DOCUMENT RESUME

ED 066 549 UD 012 919

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TITLE	Multiple Correlation Analysis of Antecedent Relationships to High School Dropout or Graduation. Project MHSC-1: Antecedents of Educational Attainment.
INSTITUTION	National Inst. of Mental Health, Bethesda, Md. Mental Health Study Center.
REPORT NO	Lab-Pap-21
PUB DATE	Nov 67
NOTE	73p.
EDRS PRICE	MF-$0.65 HC-$3.29
DESCRIPTORS	Caucasian Students; Correlation; *Dropout Identification; Educational Diagnosis; *Educational Experience; *Family Background; Females; Males; *Multiple Regression Analysis; Negro Students; *Prediction; Predictive Validity; Racial Differences; Sex Differences; Socioeconomic Status

ABSTRACT

The study reported here was directed at an identification and analysis of characteristics related to secondary school dropout or graduation that are evident in the sixth grade. Subjects used in this investigation were 1090 white males--307 dropouts and 783 graduates; 1100 white females--200 dropouts and 900 graduates; 166 Negro males--69 dropouts and 97 graduates; and, 129 Negro females--56 dropouts and 73 graduates. Subjects were drawn from a larger cohort of 4075 students that comprised the total regular enrollment of a county school system in the sixth grade in 1954. Multiple correlation analyses were performed with 21 measures available in school records in the sixth grade. These variables were correlated with the criterion of subsequent withdrawal or graduation from high school. Analyses were conducted separately for each of four race and sex groups and for the four groups combined. Although different patterns of variables were found to differentiate dropouts and graduates in the race and sex subgroups, there was a general similarity across all samples in that one or two measures of achievement or ability, age in the sixth grade which was considered to be predominantly a measure of school retention, absence, and one or two measures of family background appeared in each of the four samples. (Author/JM)

Multiple Correlation Analysis of Antecedent Relationships to High School Dropout or Graduation

Dee Norman Lloyd

Project MHSC-1

Antecedents of Educational Achievement

Laboratory Paper #21

Personal and Social Organization Section

Mental Health Study Center

National Institute of Mental Health

November 1967

Summary

The study reported here is the first of several to be conducted on the characteristics of individuals and their social background that lead to dropout or graduation from secondary school. The focus of these studies is on the different patterns that lead to educational success and failure: the characteristics that differentiate types of dropouts, the characteristics that are identifiable years prior to dropout or graduation, and changes in these characteristics over time. The present study was directed at an identification and analysis of characteristics related to secondary school dropout or graduation that are evident in the 6th grade.

Multiple correlation analyses were performed with 21 measures available in school records in the 6th grade. These variables were correlated with the criterion of subsequent withdrawal or graduation from high school. Analyses were conducted separately for each of four race and sex groups and for the four groups combined. The results were analyzed in regard to (1) different patterns of predictors in the four samples, (2) the variation in the amount of variance accounted for in the samples as compared to the four samples combined, and (3) the similarities and differences associated with race and sex. Additional analyses were undertaken wherein variables that were logically related in content were substituted for variables obtained in the original equations. These substitution analyses were undertaken to determine whether approximately the same amount of variance in the criterion could be accounted for by different

but related measures and to evaluate the evidence for factors underlying different variables appearing in the regression equations.

Fifteen of the 21 independent variables had significant correlations with the criterion of dropout or graduation in all of the four race-sex samples. All significant correlations were in the expected direction, with graduation from high school associated with younger age, higher occupation and education levels, fewer siblings, more intact homes, higher course marks and standardized test scores, fewer absences, and fewer retentions during elementary school. Two variables did not correlate significantly in any sample, the measure of school transfer and the measure of employment of the mother outside of the home. In addition, the marital status of parents was not significantly correlated with the criterion in the Negro male sample, and occupation and education level of father and number of siblings did not have significant correlations in the Negro female sample.

Multiple correlations that were substantially higher than the highest zero-order correlations were found in each of the four subsamples. Across the samples, 23% to 38% of the variance in the criterion of dropout or graduation was accounted for by a combination of variables.

The multiple correlation coefficients that were obtained in the individual samples were compared to that obtained when the four samples were combined. This comparison revealed significant variation among the individual samples in the amount of variance that

was accounted for. From this it was concluded that more refined analysis and prediction of dropout or graduation can be made when the stratifying effects of race and sex are taken into account.

White male dropouts and graduates were best differentiated or predicted by a combination of age in the 6th grade, arithmetic and language test scores, number of siblings, and occupation level of father. Variables that differentiated white female dropouts and graduates were the average of course marks in the 6th grade, number of absences, age, number of siblings, and marital status of parents. For Negro males, the education level of mother, language test score, number of absences, and age were the best differentiating variables. A combination of the intelligence test score, number of absences, marital status of parents, education level of mother, age, and whether or not the mother worked outside of the home differentiated Negro female dropouts and graduates.

Although different patterns of variables were found to differentiate dropouts and graduates in the race and sex subgroups, there was a general similarity across all samples in that one or two measures of achievement or ability, age in the 6th grade (which was considered to be predominantly a measure of school retention), absence (except for white males), and one or two measures of family background appeared in each of the four samples.

The results of the substitution analysis indicated that approximately the same amount of the major variance in the criterion was accounted for when different but related measures of achievement

and background were used. Findings of the original and substitution analyses supported the hypothesis that underlying factors could be formulated to account for relationships of variables to dropout or graduation. The five factors proposed as major dimensions relating to school success or failure were: general achievement, occupational-educational level of parents, family characteristics, retention in grade, and absence. At the level of variables or factors, however, there were relative differences among the four samples. Most of these differences were found to be associated with sex and were replicated across the race groups.

The variables that appeared to be relatively more differentiating of dropouts and graduates in the female samples were 6th grade reading achievement, absence in the 6th grade, and the marital status of parents. In the male samples there was a relatively greater discrimination from the 6th grade language usage test score, age in the 6th grade, and the education level of father. When sex was included as an independent variable in the analysis of the combined samples, it was found that it did not account for any independent variance in the criterion over and above that accounted for by the language usage score.

Differences associated with race were fewer than those associated with sex. The total amount of variance in the criterion accounted for was greater in the Negro samples than in the white samples, and this variance was accounted for by a fewer number of variables. The greatest difference between the race groups in the

relationship of variables to the criterion was associated with the socio-economic and family background measures. On the one hand, fewer of these variables were significantly related to the criterion in the Negro samples; yet, on the other hand, the relative contribution of background measures to the regression equations was greater, particularly in the Negro female sample. In the analysis of the combined samples where race was included as an independent variable, race did not account for any variance independent of other measures in the study. These results suggested that the major stratification associated with race was one of socio-economic level and family background characteristics.

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Multiple Correlation Analysis of Antecedent Relationships to High School Dropout or Graduation[1]

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The term dropout is applied to anyone who does not complete a secondary school education and receive a high school diploma. As such, dropout must be considered a complex phenomenon that subsumes many different factors and patterns of development. Attention has been called to the need for research into different types of dropouts (Miller, 1964) and the different processes that lead to dropout (Miller, Saleem, & Bryce, 1964). Closely associated with the investigation of different characteristics of subgroups of dropouts, and in many ways a necessary prior step, is the need to determine the relationships among various characteristics that are found to differentiate dropouts and graduates. Only a few of the many investigations on dropouts have gone beyond the description of characteristics of dropouts and how they differ from graduates, to an analysis of the relationships among the differentiating characteristics that were found and the relative degree to which these characteristics account

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[1]The author is director of Project MHSC-1, Antecedents of Educational Achievement, of which this study is a part. Appreciation is expressed to the many who have contributed to the project in the collection and coding of the data. Special appreciation is expressed to Mrs. Anita Green, Project Statistical Assistant, Miss Janet Modery, Project Secretary, and Mr. Jeffrey Menick, Project Clerk, for their contributions to the present study, and to Dr. Sheila Feld for her helpful comments on the manuscript. We also wish to thank the personnel of the County Board of Education who have contributed so much to making the project possible.

for differences between dropouts and graduates. Opstad (1958), as part of a larger study, computed multiple correlations to determine the relative contribution of 9th grade test scores, other high school measures, and elementary school marks to the prediction of high school dropout or graduation. Of the eight variables in the analysis, a combination of five produced a multiple correlation of .625 for boys: IQ score, composite score on the Iowa Test of Educational Development, high school grade point average, number of extracurricular activity areas participated in, and educational level of parents. Only three variables were needed to produce a multiple correlation of .653 for girls: high school grade point average, amount of absence, and number of extracurricular activity areas participated in. Urdal (1963) compared dropouts and a randomly selected group of stay-ins (not necessarily graduates) on variables taken from 8th grade information by means of discriminant function analysis. Twelve variables were selected from among those showing significant mean differences between the groups. Of these, four variables produced a maximally efficient discriminant: the Metropolitan Achievement Test language study skills score, education level of father, participation in clubs and school service, and attitude toward school. This discriminant correctly classified approximately 68% of the subjects. Livingston (1958) found a multiple correlation of .70 with dropout or graduation using four variables: participation in formal and informal activities,

number of grades retained, and persons with whom student resided. Data in this study were based on information available in elementary school and apparently information available up to the 8th grade. Livingston's sample differed from others in that race, sex, and occupational status of principal wage earner were not significantly related to the criterion of dropout or graduation. A summary of the results of these studies is presented in Table 1. Results of these studies indicated that a sizeable amount of difference between dropouts and graduates can be accounted for with relatively few variables. These results are additionally encouraging when one considers that much of the information was gathered from school records.

When a combination of variables that differentiate dropouts and graduates has been obtained, additional questions can be posed concerning the generalization of the findings. Separate from the question of replication in other samples that would be necessary to establish a prediction formula, there is the question as to whether the variables can be generalized, that is, whether the different measures used in various studies are tapping into the same underlying factors. Since the types of standardized tests in use vary from place to place and over time, and different types of information are available to different researchers and school personnel, this type of generalization is very important for synthesizing and applying the results of various studies. An understanding of underlying factors and their relationships is also of value to theory, in that

Table 1

Variables Differentiating High School Dropout or Graduation in Related Studies

Variable	Opstad (1958)[a] (9th grade) M	F	Urdal (1963)[b] (8th grade)	Livingston (1958)[c]
Retained in grade				XX
Absence	0	-.174	0	0
Activities	.150	.356	XX	XX
Grade point average	.453	.216	0	0
Elementary school marks	0	0		
IQ score	.188	0		0
ITED total achievement score	-.175	0		
Reading achievement score				0
Language skills score			XX	
Education level of parents	.145	.102	XX	
Father's occupation level	0	0	0	
Marital status				XX
Hours worked per week			0	
Attitude toward school			XX	
N	216	227	210	309
Graduates	115	106	133	193
Dropouts	101	121	77	116
Multiple R	.625	.659	-	.700
% correct classification	82%	80%	68%	-

Note.--The symbol 0 indicates variable included in analysis, but not a significant predictor. XX indicates a significant predictor.

[a]Several variables included data covering all four years of high school. Test scores were obtained in the 9th grade. Education level combined education of both parents. Participation in activities was the number of different areas, e.g., music, speech, or athletics participated in. Percent of correct classification was obtained by applying regression equations to groups not in original analysis. Figures reported in body of table are beta weights.

[b]Discriminant function between dropouts and randomly-selected stay-ins (not necessarily graduates). Relative weights of variables not reported. All data were from the 8th grade. All variables included in analysis had significant mean differences between groups. Attitudes and participation in extracurricular activities were obtained from questionnaire and an activities inventory. Attitude toward teacher was included in analysis, but did not contribute to discriminant. Two activity scores were included, arts and science, and clubs; only activity in clubs was significant.

[c]Exact grade or grades of information for variables was not reported. Variables apparently include information available up to and including the 8th grade. Two measures of participation in activities contributed to the prediction equation, formal and informal school activities.

it provides a basis for more refined investigations into the types of dropouts and the process of dropout.

Another type of generalization that applies to dropout studies is the generalization of findings over different points in time. For the practical application of findings in the early identification of potential dropouts and the development of preventative programs, it is important to know the characteristics of dropouts that manifest themselves prior to the student's withdrawal from school. The need for information to identify potential dropouts as far back as elementary school has been emphasized by Livingston (1959) and Porter (1963).

The present study was designed to contribute information to the issues presented above. Data were taken from information gathered on a cohort of students who were followed from elementary school to high school dropout or graduation. Multiple correlation analyses were performed separately for each of the four race-by-sex subgroups in this cohort. This provided for possible replication of findings across samples and an analysis of differences and similarities in the pattern of predictors across race and sex. Information for the independent variables was purposefully restricted to that available at the 6th grade in order to determine the indications of high school dropout or graduation that are apparent in the last year of elementary school. Additional analyses were performed wherein variables that were logically related to those appearing in the

initial analysis were substituted for the original variables. The purpose of these second analyses was to provide a more general statement of the results and to evaluate the evidence for factors underlying different variables appearing in the regression equations.

Method

Subjects

Subjects used in this investigation were 1090 white males, 307 dropouts and 783 graduates; 1100 white females, 200 dropouts and 900 graduates; 166 Negro males, 69 dropouts and 97 graduates; and 129 Negro females, 56 dropouts and 73 graduates. Subjects were drawn from a larger cohort of 4075 students that comprised the total regular enrollment of a county school system in the 6th grade in 1954. These subjects were followed to their transfer, withdrawal, or graduation from high school. Of the 85 elementary schools involved in the study, 67 were attended predominantly by white children, 18 by Negro children. The county from which the study subjects were drawn is located in a Middle Atlantic state. It is part of a metropolitan area, containing a portion of the central city's suburbs. The county also contains areas, however, that are classed as rural. The county is one of the 22 most rapidly growing counties in the United States, having a population that increased from 194,182 in 1950 to 357,395 in 1960. The county has a greater proportion of people under 45 years of age and a higher median income and occupation level than

that of the population of the United States taken as a whole (Goldsmith and Stockwell, 1965).

Subjects in the cohort who were eliminated from this investigation were students who transferred out of the school district prior to completing high school and the dropouts and graduates who did not have complete information on all variables used in the analysis. The percentage of dropouts and graduates that were eliminated from consideration because of missing information ranged from 11.6% in the white female graduate group to 40% in the Negro male dropout group. The amount of missing information was greater for dropouts and males in the white samples and for dropouts in the Negro male sample. In the Negro female sample approximately 35% of the subjects were removed in both the dropout and graduate groups.[2]

Criterion

A dichotomized variable that categorized subjects who withdrew from high school prior to graduation and who completed the 12th grade

[2]Mean differences between the total number of subjects in each group and the reduced number used in this analysis were calculated for each of the variables. In general, the subjects removed from consideration in the analyses were similar across all groups. They tended to be older, to have parents of lower education, to come more often from broken homes, to have lower class marks and test scores, more absences, and more elementary school retentions. This suggested there was a bias in the samples, associated with removal of subjects with missing data. In addition, the ranges on some variables were restricted to a slight degree. Because the direction of differences was the same in the graduate and dropout groups, however, there was no indication that an artificial relationship with the criterion measure of dropout or graduation was introduced.

and graduated was the criterion. In the coding system, dropouts were coded as 2 and graduates were coded as 3, so that positive correlations were associated with graduation. Graduation was determined from indications on the permanent record cards and from lists of the graduating classes of county high schools in 1961, the normal progression year for graduation. In addition, summer and night school graduation lists and the regular graduation lists in 1962 and 1963 were used to find retained subjects who graduated.

Subjects were classified as dropouts if they received official school codes for reasons of withdrawal other than those specifying a transfer to another school. This group combined what are referred to as voluntary and involuntary withdrawals. Dropouts in this sample, however, would be predominantly classified as voluntary, with only 5% being classified as committed to an institution, special, physical disability, economic reason, or death. The most common reason for dropout listed on the school records was the catch-all term "16 years of age or over," which was applied to approximately 90% of the male dropouts and approximately 75% of the female dropouts.

Independent Variables

A total of 21 independent variables were derived from information available at the 6th grade level. All information was taken from elementary school permanent record cards or classroom record sheets for standardized test scores. Most of these variables have been found in previous research to reflect differences between

dropouts and graduates, however, not necessarily at the 6th grade level.

Age in months in the 6th grade (Age) was used largely as a measure of the number of nonpromotions (retentions) in elementary school. It was recognized, however, that this variable also contained variance associated with age at first entering school. The education level of both the father and the mother and the occupation level of the father as of the 6th grade were used as measures of socio-economic background. Education Level of Father and Education Level of Mother consisted of three categories: elementary, high school, and beyond high school. Occupation Level of Father consisted of seven categories, adapted from the occupational scale of the Index of Social Position (Hollingshead and Redlich, 1958). The number of siblings of the subject, whether or not the mother was employed outside of the home (Employment of Mother), and marital status of parents were measures of family characteristics. Marital Status of Parents was considered to be a gross measure of intact or broken home. The two categories of the variable indicated (1) that the subject's natural parents were alive and married or (2) that the natural parents were separated, divorced, deceased, or remarried.

Marks received in the 6th grade courses of reading, language, spelling, arithmetic, social studies, and science, the average of these marks (Grade Point Average), and the number of days absent in the 6th grade (Absence) were used as measures of school performance and behavior. The 6th grade standardized test scores were the

Total Mental Factors score from the California Test of Mental Maturity (CTMM IQ Score), elementary short form, 1950 edition; and the Total Reading, Total Arithmetic, and Total Language scores from the California Achievement Test (CAT), elementary battery, 1950 edition.

Two measures included information covering all of the elementary school years. These were the measures of school progression (Retention) and school transfer. Retention was a dichotomized variable of regular progression vs. retention in one or more grades from the 1st through the 6th grade. School Transfer was a dichotomized variable of attendance in one school vs. several schools since entering the county school system. These variables were limited measures of progression and school mobility in that retentions or school transfers prior to the time that subjects entered the county school system may not have been recorded on the school records. The means and standard deviations for each of the subgroups on these variables are presented in Table A in the Appendix.

Procedures

Multiple regression analyses were carried out for each race and sex group and the four groups combined.[3] The procedure of

[3]Analyses were computed by means of the IBM 360 computer version of the BMD02R stepwise regression program (Dixon, 1965). This program successively adds variables to the multiple linear regression equation. The variable with the highest zero-order correlation with the criterion is selected first. At each additional step, the variable having the highest partial correlation with the criterion, partialling out the contribution of all variables previously entered, is selected. This procedure continues until all variables have

conducting separate analyses for each of the four race-by-sex samples was based on the assumption that these subgroups would show differential patterns of variables related to dropout or graduation. In order to gain some indication of the validity of this assumption, the results of the analysis of the combined samples were compared with the results that were obtained for the individual samples. If the variables that contributed to the maximum multiple correlation in each sample were sufficiently different, it would be expected that these differences would cancel each other out when the groups were combined and that the multiple correlation from the combined groups would not be a good reflection of the correlations from the separate subgroups. On the other hand, if the configuration of relationships to the criterion were similar in each of the four samples, the multiple correlations in the subsamples would be close estimates of the multiple correlation obtained from the combined samples.

In the analysis of the combined samples, race and sex were included as independent variables in order to determine whether they would account for variance in the criterion that was independent of that accounted for by the other measures in the analysis.

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entered the equation or until a specified level of significance for adding variables is reached. The program provides b weights for variables. The beta weights reported were calculated from the standard deviations and b weights given in the computer computations.
Appreciation is expressed to Mr. Meyer Gordon of the Computer facility at the National Institutes of Health for his assistance in programming and supervising the computer analyses.

That is, it was assumed that race and sex were potential moderator variables, and, when controlled, they would result in differential patterns among the independent variables. If these variables also accounted for variance in the criterion over and above that accounted for by the other measures, it would indicate that there are other relationships with the criterion associated with race or sex that need to be explored.

In a second set of analyses, variables that were logically related in content (i.e., measures of achievement, retention, and social background) were substituted for variables obtained in the first analysis. Since these analyses were dependent upon results of the first set of analyses, the specific procedures are outlined following the results of the first analyses.

Results

Correlations

Fifteen of the 21 independent variables had significant correlations with the criterion in all of the four race-sex samples. All significant correlations were in the expected direction, with graduation from high school associated with younger age, higher occupation and education levels, fewer siblings, more intact homes, higher course marks and standardized test scores, fewer absences, and fewer retentions during elementary school. Two variables did not correlate significantly in any sample, School Transfer and Employment of Mother. This latter variable,

however, did enter into the regression equation in the Negro female sample. Four other variables were significant in both of the white samples but not in both of the Negro samples. Marital Status of Parents was not significantly related to the criterion in the Negro male sample, and Occupation Level of Father, Education Level of Father, and Number of Siblings were not significantly related to the criterion in the Negro female sample. The intercorrelation matrices of the independent variables and their correlations with the criterion are presented in Tables B and C in the Appendix.

The largest zero-order correlation with the criterion in each sample was from an achievement or ability measure: the CAT Language score for white males (.398), the Grade Point Average for white females (.331), and the CTMM IQ score for Negro males and Negro females (.459 and .463, respectively).

Race and Sex Samples

Multiple correlations that were substantially higher than the highest zero-order correlations were found in each of the four samples. In the two white samples, eight variables had significant beta weights ($p < .05$), and the obtained multiple correlations for white males and white females, respectively, were .532 and .482. The coefficients obtained in the two Negro samples were higher, and equations included fewer variables than those in the two white samples. In the Negro male sample, when the fifth variable entered the equation, the beta weight for the first variable that had

entered dropped below the .05 significance level; so, there were two four-variable equations that were significant, but no five-variable equation with all variables significant. The highest multiple correlation of the two four-variable equations was .605. Six variables in the Negro female sample had significant beta weights and produced a multiple correlation of .618.

Because of the differences in sample size, interpretations of the results for the white samples and the Negro samples were considered to be of a different order. The white samples with over 1000 subjects qualified as large samples. Because of the greater reliability of the statistics in this size of a sample, more confidence could be placed in interpretation and generalization of the results. The smaller size of the Negro samples increased the possibility that chance variations and sample-specific characteristics would affect the results of multiple regression analyses, and more tentative interpretation of findings in these samples would be appropriate. More confidence could be placed in the results in the smaller Negro samples, however, that were replicated in the larger white samples.

The difference in sample size also contributed to the problem of determining a standard for the comparison of findings across groups. In the white samples, three of the eight variables, although statistically significant, accounted for very little independent variance in the criterion. The reverse was true in the smaller Negro samples, where variables that did not have significant beta weights

added more than 1% to the total variance accounted for in the criterion. The resolution to this problem appeared to be in the equation that would provide the maximum comparability across samples in terms of number and overall significance of variables being compared. Accordingly, the primary emphasis for comparison of results across samples was on the five variables in the white samples that accounted for more than 1% of the variance in the criterion (degree of statistical association appropriate for large samples) and the four and six variables in the Negro samples that had significant beta weights (statistical significance appropriate for small samples). The three additional significant predictors in the white samples were considered to be reliable findings and used secondarily for comparison. The additional variables in the Negro samples that did not have significant beta weights but did account for more than 1% of the variance were also considered, but more tentatively.

The correlations of variables with the criterion and the results of the multiple correlation analysis in the four race and sex samples are presented in Tables 2, 3, 4, and 5. The beta weights and multiple correlations for three equations are reported for each sample: the equation for the first four variables, which accounted for the majority of the variance in the criterion, the equation containing variables that added 1% or more to the total variance accounted for in the criterion, and the equation containing all the variables with beta weights significant at the .05 confidence level.

Table 2

Zero-Order Correlations of 21 Elementary School Variables with Dropout-Graduation and Beta Coefficients and Multiple Correlations for 4, 5, and 8 Variable Equations: White Male Sample (N=1090)

	Variables	r	Betas for 4 variables	Betas for 5 variables[b]	Betas for 8 variables[c]
1	Age in months	-.333	-.2302	-.2221	-.2122
2	Education of father	.242			
3	Education of mother	.229			.0694
4	Siblings	-.235	-.1476	-.1401	-.1238
5	Occupation of father	.221		.1098	.0777
6	Marital status of parents	-.125			-.0727
7	Employment of mother	.011[a]			
8	6th mark - reading	.309			
9	6th mark - language	.304			
10	6th mark - spelling	.282			
11	6th mark - arithmetic	.323			
12	6th mark - social studies	.340			.0699
13	6th mark - science	.318			
14	6th grade point average	.343			
15	6th CTMM IQ score	.384			
16	Days absent in 6th grade	-.085			
17	Retention	-.232			
18	School transfer	-.050[a]			
20	6th CAT - reading	.372			
21	6th CAT - arithmetic	.389	.1913	.1806	.1540
22	6th CAT - language	.398	.1842	.1737	.1430
		R	.5090	.5201	.5316
		R^2	.2591	.2705	.2825
		SE of Est	.3881	.3852	.3826

[a]Not significant at .05 level.

[b]Variables increasing total variance accounted for in criterion more than 1%.

[c]Maximum number of variables with significant beta weights ($p < .05$).

Table 3

Zero-Order Correlations of 21 Elementary School Variables with Dropout-Graduation and Beta Coefficients and Multiple Correlations for 4, 5, and 8 Variable Equations: White Female Sample (N=1100)

	Variables	r	Betas for 4 variables	Betas for 5 variables[b]	Betas for 8 variables[c]
1	Age in months	-.223	-.1613	-.1570	-.1455
2	Education of father	.203			
3	Education of mother	.207			.0685
4	Siblings	-.202	-.1216	-.1243	-.1089
5	Occupation of father	.190			.0594
6	Marital status of parents	-.168		-.1180	-.1154
7	Employment of mother	-.001[a]			
8	6th mark - reading	.303			
9	6th mark - language	.300			
10	6th mark - spelling	.263			
11	6th mark - arithmetic	.282			
12	6th mark - social studies	.261			
13	6th mark - science	.245			
14	6th grade point average	.331	.2763	.2648	.1709
15	6th CTMM IQ score	.286			
16	Days absent in 6th grade	-.241	-.2005	-.1928	-.1902
17	Retention	-.227			
18	School transfer	-.006[a]			
20	6th CAT - reading	.283			
21	6th CAT - arithmetic	.286			
22	6th CAT - language	.294			.1057
		R	.4475	.4626	.4823
		R^2	.2003	.2140	.2326
		SE of Est	.3457	.3429	.3392

[a]Not significant at .05 level.

[b]Variables increasing total variance accounted for in criterion more than 1%.

[c]Maximum number of variables with significant beta weights ($p < .05$).

Table 4

Zero-Order Correlations of 21 Elementary School Variables with Dropout-Graduation and Beta Coefficients and Multiple Correlations for 4 and 5 Variable Equations: Negro Male Sample (N=166)

	Variables	r	Betas for 4 variables[c]	Betas for 4 variables[c]	Betas for 5 variables[b]
1	Age in months	-.441		-.2572	-.1956
2	Education of father	.263			
3	Education of mother	.305	.2231	.2053	.2112
4	Siblings	-.154			
5	Occupation of father	.230			
6	Marital status of parents	-.016[a]			
7	Employment of mother	.121[a]			
8	6th mark - reading	.366			
9	6th mark - language	.355			
10	6th mark - spelling	.380			
11	6th mark - arithmetic	.316			
12	6th mark - social studies	.380			
13	6th mark - science	.363			
14	6th grade point average	.414			
15	6th CTMM IQ score	.459	.2605		.1570[a]
16	Days absent in 6th grade	-.348	-.2077	-.1829	-.1770
17	Retention	-.279			
18	School transfer	-.112[a]			
20	6th CAT - reading	.366			
21	6th CAT - arithmetic	.327			
22	6th CAT - language	.443	.2096	.2841	.2100
		R	.5939	.6046	.6143
		R^2	.3527	.3656	.3774
		SE of Est	.4026	.3986	.3961

[a]Not significant at .05 level.

[b]Variables increasing total variance accounted for in criterion more than 1%.

[c]Maximum number of variables with significant beta weights ($p < .05$).

Table 5

Zero-Order Correlations of 21 Elementary School Variables with Dropout-Graduation and Beta Coefficients and Multiple Correlations for 4, 6, and 9 Variable Equations: Negro Female Sample (N=129)

	Variable	r	Betas for 4 variables	Betas for 6 variables[c]	Betas for 9 variables[b]
1	Age in months	-.414		-.1943	-.1871
2	Education of father	.017[a]			-.1446[a]
3	Education of mother	.179	.1732	.2104	.2875
4	Siblings	-.089[a]			
5	Occupation of father	.109[a]			
6	Marital status of parents	-.174	-.2344	-.2245	-.2271
7	Employment of mother	-.096[a]		-.1784	-.1743
8	6th mark - reading	.271			
9	6th mark - language	.325			
10	6th mark - spelling	.393			
11	6th mark - arithmetic	.214			-.2062[d]
12	6th mark - social studies	.383			.1993[a]
13	6th mark - science	.295			
14	6th grade point average	.335			
15	6th CTMM IQ score	.463	.3866	.2701	.2909
16	Days absent in 6th grade	-.359	-.2038	-.2307	-.2039
17	Retention	-.397			
18	School transfer	-.081[a]			
20	6th CAT - reading	.430			
21	6th CAT - arithmetic	.390			
22	6th CAT - language	.387			
		R	.5694	.6183	.6504
		R^2	.3239	.3822	.4228
		SE of Est	.4156	.4006	.3920

[a]Not significant at .05 level.

[b]Variables increasing total variance accounted for in criterion more than 1%.

[c]Maximum number of variables with significant beta weights ($p < .05$).

[d]Variable 11, which is a suppressor variable, has a significant beta weight only when variable 12 is added to the regression equation.

Age in the 6th grade was the only variable that was a significant predictor in all four samples. Absence was the second variable most common to all samples, appearing in all but the white male sample. Considered by the rank order of their beta weights, Age, the CAT Arithmetic and Language scores, Number of Siblings, and Occupation Level of Father were the best variables to differentiate dropouts and graduates in the white male sample. In the white female sample, Grade Point Average, Absence, Age, Number of Siblings, and Marital Status of Parents were the best differentiating variables. For Negro males, Education Level of Mother, the CAT Language score, Absence, and either the CTMM IQ score or Age were the variables with significant beta weights. The CTMM IQ score, Absence, Marital Status of Parents, Education Level of Mother, Age, and Employment of Mother were variables with significant beta weights in the Negro female sample.

Some similarities were noted between sex groups across race. The CAT Language score had relatively greater weight in the equations for males, and Marital Status of Parents had relatively greater importance in the equations for females. There appeared to be a stronger relationship of Absence in the female samples. This variable did not appear at all in the white male equation and had a slightly lower weight in the Negro male sample than it did in the Negro female sample. There was a slightly stronger relationship of Age to the criterion in the male samples. Results of the second set of

analyses revealed additional sex-associated differences; these are reported below.

Although different patterns of variables discriminated dropouts and graduates in the race and sex subgroups, there was a general similarity in the results across all samples. One or two measures of ability or achievement (grade point average, IQ, or achievement test score), Age (which was considered to be predominantly a measure of school retention), Absence (except for white males), and one or two measures of family background appeared in each of the four samples.

Combined Samples

The results of the stepwise multiple regression analysis for all samples combined are presented in Table 6. Although 10 variables had significant beta weights ($p < .001$), only five variables accounted for more than 1% of the variance in the criterion. These five variables in the order of their relative contribution to the equation were the CAT Language score, Age, Absence, the Mark in Social Studies, and Education Level of Mother. The multiple correlation for this equation (.505) was higher than that obtained for the white female sample but lower than the coefficients in the three other samples. To assess how representative the combined-sample multiple correlation was of the individual-sample correlations, the fiducial limits were calculated for the multiple correlation obtained in the combined

Table 6

Zero-Order Correlations of 21 Elementary School Variables with Dropout-Graduation and Beta Coefficients and Multiple Correlations for 4, 5, and 10 Variable Equations: Combined Samples (N=2485)

	Variables	r	Betas for 4 variables	Betas for 5 variables[b]	Betas for 10 variables[c]
	Race	-.143			-.0883
	Sex	.105			
1	Age in months	-.342	-.2246	-.2164	-.2022
2	Education of father	.241			
3	Education of mother	.244	.1245	.1175	.0784
4	Siblings	-.239			-.1158
5	Occupation of father	.237			.0665
6	Marital status of parents	-.134			-.0880
7	Employment of mother	.007[a]			
8	6th mark - reading	.331			
9	6th mark - language	.321			
10	6th mark - spelling	.306			
11	6th mark - arithmetic	.311			
12	6th mark - social studies	.324		.1228	.0822
13	6th mark - science	.292			
14	6th grade point average	.360			
15	6th CTMM IQ score	.386			
16	Days absent in 6th grade	-.196	-.1294	.1244	-.1141
17	Retantion	-.280			
18	School transfer	-.031[a]			
20	6th CAT - reading	.370			
21	6th CAT - arithmetic	.375			.1077
22	6th CAT - language	.392	.2848	.2246	.1561
		R	.4942	.5049	.5304
		R^2	.2442	.2549	.2813
		SE of Est	.3789	.3763	.3699

[a]Not significant at the .01 level.

[b]Variables incrassing totsl varisnce accounted for in criterion more than 1%.

[c]Maximum number of varisbles with significant beta weights ($p < .01$).

samples. Comparing the multiple correlations of the individual samples with these limits revealed that only the correlation for the white male sample fell within the .01 confidence interval of the combined-sample correlation (.466 to .544). Thus, there was significant variation in the size of the multiple correlations in the subsamples that would not have been revealed in doing a single analysis with the combined groups.

Of the variables that accounted for the most variance in the criterion when the samples were combined, the Mark in Social Studies was the only variable that was not found among the five most significant variables in the separate samples. The other measures represented a combination of the highest predicting variables in one or more of the subsamples. The different patterns of variables noted for the separate samples, such as, Absence not appearing in the prediction for white males, Education Level of Mother being more prominent in the equations for the two Negro samples, and the CAT Language score being more prominent in the two male samples, were obscured in the combined analysis.

Although there were significant differences in the frequencies of dropouts and graduates across sex and race, neither Sex nor Race correlated very highly with the criterion. The correlation of Race with dropout or graduation was -.143, indicating that dropout was associated with being Negro. The correlation of Sex with the criterion was .105, indicating that dropout was associated with being

male. The variable of Sex did not enter the multiple regression equation with a significant beta weight, from which it can be inferred that the relationship between being male and being a dropout was accounted for by other variables in the equation. Inspection of the partial correlations of Sex with the criterion when the relationships of other variables were controlled revealed that the correlation of the CAT Language score with the criterion included all variance with the criterion associated with Sex. (The partial correlation of Sex and the criterion with the CAT Language score controlled was -.003.)

A similar inspection of the partial correlations of Race with the criterion revealed that the multiple correlation of the CAT Language score and Age with the criterion accounted for all variance in the criterion associated with Race. (The partial correlation of Race with these variables controlled was -.003.) Race, however, was the ninth variable to be added to the 10-variable regression equation and entered as a suppressor variable. This would indicate that there were differences between the races on other independent variables in the equation and that in one race these variables were not as strongly related to the criterion as in the other race. Therefore, when Race was taken into account, the prediction of other independent variables was increased. The additional amount of variance accounted for in the criterion by including Race, however, was very small (0.4%), and would be of little practical significance. The finding, however,

further supported the hypothesis that differential patterns of variables were related to the criterion in the different race groups.[4]

Substitution of Related Measures

Procedures. The similarities that were found across samples in the first analyses suggested that the underlying dimensions

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[4] From the calculations provided by the computer, it was possible to determine which of the independent variables were affected by the inclusion of Race. By comparing the increase in size of the beta weights for variables from step 8 to step 9 (before and after Race had been included), it was determined that Number of Siblings and the CAT Arithmetic score were related to Race in terms of suppression variance. In the results for the individual samples, both of these variables accounted for independent variance in the criterion in the white samples, but not in the Negro samples. In order to explore the nature of the suppression effect, the distribution of dropouts in each category of the Number of Siblings and CAT Arithmetic score variables were compared across the Negro and white groups. For Number of Siblings, there was a clear trend in the white samples with the percentage of dropouts increasing with larger family size. A similar trend appeared in the Negro samples over the range of 0 to 4 siblings; however, in larger families there was a lower percentage of dropouts, except for the last category of 9 or more siblings. The percentage of dropouts in the Negro and white samples over the centile categories of the CAT Arithmetic score revealed a similar difference in trend. There was a fairly consistent decrease in the percentage of white dropouts in successively higher centile categories, however, this trend only existed below the 60th percentile for Negroes. The zero-order correlation of Race with the criterion associated dropout with being Negro. When the variable of Race entered the regression equation, the sign was reversed, indicating that dropout was related to being white (in relationship to the other variables in the equation). Since the relationship of Number of Siblings and the Arithmetic score to the criterion was greater in the white samples, the contribution of these variables to the prediction of dropout was enhanced when an additional weight was assigned to the status of being white; or, conversely, the contribution of these variables to the prediction of graduation was enhanced by the addition of a weight to the status of being Negro.

that discriminated dropouts and graduates in the 6th grade data were: achievement, absence, elementary school retention, and social background. There were two achievement measures that had significant independent variance with the criterion in the white samples, and two or more background measures had independent contributions to the regression equations in all but the Negro male sample. This suggested that more than one underlying dimension of achievement and social background might be differentiated.

Since there were several achievement and background measures in the battery of variables used, additional analyses were undertaken to determine whether approximately the same amount of variance in the criterion could be accounted for by measures that were different but similar in content to measures in the original equations. The procedure for these analyses involved recomputation of multiple correlations in each of the samples, alternately removing the achievement and background measures from the battery that accounted for significant independent variance in the original equations. The hypothesis was that when achievement measures were removed from the battery, the new regression equation would contain other achievement measures, and when background measures were removed, they would be replaced by other background measures. An additional multiple correlation was computed in each sample with Age removed from the battery of measures. From the hypothesis that the largest proportion of variance in Age was associated with school retention, it was predicted that when Age was

omitted from consideration, Retention would enter the new equation. Because of the possibility that retentions prior to the time a subject entered the county school system may not have been recorded on the school record, however, it was not expected that Retention would account for as much independent variance in the criterion as Age. Confirmation of the hypotheses for this analysis would lend support to the inference that the findings could be described in terms of factors or dimensions underlying specific predictors of dropout or graduation.

As an additional exploration of relationships among the achievement measures, regression equations were computed that included a specified achievement measure (forced into the equation) that did not appear in the original results.[5] With this procedure, the achievement variable that had the highest weight in the original equation was omitted and a related measure was forced into the regression equation. A second achievement variable that had appeared in the original equation was left free to enter the new equation.

Multiple correlations and beta weights for substitution equations were compared with the original five-variable equations in the white male, white female, and Negro male samples and the six-variable

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[5]With the "Force" option of the computer program, the experimenter can assign priority levels to any or all variables. The program enters variables into the regression equation according to their order of priority. In the present analysis, only one variable in each problem was assigned a higher priority. The other variables entering the equations were selected on the basis of the largest partial correlation, as in the original equations.

equation in the Negro female sample. These equations are presented in Tables 7, 9, 11, and 12. Some additional relationships among achievement measures in the white male and white female samples were more apparent in the equations containing all variables with significant beta weights. These are presented in Tables 8 and 10.

Achievement and ability measures. When measures of achievement in the original equations were omitted from consideration, other test scores or course marks entered the equations in all four samples. In all but one case (white male sample), the new achievement measure accounted for more than 1% of additional independent variance in the criterion. The multiple correlations, when one achievement measure was omitted, were very close to the size of the original correlations. The greatest difference was .013 (Negro female sample). When two achievement measures were omitted, the lowest multiple correlation obtained was .029 less than the original (white male sample). When achievement measures were forced into equations, the obtained correlations were, at greatest, only .021 below the original (Negro female sample). There were several instances, however, when the achievement variable that was forced did not retain a significant beta weight in the equation. In general, the results supported the hypothesis that related achievement measures would substitute for those obtained in the original analysis. There were differences among samples, however, in the content of substitute measures and the degree to which the same measure qualified as a substitute.

Table 7

Beta Coefficients and Multiple Correlations with Dropout or Graduation for Original 5 Variable Equation and Equations with Substitution of Achievement, Background, and Retention Measures: White Male Sample (N=1090)

	Variables	r	Original	Achievement and Ability (1)	(2)	(3)	(4)	(5)
1	Age in months	-.333	-.2221	-.2225	-.2060	-.2206	-.2273	-.2269
2	Education of father	.242						
3	Education of mother	.229						
4	Siblings	-.235	-.1401	-.1430	-.1335	-.1511	-.1460	-.1453
5	Occupation of father	.221	.1098	.1154	.1143	.1120	.1081	.1148
6	Marital status of parents	-.125						
7	Employment of mother	.011[a]						
8	6th mark - reading	.309						
9	6th mark - language	.304						
10	6th mark - spelling	.282						
11	6th mark - arithmetic	.323						
12	6th mark - social studies	.340		.1130[b]	.1616			
13	6th mark - science	.318						
14	6th grade point average	.343						.0850(F)
15	6th CTMM IQ score	.384			.1578	.0578(F)[a]		
16	Days absent in 6th grade	-.085						
17	Retention	-.232						
18	School transfer	-.050[a]						
20	6th CAT - reading	.372					.0880(F)	
21	6th CAT - arithmetic	.389	.1806	.2376	(X)	.2600	.2380	.2454
22	6th CAT - language	.398	.1737	(X)	(X)	(X)	(X)	(X)
	Multiple correlation		.5201	.5139	.4908	.5070	.5090	.5096
	Multiple correlation squared		.2705	.2641	.2408	.2570	.2591	.2597
	Difference in percent of variance from original equation		-	-0.64	-2.95	-1.35	-1.14	-1.08

Note.--Variables omitted from consideration are denoted by (X). Variables forced into equation are denoted by (F). Figures given are beta weights. All variables had significant beta weights and added more than 1% to the total variance accounted for in the criterion except where noted.

[a]Not significant at the .05 level.

[b]Addition of variable increased the total variance accounted for in the criterion less than 1%.

Table 7 (continued)

Substitution of Background and Retention Measures:
White Male Sample (N=1090)

	Variables	r	Original	Background (6)	Background (7)	Retention (8)
1	Age in months	-.333	-.2221	-.2307	-.2318	(X)
2	Education of father	.242			.1231	
3	Education of mother	.229		.1288	(X)	-.1514
4	Siblings	-.235	-.1401	(X)	(X)	.1226
5	Occupation of father	.221	.1098			
6	Marital status of parents	-.125		-.0813[b]	-.0765[b]	
7	Employment of mother	.011[a]				
8	6th mark - reading	.309				
9	6th mark - language	.304				
10	6th mark - spelling	.282				
11	6th mark - arithmetic	.323				
12	6th mark - social studies	.340				
13	6th mark - science	.318				
14	6th grade point average	.343				
15	6th CTMM IQ score	.384				
16	Days absent in 6th grade	-.085				
17	Retention	-.232				-.0881[b]
18	School transfer	-.050[a]				
20	6th CAT - reading	.372				
21	6th CAT - arithmetic	.389	.1806	.1731	.1718	.1947
22	6th CAT - language	.398	.1737	.1904	.1875	.1831
	Multiple correlation		.5201	.5095	.5079	.4813
	Multiple correlation squared		.2705	.2596	.2579	.2317
	Difference in percent of variance from original equation		-	-1.09	-1.26	-3.88

Table 8

Beta Coefficients and Multiple Correlations with Dropout or Graduation for Original 8 Variable Equation and Equations with Substitution of Achievement and Background Measures: White Male Sample (N=1090)

	Variables	r	Original	Achievement (1) (7 var)	Achievement (2)	Background (3) (7 var)
1	Age in months	-.333	-.2122	-.2179	-.2221	-.2222
2	Education of father	.242				.0749
3	Education of mother	.229	.0694	.0700	.0732	.0866
4	Siblings	-.235	-.1238	-.1331	-.1182	(X)
5	Occupation of father	.221	.0777	.0833	.0765	(X)
6	Marital status of parents	-.125	-.0727	-.0785	-.0828	-.0776
7	Employment of mother	.011[a]				
8	6th mark - reading	.309				
9	6th mark - language	.304				
10	6th mark - spelling	.282				
11	6th mark - arithmetic	.323			.0817	
12	6th mark - social studies	.340	.0699	.1023	.0936	.0793
13	6th mark - science	.318				
14	6th grade point average	.343				
15	6th CTMM IQ score	.384			----[b]	
16	Days absent in 6th grade	-.085				
17	Retention	-.232				
18	School transfer	-.050[a]				
20	6th CAT - reading	.372			.1460	
21	6th CAT - arithmetic	.389	.1540	.2320	(X)	.1433
22	6th CAT - language	.398	.1430	(X)	(X)	.1593
	Multiple correlation		.5316	.5227	.5081	.5174
	Multiple correlation squared		.2825	.2732	.2582	.2677
	Difference in percent of variance from original equation		-	-0.92	-2.43	-1.48

Note.--Variables omitted from consideration are denoted by (X). Figures given are beta weights. All variables had significant beta weights at the .05 level. Equations in columns (1) and (2) are extensions of equations in columns (1) and (2) in Table 7.

[a]Not significant at the .05 level.

[b]Removed when variable 20 entered.

Table 9

Beta Coefficients and Multiple Correlations with Dropout or Graduation for Original 5 Variable Equation and Equations with Substitution of Achievement, Background, and Retention Measures: White Female Sample (N=1100)

	Variables	r	Original	Achievement and Ability (1) (6 var)	(2) (6 var)	(3) (6 var)	Background (4)	(5)	Retention (6) (6 var)
1	Age in months	-.223	-.1570	-.1507	-.1532	-.1626	-.1621	-.1662	(X)
2	Education of father	.203							
3	Education of mother	.207					-.1145	(X)	.1071
4	Siblings	-.202	-.1243	-.1308	-.1388	-.1192	(X)	(X)	-.1144
5	Occupation of father	.190						.1001[b]	
6	Marital status of parents	-.168	-.1180	-.1200	-.1202	-.1135	-.1174	-.1125	-.1197
7	Employment of mother	-.001[a]							
8	6th mark - reading	.303		.1513	.1613				
9	6th mark - language	.300				.1675			
10	6th mark - spelling	.263							
11	6th mark - arithmetic	.282			.1305				
12	6th mark - social studies	.261							
13	6th mark - science	.245							
14	6th grade point average	.331	.2648	(X)	(X)	(X)	.2608	.2607	.2364
15	6th CTMM IQ score	.286							
16	Days absent in 6th grade	-.241	-.1928	-.1981	-.1925	-.2001	-.1897	-.1966	-.1833
17	Retention	-.227							-.0998[b]
18	School transfer	-.006[a]							
20	6th CAT - reading	.283				.1229 (F)			
21	6th CAT - arithmetic	.286							
22	6th CAT - language	.294		.1488	(X)	(X)			
	Multiple correlation		.4626	.4663	.4629	.4609	.4600	.4567	.4587
	Multiple correlation squared		.2140	.2175	.2143	.2124	.2116	.2086	.2104
	Difference in percent of variance from original equation		-	0.35	0.03	-1.57	-0.24	-0.54	-0.36

Note.--Variables omitted from consideration are denoted by (X). Variables forced into equation are denoted by (F). Figures given are beta weights. All variables had significant beta weights and added more than 1% to the total variance accounted for in the criterion except where noted.

[a]Not significant at the .05 level.

[b]Addition of variable increased the total variance accounted for in the criterion less than 1%.

Table 10

Beta Coefficients and Multiple Correlations with Dropout or Graduation for Original 8 Variable Equation and Equations with Substitution of Achievement Measures: White Female Sample (N=1100)

	Variables	r	Original	Achievement (1) (9 var)	Achievement (2) (9 var)	Achievement (3)
1	Age in months	-.223	-.1455	-.1430	-.1490	-.1522
2	Education of father	.203				
3	Education of mother	.207	.0685	.0716	.0752	.0924
4	Siblings	-.202	-.1089	-.1183	-.1168	-.1132
5	Occupation of father	.190	.0594	.0596	.0646	
6	Marital status of parents	-.168	-.1154	-.1164	-.1145	.1143
7	Employment of mother	-.001[a]				
8	6th mark - reading	.303		.0897	.0847	
9	6th mark - language	.300			.0882	.1072
10	6th mark - spelling	.263				
11	6th mark - arithmetic	.282		.1015	.1061	.1150
12	6th mark - social studies	.261				
13	6th mark - science	.245				
14	6th grade point average	.331	.1709	(X)	(X)	(X)
15	6th CTMM IQ score	.286				
16	Days absent in 6th grade	-.241	-.1902	-.1894	-.1864	-.1892
17	Retention	-.227				
18	School transfer	-.006[a]				
20	6th CAT - reading	.283				.0782(F)[b]
21	6th CAT - arithmetic	.286				
22	6th CAT - language	.294	.1057	.1054	(X)	(X)
	Multiple correlation		.4823	.4835	.4803	.4768
	Multiple correlation squared		.2326	.2338	.2307	.2273
	Difference in percent of variance from original equation		-	0.12	-0.19	-0.53

Note.--Variables omitted from consideration are denoted by (X). Variables forced into equation are denoted by (F). Figures given are beta weights. All variables had significant beta weights at the .05 level. Equations in columns (1), (2), and (3) are extensions of equations in columns (1), (2), and (3) of Table 8.

[a]Not significant at the .05 level.

[b]The 9th variable to enter equation was Occupation Level of Father. At that step, beta weight for CAT-Reading was not significant.

Table 11

Beta Coefficients and Multiple Correlations with Dropout or Graduation for Original 5 Variable Equation and Equations with Substitution of Achievement, Background, and Retention Measures: Negro Male Sample (N=166)

	Variables	r	Original	Achievement and Ability (1)	(2)	(3)	Background (4)	Retention (5)
1	Age in months	-.441	-.1956	-.2361	-.2686	-.2536	-.2021	(X)
2	Education of father	.263					.1685	
3	Education of mother	.305	.2112	.1829	.2226	.2140	(X)	.2236
4	Siblings	-.154						
5	Occupation of father	.230						
6	Marital status of parents	.016[a]						
7	Employment of mother	.121[a]						
8	6th mark - reading	.366						
9	6th mark - language	.355						.1278[a]
10	6th mark - spelling	.380						
11	6th mark - arithmetic	.316						
12	6th mark - social studies	.380						
13	6th mark - science	.363		.1183[a]				
14	6th grade point average	.414			.1351[a]			
15	6th CTMM IQ score	.459	.1570[a]	(X)	(X)	(X)	.1567[a]	.2227
16	Days absent in 6th grade	-.348	-.1770	-.1726	-.1796	-.1828	-.1906	-.2082
17	Retention	-.279						
18	School transfer	-.112[a]						
20	6th CAT - reading	.366						
21	6th CAT - arithmetic	.327			.1466[a]	.0848(F)[a]		
22	6th CAT - language	.443	.2100	.2571	(X)	.2282	.2035	.1620[a]
	Multiple correlation		.6143	.6138	.5938	.6079	.6014	.6026
	Multiple correlation squared		.3774	.3768	.3526	.3695	.3617	.3631
	Difference in percent of variance from original equation		-	-0.06	-2.48	-0.79	-1.57	1.43

Note.--Variables omitted from consideration are denoted by (X). Variables forced into equation are denoted by (F). Figures given are beta weights. All variables had significant beta weights and added more than 1% to the total variance accounted for in the criterion except where noted.

[a]Not significant at the .05 level.

Table 12

Beta Coefficients and Multiple Correlations with Dropout or Graduation for Original 6 Variable Equation and Equations with Substitution of Achievement, Background, and Retention Measures: Negro Female Sample (N=129)

	Variables	r	Original	Achievement and Ability (1)	(2)	(3)	Background (4)	Retention (5)
1	Age in months	-.414	-.1943	-.2491	-.2578	-.2664	-.2029	(X)
2	Education of father	.017[a]					-.1272[a]	
3	Education of mother	.179	.2104	.2017	.2413	.2168	.2369	.2133
4	Siblings	-.089[a]						
5	Occupation of father	.109[a]						
6	Marital status of parents	-.174	-.2245	-.2041	-.2106	-.2107	(X)	-.2264
7	Employment of mother	-.096[a]	-.1784	-.1728	-.1632	-.1834	-.1855	-.1822
8	6th mark - reading	.271						
9	6th mark - language	.325						
10	6th mark - spelling	.393			.1834			
11	6th mark - arithmetic	.214						
12	6th mark - social studies	.383						
13	6th mark - science	.295						
14	6th grade point average	.335						
15	6th CTMM IQ score	.463	.2701	(X)	(X)	(X)	.2638	.3075
16	Days absent in 6th grade	-.359	-.2307	-.2473	-.2453	-.2530	-.2248	-.2110
17	Retention	-.397						-.1473[a]
18	School transfer	-.081[a]						
20	6th CAT - reading	.430		.2005	(X)	(X)		
21	6th CAT - arithmetic	.390						
22	6th CAT - language	.387				.1587 (F)[a]		
	Multiple correlation		.6183	.6053	.6019	.5964	.5873	.6097
	Multiple correlation squared		.3823	.3664	.3623	.3557	.3449	.3717
	Difference in percent of variance from original equation		-	-1.59	-2.00	-2.66	-3.74	-1.06

Note.--Variables omitted from consideration are denoted by (X). Variables forced into equation are denoted by (F). Figures given are beta weights. All variables had significant beta weights and added more than 1% to the total variance accounted for in the criterion except where noted.

[a]Not significant at the .05 level.

In the white male sample, the CAT Language score was the achievement measure with the highest correlation with dropout or graduation. When this variable was omitted from consideration, the Mark in Social Studies was the fifth variable to enter the new equation (Table 7, column 1). Although the obtained multiple correlation was very close to that for the original equation, the Mark in Social Studies added a smaller amount of independent variance than the CAT Language score had in the original equation. This suggested that some of the variance accounted for by the language score in the original equation was compensated for by other variables in the new equation. The increased size of the beta weight of the CAT Arithmetic score in the new equation indicated that additional variance, presumably shared with the language score, was accounted for by the arithmetic score. Since the Mark in Social Studies had a significant beta weight in the original equation, it was unlikely that much of the independent variance accounted for by this variable was the same variance accounted for by the CAT Language score. This was indicated more strongly in the equation of all variables with significant beta weights (Table 8, column 1), where no new variable replaced the CAT Language score. This suggested that although some shared variance with the arithmetic test score and the Mark in Social Studies was replaced, there was some additional variance with the criterion that was uniquely accounted for by the CAT Language score.

When both the CAT Language score and CAT Arithmetic score were omitted (Table 7, column 2), the Mark in Social Studies and the CTMM IQ score entered as replacements. The multiple correlation for the first five variables was .491, which is .029 less than the correlation with the original variables. When all variables with significant beta weights were considered (Table 8, column 2), there was an interesting change in the variables that comprised this equation. The IQ score was removed in favor of the CAT Reading score, and the Mark in Arithmetic was added.

When the IQ score was forced into the equation, with the CAT Language score omitted (Table 7, column 3), the IQ score did not retain a significant beta weight after the CAT Arithmetic score entered the equation. When the CAT Reading score and the Grade Point Average were forced variables, in place of the CAT Language score (Table 7, columns 4 and 5), their relative contribution was less than that of the CAT Language score; however, the total variance in the criterion accounted for was not substantially reduced. Again, a greater amount of variance was accounted for by the CAT Arithmetic score than in the original equation.

In the white female sample, the Grade Point Average had the highest correlation with dropout or graduation. When this variable was omitted from consideration, six rather than five variables added more than 1% of total variance accounted for in the criterion. The new variables in this equation were the Mark in Reading and the CAT

Language score (Table 9, column 1). When the CAT Language score and the Grade Point Average were removed from consideration (Table 9, column 2), there were also six variables, rather than five, that accounted for more than 1% of the variance. This equation contained both the Mark in Reading and the Mark in Arithmetic. The multiple correlations from these six-variable equations were slightly higher than that for the original five-variable equation. When the CAT Reading score was forced into the equation with Grade Point Average and the CAT Language score omitted (Table 9, column 3), the resulting six-variable equation included the Mark in Language.

When all variables with significant beta weights were considered (Table 10), there was a correspondence between the subject matter of the original and substitution variables that was not apparent in the first six variables to appear in the equations. With the Grade Point Average omitted (Table 10, column 1), the two new variables in the complete equation were the Mark in Reading and the Mark in Arithmetic. When the CAT Language score was also omitted (Table 10, column 2), the Mark in Language entered. A further parallel occurred when the CAT Reading score was a forced variable (Table 10, column 3). With the CAT Reading score in the equation, the Mark in Reading did not enter.

When it was determined that the major components contained in the variance of the Grade Point Average were reading and arithmetic achievement, the results were much closer to those obtained for white

males. Three independent components of achievement were found to be related to the criterion in both samples, reading, arithmetic, and language skills. These had different rank order of importance, however, with reading achievement more prominent in the white female sample and language skills more prominent in the white male sample.

In the original analysis for Negro males, the CTMM IQ score or the CAT Language score were combined with other variables to produce a sizeable multiple correlation; however, only the CAT Language score accounted for significant variance when Age was controlled (Table 4). The results of substitutions of achievement measures (Table 11) showed that there was no significant replacement for the CAT Language score among the other achievement variables (column 2), and other achievement measures added little additional variance when the language score was included in the equation (columns 1 and 3). All new variables entering the equations, however, were achievement measures, and all accounted for an additional 1% or more variance in the criterion.

In the Negro female sample, the CTMM IQ score was the measure with the highest correlation with the criterion. When this variable was omitted from consideration, the CAT Reading score replaced it (Table 12, column 1). When both the CTMM IQ score and the CAT Reading score were omitted, the Mark in Spelling appeared in the equation. In two additional substitution equations, with both the CTMM IQ score and the CAT Reading score omitted, the CAT Language score (Table 12, column 3) and CAT Arithmetic score (not shown) were alternately forced

into the equation. Neither of these variables retained significant beta weights with the addition of five other variables. In contrast to results in the white samples, two independent components of achievement were not evident in the Negro samples. As with the white samples, however, an additional achievement measure did appear better than others as a replacement for the original achievement variable. Results were similar to those in the white samples, in that the language score was relatively more differentiating for males and reading achievement was more differentiating for females.

Socio-economic and family background measures. When one background measure from the original equations was omitted, another background measure replaced it in each of the four samples. Resulting multiple correlations were approximately .01 lower in the white male, white female, and Negro male samples and .03 lower in the Negro female sample. When two background measures were omitted, however, both were not replaced in all samples. As with the achievement variables, there were differences among the samples in the degree to which the same measure qualified as a substitute.

The family background measure accounting for the most independent variance in the criterion in the two white samples was Number of Siblings. When this variable was omitted from consideration in the white male sample, Educational Level of Mother and Marital Status of Parents entered the equation, Marital Status of Parents displacing Occupation Level of Father as the fifth variable to enter the equation (Table 7, column 6). Marital Status of Parents, however, increased the variance

accounted for by less than 1%. When both Number of Siblings and Education Level of Mother were omitted, the Education Level of Father was the fourth variable to enter the equation. The multiple correlations for these two substitution equations were only .01 below that of the original. When Number of Siblings and Occupation Level of Father were both omitted (Table 8, column 3), the Education Level of Father also entered the equation.

Several relationships among the background measures in the white male sample were suggested in these results. First, Education Level of Father substituted for Education Level of Mother and Occupation Level of Father, variables all logically related as measures of socio-economic status. Second, the appearance of both measures of education level in the same equation indicated that these variables had some independent as well as overlapping variance in the criterion. Third, in the equations where Number of Siblings was omitted, seven rather than eight variables had significant beta weights, suggesting that Number of Siblings accounted for some variance in the criterion that was not shared with any other single measure.

When the Number of Siblings was omitted from consideration in the white female sample, the fifth variable to enter the equation was Education Level of Mother (Table 9, column 4). The resulting correlation was .460 compared to .463 for the original variables. When both the Number of Siblings and Education Level of Mother were omitted from consideration (Table 9, column 5), the Occupation Level of Father entered the equation; however, this variable increased the

variance accounted for in the criterion less than 1%. Results of these substitutions were similar to results in the white male sample, in that Education Level of Mother and Marital Status of Parents were more prominent when Number of Siblings was omitted. The samples differed, however, in respect to Education Level of Father. In the white female sample, this variable did not replace Education Level of Mother or enter any other substitute equation. Although the Occupation Level of Father was more prominent in the equation in the white female sample when Education Level of Mother was omitted, both Education and Occupation Level of Father had independent relationships to the criterion in the white male sample.

In the Negro male sample, Education Level of Mother was the most prominent background measure in the original equation. When this variable was omitted (Table 11, column 4), the Education Level of Father entered. (The sixth variable to enter, although not significant, was Number of Siblings.) The multiple correlation of .601 was only .013 lower than that for the original equation.

In the Negro female sample, background measures that did not appear in the original equation did not have significant zero-order correlations with the criterion. Given these circumstances, it was not anticipated that comparable equations could be found by omitting any of the background measures in the original equation. When the highest predictor from the background measures, Marital Status of Parents, was omitted from consideration (Table 12, column 4), another background measure was among the first six variables to enter the

equation; however, its beta weight was not significant. This variable was Education Level of Father, which entered as a suppressor variable (as it did in the original equation). When other background measures were omitted in the Negro female sample, they were not replaced.

Although the possibilities for substituting background measures were more limited in the Negro samples, one finding corroborated a finding in the white samples. For Negro males, Education Level of Father was clearly interchangeable with Education Level of Mother.

Retention measures. When Age was omitted from consideration, Retention entered the equations in all but the Negro male sample.[6] Retention did not account for as much variance as Age, however, and did not have a significant beta weight in the Negro female sample. The multiple correlation in the white male sample (Table 7, column 8), was almost .04 below the original correlation, with Age in the equation. In the white female sample, Education

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[6] A possible explanation for Retention not appearing in the Negro male equation was that this dichotomized variable combined two or more retentions with one retention. The percentage of nonpromotions among graduates was higher for Negro males than for the other samples (25%, compared to 10% for Negro females and 5% and 2% for white males and females). The greatest discrimination between Negro male dropouts and graduates occurred in the number of second retentions, with 26.6% of Negro male dropouts having two or more retentions compared to 2.4% of the graduates. (The correlation in the Negro male sample between the three-level variable, Regular-retained once-retained twice; and dropout or graduation was -.39 compared to -.28 for the dichotomized variable in this analysis.) Two retentions would be reflected in the variance of Age.

Level of Mother entered before Retention, so that the correlation reported in Table 9, column 6 is higher than it would have been without the additional variable in the equation. The fifth variable to enter the equation for Negro males was the Mark in Spelling (Table 11, column 5), which did not have a significant beta weight, and Retention did not appear at a later step. In the Negro female samples where the zero-order correlation of Retention with the criterion was almost as high as that of Age, the substitution of measures resulted in the least loss of variance (Table 12, column 5). Although the beta weight for Retention was not significant, the obtained correlation was only .009 lower than the correlation for the equation containing Age. In both of the Negro samples, however, the beta weight for the IQ score was larger when Age was omitted.

The results supported the hypothesis that the measure of retention and the measure of age were accounting for similar variance, attributable to nonpromotion in elementary school. It can be inferred that with more accurate measurement of retention in grade, such a variable could be used as a substitute for Age in prediction of dropout and graduation. Since information concerning a student's age is usually more readily available than information on school progression, however, age would usually be a more reliable measure to use in predictive studies.

Sex-Associated Differences

In evaluating the results for differences between the sexes, the relative importance of variables in discriminating dropouts and

graduates was judged from their relative contribution to the regression equations and from the order of the variable's appearance in the equation. For example, the first four variables to enter the equations were considered to be more important because they accounted for a greater percentage of the total variance in the criterion than those appearing later; even though in an equation with a greater number of variables, the relative contribution of an early- and late-appearing variable may be reversed. In the majority of differences associated with sex that were found, there was less of a difference between white males and females than there was between Negro males and females. It is not known whether this finding was related to the fact that there were fewer variables being considered in the Negro male sample.

In the original analysis and substitution analyses, sex-associated differences were found in regard to achievement variables. The CAT Language score was relatively more discriminating in the equations for males, and reading achievement was more discriminating for the females. The CAT Reading score substituted well in the Negro female sample for the CTMM IQ score, and the Mark in Reading was the variable accounting for a major part of the contribution made by the Grade Point Average in the white female sample. In the white male sample, the reading score entered one substitution equation (Table 8, column 2) and, when forced into the regression equation, produced a higher multiple correlation than did other forced

achievement measures. The CAT Language score entered the regression equation in the white female sample, although its independent variance with the criterion was much lower than in the white male sample. This suggested that there was a smaller difference between the white samples in regard to these measures. When the CAT Reading score was a forced variable in the Negro male sample and when the CAT Language score was a forced variable in the Negro female sample, the multiple correlations that resulted were the lowest of the correlations with achievement measures substituted.

Results also showed relatively greater discrimination of course marks for white females and of standardized test scores for white males. This difference, however, was not replicated in the Negro samples.

Age was a relatively better indicator of dropout or graduation in the male samples, as evidenced by the higher zero-order correlations with the criterion and the relatively larger beta weights of the variable in the male samples.

Similar findings suggested that Absence was of relatively greater importance in the female samples.

The Marital Status of Parents ranked among the first four variables in amount of variance accounted for in the criterion in both of the female samples. This variable did not have a significant correlation with the criterion and did not appear in the equation for Negro males. The variable did have a significant beta weight in the

white male sample; however, it accounted for less variance than in the white female sample.

The results also suggested that the two background measures concerned with subjects' fathers were more differentiating for males, however, the relative importance of the Education Level of Father has to be considered in relationship to Education Level of Mother as well as across the sex groups. In both male samples, when the Education Level of Mother was omitted, the Education Level of Father entered the new equations and accounted for a similar amount of independent variance. In the white female sample, the Education Level of Father did not replace the Education Level of Mother, and in the Negro female sample, neither Education Level nor Occupation Level of Father had a significant correlation with the criterion. In the white male sample, the Occupation Level of Father contributed relatively more independent variance to the original equation than in the white female sample. Results in the white male sample also indicated that the Education Level of Father contributed variance independent of Education Level of Mother when Occupation Level of Father was omitted from the equation.

Race-Associated Differences

At the most general level of results, it was found that the total amount of variance in the criterion accounted for was greater in the Negro samples than in the white samples. Also, this variance was accounted for by a fewer number of variables.

In the patterns of relationships to the criterion, the greatest difference that was found between the race groups was associated with the socio-economic and family background measures. On the one hand, fewer of these variables were significantly related to the criterion in the Negro samples; yet, on the other hand, the relative contribution of background measures to the regression equations was greater in the Negro samples. There were significant mean differences between the white samples and Negro samples, dropouts and graduates combined, on all of these measures. The Negroes came from families with lower mean levels of occupation and education, a greater number of broken homes, and a higher mean number of siblings. In relation to dropout or graduation, the analysis of the combined samples showed that Race did not account for any variance independent of other measures in the study. These results would suggest that the major stratification or moderation made by race was one of socio-economic and family background characteristics.

In the white samples, there were significant independent contributions to the regression equations from components of achievement, language skills or reading, and arithmetic. In the Negro samples, only one measure of achievement, a standardized test score, accounted for significant independent variance in the criterion.

Discussion

The multiple correlation coefficients obtained for the four race-by-sex groups (.5316, .4823, .6143, and .6183) were not as high

as those obtained by Opstad (1958) using data from all four years of high school (.6249 and .6590), nor as high as that found by Livingston (1958) using data available prior to the 9th grade (.70). The percentage of subjects correctly classified as dropouts or graduates (approximately 75% of the white male, white female, and Negro male samples and 80% of the Negro female sample),[7] however, did compare favorably with the classification obtained by Urdal (1963) using 8th grade data (68%). Considering that the data in the present analyses were restricted to the information available at the 6th grade, two and three years earlier than the other studies, the size of coefficients are impressive. In terms of variance accounted for, the results indicated that 23% to 38% of the variance between dropout and graduation can be accounted for from two to five years prior to the time the majority of students drop out of school.

From the application of the multiple regression technique to the same set of variables in four different groups, several comparisons were possible. It was first determined that there was significant variation in the amount of variance that could be accounted for in the different samples. From this, it was concluded that more refined analysis and prediction of dropouts can be made when the stratifying variables of Race and Sex are taken into account.

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[7]Classification data were obtained from discriminant function analyses that were equivalent to the multiple correlation analyses reported here. Results of these analyses will be reported in conjunction with extended analyses to be done on the characteristics of subjects who were misclassified, i.e., dropouts who were predicted to graduate and graduates who were predicted to drop out.

Second, the different but logically related achievement and background measures in the original equations suggested that the findings could be described in terms of underlying factors related to dropout or graduation. Results of the second set of analyses, where similar variables were substituted for each other, supported this hypothesis. Similarities between these findings and the results of previous factor analyses, which included the measures and samples in the present study (Lloyd, 1967), lend further support to the formulation of factors relating to dropout or graduation. Of the six orthogonally rotated factors that were interpreted in the previous study, five were found in the present results: General Achievement, Occupation and Education Level of Parents, Absenteeism, Retarded Learning (retention), and Home and Family Characteristics (defined by Number of Siblings and Marital Status of Parents). Mobility, the sixth factor, was represented in this analysis by the measure of school transfer, but this variable was not found to be significantly related to the criterion in any sample. In the female samples, all five factors were represented in the present results; in the male samples, four of the five were found. The exceptions were that there was not significant independent variance from a measure of home and family characteristics in the Negro male sample and that Absence did not appear in the results in the white male sample.

Although this is a motley group of factors, covering characteristics of parents and the behavior, age, and performance on

standardized tests of children, there are several benefits that can be derived from the formulation of factors, even if they are vague in meaning and diverse in substance. Of primary benefit is that they provide an empirical basis for the comparison and development of further investigations. For the practical problem of developing predictive equations, the factors provide guidelines for selection of variables. For both predictive and analytic investigations, they provide a basis from which to explore additional predictive factors. For further investigation of differential patterns in the dropout process, they may prove to be useful as stratification variables or as indices for profile comparisons. For example, do dropouts from low occupational-educational background reveal different patterns of behavior, test scores, school performance, time and reason of dropout, etc., than dropouts from high educational background, or different patterns than dropouts where low ability or high absence appears to be a predominant characteristic.

Comparison of results across groups also enabled an assessment to be made of differences that were associated with sex. Although it was anticipated that the difference in the size of the samples might make it difficult to assess sex-associated similarities across the race groups, this was generally not the case. Most sex differences were replicated across race. These findings suggest that the pattern of influences on later educational success and failure are relatively different for boys and girls, and that sex is a relevant

variable to use in formulating types of dropouts. The reasons behind the relative differences associated with sex were not readily explainable. Replication of these findings across samples in the present study and similarities in results of related studies, however, provide evidence for their existence. These differences and some of the difficulties posed by the vague meaning of several of the variables are discussed for their implications for future research.

The separate components of general achievement that were independently related to dropout and graduation were reading, arithmetic, and language skills. Reading was more differentiating in the female samples, and language skills was more differentiating in the male samples. The verbal-numerical distinction is one of the most established in the ability area (Coleman and Cureton, 1954; McNemar, 1964), and the independent contribution of reading and arithmetic to dropout or graduation was not surprising. Although, in the Negro samples, there was not significant independent variance accounted for by two achievement measures, the CTMM IQ score, which was a prominent variable in both samples, is composed of verbal and non-verbal (including numerical) subscores. The CAT Language subtest, however, is not a measure of verbal achievement (although it correlates highly with the reading subtest), but measures knowledge of language mechanics.

With particular skills being stressed at different stages in the educational process, it would be expected that different skills

would better discriminate educational success or failure at different grade levels (Anderson and Leton, 1963). This would not indicate that a particular skill is less important to ultimate success, but that it may be relatively less useful in differentiating the successes and failures at certain points in time. This, in part, may account for the discriminating power of the language score in the present samples. It is interesting, however, that a test with similar content was found by Urdal (1963) to discriminate dropouts and stayins at the 8th grade level.

The finding that Absence was not a significant contributor to the regression equation in the white male sample may be related to the fact that there was a significant difference ($p < .01$) between white male dropouts in this sample and the total sample of white male dropouts from which it was drawn. This difference indicated that subjects omitted from the analysis because of missing observations on some of the variables had more absences in the 6th grade. Although this bias in the sample must be considered as a possible reason for Absence not appearing in the equation for white males, there were other indications that this may be a true finding. The correlation of Absence with the criterion that was based on the total white male sample was only -.133, compared to -.085 in the subsample used in this analysis. Both of these correlations were considerably lower than the comparable correlations in the other three samples. Also, a similar difference between males and females was found by Opstad (1958)

who used a measure of absence taken over all years of high school. The question arises as to whether absenteeism is a symptom of the dropout process or a part of a causal chain of events. In high school one would expect the former, with absence reflecting disengagement from school and turning of interests elsewhere. In the 6th grade, however, there is more of a possibility of absence resulting in missed course work, which in turn could lead to later failure. If the greater association of absence had been with males, the suggestion of the symptom relationship would have been stronger because more boys than girls withdrew in earlier grades, i.e., in the 8th and 9th grades. The reason for the greater association of absence in the 6th grade with later dropout for females needs more investigation.

In the results, Age appeared to be relatively more differentiating for males than for females. Although Age was an effective predictor of dropout or graduation, this variable does not contribute much to an understanding of the dropout process. Age was considered to be primarily a measure of school retention, which was substantiated by the results of the substitution analysis. Further, the relationship of Age and Retention to the general ability measures on the factor of Retarded Learning (Lloyd, 1967) suggests that school retention is closely associated with low measured ability. Other relationships associated with school retention and age, however, should be explored. For example, it was recognized that age at first entering school would

contribute to variance in Age. In a study of the relationship between age at entering the 1st grade and later achievement, Baer (1958) found that older children had a higher level of achievement in later grades, an opposite relationship to that of Age and drop-out or graduation found in this study. If some of the variance in Age was positively related to graduation, that variance would have decreased the overall negative relationship of Age and the criterion, due to variance associated with retention. More refined analyses may also reveal other characteristics of being retained in grade that affect later performance, such as the specific grade in which a student is retained and the loss of peer group association by retention (Thomas and Knudsen, 1965). These effects may have influences on later dropout or graduation that are separate from that of retarded learning, which is presumably the major reason for retention.

The results showed a relatively greater relationship of the Marital Status of Parents to the criterion in the female samples than in the male samples. It is particularly interesting that this relationship was replicated across race because there were several differences between the races in the distribution on this variable and other social background measures. First, there was a significant mean difference between the white samples and the Negro samples on Marital Status of Parents, with the Negro samples having more broken homes (situations other than living with both natural parents). This overall difference, however, was largely the result of a greater number

of Negro graduates having broken homes. The distribution on the variable for dropouts was approximately the same across race. Among the dropouts, however, there were qualitative differences across race in the type of disruption of family, with a higher percentage of Negro dropouts living with foster parents or relatives and a higher percentage of white dropouts having divorced parents. Considering these differences and the differences between the races in occupational and educational level, the finding suggests that the greater relationship of broken home and later dropout for females is maintained over groups with different socio-economic backgrounds and different qualitative types of home situations. This finding closely parallels that of Stetler (1959). In that study, dropouts and graduates were compared on a measure of whom a student lives with. Significant differences were found for white males, white females, and Negro females, but not for Negro males. The difference for white females was greater than for white males, as in the present results. Differences between the races in the relationship of number of siblings and occupation and education level of parents to dropout or graduation that were found by Stetler were also similar to results in the present analysis.

An additional association with sex that was replicated across race was the relatively greater independent contribution of Education Level of Father in the male samples. A similar relationship was found in a study by Van Dyke and Hoyt (1958), where a slightly higher relationship with dropout was found for father's education level among

boys and for mother's education level among girls. Although these were small relative differences in both studies, the findings are congruent with the theoretically expected role identification with the parent of the same sex and suggest that the educational outcome of a boy is relatively more influenced by his father and the outcome of a girl is relatively more influenced by her mother. The present results also suggest, however, that the educational background of the mother influences both sexes.

Dropout is a useful unit of analysis in that it represents a gross behavioral distinction between educational success and failure. It is important, however, not to let the concept obscure the broader problem of the development and adjustment of individuals in the context of the educational process, which is only hallmarked by eventual dropout or graduation. There is need for much more knowledge concerning the educational process and the effects of the school context on the developmental processes in the individual. Although results of this study pointed to differences that relate to educational success or failure for boys and girls, it is not known, for example, whether or not these differences were influenced by different standards or expectations for the performance of boys and girls in the school setting. It is only from more refined investigations into the interactions of developmental factors in the educational context that a dynamic theory of educational development can be formulated. Research directed at types of dropouts and the dropout process can

be a fruitful approach to understanding educational development, if such research is viewed as a part of and takes into account other aspects of the larger problem.

References

Anderson, H. E., Jr., & Leton, D. A. Optimum grade classification with the California Achievement Test Battery. Educational and Psychological Measurement, 1963, 23, 135-143.

Baer, C. J. The school progress and adjustment of underage and overage students. Journal of Educational Psychology, 1958, 49, 17-19.

Coleman, W., & Cureton, E. E. Intelligence and achievement: The "Jangle Fallacy" again. Educational & Psychological Measurement, 1954, 14, 347-351.

Goldsmith, H. F., & Stockwell, E. G. Socio-demographic characteristics of rapid growth counties in the United States. Some preliminary considerations. Laboratory Paper No. 12, Mental Health Study Center, National Institute of Mental Health, August 1965.

Hollingshead, A. B., & Redlich, F. C. Social class & mental illness: A community study. New York: Wiley & Sons, 1958.

Livingston, A. H. High-school graduates and dropouts - a new look at a persistent problem. School Review, 1958, 66, 195-203.

Livingston, A. H. Key to the dropout problem: The elementary school. Elementary School Journal, 1959, 59, 267-270.

Lloyd, D. N. Factor structure of elementary school record data in race and sex groups. Laboratory Paper No. 20, Mental Health Study Center, National Institute of Mental Health, November 1967.

McNemar, Q. Lost: Our intelligence? Why? American Psychologist 1964, 19, 871-882.

Miller, S. M. Dropouts - a political problem. In D. Schreiber (Ed.), The school dropout. Washington, D.C.: National Education Association, 1964. Pp. 11-24.

Miller, S. M., Saleem, B. L., & Bryce, H. School dropouts: A commentary and annotated bibliography. Syracuse, N.Y.; Syracuse University Youth Development Center, 1964.

Opstad, P. E. Non-scholastic factors associated with drop-outs from public schools in Iowa. Unpublished doctoral dissertation, University of Iowa, 1958. University Microfilms, #58-2977. (Also reported in Van Dyke, L. A., & Hoyt, K. B. The drop-out problem in Iowa high schools. Iowa City: State

Porter, J. W. The heart of the dropout problem: Early identification. Michigan Educational Journal, 1963, 40, 362-365 & 397.

Stetler, H. G. Comparative study of Negro and white dropouts in selected Connecticut high schools. State of Connecticut Commission on Civil Rights, Hartford, Connecticut, 1959.

Thomas, S., & Knudsen, D. D. The relationship between nonpromotion and the dropout problem. Theory into Practice, 1965, 4, 90-94.

Urdal, L. B. (principal investigator), et al. Dropouts: An analysis of personal variables within the school situation. Olympia, Washington: Office of State Superintendent of Public Instruction, Research Department, 1963.

Appendix

Table A

Means and Standard Deviations of Elementary School Variables and Dropout or Graduation in Secondary School for Race-Sex Samples

	Variable	White Males Mean	White Males S.D.	White Females Mean	White Females S.D.	Negro Males Mean	Negro Males S.D.	Negro Females Mean	Negro Females S.D.
1	Age in months	140.021	6.071	138.495	4.937	144.771	10.310	142.682	10.496
2	Education of father	3.672	1.683	3.723	1.704	5.319	1.165	5.225	1.288
3	Education of mother	3.713	1.518	3.769	1.497	5.042	1.130	4.930	1.306
4	Siblings	2.111	1.675	2.105	1.627	4.693	2.567	4.853	2.690
5	Occupation of father	4.220	1.484	4.227	1.472	5.922	1.139	5.969	1.262
6	Marital status of parents	1.070	0.255	1.095	0.294	1.139	0.347	1.101	0.302
7	Employment of mother	1.272	0.445	1.309	0.462	1.343	0.476	1.341	0.476
8	6th mark - reading	2.021	0.656	2.271	0.623	1.783	0.671	2.078	0.714
9	6th mark - language	1.985	0.554	2.226	0.537	1.982	0.510	2.124	0.625
10	6th mark - spelling	2.006	0.634	2.300	0.601	1.886	0.617	2.256	0.653
11	6th mark - arithmetic	2.092	0.614	2.148	0.582	1.886	0.664	2.000	0.661
12	6th mark - social studies	2.079	0.553	2.195	0.514	2.048	0.559	2.132	0.630
13	6th mark - science	2.076	0.484	2.098	0.439	2.090	0.514	2.054	0.535
14	6th grade point average	1.904	0.503	2.084	0.476	1.789	0.502	1.977	0.596
15	6th CTMM IQ score	103.066	16.067	105.715	14.480	86.476	15.460	88.016	16.469
16	Days absent in 6th grade	2.017	1.035	2.111	1.084	2.428	1.499	2.287	1.353
17	Retention	1.098	0.298	1.043	0.202	1.349	0.478	1.279	0.450
18	School transfer	1.378	0.485	1.401	0.492	1.301	0.460	1.419	0.495
19	Dropout or graduation	2.718	0.450	2.818	0.386	2.584	0.494	2.566	0.498
20	6th CAT - reading	5.730	1.496	6.181	1.318	4.504	1.090	4.935	1.159
21	6th CAT - arithmetic	6.086	0.861	6.230	0.730	5.264	0.806	5.457	0.864
22	6th CAT - language	5.873	1.030	6.426	0.939	5.062	0.898	5.625	0.994

Table B

Intercorrelation of Elementary School Variables and Dropout or Graduation in Secondary School for White Males (below diagonal) and White Females (above diagonal)

	Variable	19	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	20	21	22
19	Dropout or graduation		-223	203	207	-202	190	-168	-001	303	300	263	282	261	245	331	286	-241	-227	-006	283	286	294
1	Age in months	333		-120	-116	143	-091	048	-005	-124	-056	-098	-086	-086	-068	-112	-114	065	378	004	-122	-118	-105
2	Education of father	242	-132		522	-190	632	-042	-023	254	237	180	174	240	214	271	293	-082	-106	-013	329	236	265
3	Education of mother	229	-125	524		-183	392	-011	094	203	210	150	134	201	177	213	255	-087	-111	-011	257	184	226
4	Siblings	-235	128	-178	-216		-116	002	-213	-127	-149	-114	-073	-151	-132	-166	-191	055	180	028	-186	-125	-126
5	Occupation of father	221	-126	627	434	108		-055	-050	233	209	157	174	200	160	239	260	-032	-059	-037	288	213	234
6	Marital status of parents	-125	061	-019	022	021	-076		191	-082	-120	-080	-093	-081	-094	-103	-108	075	084	007	-090	-124	-086
7	Employment of mother	011	-013	032	145	-240	-036	141		-046	-004	-023	-001	-016	-015	-007	020	-032	-005	016	-006	-034	-011
8	6th mark - reading	309	-213	262	226	-199	233	-064	034		746	676	629	630	552	810	630	-070	-236	-083	711	586	625
9	6th mark - language	304	-198	200	168	-198	166	-077	050	737		678	614	661	617	829	566	-078	-206	-065	622	546	581
10	6th mark - spelling	282	-185	156	134	-197	123	-076	044	660	691		627	603	516	756	529	-082	-225	-062	577	538	600
11	6th mark - arithmetic	323	-198	182	177	-161	159	-059	047	597	595	593		603	591	788	529	-081	-208	-078	527	594	541
12	6th mark - social studies	340	-224	225	205	-194	149	-091	002	646	688	624	657		702	777	495	-057	-194	-088	549	489	505
13	6th mark - science	318	-176	240	224	-194	187	-051	-019	580	656	553	613	771		777	446	-044	-191	-085	496	489	472
14	6th grade point average	343	-223	220	188	-214	178	-073	030	826	853	804	738	793	746		629	-084	-255	-105	680	636	658
15	6th CTMM IQ score	384	-375	313	259	-201	265	-057	062	673	595	569	578	568	540	670		-047	-288	-012	765	664	695
16	Days absent in 6th grade	-085	060	-051	-058	033	-030	020	016	-037	-049	-035	-086	-079	-054	-052	-053		132	053	-019	-075	-042
17	Retention	-232	440	-134	-119	140	-109	055	007	-288	-259	-256	-235	-270	-256	-302	-338	063		044	-234	-224	-231
18	School transfer	-050	029	036	066	006	019	054	005	-031	-037	-034	-076	-087	-056	-062	-045	017	010		-091	-119	-079
20	6th CAT - reading	372	-239	309	256	-217	263	-059	058	751	650	635	596	593	564	728	815	-053	-303	-069		675	748
21	6th CAT - arithmetic	389	-220	243	204	-124	189	-070	007	583	568	559	634	558	530	637	706	-086	-278	-049	715		675
22	6th CAT - language	398	-227	241	197	-187	193	-106	071	688	631	629	557	562	536	690	747	-064	-303	-062	805	700	

Note.-Correlations are based on N of 1090 (white males) and 1100 (white females). Values are rounded. Decimals are omitted.

Table C

Intercorrelation of Elementary School Variables and Dropout or Graduation in Secondary School for Negro Males (below diagonal) and Negro Females (above diagonal)

	Variable	19	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	20	21	22
19	Dropout or graduation		-414	017	179	-089	109	-174	-096	271	325	393	214	383	295	335	463	-359	-397	-081	430	390	387
1	Age in months	-441		-112	-065	186	-079	-039	014	-457	-487	-486	-411	-488	-464	-497	-587	234	624	196	-496	-499	-504
2	Education of father	263	-114		580	-226	403	079	126	104	074	004	092	095	097	100	137	127	-039	-243	202	212	162
3	Education of mother	305	-128	583		-333	288	220	213	-031	-001	-039	009	036	039	007	129	-038	-047	-154	167	110	131
4	Siblings	-154	-008	-185	-255		-134	-126	-198	-112	-036	-050	004	-085	-027	-056	-161	136	079	041	-132	-137	-121
5	Occupation of father	230	-227	316	120	-010		-070	203	171	124	057	084	064	067	110	151	-088	-098	-096	200	201	108
6	Marital status of parents	-016	145	050	-031	-258	080		085	-000	-025	-013	-000	-029	063	-009	080	043	-036	-023	005	026	031
7	Employment of mother	121	-004	057	083	-121	-072	114		-009	119	-032	025	031	049	028	070	-177	-010	-180	056	053	116
8	6th mark - reading	366	-330	081	156	-092	157	-026	045		766	762	645	707	623	877	563	-322	-505	-004	586	615	574
9	6th mark - language	355	-370	051	093	019	107	049	026	626		821	699	772	704	889	633	-375	-513	-119	601	634	589
10	6th mark - spelling	380	-374	050	071	047	056	046	-030	628	706		633	715	653	829	654	-349	-510	053	625	602	615
11	6th mark - arithmetic	316	-155	109	179	-010	068	069	029	502	530	559		675	640	823	548	-314	-498	-119	513	587	516
12	6th mark - social studies	380	-317	145	233	-066	099	-066	074	594	640	560	553		767	820	581	-320	-489	-103	626	620	562
13	6th mark - science	363	-313	160	257	-121	081	-071	120	567	607	510	509	806		801	584	-238	-453	-027	633	616	547
14	6th grade point average	414	-381	128	160	-034	119	012	064	808	789	792	726	759	708		627	-374	-544	-046	641	679	622
15	6th CTMM IQ score	459	-570	089	083	048	150	085	057	546	496	523	378	474	412	548		-358	-567	-072	792	753	759
16	Days absent in 6th grade	-348	295	-105	-150	107	-162	060	-063	-148	-196	-143	-249	-242	-216	-266	-244		355	-041	-337	-427	-370
17	Retention	-279	667	-103	-062	029	-073	108	055	-273	-322	-295	-102	-222	-252	-322	-386	120		068	-553	-503	-573
18	School transfer	-112	-029	-131	-162	181	-080	-035	-032	-042	101	079	-085	-033	012	001	029	102	-013		-019	-067	-126
20	6th CAT - reading	366	-373	080	054	098	163	-003	091	633	539	575	428	503	378	621	653	-200	-284	-045		798	770
21	6th CAT - arithmetic	327	-270	055	-006	110	205	070	072	569	556	521	570	566	471	634	596	-133	-197	-078	705		760
22	6th CAT - language	443	-364	182	138	012	157	001	063	600	467	552	453	466	338	592	617	-204	-275	-182	748	661	

Note.-Correlations are based on N of 166 (Negro males) and 129 (Negro females). Values are rounded. Decimals are omitted.