	17.8

From previous analysis, multiple correlations and associated standard errors of estimate were available for multiple regression work using CAT individual student scores as criteria and SFTAA individual student scores, plus age and sex, as predictors. The standard errors of estimate based on the school means analysis are, of course, quite a bit less than the standard errors based on individual student scores. A brief comparison of these two sets of standard errors revealed that the standard errors based on the school mean data were approximately half the standard errors based on individual data at the primary grades. The standard errors based on individual data tend to increase as grade increases; the standard errors based on school mean data do not show the same pattern of increase at the upper grades. One might speculate that the lack of increase in standard errors for the secondary grades reflects the larger school sizes for this grade range, with a corresponding decrease or non-increase in between school variability.

The multiple correlation coefficients and associated standard errors of estimate for the 27 variable school socioeconomic characteristic predictor set are given in Table 4. These statistics are based on the results after 20 iterations (e.g., selections or deletions) of the predictor selection algorithm. Due to the size of the predictor set, it was decided to look at the multiple correlations and standard errors of estimate after only 6 iterations of the predictor selection algorithm, in order to compare the accuracy of the predictions for a reasonably few predictors vs. a reasonably complete set of predictors. The multiple correlations and associated standard errors of estimate for the 27 variable socioeconomic characteristic predictor set after 6 iterations of the predictor selection algorithm are given in Table 5.

TABLE 4

MULTIPLE CORRELATIONS AND STANDARD ERRORS OF ESTIMATE FOR
THE 27 VARIABLE SCHOOL SOCIOECONOMIC CHARACTERISTIC SET AFTER 20 ITERATIONS

	1.6		2.6		3.6		4.6		5.6		6.6	
	MultR	SE	MultR	SE	MultR	SE	MultR	SE	MultR	SE	MultR	SE
Vocabulary	.695	17.9	.800	17.0	.826	17.6	.826	17.6	.862	19.5	.835	23.0
Comprehension	.484	20.7	.725	20.5	.782	20.4	.791	20.4	.827	21.7	.806	25.1
Reading Total	.654	20.1	.778	19.6	.809	20.4	.815	20.4	.854	21.3	.825	25.4
Computation	.587	10.7	.662	10.3	.699	15.7	.729	16.2	.746	22.6	.734	29.5
Concepts/Pbs	.630	18.4	.737	15.9	.762	18.2	.801	17.4	.825	19.4	.771	25.8
Math Total	.629	12.7	.710	12.1	.745	16.0	.783	16.2	.789	20.6	.761	27.0
Auding	.608	13.3	.587	12.2	-	-	-	-	-	-	-	-
Mechanics	.578	23.0	.710	22.4	.751	24.5	.792	25.5	.825	25.1	.779	29.0
Usage/Struct.	.734	25.9	.794	21.6	.808	21.2	.787	20.0	.785	20.1	.741	23.4
Lang.Total	.655	24.2	.751	21.8	.773	23.2	.805	23.4	.823	22.9	.804	25.7
Spelling	.545	19.1	.747	18.6	.781	19.6	.765	21.2	.765	21.8	.790	21.8
Total Battery	.639	17.0	.770	16.1	.794	18.3	.808	20.3	.829	21.8	.857	21.8

	7.6		8.6		9.6		10.6		11.6		12.6	
	MultR	SE	MultR	SE	MultR	SE	MultR	SE	MultR	SE	MultR	SE
Vocabulary	.897	20.8	.836	28.0	.885	23.7	.911	22.7	.891	24.7	.889	25.7
Comprehension	.867	21.4	.818	27.3	.859	22.8	.883	21.4	.884	21.4	.829	26.7
Reading Total	.881	22.4	.833	29.1	.879	24.2	.910	21.9	.892	23.6	.879	26.2
Computation	.804	29.1	.778	37.8	.815	29.7	.853	27.1	.803	29.5	.780	29.2
Concepts/Pbs	.825	27.5	.795	34.1	.853	27.8	.880	26.5	.829	30.4	.800	32.5
Math Total	.27	27.9	.791	24.5	.839	28.9	.875	26.6	.823	30.9	.800	32.8
Auding	-	-	-	-	-	-	-	-	-	-	-	-
Mechanics	.809	26.9	.758	33.0	.846	24.0	.905	20.5	.858	24.0	.796	28.3
Usage/Struct.	.823	20.7	.794	26.9	.666	29.9	.833	22.8	.768	26.6	.769	27.7
Lang. Total	.833	26.0	.784	32.4	.786	28.8	.904	21.2	.851	25.5	.782	29.9
Spelling	.825	22.4	.760	29.5	.791	24.2	.851	21.1	.818	21.1	.795	25.4
Total Battery	.866	25,3	.811	34.2	.858	27.7	.909	23.2	.871	26.4	.819	31.5

TABLE 5

MULTIPLE CORRELATION AND STANDARD ERRORS OF ESTIMATE FOR
THE 27 VARIABLE SCHOOL SOCIOECONOMIC CHARACTERISTIC SET AFTER 6 ITERATIONS

	1.6		2.6		3.6		4.6		5.6		6.6	
	MultR	SE	MultR	SE	MultR	SE	MultR	SE	MultR	SE	MultR	SE
Vocabulary	.621	19.0	.749	17.3	.770	18.2	.800	18.2	.845	19.9	.822	23.0
Comprehension	.419	21.0	.687	21.2	.747	21.4	.762	21.2	.805	22.4	.776	26.0
Reading Total	.609	20.6	.747	20.2	.780	20.3	.787	21.2	.735	21.8	.815	25.4
Computation	.550	10.8	.636	10.4	.656	16.1	.712	16.2	.705	23.3	.692	30.6
Concepts/Pbs	.577	19.0	.706	16.3	.726	18.8	.780	17.8	.799	20.2	.754	25.9
Math Total	.589	13.0	.661	12.7	.701	16.7	.762	16.5	.755	21.5	.740	27.6
Auding	.568	13.5	.547	12.4	-	-	-	-	-	-	-	-
Mechanics	.488	24.1	.650	23.7	.725	25.0	.769	26.4	.799	26.3	.759	29.6
Usage/Struct.	.664	27.9	.767	22.2	.749	23.0	.762	20.4	.759	20.6	.728	23.5
Lang. Total	.577	25.5	.687	23.3	.739	24.1	.775	24.2	.793	24.0	.785	26.2
Spelling	.416	20.4	.698	19.7	.723	20.8	.740	21.8	.730	22.4	.768	22.0
Total Battery	.593	17.5	.709	17.3	.760	19.2	.781	20.9	.804	22.5	.839	22.5

	7.6		8.6		9.6		10.6		11.6		12.6	
	MultR	SE	MultR	SE	MultR	SE	MultR	SE	MultR	SE	MultR	SE
Vocabulary	.843	24.1	.786	30.5	.815	28.1	.862	26.3	.842	27.7	.840	29.0
Comprehension	.823	23.3	.762	29.1	.821	24.4	.843	24.1	.845	23.4	.760	29.6
Reading Total	.830	25.3	.788	30.7	.835	26.7	.862	25.7	.847	26.5	.829	28.9
Computation	.753	31.1	.740	39.1	.783	30.9	.842	26.5	.784	29.0	.732	30.3
Concepts/Pbs	.796	28.5	.756	35.3	.807	29.7	.846	27.7	.801	30.7	.734	34.6
Math Total	.799	28.7	.754	35.9	.815	29.9	.856	27.2	.806	30.3	.764	33.2
Auding	-	-	-	-	-	-	-	-	-	-	-	-
Mechanics	.764	28.9	.719	33.7	.792	26.5	.868	22.7	.832	24.8	.743	29.4
Usage/Struct.	.778	22.0	.737	28.7	.628	30.3	.778	24.7	.719	27.6	.713	28.9
Lang. Total	.782	28.2	.732	34.2	.758	29.8	.863	23.6	.817	26.1	.719	31.4
Spelling	.786	23.6	.732	30.1	.749	25.7	.804	22.8	.730	23.7	.740	26.9
Total Battery	.828	27.3	.760	35.7	.822	28.9	.877	25.2	.844	27.1	.741	25.1

It is worthwhile to note a few comparisons among the results presented thus far. First, with respect to multiple correlations, the median multiple correlation for the SFTAA predictor set is in the middle .80's; the median multiple correlation for the 27 variable school socioeconomic characteristic predictor set after 20 iterations is about .80; and the median multiple correlation for the 27 variable school socioeconomic characteristic predictor set after 6 iterations is in the middle .70's. In terms of standard errors of estimate, the scales of measurement are different for each CAT score. However, averaging the standard errors across the 12 grades and using the SFTAA predictor set standard errors as the base, the increase in standard errors for the 27 variable socioeconomic characteristic set after 20 iterations ranged from 11 to 54 percent, whereas the increase in standard errors after 6 iterations ranged from 13 to 69 percent. The average percent increases were respectively, 29 and 35 percent.

As mentioned above, one of the school socioeconomic characteristic measures (the percent of students attending the school who are white) could be taken, in this day and age, as controllable or non-controllable by the school. For this reason, the multiple regression analyses for the school socioeconomic characteristic predictor set were repeated eliminating this variable as a potential predictor. Again, multiple correlations and associated standard errors of estimate were recorded for 20 iterations and 6 iterations of the predictor selection algorithm. These results are presented, respectively, in Tables 6 and 7.

Comparing the results in Tables 6 and 7 to the results in Tables 3, 4, and 5, the median multiple correlation for the 26 variable socioeconomic characteristic set after 20 iterations is in the middle to high .70's and

TABLE 6

MULTIPLE CORRELATIONS AND STANDARD ERRORS OF ESTIMATE FOR
THE 26 VARIABLE SCHOOL SOCIOECONOMIC CHARACTERISTIC SET AFTER 20 ITERATIONS

	1.6		2.6		3.6		4.6		5.6		6.6	
	MultR	SE	MultR	SE	MultR	SE	MultR	SE	MultR	SE	MultR	SE
Vocabulary	.678	18.3	.770	18.1	.802	17.5	.783	19.4	.820	21.6	.765	25.7
Comprehension	.484	20.8	.712	20.9	.768	21.2	.753	22.1	.789	23.6	.752	28.1
Reading Total	.641	20.3	.748	20.5	.789	20.4	.773	22.3	.813	23.6	.774	28.5
Computation	.554	11.0	.643	10.6	.676	16.0	.677	17.5	.705	23.8	.683	31.9
Concepts/Pbs	.606	18.9	.700	16.8	.737	18.8	.752	19.3	.778	21.7	.702	29.0
Math Total	.606	13.1	.679	12.6	.724	16.5	.730	17.8	.747	22.4	.708	29.7
Auding	.595	13.5	.567	12.4	-	-	-	-	-	-	-	-
Mechanics	.572	23.1	.674	23.6	.710	25.9	.758	27.4	.786	27.5	.724	32.1
Usage/Struct.	.720	26.5	.755	23.2	.777	22.3	.758	21.0	.751	21.4	.706	24.7
Lang. Total	.639	24.5	.703	23.3	.740	24.6	.768	25.1	.781	25.0	.753	28.7
Spelling	.545	19.1	.729	19.3	.759	20.4	.722	22.7	.739	22.7	.762	23.1
Total Battery	.631	17.2	.734	17.2	.769	19.4	.763	22.0	.789	24.1	.807	25.1

	7.6		8.6		9.6		10.6		11.6		12.6	
	MultR	SE	MultR	SE	MultR	SE	MultR	SE	MultR	SE	MultR	SE
Vocabulary	.869	23.1	.836	28.7	.876	24.4	.898	24.5	.869	26.9	.869	27.4
Comprehension	.842	22.7	.804	27.9	.859	22.8	.875	22.9	.868	22.7	.835	26.9
Reading Total	.861	24.0	.825	30.0	.877	24.3	.896	24.1	.874	25.7	.865	27.6
Computation	.760	31.8	.754	39.5	.810	30.3	.832	29.2	.772	31.9	.772	30.7
Concepts/Pbs.	.793	29.4	.786	34.8	.850	28.1	.863	28.1	.814	31.6	.802	32.7
Math Total	.780	30.5	.771	35.9	.838	29.1	.857	29.1	.803	32.4	.795	33.1
Auding	-	-	-	-	-	-	-	-	-	-	-	-
Mechanics	.807	27.5	.738	34.1	.852	24.0	.890	22.7	.834	26.4	.784	28.3
Usage/Struct.	.811	21.4	.794	26.9	.666	30.2	.807	24.0	.774	26.3	.769	27.7
Lang. Total	.814	27.3	.770	33.7	.803	28.6	.884	23.2	.829	26.5	.774	30.0
Spelling	.791	23.9	.762	29.9	.799	24.1	.834	22.5	.814	21.6	.795	25.4
Total Battery	.841	27.2	.794	35.2	.855	27.9	.887	25.7	.847	28.2	.823	31.9

TABLE 7

MULTIPLE CORRELATIONS AND STANDARD ERRORS OF ESTIMATE FOR
THE 26 VARIABLE SCHOOL SOCIOECONOMIC CHARACTERISTIC SET AFTER 6 ITERATIONS

	1.6		2.6		3.6		4.6		5.6		6.6	
	MultR	SE	MultR	SE	MultR	SE	MultR	SE	MultR	SE	MultR	SE
Vocabulary	.636	18.8	.732	18.9	.768	18.3	.722	20.9	.796	22.5	.765	26.0
Comprehension	.419	21.0	.659	21.9	.693	23.1	.708	23.1	.759	24.6	.729	28.3
Reading Total	.588	21.0	.710	21.4	.760	21.2	.729	23.5	.785	24.5	.736	29.5
Computation	.503	11.2	.618	10.6	.639	16.4	.650	17.6	.656	24.7	65.3	32.3
Concepts/Pbs	.529	19.7	.634	17.7	.698	19.5	.717	19.8	.744	22.5	.671	29.2
Math Total	.558	13.3	.644	13.0	.678	17.2	.700	18.2	.704	23.2	.675	30.2
Auding	.552	13.6	.537	12.4	-	-	-	-	-	-	-	-
Mechanics	.513	23.8	.589	25.2	.664	27.1	.687	29.9	.738	29.5	.687	33.0
Usage/Struct.	.667	27.9	.716	24.2	.712	24.4	.682	23.0	.717	22.0	.684	25.0
Lang. Total	.557	26.0	.651	24.4	.693	25.8	.690	27.6	.731	26.9	.716	29.6
Spelling	.416	20.4	.683	20.1	.707	21.6	.689	23.5	.701	23.4	.734	23.4
Total Battery	.569	17.9	.688	17.8	.732	20.2	.721	23.2	.750	25.0	.774	26.3

	7.6		8.6		9.6		10.6		11.6		12.6	
	MultR	SE	MultR	SE	MultR	SE	MultR	SE	MultR	SE	MultR	SE
Vocabulary	.819	25.9	.781	31.0	.815	28.1	.845	27.8	.823	29.1	.826	30.2
Comprehension	.779	25.7	.724	31.0	.821	24.4	.833	24.7	.828	24.5	.783	28.6
Reading Total	.807	27.0	.754	32.7	.840	26.4	.848	26.8	.831	27.7	.810	30.4
Computation	.717	33.4	.661	43.3	.767	31.9	.808	28.9	.745	31.2	.741	30.2
Concepts/Pbs	.727	32.1	.674	39.5	.815	29.4	.834	28.7	.786	31.7	.734	34.6
Math Total	.713	33.2	.673	40.0	.801	30.9	.835	28.9	.779	32.1	.764	33.2
Auding	-	-	-	-	-	-	-	-	-	-	-	-
Mechanics	.737	30.3	.661	36.0	.797	26.4	.837	25.1	.791	27.3	.738	29.7
Usage/Struct.	.773	22.4	.723	29.3	.624	30.4	.742	26.4	.720	27.5	.713	28.9
Lang. Total	.761	29.4	.709	35.3	.753	30.0	.830	26.0	.779	28.3	.719	31.4
Spelling	.741	25.7	.712	31.0	.749	25.7	.776	24.2	.758	22.9	.740	26.9
Total Battery	.787	30.0	.724	37.9	.814	29.4	.849	27.7	.810	29.6	.778	33.2

the median multiple correlation for the 26 variable socioeconomic characteristic set after 6 iterations is in the low to middle .70's. In terms of standard errors of estimate, again using the standard errors from the SFTAA predictor set as the base, the increase for the 26 variable socioeconomic characteristic set after 20 iterations ranged from 13 to 66 percent, whereas the increase after 6 iterations ranged from 13 to 78 percent. The average percent increases were, respectively, 35 and 42 percent. Directly comparing the analyses including the percent white variable to the analyses excluding this variable, the standard errors increase from 2 to 7 percent for the 20 iteration solutions and from 0 to 7 percent for the 6 iteration solutions. The average percent increases for these last comparisons were both 5 percent.

Finally, it is worthwhile to look at the order of selection of the school socioeconomic characteristic variables. There were 134 multiple regression analyses run using the 27 variable set, and 134 multiple regression analyses run using the 26 variable set. For the 27 variable set, the percent white variable was by far the most frequently chosen and the earliest selected variable. It was selected during the first six iterations of the algorithm in all except seven of the 134 analyses. For the 27 variable set, the order of selection of the remaining variables was similar to the order of selection for the 26 variable regression runs.

For the 26 variable analyses, the frequency of selection of the variables during the first six iterations of the algorithm is given in Table 8. As can be seen, the occupational category variables are quite frequently selected, as are the geographic region variables, especially Southeast. The percent of students living with only one parent is also frequently selected. Other variables selected a fair portion of the time include the Public School

TABLE 8

ORDER OF SELECTION OF PREDICTORS FROM THE SCHOOL SOCIOECONOMIC CHARACTERISTICS

	Variable	Frequency of Selection
1.	Occupational category: % Unskilled	128
2.	Geographic region: Southeast	105
3.	% students in homes with only one parent	104
4.	Occupational category: % Professional	68
5.	Stratification: Public (0-1)	47
6.	# students at grade level	35
7.	% students with employed mothers	34
8.	District size: Small, Medium, Large (1-2-3)	34
9.	Geographic region: New England	31
10.	Geographic region: Plains	30
11.	% students with English as a second language	21
12.	Geographic region: Southwest	16
13.	Geographic region: Mideast	15
14.	Occupational category: % white collar	12
15.	Community type: Rural (0-1)	12
16.	Neighborhood served: Medium City (0-1)	11
17.	Community type: Town (0-1)	11
18.	Neighborhood served: Industrial Suburb (0-1)	10
19.	Geographic region: Great Lakes (0-1)	8
20.	Community type: Urban (0-1)	8
21.	Neighborhood served: Inner City (0-1)	6
22.	Neighborhood served: Residential suburb (0-1)	5
23.	Neighborhood served: Rural area	5
24.	% students who attended the school last year who are no longer attending the school.	3
25.	Neighborhood served: Small Town	2
26.	Neighborhood served: Residential area of a large city	2

stratification variable, the number of students at grade level variable, the percent of students with employed mothers variable, and the average enrollment per grade variable.

DISCUSSION and CONCLUSION

It is widely believed that the best prediction of achievement test scores is a prediction based on previous achievement test scores, that the second best prediction is a prediction based on academic aptitude test scores, and that socioeconomic characteristics provide prediction less accurate than either previous achievement test scores or academic aptitude test scores. The results presented in this paper do nothing to dispel this hierarchy.

There are several measurement kinds of issues that should be mentioned. First, it should be noted that the variables entering into the socioeconomic characteristic set come from a variety of scales. In particular there are quite a few 0-1 variables included. The results presented in Table 8 show that these variables tend not to be those frequently selected in the first six iterations. Note that all the neighborhood served and community type variables are 0-1. It is possible that measures of these variables on more appropriate or more powerful scales would yield better predictive power for this class of variables.

Second, the lack of cross-validation for these results is painfully obvious. The data, of course, come from a rather large and expensive data collection. Even so, when working with the school as the basic unit for each data point, the number of data points for each grade level is not large. The results of these analyses will be used to provide expected scores for

schools as norms against which obtained scores on the CAT may be evaluated. For this reason, every data point available was used to derive the regression weights. This eliminated any possibility of cross-validation using the data set in hand. As just mentioned, the results will be used to provide a standard against which obtained scores on the CAT may be evaluated; as this is done, correlations may be found between the obtained school means and the expected scores, thus providing cross-validation for each application.

Third, a number of further research questions might be addressed using the basic data developed during this study. Two such questions concern 1) the relationship between the school socioeconomic characteristic variable set and the SFTAA variable set, and 2) whether the school socioeconomic characteristic variable set adds predictive accuracy beyond that offered by the SFTAA variable set. Also, further work could be done using the controllable school socioeconomic characteristic variables. The data source for this work is rather rich, and the results presented in this paper provide only a small fraction of what could be done.

Finally, the issue of circularity for aptitude and achievement tests should be mentioned. Although aptitude tests and achievement tests are designed to measure distinctly different constructs, many people believe that empirically speaking the two types of tests do nothing more than measure the same thing. The present paper does not address itself to this issue. However, it might be mentioned that the standard or norm derived from the regression expectation based on school socioeconomic characteristics avoids the circularity question, whereas use of the regression expectation based on the SFTAA predictor set does not. This consideration points out one of the major advantages of the expectations provided by the school socioeconomic characteristic measures.

The level of predictive accuracy for the school socioeconomic characteristic variable set is quite encouraging. As given above, the multiple correlations run from .05 to .10 lower, on the average, than the multiple correlations based on the SFTAA variable set, depending on the actual variables allowed to be predictors and the number of predictors. In terms of standard errors of estimate, the predictions are 30 to 40 percent less precise, again depending on the predictor set and the number of predictors.

The purpose of this study was the development of two sets of variables that might be used to provide expected scores on the CAT battery. This author's conclusion is that both the SFTAA set and the school socioeconomic characteristic set do provide adequate prediction for school means. When the time and effort necessary to collect data upon which to base prediction are taken into account, the desirable course of action may well be base expectations on the more easily obtained school socioeconomic characteristic variables in preference to the student time consuming the expensive academic aptitude test data.

In summary, this paper presents results from an effort to develop two sets of predictor variables for regression expectation of school means on an achievement battery. One set of variables was school mean scores on an academic aptitude test, along with average age and average sex for the schools. The other set was school socioeconomic characteristic data from a questionnaire filled in by each school principal. The academic aptitude predictor set provided the more precise prediction, but the prediction based on the school socioeconomic data was judged sufficiently accurate to provide very useful expectations. The two expectation systems may be used, in conjunction with national norms and special group norms, as standards against which actual obtained scores on an achievement battery may be compared.

References

Burket, George R. "Adaptation of Differential Predictor Selection to a Stepwise Algorithm." Paper given at the Psychometric Conference Honoring Paul Horst, Seattle, Washington, 1969.

CTB/McGraw-Hill. "Bulletin of Technical Data Number 1 - California Achievement Test." CTB/McGraw-Hill, Monterey, California, 1970.

Flanagan, J. D. Project Talent: Studies of the American High School. Pittsburgh: University of Pittsburgh Press, Project Talent Office, 1962.

Gulliksen, H. Theory of Mental Tests. Wiley and Sons, New York, 1950.

Hogan, Thomas P. Socioeconomic predictors of cognitive test performance in school children. Unpublished doctoral dissertation, Fordham University, New York, 1970.

Lennon, Roger T. Prediction of academic achievement and intelligence from community and school system characteristics. Unpublished doctoral dissertation, Columbia University, New York, 1952.

Thorndike, R. L. Community variables as predictors of intelligence and academic achievement. J. Ed. Psych, 42, 321-338, 1951.

APPENDIX A

*SCHOOL CHARACTERISTICS QUESTIONNAIRE

Name _____

Address _____

School Name _____ School Zip Code _____

1. How many students are enrolled in this school at each of the following grade levels?

K_____	7_____
1_____	8_____
2_____	9_____
3_____	10_____
4_____	11_____
5_____	12_____
6_____	

2. About what percentage of the students who attended this school last year are no longer attending this school (do not count those who have moved because of graduation or are being bussed to other schools)?

_____%

3. How old is the main classroom building of this school plant?

_____years old.

4. About what percent of the families of students at this school are represented at a typical meeting of the PTA or similar parent group?

_____%

5. Which of the following categories best describe the neighborhood served by this school?

_____a. rural area
_____b. residential suburb
_____c. industrial suburb
_____d. small town (5,000 or less)
_____e. city of 5,000 or 50,000
_____f. residential area of a large city (50,000+)
_____g. inner part of a large city (50,000+)

6. About what percentage of students in this school have mothers who are employed outside of the home?

_____%

7. From which of the following groups (check all that apply) is formal approval required to initiate new education programs in this school (e.g., team teaching, new curricula, ungraded classrooms, resource rooms, etc.)?

_____Board of Education
_____Superintendent
_____District administration other than Superintendent
_____Parents
_____Teachers
_____No formal approval needed

8. About how long does it usually take to implement a new educational program in this school (i.e., from the time the decision is made to adopt it until the time it is actually introduced)?

_____months

9. (a) (Elementary schools) What is the copyright date of the regular class reading book used in the third grade at this school? _____

(b) (Junior and senior high schools) What is the copyright date of the regular American history text used in this school? _____

10. About what percentage of the students in this school are White?

_____%

11. What is the annual salary of the principal of this school

$_____

12. What is the starting annual salary of a fully certified beginning teacher in this school system?
$_____

13. (Elementary schools only) About what percentage of the students now in Grade 1 in this school attended Kindergarten or its equivalent?

_____%

14. About what percentage of the students in this school are living in homes in which there is only one parents _____%

15. About what percentage of the students in this school speak a language other than English outside of school or come from homes in which a language other than English is spoken most of the time?
_____%

16. About what percentage of the pupils served by this school fall into each of the categories listed in the chart below (the total should equal 100%)?

Occupational Category	%
children of professionals and managers (doctors, lawyers, engineers, executives, etc.)	
children of white collar workers other than those in (a) above (proprietors, salesmen, clerks, etc.)	
children of skilled workers (electricians, carpenters, repair men, factory workers, etc.)	
children of unskilled workers (laborers, janitors, dishwashers, etc.)	
TOTAL	100%

17. About how many catalogued volumes are there in the library of this school? _____volumes

18. What is the average full-time teaching experience of the teaching staff of this school (consider counseling as teaching experience)?

_____years

19. What is the approximate average annual salary of the teaching staff in this school?
$_____

20. Please estimate in the chart below the number of hours per week that each of the specified kinds of people are working in this school?

Type of person	# of hours per week
Guidance Counselor	
Psychologist	
Child Welfare & Attendance Office	
Nurse	
Speech Therapist	
Remedial Reading Specialist	
English-Second-Language Specialist	
Art Teacher	
Music Teacher	
Sex Education Consultant	
Librarian	
Teacher Aids	

APPENDIX B

INTERNAL ANALYSIS OF SCHOOL SOCIOECONOMIC CHARACTERISTICS DATA

As part of the CTB/McGraw-Hill standardization research for the California Achievement Tests - 1970 and the Short Form Test of Academic Aptitude, a questionnaire was sent to each participating school requesting information on a variety of student, staff, and physical characteristics. The data collected via this questionnaire are summarized in this report.

The first section describes the sampling procedure used for the joint CAT/SFTAA standardization and the questionnaire return pattern. The second section presents summaries of the questionnaire responses.

I. Sampling Design and Return Rate.

The standardization research for CAT and SFTAA involved 397 schools and over 200,000 students. Separate samples were drawn for public and Catholic schools. The public school sample was drawn using a stratified random sampling procedure: seven geographic regions (New England, Mideast, Great Lakes, Plains, Southeast, Southwest, and West), three community sizes (small, medium, and large), and four community types (urban, rural, town, and other) were defined and proportionate random samples were drawn. The public school sample involved 355 schools.

The Catholic school sample was drawn proportionately based on geographic region, community size, and school type (diocesan vs. private). This sample involved only 42 schools. The questionnaire results from the Catholic sample are not included in this report.

Of the 355 public schools participating, 349 (or 98.3%) returned questionnaires. The number of schools responding for each cell in the design is given in Table 1A. Please note that these numbers do not indicate the number of students in these groups; some schools are many times larger than others. A blank space in the table indicates that the percent of the total population for that cell was not large enough to warrant that a sample be drawn. Note also that there are several zeroes recorded. A zero indicates a cell for which all school districts contacted declined participation in the standardization. Of the six schools not returning questionnaires (and hence not recorded in Table 1A), one was in the New England Large Urban cell, two were in the Mideast Small Rural cell, one was in the Mideast Medium Urban cell, and two were in the Great Lakes Small other cell.

One item on the questionnaire dealt with the neighborhood served by the school, i.e., community type and size. All 349 respondents answered this item. Table 1B gives the number of schools, divided into elementary and secondary, responding in each neighborhood category. The community type and size as described by questionnaire respondents corresponded quite well with the community type and size definitions used by CTB. Of the

Table 1A

Schools Responding to the Questionnaire by Sampling Cells

GEOGRAPHIC REGION	COMMUNITY SIZE AND TYPE												
	Small				Medium				Large				
	Urban	Rural	Town	Other	Urban	Rural	Town	Other	Urban	Rural	Town	Other	TOTAL
New England		9	7	6			0	3					25
Mideast		11	3	5		0	11	0			0		33
Great Lakes	10	13	15	0		0	4	15					57
Plains	9	7	10	4			5	6					41
Southeast	19	7	14	5	3	12	10	8		3	8		89
Southwest	10	6	3	5		2	9	5			3		43
West	11	12	7	4	3	0	7	12			5		61
TOTAL:	62	65	59	29	6	14	46	49		3	16		349

Table 1B

Schools Responding to the Questionnaire by Neighborhood Self-Description

NEIGHBORHOOD SELF DESCRIPTION	ELEMENTARY	SECONDARY	BOTH	TOTAL
Rural area	31	11	19	61
Residential suburb	46	29	0	75
Industrial suburb	7	3	0	10
Small town	21	14	5	40
City of 5,000 to 50,000	28	21	1	50
Residential area of a large city	21	9	0	30
Inner part of a large city	14	5	0	19
Rural area and small town	23	7	4	34
Other	18	11	1	30
TOTAL:	209	110	30	349

349 schools responding, only 26 (or 7.4%) described themselves as serving neighborhoods inconsistent with CTB's definitions.

II. Thirty Questionnaire Items.

The 30 questionnaire items summarized here may be grouped into 3 categories: 1) Demographic Student Characteristics, 2) Physical Plant and Administrative Characteristics, and 3) School Staff Characteristics. Table 2 presents the number of respondents and average response for each of the 30 items grouped according to these 3 categories. Separate responses are given for elementary and secondary schools.

Response patterns for each of the 30 items are now discussed. Unless otherwise noted, the patterns were the same for elementary and secondary schools.

A. Student Demographic Characteristics.

1. Student mobility (#2):

The average response was 10.6%. Mobility rose from small to medium to large districts (8.9% to 11% to 15.5%). The highest mobility percentages were found in the Great Lakes, Southwest, and West, and in those schools describing themselves as "inner city" (18.3%).

2. PTA Attendance (#4):

The average response was 17.9%. New England schools had the highest average percentage (28.2%) while schools in the West had the lowest average percentage (13.8%). Elementary schools in general reported higher percentages than did secondary schools.

3. Employed Mothers (#6):

The average percentage was 39.8%. The highest percentages were given by schools describing themselves as "inner city" (47.1%) and "industrial suburb" (46.6%).

4. Percent white (#10):

The overall average percentage was 82.7%. Obvious subgroup patterns were found for the community size (89.5% white for "small" school districts, 81.9% white for "medium" school districts, and 65.5% for "large" school districts) and community type (67.3% White for "urban", between 86.8% and 88.2% for "rural", "town", and "other"). In addition, geographic region had a sub-group pattern showing high per cent white for New England, Mideast, Great Lakes, and Plains (all between 86.5% and 98.2%) and low per cent white for Southeast, Southwest, and West (between 71.4% and 79.2%). Finally, schools describing

Table 2
Average Responses to 30 Questionnaire Items

	ELEMENTARY		HIGH SCHOOL		TOTAL	
	N	X	N	X	N	X
Student Demographic:						
Mobility (#2)	219	11.3%	129	7.8%	318	10.6%
PTA Attendance (#4)	211	21.1%	121	11.9%	305	17.9%
Employed Mothers (#6)	228	39.6%	132	39.9%	330	39.8%
Per Cent White (#10)	239	80.8%	140	84.6%	349	82.7%
Kindergarten (Elementary Schools) (#13)	210	66.5%				
One Parent (#14)	225	13.0%	131	14.7%	326	13.6%
English Second (#15)	224	4.8%	134	3.1%	328	4.4%
Occupation: Professional (#16)	232	11.3%	137	11.6%	339	11.8%
Occupation: White Collar (#16)	232	23.4%	137	25.3%	339	24.8%
Occupation: Skilled (#16)	232	36.1%	137	35.0%	339	35.2%
Occupation: Unskilled (#16)	232	29.2%	137	28.1%	339	28.2%
Physical Plant and Administrative:						
Plant Age (#3)	235	24.2yrs.	133	20.5yrs.	340	23.2yrs.
New Programs (#8)	200	7.6mos.	126	7.6mos.	229	7.7mos.
Library (#17)	219	4121 books	129	6917 books	322	5205 books
Staff Characteristics:						
Principal's Salary (#11)	227	$12,489	133	$13,701	332	$13,104
Average Starting Salary (#12)	237	$ 6,503	137	$ 6,347	345	$ 6,484
Average Salary (#19)	223	$ 7,981	136	$ 8,040	330	$ 8,091
Average Experience (#18)	227	12.3yrs.	137	10.6yrs	334	11.6yrs
Guidance Counselor (#20)	90	20.0hrs.	130	51.2hrs.	193	39.7hrs.
Psychologist (#20)	84	4.4hrs.	53	8.8hrs.	132	6.2hrs.
Welfare Officer (#20)	62	3.7hrs.	64	8.0hrs.	119	6.0hrs.
Nurse (#20)	167	12.3hrs.	93	17.3hrs.	244	14.2hrs.
Speech Therapist (#20)	145	8.7hrs.	65	9.2hrs.	205	8.9hrs.
Remedial Reading (#20)	133	26.3hrs.	76	29.6hrs.	192	27.0hrs.
English Second Language (#20)	20	21.9hrs.	33	39.2hrs.	46	32.8hrs.
Art (#20)	105	16.8hrs.	102	34.9hrs.	194	25.8hrs.
Music (#20)	180	21.1hrs.	124	36.6hrs.	286	26.8hrs.
Sex Education(#20)	7	5.3hrs.	11	17.6hrs.	17	12.9hrs.
Librarian (#20)	159	25.9hrs.	132	37.0hrs.	262	30.8hrs.
Teacher Aides (#20)	139	56.2hrs.	67	59.0hrs.	179	57.1hrs.

themselves as "inner city" gave an average percentage of 43.2% whereas all other self-description categories had average percentages between 78.4% and 94.9%.

5. Kindergarten attendance (answered by Elementary Schools only) (#13):

   The average response was 66.5%. Sub-group averages indicated that the Southeast (26.6%) and Southwest (46.0%) were below average whereas all other geographic regions were above. Schools describing themselves as serving "rural areas" (48.7%) were also below the overall average.

6. Only one parent (#14):

   The average response was 13.6%. Schools describing themselves as "inner city" had a 33.8%, far above all other self-description categories. Large urban areas, especially in the Southeast, Southwest, and West showed the highest average percentages.

7. English is second language (#15):

   The average response was 4.4%. Once again, schools describing themselves as "inner city" (25.1%) were far above the average. Schools in the Southwest (13.6%) and West (7.7%) also were above the average percentage.

8. Professionals (#16):

   The average response was 11.8%. Highest percentages were given by schools describing themselves as "residential suburb" (20.2%), and "residential area of a large city" (17.8%), and lowest percentages were given by schools describing themselves as "inner city" (1.8%) and "rural area" (6.1%).

9. White collar workers (#16):

   The average response was 24.8%. Schools describing themselves as "rural area" were somewhat lower (17.0%) and schools describing themselves as "residential suburb" (35.5%) or "residential city" (31.1%) were somewhat higher than the overall average.

10. Skilled workers (#16):

    The average response was 35.2%. Schools describing themselves as serving "rural areas" had somewhat higher than average responses.

11. Unskilled workers (#16):

The average response was 28.2%. Lowest responses were given by the Mideast (13.5%) and New England (13.0%) schools, and by schools describing themselves as serving "residential suburbs" (14.8%) and "residential area of a large city" (22.6%). Highest responses were given by schools describing themselves as serving "industrial suburbs" (53.0%) and "inner city" (45.0%).

B. Physical Plant and Administrative Characteristics.

1. School building age (#3):

The average response was 23.2 years. Predictably, the oldest average age was given by those schools describing themselves as "inner city" (35.7 years), whereas the youngest average age was given by those schools describing themselves as "residential suburbs" (16.0 years). Secondary schools reported a lower average age (20.5 years) than did elementary schools (25.2 years).

2. New educational program (#8):

The average response was 7.7 months. Schools describing themselves as "inner city" implemented new programs more quickly (2.8 months) than all others; schools describing themselves as "residential suburbs" were slowest (9.3 months).

3. Size of library (#17):

The average response was 5,205 volumes. The average response became larger as the school district size became larger: 4,185 volumes for "small" school districts, 6,123 volumes for "medium" sized school districts, and 7,044 volumes for "large" school districts. Below average responses were returned by schools describing themselves as "rural area" (4,119), and "inner city" (4,408), whereas above average responses were returned by schools describing themselves as "residential suburb" (6,839), and "residential area of a large city" (6,236). Elementary schools had smaller libraries (4,121 book average) than did secondary schools (6,917 book average), but the response patterns were the same.

C. Staff Characteristics.

1. Principal's salary (#11):

The average response was $13,104. Differences were evident for school district size: "small" sized districts reported an

average salary of $11,940, "medium" school districts reported an average salary of $13,213, and "large" districts reported an average salary of $16,121. As might be expected, sub-group means were above average in the urban schools, and in the New England, Mideast, Great Lakes, and West geographic regions. "Inner city" salaries were the highest reported ($17,137), with "residential suburb" and "residential area of a large city" above average, and "rural area" salaries the lowest ($10,873). Elementary school salaries were generally lower than secondary school salaries.

2. Starting salary (#12):

The average starting salary was $6,484. The sub-group patterns were the same as the patterns for principals' salaries. No differences between elementary and secondary schools were noted.

3. Average salary (#19):

The average salary reported was $8,091. The pattern of sub-groups responses was the same as 1) and 2) above, except that "medium" sized school districts reported an average salary ($7,898) slightly lower than the "small" school districts ($8,027). Again, no real differences between elementary and secondary school salaries were noted.

4. Average teaching experience (#18):

The average response was 11.6 years. Though differences were not large, the "rural area" and "small town" responses were higher (averaging 12.5 years) than the "inner city", "residential area of a large city", and "suburb" responses (9.2 years). The average response for elementary schools was slightly higher (12.3 years) than the average response for secondary schools (10.6 years).

5. Number of hours per week for specialists (#20):

The responses to this questionnaire item are summarized in Table 2. The general sub-group trend for this item was that "large" and "urban" schools, especially in New England and Mideast states, reported more hours of specialists than did schools in "small" or "rural" areas. This trend was especially noted for Guidance Counselors, Art and Music Teachers, and Teacher Aides. Differences between elementary schools and high schools are also noted, most notably in the employment of Guidance Counselors.