THE EFFECT OF CERTAIN SUBCULTURAL BACKGROUND FACTORS ON THE PREDICTION OF GRADES AT THE UNIVERSITY OF MICHIGAN

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Roy E. Halladay

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Roy Eldon Halladay

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Stanley E. Hecker
Major professor

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ABSTRACT

THE EFFECT OF CERTAIN SUBCULTURAL BACKGROUND FACTORS ON THE PREDICTION OF GRADES AT THE UNIVERSITY OF MICHIGAN

by Roy E. Halladay

The Problem

The colleges and universities of this country have, in this decade, turned from general adherence to a philosophy on admission typically labeled "open-door" to acceptance, in varying degrees, of a philosophy of "selective admission." This change has come about as a result of the shear weight of numbers of students seeking admission to institutions of higher education and the inability, or disinclination, on the part of some institutions to meet the demand for facilities. The resulting need to select, from multiple applicants, those to be granted admission has caused many colleges and universities to seek out measures to be used in predicting the probable success of the applicants that they may then grant acceptances to those with the highest expectancy for retention. Most of these colleges have turned to some combination of aptitude tests, achievement tests, and secondary school record to arrive at this prediction.

With the increased use of test scores as a part of the consideration of applications to college have come criticisms related to over-emphasis on these factors and their "fairness" to certain groups of applicants. The charges have been leveled, for instance, that such tests are designed by persons of middle-class cultural background and hence are

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not appropriate for groups which depart from this "norm," i.e., the minority groups and the culturally disadvantaged. Also charged is that some students, such as those from small, rural schools, are not sophisticated test takers and are therefore disadvantaged in the admission decision.

At the same time, there is another group of critics who charge that since the secondary school record is so poorly defined, and particularly since the college-going population is so mobile as to prevent admissions officers from always knowing the high school, that standardized aptitude and achievement tests are the only way of making "fair" decisions about students from diverse educational backgrounds.

The Study Design

This study was designed to investigate one facet of this concern for "fairness": the relative effect of either small school-rural educational background or large school-urban background on the ability to predict academic performance in college.

Data for the study was collected from the 1962-65 freshman classes of the College of Literature, Science, and Arts of the University of Michigan. Three groups were defined and studied. A small-rural group included 101 students who had entered the University from secondary schools in Michigan with graduating classes of less than 100 students from towns of under 15,000 population which are located in areas of the state dependent primarily on the natural resources for their economy. These were upper peninsula and upper-

lower peninsula towns. A large-urban group of 256 students was selected from comprehensive secondary schools with enrollments well in excess of 500 students and from industrially oriented towns in Michigan of over 15,000 population. A third group of 495 students was used as a control, or comparison, group and consisted of a random sampling of every sixth person in the freshman class of 1964-65.

Variables included in the study were: the Scholastic Aptitude Test of the College Entrance Examination Board, the English Composition Test of the College Board, an average of College Board Achievement Tests, the Secondary School Percentile Rank, and the University Freshman Grade-Point Average.

The Study Results

The results of the study suggest that:

1. The means of the Scholastic Aptitude Test, the Achievement Tests, and the Freshman Grade-Point Average are significantly lower for students from small-rural schools than they are for students from large-urban schools or from the freshman class taken as a whole.

2. The ability of the Scholastic Aptitude Test and the Achievement Tests to predict Freshman Grade-Point Averages is not significantly different for either the small-rural group or the large-urban group than it is for the freshman class as a whole.

3. The mean Secondary School Ranks differ significantly between groups, but in an order inverse to the order of means on the Scholastic Aptitude Test, the Achievement Tests, and the University Freshman Grade-Point Average. That is, the small-rural group tend to present the highest ranks and the control group the lowest.

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4. There is a significant difference between the study groups in the ability of the Secondary School Percentile Rank to predict academic success at the University of Michigan. The correlations between University Grade-Point Average and this variable are: r(rural) = .191, r(urban) = .441, and r(control) = .320.

5. Combining the predictor variables in a multiple regression equation tends to compensate for the variation in Secondary School Percentile Rank, but does not completely make up for the variability in this factor. The multiple correlations for Scholastic Aptitude Test-Verbal, Scholastic Aptitude Test-Mathematical, and Secondary School Percentile Rank as predictors of Freshman Grade-Point Average were: R(rural) = .399, R(urban) = .551, and R(control) = .479.

6. It would appear that the use of a single prediction equation for all students does not predict in a similar manner for students from small-rural or large-urban secondary schools as it does for the students in general. More specifically, such an equation would appear to over-predict for students from small-rural schools. For students in about the top five per cent of classes in large-urban schools, a single prediction equation would seem to be an equivalent predictor, but for those nearer the middle of their class in these schools, the single prediction equation appears to over-predict by a margin which increases the farther down the ranking the student appears.

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BY

Roy Eldon Halladay

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CHAPTER I

THE PROBLEM

THE DECADE OF REVOLUTION

The period 1960-1970 may well go into the history books as the decade of revolution in education. This period is not only being marked by sweeping methodological and technological changes in the process of education but those changes are coming at a time when the post-World War II baby boom is flooding the educational market place. The massive increase in numbers, caused on the one hand by population increases and on the other by an increased interest in and need for education at all levels by the populace, has forced educational institutions to review and revamp their educational processes.

This change has been no more pronounced nor no more upsetting to the people of the nation any place than it has in the movement of young people from secondary school to college. One of the overt signs of this change has been a turn to the use of externally administered tests as major implements of selection of applicants to college. As some evidence of this shift, in 1960 the College Entrance Examination Board administered 661,335 Scholastic Aptitude Tests (used by colleges and universities as one predictor in admission), while in

1965, 1,269,442 took the same test.[1]

Several factors have contributed to this turn to selective admission and the use of aptitude and achievement tests in the selection process. Already mentioned is the increase in numbers of college-age youth and the increased percentage of secondary school graduates going to college. The nation's colleges have been hard pressed to provide sufficient dormitory space, classroom facilities, and faculty to meet the demand. As a consequence the colleges, first the small private ones and more recently and in increasing numbers the large and the public, have been forced to select their freshmen classes from a number of applicants which exceeds the capacity of the institutions. The colleges are forced into selection. This process, more often than not, takes the form of selecting those students who exhibit, through past achievement and through tests of aptitude and achievement, the highest potential for academic success in college.

Aside from numbers, however, at least three other factors have made the use of tests and other objective measures as predictors of academic success a regular part of the admission process. First, the increased percentage of secondary school graduates desiring to go to college has resulted in greater heterogeneity. Since it is difficult for colleges, particularly small ones, to meet the educational needs of

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[1]Unpublished reports, Educational Testing Service, Princeton, New Jersey, 1965.

such a range of abilities they tend to select those for whom they can best provide. Secondly, the educational revolution referred to has resulted in an increased diversity in the quantity and quality of secondary education. This range of curriculum offerings, methods of teaching, and quality of faculties forces colleges to look for new standards of comparison between schools. Gone are the days of the Carnegie Unit. It is no longer possible to compare students on the basis of the number of units of preparation they have had in secondary school. Thirdly, modern society is mobile. Whereas the college bound once tended to go to college near home, this factor now has little bearing on college selection. The result is that college admissions officers can no longer be expected to know the secondary schools from which they may be drawing their candidates. Without this familiarity, they must rely more heavily on standardized tests to help them make judgments about the relative quality of preparation of individual candidates.

THE CONCERN ABOUT FAIRNESS

The greater reliance on tests in the admission process has frequently caused popular opinion to question the "fairness" of these instruments in the decision-making process. Protests over what is sometimes imagined to be over reliance on such factors are common.[2] There are frequent criticisms

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of the Scholastic Aptitude Test of the College Entrance Examination Board, claiming that it is "unfair" to students from low socioeconomic areas, from rural areas, candidates who lack imagination, candidates who are not sophisticated about test taking, candidates from schools where few go on to college, and so on.

Much concern about "fairness" is related to the social revolution taking place in America. This concern has many dimensions. Do the objective measures used in admissions discriminate against race? Do these measures predict equally well for applicants regardless of the school attended, or the geographic area of the country where they live, or the socioeconomic status of their parents?

This concern for "fairness" to minority groups is by no means limited to the negro race. Similar questions could be raised on behalf of the French-Canadians along the Maine border, the eight million "old Americans" in the two hundred fifty counties of the Southern Appalachias, the more or less stranded people in the Lakes States cut-over areas, the Indians, the Spanish-Americans, and other foreign language groups.

Another area in which the validity of such tests comes under question is in that of international education. This is not only a decade of revolution in education within our

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such to which the reader might refer and which cites other examples is: Hillel Black, They Shall Not Pass (New York: Wm. Morrow and Company, 1963), p. 334.

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own country but it may well be the period in which higher education gains a firm foothold in the international setting. This may be accomplished in two ways; on the one hand, through the assistance with educational problems offered by the United States of America to other countries, and, on the other, through the education of foreign nationals in American colleges and universities. In either case, wherever use is made of educational tests, the problem of cultural influences on these tests will arise and will need to be understood and dealt with.

RURAL-URBAN FACTORS AND SCHOOL SIZE AS DETERRENTS TO COLLEGE ADMISSION

Studies relating the effects of cultural background on aptitude test scores have isolated the following factors: race, occupation, rural-urban factors, school differences, and socio-economic class differences.[3] The interrelated complexity of these problems prevents their study in toto.

This study deals with a combination of these factors, i.e., the rural-urban aspect combined with size of school, because it is believed that this may be a significant variable in determining access to higher education in the United States.

Over 70 per cent of the nation's public schools are

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[3]Charles M. Lucas, Survey of the Literature Relating to the Effects of Cultural Background on Aptitude Test Scores, A Report to the Research Committee of the College Entrance Examination Board, June 30, 1953. Prepared by Educational Testing Service (Research Bulletin 53-13, June 30, 1953), p. 3.

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located in small towns or rural areas.[4] Over 50 per cent of these schools are of such a size as to make quality programs nearly impossible or definitely improbable. Whereas about three-quarters of the city schools have accelerated curricula available for superior students, approximately half that many have such provisions available in the other schools.[5] Flanagan found in his studies of the American high school that the rural-urban factor correlates highly with the size of the school and such related items as the number of books in the library, the summer school policy, the offerings of the curriculum, the experience of teachers, the education of teachers, lack of guidance programs, lack of homogeneous grouping, and travel.[6]

NEED FOR RESEARCH

With the growing interest in, and concern about, the use of tests in the college admission process, there arises an increased need to explore the validity of these tests for determining the admissibility to college of candidates with varying backgrounds. The action, based upon the results of such studies, might take one of two directions. One action might tend to be tied to the philosophy that cultural bias

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[4]John C. Flanagan et. al., A Survey and Follow-Up Study of Educational Plans and Decisions in Relation to Aptitude Patterns: Studies of the American High School (Pittsburgh: The University of Pittsburgh, 1962), pp. 2-45.

[5]Ibid., pp. 2-46.

[6]Ibid., pp. 6-23.

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should be eliminated from all such tests wherever possible. On the other hand, Anastasi[7] and Turnbull,[8] have pointed out that the elimination of "cultural differentials" from a test may reduce its validity for the prediction of most criteria, which themselves are culturally loaded. What follows, however, does not detract from the basic problem. It is necessary that it be understood how differences, if they exist, come about and how they relate to the criterion. Knowing if and where such biases in tests exist will allow test developers either to duplicate them in parallel tests in order to make results consistent, or to eliminate them if this results in a better predictive instrument or is desirable on some other basis.

Recent surveys of the literature report studies that support either side of the argument about whether or not cultural differences result in differences on various tests of aptitude.[9] Two fairly recent studies, for instance, have attempted to relate the differences on the Scholastic Aptitude Test of the College Entrance Examination Board resulting from certain of these

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[7]A. Anastasi, "Some Implications of Cultural Factors for Test Construction," Proceedings 1949 Invitational Conference on Testing Problems (Princeton, N.J.: Educational Testing Service, 1950), pp. 13-17.

[8]William W. Turnbull, "Influence of Cultural Background on Predictive Test Scores," Proceedings 1949 Invitational Conference on Testing Problems (Princeton, N.J.: Educational Testing Service, 1950), pp. 29-34.

[9]The reader is referred specifically to two such surveys: Lucas, loc. cit. and David E. Lavin, The Prediction of Academic Performance (New York: Russell Sage Foundation, 1965).

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cultural factors to the criterion of grades in college. Schultz found that the Scholastic Aptitude Test scores neither over-predict nor under-predict for various socioeconomic classes.[10] Wing, on the other hand, found that gains in predictions could be made if cultural background factors are taken into consideration.[11]

The problem that exists, therefore, is one of determining which cultural factors, if any, affect the results of tests used in the selection of students for colleges and, further, exactly how they affect these tests.

THE PROSPECTUS

This is a statistical study of the relative effect of rural and urban academic backgrounds on the ability to predict academic performance at the University of Michigan. The study seeks to determine if there is anything inherent in the rural or urban educational environment, reflected in the usual predictive factors of aptitude and achievement tests and secondary school achievement, which, in some way, may cause the prediction of success to be influenced in an abnormal manner.

The study will attempt to answer the following basic

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[10]D. G. Schultz, The Relationship Between College Grades and Aptitude Test Scores for Different Socioeconomic Groups (Princeton: Educational Testing Service, 1953).

[11]Cliff W. Wing, Jr. and Virginia Ktsanes, The Effect of Certain Cultural Background Factors on the Prediction of Student Grades in College (unpublished report to the College Entrance Examination Board, 1960).

questions:

(1) Is the Scholastic Aptitude Test of the College Entrance Examination Board biased as a predictor of academic success in college for small school-rural or large school-urban type applicants?

(2) Are the Achievement Tests of the College Entrance Examination Board biased predictors of academic success in college for either small school-rural or large school-urban type applicants?

(3) Is the secondary school achievement record, as a predictor of academic success in college, affected by the cultural nature and size of the secondary school?

(4) Do the combination of predictive factors (Scholastic Aptitude Test-Verbal, Scholastic Aptitude Test-Mathematical, achievement tests, and high school record) predict as well, and in the same way, for applicants from small-rural secondary schools and for applicants from large-urban schools as they do for the applicant group as a whole?

The data to accomplish this study have been drawn from the freshman classes of the University of Michigan's College of Literature, Science, and Arts for the years 1962-65. Further, the populations studied are drawn from secondary schools within the state of Michigan that are readily classified as small-rural or large-urban.

There is a primary limitation in this study design which should be clarified here. Since the University of

Michigan is quite selective in its admission process, the ability range of the students in the study is limited to the more able. However, even though the results will be strictly applicable only to the University of Michigan, it should be possible to draw some implications which may be of importance to the educational community at large.

CHAPTER II

RELATED LITERATURE

PREVIOUS REVIEWS OF THE LITERATURE

The literature contains scores of studies concerning the effect on test scores of cultural background, and many complete and adequate summaries of work done in this general area also appear in the literature.

One of the most extensive in this area was a survey prepared by Charles M. Lucas of the Educational Testing Service for the Research Committee of the College Entrance Examination Board.[1] Lucas not only reported on the general points of view regarding cultural influence on test scores and on the research and development of culture-free tests but also reported on studies of specific socioeconomic influences on tests. In particular, Lucas reported on studies of racial comparisons, occupational group comparisons, rural-urban comparisons, school comparisons, and socioeconomic class comparisons. Lucas reported that methodological shortcomings, of one type or another, as well as differing experimental designs, rendered many of the results of the studies he reviewed not strictly

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[1]Survey of the Literature Relating to the Effects of Cultural Background in Aptitude Test Scores (Princeton: Educational Testing Service, 1953).

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comparable. Notwithstanding both these difficulties and the seemingly contradictory findings of a few of the studies, he reported that the bulk of the evidence seemed to indicate that cultural background, on the average, tends to influence scores on intelligence and scholastic aptitude tests. The effect of this influence, as reflected in group tendencies, was, in many instances, shown to be quite marked and in others, practically non-existent.

A very recent, and complete, review of studies concerning test scores and cultural background was done by David E. Lavin for the Russell Sage Foundation.[2] Of special interest to this study is Lavin's review of thirteen studies which reported that socioeconomic status is positively related to academic performance. That is, the higher one's social status, the higher his level of performance. These studies, reported by Lavin, indicate that this relationship holds for all educational levels.[3] Of special interest, also, are six studies reported by Lavin whose findings contrast with the previously mentioned thirteen studies reporting a positive relationship.[4] Lavin concludes that the relationship between socioeconomic status and academic performance is positive through most of the socioeconomic status range, but at the upper levels it is inverse.[5]

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[2]The Prediction of Academic Performance (New York: The Russell Sage Foundation, 1965).

[3]Ibid., p. 125. [4]Ibid., p. 152. [5]Ibid., p. 126.

Other reviews and summaries specific to socioeconomic background have been published by Lorimer and Osburn,[6] Neff,[7] Herrick,[8] and Jones.[9]

STUDIES OF SCHOOL COMPARISONS

A number of studies have reported results of comparing test scores of groups of individuals with various types of school background. Commonly considered school characteristics are size of school, location of school in good or poor socioeconomic neighborhood, and public or private school.

The Project Talent survey indicated a very high relationship between size of high schools and whether or not they were rural or urban.[10] However, school size in itself may not necessarily be colinear with rural-urban location if one takes

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[6]F. Lorimer and F. Osborn, "Variation in Certain Intellectual Development Among Groups Classified by Occupation or Social Status," Chapter VIII of Dynamics of Population (New York: Macmillan and Company, 1934), pp. 157-176.

[7]W. S. Neff, "Socio-Economic Status and Intelligence: A Critical Survey," Psychological Bulletin, 1958, 35, 727-757.

[8]J. E. Herrick, "What Is Already Known About the Relation of the I.Q. to Cultural Background," Chapter II of Intelligence and Cultural Differences by Eells, K. et al. (Chicago: University of Chicago Press, 1957).

[9]H. E. Jones, "Environmental Influences on Mental Development," Chapter XI of Manual of Child Psychology, ed. Leonard Carmichael (New York: John Wiley and Sons, Inc., 1946), pp. 528-632.

[10]John C. Flanagan, et al., A Survey and Follow-Up Study of Educational Plans and Decisions in Relation to Aptitude Patterns: Studies of the American High School (Pittsburgh: University of Pittsburgh, 1962), pp. 2-45.

into account the occurrence of large, rural, consolidated schools and relatively small, decentralized, urban schools. For this reason studies which have separated these factors are reviewed here, but the present study has been designed to control both factors.

Feder[11] divided entering college freshmen into two groups according to size of secondary school attended. He found that students from large schools scored higher on qualifying examinations than those from small schools. In a similar study, Smith[12] divided secondary school students into groups by size of school where small schools were defined as having enrollments of less than 250 and large schools more than 250 students. It was reported that mean scores were significantly higher in mental, history, and English tests for students from the larger schools than those from smaller schools. In another study, Allison and Barnett[13] divided college students into three groups according to the size of secondary school they had attended. The groups consisted of 282 students from small high schools (enrollments less than

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[11]D. D. Feder, "Factors Which Affect Achievement and Its Prediction at the College Level," Journal of the American Association of Collegiate Registrary, 1940, 15 107-118; Educational Abstracts, 1940, 5, No. 292, 76.

[12]W. R. Smith, "Test Results Reveal Advantages of Larger Schools" (Publ. Educ. Pa., 1930, 5, No. 5, 13), Psychological Abstracts, 1930, 12, No. 2141, 234.

[13]G. Allison and A. Barnett, "Freshman Psychological Examination Scores As Related to Size of High Schools," Journal of Applied Psychology, 1940, 24, 651-652.

150), 435 students from schools of intermediate size (enrollments of 150 to 500), and 283 students from large schools (enrollments of 500 and over). There was considerable overlapping, yet differences in the mean Q (quantitative) and L (language) scores of the American Council on Education Psychological Examination were found to be statistically significant. All differences were in favor of the larger schools for all comparisons. Allison and Barnett reported a correlation of .372 between gross score and size of high school enrollment. Findings in greater detail were as follows:

High School Comparison	Critical Ratio of Q Score Differences	Critical Ratio of L Score Differences
Small and Intermediate	3.73	5.59
Small and Large	7.59	10.48
Intermediate and Large	4.40	4.97

RURAL-URBAN COMPARISONS

Many investigators have seized upon the possibility of making comparisons of mental ability between rural and urban children. The majority of these seem to show that the mental scores of urban subjects tend to be higher than those of rural subjects.

Klineberg[14] made a study of ten to twelve year old

[14]O. Klineberg, "A Study of Psychological Differences Between 'Racial' and National Groups in Europe," Archives of Psychology, 1931, No. 132.

European boys by comparing their results on a performance-type test. He found the difference between the mean of the urban sample of 300 and the rural sample of 700 to be over eight times its standard error. In terms of overlapping, only 30 per cent of the rural children reached or exceeded the median of the urban group. Koch and Simmons[15] compared the mean scores for urban and rural children between the ages of eight and fifteen years. Tested were 294 urban and 326 rural children of native American stock as well as 270 urban and 180 rural children of Mexican stock. The test administered was either the National Intelligence Test or the Detroit Intelligence Test. Results indicated a superiority in favor of the urban group to the extent shown in the following table:

Comparison	Range of Difference Between Means For Each Age Legel	Range of Critical Ratio
Urban American and Rural American	0-23	.2-5.4
Urban Mexican and Rural Mexican	17-28	3.8-10.1

Many other reports of rural-urban comparisons in mental ability have appeared in the literature. Predominant findings have been that lower scores in mental tests appear to be associated with a rural environment. Among these are studies

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[15]H. L. Koch and R. Simmons, "A Study of the Test Performance of American, Mexican, and Negro Children," Psychological Monograph, 1926, 35, No. 5.

by Pintner,[16] Pressey and Thomas,[17] Pressey,[18] and Irion and Fisher.[19] Pintner reported the median index of intelligence for 154 rural school children to be 10 per cent below the median of an urban group. Pressey and Thomas found only 27 per cent of their rural sample tested to be above the norm for urban children. In another paper, Pressey reported that only 22 per cent of 183 rural children, ages six, seven, and eight years, scored above the median for age as determined from urban children. Irion and Fisher found that the median score for their sample of 361 rural children, between the ages of ten and sixteen years, was ten points below the urban norm on the basis of the National Intelligence Test.

Fewer studies have been done on the relation of rural-urban differences on scores of tests of aptitude than on tests of intelligence. Those which have been done, however, generally show much the same relationship as those attributed to intelligence tests. Turnbull, reporting on studies at the

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[16]R. Pintner, "A Mental Survey of the School Population of a Village," School and Society, 1917, 5, 597-600.

[17]S. L. Pressey and J. B. Thomas, "A Study of Country Children in a Good and Poor Farming District by Means of A Group Scale of Intelligence," Journal of Applied Psychology, 1919, 8, 534-539.

[18]L. W. Pressey, "The Influence of Inadequate Schooling and Poor Environment Upon Results of Tests of Intelligence," Journal of Applied Psychology, 1920, 4, 91-96.

[19]T. Irion and F. C. Fisher, "Testing the Intelligence of Rural School Children," American School Master, 1921, 14, 221-223.

Educational Testing Service,[20] showed that results of a study of the first Army-Navy College Qualifying Test indicated that differences were significantly in favor of the urban sample, especially in the verbal area. Furthermore, the analysis of variance performed on this Army-Navy sample showed that differences between groups depended upon individual items rather than upon the type of test material.

In a study of students at the University of Kansas,[21] Smith found that percentile scores of the American Council on Education Psychological Examination (ACE) showed a slight tendency to decrease with distance from urban centers. Also studying results of the ACE,[22] Nelson found an urban group of 580 college entrants to be significantly higher in average total score than a rural group of 466. By contrast to these studies, Frederickson, Olsen, and Schrader studying the first semester grades at Kenyon College[23] could find no clear trend in the relationship between size of community and tendency for better achievement in college than had been indicated by other

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[20]W. W. Turnbull, "Influence of Cultural Background on Predictive Test Score," Proceedings 1949 Invitational Conference on Testing Problems (Princeton: Educational Testing Service, 1950), 29-34.

[21]M. Smith, "An Urban-Rural Intellectual Gradient," Sociological Society Research, 1943, 27, 307-315.

[22]C. W. Nelson, "Testing the Influence of Rural and Urban Environment on ACE Intelligence Test Scores," American Journal of Sociology, 1942, 7, 743-751.

[23]N. Frederickson, M. Olsen, and W. B. Schrader, Prediction of First Semester Grades at Kenyon College, 1948-1949 (Princeton: Educational Testing Service, 1950).

predictive measures.

The studies of rural-urban differences in both intelligence and scholastic aptitude yield evidence in favor of linking higher scores with urban residence. Statistically significant differences between rural and urban samples have often been reported. Overlap of some distributions has also been found. Two possible explanations for these score differences stem from a number of studies. Environmental differences may operate so as to insure superior test performance for the group which happens to be closest culturally to the population on which the test has been standardized. Secondly, selective migration may operate so that the less intelligent remain in the rural setting while the mentally superior gravitate to the cities.

One study supporting the first of these hypotheses was done by Shimberg.[24] He made an investigation into the validity of norms with reference to urban and rural groups by constructing two information tests, standardizing one on a rural group, and the other on an urban group. When both tests were administered to 4,812 rural children in grades three to twelve, and to 962 urban children in grades four to seven, the urban group was found to be one year retarded on the basis of the test standardized on the rural group and vice versa. Differences

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[24]M. Shimberg, "An Investigation into the Validity of Norms with Special Reference to Urban and Rural Groups," Archives of Psychology, 1928-29, 16, Ser. 104.

in both instances were significant to the extent that the ratios of the differences to the standard error ranged from 5.56 to 9.33.

In another study, Wheeler[25] tested 3,252 children in the Eastern Tennessee mountain area and compared the results with a similar study he had made ten years earlier. He found about the same rate of decline in I.Q. with increase in age from six to sixteen years (about two points each year). However, the 1940 mountain child was found to be mentally superior to his 1930 prototype at all ages and all grades, an average increase in I.Q. of ten points. Wheeler also noted that during the decade intervening between his two studies, there had been definite improvement in the economic, social, and educational status of this mountain area and that improved test scores are apparently associated with improvement in environmental conditions.

In support of the explanation that rural-urban differences on intelligence and aptitude tests exist because the more intelligent individuals migrate to the larger cities is a study by Gist and Clark.[26] They followed up 2,544 rural Kansas secondary school pupils thirteen years after being

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[25]L. R. Wheeler, "A Comparative Study of the Intelligence of East Tennessee Mountain Children," Journal of Educational Psychology, 1942, 33, 321-334.

[26]N. P. Gist and C. D. Clark, "Intelligence as A Selection Factor in Rural-Urban Migration," American Journal of Sociology, 1928, 40, 284-294.

tested with Terman group tests of intelligence. Of those located, roughly 38 per cent were living in urban centers and 62 per cent in rural areas. On the average, the migrants to urban centers were those who had scored higher, when tested thirteen years previously, than those who had remained in a rural environment. Also, those who had migrated to large cities surpassed those who had migrated to smaller cities. Papers by Sanford[27] and Mauldin[28] also lent support to the selective migration hypothesis.

STUDIES OF ACADEMIC PREDICTION

The literature reviewed up to this point bears directly on studies of the effect of culture on certain of the variables which are considered in predicting academic success in college. Specifically, this chapter has dealt so far with the influence of rural-urban environment and size of secondary school on tests of intelligence and scholastic aptitude. Attention will now be turned to studies which relate directly to the correlation of these factors with college grades and their bearing upon the prediction of academic success in college.

Wing and Ktsanes compared the relationship between college grades, scores on the Scholastic Aptitude Test of the

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[27]G. A. Sanford, "Selective Migration in a Rural Alabama Community," American Sociological Review, 1940, 5, 759-766.

[28]W. P. Mauldin, "Selective Migration from Small Towns," American Sociological Review, 1940, 5, 748-758.

College Entrance Examination Board, and secondary school performance measures for students from varying social-class backgrounds at Tulane University.[29] The two sets of cultural background factors were (1) father's occupation, as an indicator of social class, and (2) urban or rural home background. The results indicated that the working class and rural men do not do as well in college as can be expected on the basis of their Scholastic Aptitude Test scores and secondary school rank in class; and that the upper-class and city men do better than can be expected on the basis of their Scholastic Aptitude Test scores and secondary school rank. The authors concluded that small but consistent gains in prediction are likely to occur if cultural background factors are taken into consideration.

In direct contrast to these findings were those of Schultz earlier.[30] Schultz studied 1700 male students in seven colleges who took the Selective Service College Qualifying Test in May or June of 1951 and later took the Scholastic Aptitude Test. In comparing the regression equations for various status groups the differences were found not to be statistically significant and to be small and inconsistent.

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[29]Cliff W. Wing, Jr. and Virginia Ktsanes, The Effect of Certain Cultural Background Factors on the Prediction of Student Grades in College (New Orleans, Louisiana: Tulane University, 1960).

[30]D. G. Schultz, The Relationship Between College Grades and Aptitude Test Scores for Different Socio-economic Groups (Princeton, N.J.: Educational Testing Service, 1953).

It was concluded in this study that scholastic aptitude test scores predict grades equally well, and neither over-predict nor under-predict for all socioeconomic classes among college students, and that this equivalence was not altered after a period of attendance. In this study Schultz does admit to a very inadequate representation of the lowest socioeconomic levels.

Shaw and Brown performed a study which related college performance to the size of the town from which the students had come.[31] Using Fisher's variance ratio technique, they found that there was a significant difference in achievement as measured by college grades between groups from various size communities, with a higher comparative percentage of achievers coming from larger communities. In the same study no significant difference was found between the results of achievement tests taken by the same students. The conclusion of the Shaw-Brown study, which has relevance for this study, is the conclusion relating the results to the differing value systems of the various size communities. Although it is evident that the authors failed to explore other hypotheses, and have little evidence to support this conclusion, they do raise a question which should be explored by further research.

Washburne conducted a study on two college campuses

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[31]Merville C. Shaw and Donald J. Brown, "Scholastic Underachievement of Bright College Students," Personnel and Guidance Journal, 1957, 36, 195-199.

which attempted to relate socioeconomic factors, including urbanism, to college performance.[32] Although the results are clouded by quite different results from the two campuses, one in the southwest and one in the northeast, it was concluded by the study that correlation between the degree of urbanism and college performance was positive on the lower end of the urban scale but very low on the upper end. They set a lower limit of 500,000--the population of metropolitan areas, as the point at which the heterogeneity of students made them indistinguishable in regard to college performance. In contrast again, another study found that while urban students are higher in aptitude than rural students, they were no different in academic performance.[33] However, as the authors explain, the rural students tended to be registered in colleges of agriculture, and urban students in business or arts and sciences colleges; consequently, it is difficult to interpret the results of this study because the criterion is not the same.

It is difficult to find studies which adequately separate the variable urbanism (or ruralism) from that of school size. The suggestion coming from most studies is that if school size does have a relationship to college performance,

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[32]Norman F. Washburne, "Socio-economic Status, Urbanism and Academic Performance in College," Journal of Educational Research, 1959, 53, 130-137.

[33]William B. Sanders, R. Travis Osborne, and Joel E. Greene, "Intelligence and Academic Performance of College Students of Urban, Rural, and Mixed Backgrounds," Journal of Educational Research, 1955, 49, 185-193.

it is likely a result of differences in facilities, teacher competance, and the like. Small high schools are probably found more frequently in rural areas and their facilities and teacher salaries are likely to be inferior. Two studies examine the relation between size of secondary school and academic performance in college and find opposite results. Altman, studying this question at Central Michigan College, reports no significant difference in the performance in college for students from varying size secondary school classes.[34] Hoyt, on the other hand, in a rather thorough study of 884 freshman students at Kansas State University, found that when ability is held constant a given secondary school rank will tend to over-predict the achievement of the student from the small secondary school and under-predict the achievement of the student from the larger school.[35]

SUMMARY

Individuals who attend larger secondary schools and schools located in higher socioeconomic areas, as compared with those who attend smaller secondary schools and schools in communities of lower social status have been found to score

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[34]Esther R. Altman, "The Effect of Rank in Class and Size of High School on the Academic Achievement of Central Michigan College Seniors, Class of 1957," Journal of Educational Research, 1959, 52, 307-309.

[35]Donald P. Hoyt, "Size of High School and College Grades," Personnel and Guidance Journal, 1959, 37, 569-573.

higher on intelligence tests. Overlapping of score distributions seems to be consistently present. Factors other than size, location, and type of school very likely operate. Among these are socioeconomic factors and factors related to selection and motivation.

Studies of rural-urban differences in intelligence and scholastic aptitude yield evidence in favor of linking higher scores with urban residence. Statistically significant differences between rural and urban samples have often been reported. Overlap of score distributions has also been found. Two possible explanations for these score differences stem from a number of studies. On the one hand, environmental differences may operate to insure superior test performance for the group which happens to be closest culturally to the population on which the test has been standardized. Secondly, selective migration may operate so that the less intelligent remain in the rural setting while the mentally superior gravitate to the cities.

Studies relating rural-urban backgrounds and size of secondary school class to the prediction of academic performance in college are contradictory and inconclusive. It seems apparent that the inability to separate the many factors related to the general term "socioeconomic status" may be a contributing factor in the contradictory results of studies. Where secondary school size has been studied, it is not clear to what extent the influence of such factors as the quality of

the schools or the native ability of the populations has been controlled. Similarly, rural-urban findings are ambiguous. A number of factors, either singly or in combination, could account for the results. As in studies of school size, such things as intelligence, social-class levels, and quality of schools may or may not be operating. At present, the research findings do not allow an assessment of the possibilities.

CHAPTER III

SOURCE AND CLASSIFICATION OF DATA

SOURCE OF DATA

Several factors had a direct bearing on the source of the data. Since the primary objective of the study was to compare the effect of rural versus urban backgrounds on the ability of the Scholastic Aptitude Test of the College Entrance Examination Board to predict academic success, it was necessary to locate a college or university where the Scholastic Aptitude Test is required of all applicants and where both rural and urban sub-populations could be clearly identified. The University of Michigan was chosen for this purpose since they have required the Scholastic Aptitude Test as part of the admissions credentials since 1962. The availability of a number of classes with test data proved helpful since the percentage of applicants from rural secondary schools is comparatively small and it was necessary to combine several classes to obtain a sufficient sample size.

THE SCHOLASTIC APTITUDE TEST

The Scholastic Aptitude Test (which shall hereafter be referred to as the SAT) offered by the College Entrance Examination Board and administered by Educational Testing Service, is

a three-hour objective test of verbal and mathematical skills. The verbal sections are designed to measure ability to understand the relationships among words and ideas and reading comprehension. This portion has separately timed sections such as sentence completion, reading comprehension, analogies, and antonyms arranged in approximate order of difficulty. The mathematical section is designed to measure abilities closely related to college-level work in the liberal arts and engineering by getting answers to such basic questions as: (1) How well has the testee mastered elementary mathematics? (2) How well can he apply what is already known to new situations? and (3) How can he use what is known in insightful and non-routine ways of thinking?[1]

Scores on the SAT and on the College Board's Achievement Tests are reported on a scale ranging from 200 to 800. The reference group was all twelfth grade students who took the tests in April, 1941. The mean standard rating for the fixed reference group was set at 500 and the standard deviation of the ratings at 100.[2] Standard errors of measurement and reliability coefficients for the SAT and Achievement Tests may be found in Table 1.

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[1]For a full description of the Scholastic Aptitude Test the reader is referred to A Description of the Scholastic Aptitude Test, prepared and produced annually for the College Entrance Examination Board by Educational Testing Service, Princeton, New Jersey.

[2]Henry S. Dyer and Richard G. King, College Board Scores: Their Use and Interpretation (Princeton: Educational Testing Service, 1955), pp. 101, 102.

TABLE 1.--Standard errors of measurement and reliability coefficients for the College Entrance Examination Board Scholastic Aptitude Test and Achievement Tests[3]

Test	S.E.[a]	r
Scholastic Aptitude Test-Verbal	32	.90
Scholastic Aptitude Test-Mathematical	34	.88
American History and Social Studies	31	.90
Biology	35	.88
Chemistry	30	.91
English Composition	37	.87
European History and World Cultures	31	.90
French	26	.93
German	20	.96
Hebrew	21	.96
Latin	34	.89
Mathematics Level I (Standard)	36	.87
Mathematics Level II (Intensive)	32	.90
Physics	30	.91
Russian	23	.95
Spanish	28	.92

[a]The Standard Errors of Measurement for all tests are computed from the application of Kuder-Richardson Formula 20.

The validity of the Scholastic Aptitude Test as a predictor of college grades has been studied frequently in many colleges. John Howell prepared a compendium of validity study results for the College Entrance Examination Board showing a wide range of validity coefficients.[4] Howell's results are summarized in Tables 2 and 3.

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[3]College Board Score Reports: A Guide for Counselors and Admissions Officers (Princeton: Educational Testing Service, 1965), p. 46.

[4]John Howell, A Compendium of College Board Validity Study Results, 1958-1964, an unpublished report to the College Entrance Examination Board, 1965.

TABLE 2.--Frequency distributions of zero-order correlations of HSR (or HSA), SAT-V, and SAT-M with Freshman grade point average (semester or year) for 271 groups in four-year and two-year colleges, exclusive of Engineering groups[b]

Zero-order Correlations	HSR (or HSA)				SAT-V				SAT-M			
	M	W	M&W[a]	T[a]	M	W	M&W[a]	T[a]	M	W	M&W[a]	T[a]
.80-.84												
.75-.79												
.70-.74	1	4	3	8								
.65-.69	2	9	8	19		3		3				
.60-.64	7	21	5	33	1	6	1	8		3	1	4
.55-.59	19	20	6	45	1	14	4	19		12	-	12
.50-.54	16	11	11	38	3	20	4	27	8	13	2	23
.45-.49	20	14	2	36	11	13	10	34	8	18	1	27
.40-.44	16	17	9	42	15	11	10	36	15	14	10	39
.35-.39	14	10	6	30	17	10	13	40	21	13	9	43
.30-.34	3	3	4	10	23	13	4	40	18	8	15	41
.25-.29	3	2	1	6	13	13	6	32	13	10	6	29
.20-.24	1	2		3	6	8	3	17	10	12	4	26
.15-.19		1		1	10	2		12	5	5	6	16
.10-.14					2	1		3	3	5	1	9
.05-.09									1	-		1
.00-.04										1		1
Total	102	114	55	271	102	114	55	271	102	114	55	271
Median	.48	.53	.52	.50	.34	.44	.40	.38	.35	.41	.33	.36

[a]Exclusive of groups that overlap separate sex groups.

[b]From John Howell, A Compendium of College Board Validity Study Results, 1958-1964, an unpublished report to the College Entrance Examination Board, 1965.

TABLE 3.--Frequency Distributions of zero-order correlations of HSR (or HSA), SAT-V, SAT-M with Freshman grade point average (semester or year) for 63 Liberal Arts groups, Classified According to Sex[b]

Zero-order Correlations	HSR (or HSA)				SAT-V				SAT-M			
	M	W	M&W[a]	T[a]	M	W	M&W[a]	T[a]	M	W	M&W[a]	T[a]
.80-.84												
.75-.79												
.70-.74	1	2		3								
.65-.69	1	-	3	4								
.60-.64	1	1	1	3	1			1				
.55-.59	1	3	2	6	-		2	2		1		1
.50-.54	2	1	2	5	1	4	3	8	1	3		4
.45-.49	3	3	1	7	2	3	1	6	3	3		6
.40-.44	6	11	1	18	-	1	-	1	1	1	1	3
.35-.39	4	6	2	12	4	5	2	11	1	4	3	8
.30-.34	-	2		2	5	4	1	10	3	1	3	7
.25-.29	-	-		-	3	7	2	12	5	4	2	11
.20-.24	1	2		3	2	4	1	7	4	7	2	13
.15-.19					2	2		4	1	2	1	4
.10-.14						1		1	-	4		4
.05-.09									1	-		1
.00-.04										1		1
Total	20	31	12	63	20	31	12	63	20	31	12	63
Median	.43	.42	.54	.43	.32	.31	.42	.33	.28	.26	.31	.28

[a]Exclusive of groups that overlap separate sex groups.

[b]From John Howell, A Compendium of College Board Validity Study Results, 1958-1964, an unpublished report to the College Entrance Examination Board, 1965.

It is clear that over-all, the SAT-Verbal is a better predictor of first year college grades in general than is the SAT-Mathematical. It is obvious that SAT-M cannot be neglected, however, since when appropriately combined with the SAT-V it improves the prediction based on either one alone. Tables 4 and 5 clearly show the gains in correlation which can be made when the Scholastic Aptitude Test is combined with the high school record.

TABLE 4.--Multiple correlation of HSR (or HSA) and SAT with Freshman grade point average (semester or year) for 231 groups in four-year and two-year colleges, exclusive of engineering groups[a]

Multiple Correlations	Men	Women	Both Sexes Combined	Total
.80-.84		1		1
.75-.79	2	10	4	16
.70-.74	6	25	6	37
.65-.69	9	20	6	35
.60-.64	14	12	3	29
.55-.59	29	8	8	45
.50-.54	16	9	7	32
.45-.49	6	8	3	17
.40-.44	7	4	3	14
.35-.39	2	1	1	4
.30-.34		1		1
.25-.29				
.20-.24				
.15-.19				
.10-.14				
.05-.09				
.00-.04				
Total	91	99	41	231
Median	.57	.66	.59	.60

[a]From John Howell, A Compendium of College Board Validity Study Results, 1958-1964, an unpublished report to the College Entrance Examination Board, 1965.

TABLE 5.--Multiple correlation of HSR (or HSA) and SAT with Freshman grade point average (semester or year) for 41 Liberal Arts groups, classified according to sex[a]

Multiple Correlation	Men	Women	Both Sexes Combined	Total
.80-.84				
.75-.79	1	1		2
.70-.74	2	1	3	6
.65-.69	-	2	4	6
.60-.64	-	3	2	5
.55-.59	2	4	1	7
.50-.54	3	11	1	5
.45-.49	1	4	-	5
.40-.44	2	1	2	5
.35-.39				
.30-.34				
.25-.29				
.20-.24				
.15-.19				
.10-.14				
.05-.09				
.00-.04				
Total	11	17	13	41
Median	.54	.58	.65	.58

[a]From John Howell, A Compendium of College Board Validity Study Results, 1958-1964, an unpublished report to the College Entrance Examination Board, 1965.

THE ACHIEVEMENT TESTS

Educational Testing Service prepares and administers for the College Entrance Examination Board one-hour objective tests in the following subjects:

American History and Social Studies
Biology
Chemistry
English Composition
European History and World Cultures
French
German
Hebrew
Latin
Mathematics, Level I (Standard)
Mathematics, Level II (Intensive)
Physics
Russian
Spanish

These tests are designed to measure not only a student's knowledge of the facts about a subject, but also his ability to reason with facts in order to solve problems appropriate to the subject.

On application to the University of Michigan's College of Arts and Sciences, a person is required to submit the results of three achievement tests. One of these must be the English Composition Test and the other two may be of his choosing.

The English Composition Test is composed of three parts. One part is a free-response exercise while the other two are composed of multiple-choice questions. The multiple-choice questions examine skill in three aspects of writing: expressing ideas correctly and effectively, organizing ideas logically, and using language with sensitivity to appropriate tone and meaning. The free-response exercises are either essay or interlinear. The essay offers the testee an opportunity to provide both the idea and the clear expression of it; the interlinear provides the idea but asks the test-taker to improve the way in which the idea has been expressed.[5]

Like the Scholastic Aptitude Test, the Achievement Tests are reported on a scale of 200-800. The reference group is the

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[5]For a full description of the Achievement Tests the reader is referred to A Description of the College Board Achievement Tests, prepared and published annually for the College Entrance Examination Board by Educational Testing Service, Princeton, New Jersey.

same as for the SAT.[6] Table 1 lists the standard errors of measurement and the reliability coefficients for the various Achievement Tests.

Since the University of Michigan requires all applicants to submit the results of the English Composition Test, as one of three achievement tests required, and allows the applicant a choice of the remaining two, this study treats the English Composition Test as one distinct variable and the average of the remaining achievement tests as another distinct variable.

THE SECONDARY SCHOOL RECORD

There are various ways of reporting the secondary school record and including it as a predictor in multiple regression equations to predict college grades. These include a grade point average based on all subjects taken in secondary school, a grade point average based on so-called "academic" subjects, a rank-in-class presented as a percentile or, sometimes, converted to an adjusted-rank based on the size of the class. The latter method, obtained by the formula $C.R. = \frac{A.R.-.5}{N}$ where C.R. equals converted rank, A.R. equals actual rank and N equals the size of the graduating class, takes into account the difficulty of ranking near the top in large classes where ability is normally distributed.

The data used in this study presents the secondary

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[6]Dyer, loc. cit.

school record as a straight percentile obtained by dividing the position in the class ranking by the total number of students in the graduating class.

THE COLLEGE GRADE-POINT AVERAGE

As a criterion the cumulative freshman grade point average was used.[7] This average was obtained by dividing the total number of honor points earned by the total number of credits earned. The University of Michigan's honor point scale is as follows: A - 4, B - 3, C - 2, D - 1, E - 0.

CLASSIFICATION OF DATA

Large-Urban -- Small-Rural Classification

If the results of a study of this sort are to be useful on application to future secondary school graduates the subpopulations must be clearly identified. It is not possible to do this by application of the sociological terms "rural" and "urban." Historically the term "rural" has applied to areas devoted to agriculture. Associated with the term has been the one-room elementary school and the small consolidated secondary school. Modern times and the ease of mobility, however, have fused the rural and urban areas. A person may live on a "farm" but still work in, and be a part of, an urban social life. Consolidation has sometimes resulted in the

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[7]This is true except for nineteen students in the small-rural group for whom only first semester averages were available.

creation of schools of such size and with such facilities that the educational program could be far superior to those in some urban areas. On the other hand, in large cities there is frequently a wide range of kinds and quality of schools to be found within single systems, all technically urban schools if one were to depend on this simple dichotomous classification.

For purposes of this study it was decided to classify the groups to be studied into "small-rural" and "large-urban" groups which were operationally defined as follows. The "small-rural" group (see Appendix A) includes all students from schools in Michigan north of the southern boundaries of Oceana, Newaygo, Mecosta, Isabella, Gladwin, Ogemaw, and Iosco counties which had graduating classes of less than 100 students. The "large-urban" group (see Appendix B) was drawn from communities south of the previously mentioned border in cities over 15,000 in population where all students in the community attend one or more secondary schools of heterogeneous population and with graduating classes greater than 100 students. In this latter group, large school systems where schools exist with extremely high or low percentages of students attending college were eliminated.

The effect of drawing the two groups from the northern and southern sections of the state was to place in the small-rural group schools located in areas traditionally devoted to farming, lumbering, hunting, and fishing, and similar pursuits

depending primarily on the natural resources of the land. Southern Michigan, on the other hand, is highly industrialized being the center of the nation's auto industry and supporting services.

The Control Group

In order to provide a reference group against which to compare the experimental groups, a sample made up of every sixth individual in the 1964-65 freshman class of the College of Literature, Science, and Arts of the University of Michigan was drawn.

CHAPTER IV

ANALYSIS AND INTERPRETATION OF THE DATA

SUMMARY OF THE DATA

A complete summary of the data for this study will be found in Appendix C. For each variable the distribution is presented indicating the number in each interval and the per cent below that interval. Presented there, also, are the means and standard deviations for each variable in each group. For easier reference, a summary is presented here in Table 6.

DIFFERENCES IN MEANS

Although the primary concern of this study is with the comparison of correlations of the various predictors with the criterion, it seems important as background to the problem that the differences between the variable means for the Rural, Urban, and Control groups be analyzed. Accordingly, an analysis of variance was carried out for the three groups for each variable in the study. Although the results may be found in the separate analysis of variance summary tables in Appendix D, they are summarized here in Table 7.

It can be seen, from Table 7, that the differences between means, on an over-all test of significance, are significant at the 5 per cent level for all variables.

TABLE 6.--Summary of sample sizes, means, and standard deviations for Rural, Urban, and Control groups for all variables

VARIABLE	STATISTIC	RURAL	URBAN	CONTROL
SAT-VERBAL	Total N	101	256	495
	Mean	537	568	568
	S. D.	87	88	87
SAT-MATH	Total N	101	256	495
	Mean	555	598	602
	S. D.	91	94	97
PRCTL RANK	Total N	101	256	496
	Mean	92.61	92.23	89.72
	S. D.	6.73	6.85	9.26
ENG. COMP TEST	Total N	86	230	418
	Mean	531	558	563
	S. D.	78	89	92
ACH. TEST AVG.	Total N	94	237	448
	Mean	534	567	573
	S. D.	65	77	77
FR. G.P.A.	Total N	100	256	402
	Mean	2.17	2.47	2.47
	S. D.	.74	.65	.74

TABLE 7.--F ratios resulting from analysis of variance between Rural, Urban, and Control groups

Variable	F[a]
Percentile Rank	10.36
SAT-Verbal	5.91
SAT-Mathematical	8.81
English Composition Test	4.52
Achievement Test Average	10.04
Freshman Grade-Point Average	7.91

[a] $F_{.95} = 3.00$

In order to further analyze the differences between means, to see more exactly where the significant differences are, an analysis was made between pairs of groups on each variable using the Newman-Keuls procedure for making A Posteriori tests of significance making use of the studentized range statistic.[1] The results of these tests are summarized in Table 8.

All of the variables except Secondary School Percentile Rank fall into the same pattern. There are significant differences in the means at the 5 per cent level between the Rural and the Urban groups, and between the Rural and Control groups, for all variables except Secondary School Percentile Rank. Furthermore, these differences are all in the same direction, i.e., the Rural group has the lowest mean and the Control group has the highest.[2]

The exception to this pattern is on the variable Secondary School Percentile Rank where almost the exact opposite set of relationships prevail. Here the mean rank for the Control group is lowest and the mean rank for the Rural group is highest of the three groups compared. The difference between the Rural group and the Control group, and between the Urban group and Control group, are both significant at the 5 per cent level.

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[1]B. J. Winer, Statistical Principles in Experimental Design (New York: McGraw-Hill, 1962), pp. 77ff.

[2]The one exception is on Freshman Grade-Point Average where the means for the Urban and Control groups are equal.

TABLE 8.—Results of the Newman-Keuls tests of significance for pairs of variables from Rural, Urban, and Control groups

Variable	Means			Differences			$\sqrt{ms_w/\tilde{n}} \cdot q_{.95(r,N-2)}$		
	R	U	C	U - R	C - R	C - U	q_{RU}	q_{RC}	q_{UC}
SAT-Verbal	537	568	569	31*	32*	1	16.59	19.82	19.82
SAT-Mathematical	555	598	602	43*	47*	4	19.27	23.01	23.01
Percentile Rank	92.61	92.23	89.72	-0.38	-2.89*	-2.51*	2.01	2.01	1.68
Eng. Comp. Test	531	558	563	27*	32*	5	19.47	23.26	23.26
Ach. Test Average	534	567	573	33*	39*	6	14.93	17.88	17.88
Freshman G.P.A.	2.17	2.47	2.47	0.30*	0.30*	0	0.14	0.17	0.17

*Significant at the 5 per cent level

The difference in means between the Rural group and the Urban group for Secondary School Percentile Rank are not significant at the 5 per cent level.

Since the standard analysis of variance technique depends to some extent on the assumption that samples are normally distributed and because it is obvious from inspection of the data that the Secondary School Percentile Rank does not fit this condition, a further test of the differences in means of this variable, which does not depend on this assumption, was carried out. This non-parametric, or distribution-free, comparison test is a simplification of the Rank test. It is arrived at by merely classifying all scores as being above, or not above, the median of the combined samples.[3] A contingency table is then set up and a chi-square computed. In this case chi-square for the Rural-Control comparison is 7.132 and for the Urban-Control comparison 4.786. Both of these results are significant at the 5 per cent level. This non-parametric test, therefore, bears out the results of the somewhat questionable analysis of variance that the difference in means between the Rural and Control groups and between the Urban and Control groups are significant at the 5 per cent level.

DIFFERENCES IN CORRELATIONS OF PREDICTOR VARIABLES WITH THE CRITERION

Of primary concern in this study is the degree to which

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[3]Helen M. Walker and Joseph Lev, Statistical Inference (New York: Henry Holt & Co., 1953), p. 435.

each of the predictor variables tends to agree with the criterion of Freshman Grade-Point Average and the relationship of these correlations between groups.

It can be seen, from Table 9, that these zero-order correlations range from .191, the correlation for Secondary School Percentile Rank in the Rural group, to .540, the correlation of the Achievement Test Average in the Urban group. It should be noted here that, contrary to the order of the values of the means of the variables, the correlations, in every instance except the SAT-Mathematical, found the Urban group with the highest values and the Rural group, again with the exception of SAT-Mathematical, with the lowest values. In the case of SAT-Mathematical, the correlation for the Rural group was .337, for the Urban group .305, and for the Control group .272.

TABLE 9.—Correlation of SAT-V, SAT-M, Secondary School Percentile Rank, English Composition Test, and Achievement Test Average, with Freshman Grade-Point Average for Rural, Urban, and Control groups

Predictor	Rural	Urban	Control
SAT-Verbal	.296	.439	.402
SAT-Math.	.337	.305	.272
Percentile Rank	.191	.441	.320
Eng. Comp. Test	.319	.448	.409
Ach. Test. Avg.	.390	.540	.484

The question next becomes one of considering whether or not these correlations are enough different that the groups can be considered to have come from different populations in

regard to that particular variable. To test for this difference in correlation the statistic $Z = Z_{r_1} - Z_{r_2} \Big/ \sqrt{\frac{1}{N_1-3} - \frac{1}{N_2-3}}$ is used. This variable, introduced by R. A. Fisher, is normally distributed and, hence, its significance may be determined by reference to the normal probability curve at Z = .95.[4] The results of these tests are given in Table 10.

TABLE 10.—Tests of significance between pairs of zero-order correlations of predictor variables with Freshman Grade-Point Average for Rural (r), Urban (u), and Control (c) groups

Variable	Z(r,c)	Z(u,c)	Z(r,u)
SAT-Verbal	1.07	0.58	1.37
SAT-Mathematical	0.59	0.30	0.27
Percentile Rank	1.26	1.82*	2.36*
Eng. Comp. Test	0.96	0.48	1.22
Ach. Test Avg.	0.99	0.94	1.54

$Z_{.95} = 1.645$

*Significant at 5 per cent level

It can be seen that the only significant differences in correlation are between the variable Secondary School Percentile Rank and Freshman Grade-Point Average of the Urban-Control comparison and of the Rural-Urban comparison.

Since the only variable which shows significant differences in either means or correlation with Freshman Grade-Point Average is the Secondary School Percentile Rank, it may be of

[4] Ibid., p. 256.

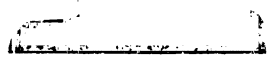
interest to summarize those relationships. This is done in Table 11.

TABLE 11.--Comparisons of Means and Correlations with Freshman Grade-Point Average for Secondary School Percentile Rank for Rural (r), Urban (u), and Control (c) groups

Statistic	r vs c	u vs c	r vs u
Mean	**	**	---
Correlation	---	**	**

**Significant at the 5 per cent level

The reader is cautioned, at this point, about the degree of confidence which may be placed in the conclusions regarding the Secondary School Percentile Rank. It will be remembered that the distribution of this variable is very skewed toward the upper end of the rankings. Even though the means have been compared by the use of a non-parametric test, it is still quite conceivable that this non-normality is causing the differences on this variable to appear greater than, in fact, they really are. There is still another cause for concern in this regard. Since relatively small numbers of students apply to the University of Michigan from the kind of schools which have been described as small-rural, the differences may be due, in part at least, to the differences in sampling between the various groups in the study.



DIFFERENCES IN STANDARD ERRORS OF ESTIMATE OF VARIABLES

The standard errors of estimate for predicting the criterion Freshman Grade-Point Average for each of the variables are given in Table 12.

TABLE 12.--Standard Errors of Estimate for predicting Freshman Grade-Point Average by SAT-V, SAT-M, Secondary School Percentile Rank, English Composition Test, and Achievement Test Average for Rural, Urban, and Control groups

Predictor	Rural	Urban	Control
SAT-Verbal	.705	.583	.693
SAT-Math.	.695	.618	.728
Percentile Rank	.724	.582	.717
Eng. Comp. Test	.699	.580	.691
Ach. Test Avg.	.679	.546-	.662

It is of interest at this point in the interpretation of the data to determine if these differences between groups are greater, as a whole, to an extent which cannot be attributable to chance. A method, proposed by Gulliksen and Wilks, was used to test for the significance of these differences.[5] To accomplish this test a pooled error of estimate ($S.E._{ij}$) is obtained and the absolute value of the statistic G_A is obtained by the formula $G_A = N_{ij} \log_e (S.E._{ij}) - N_i \log_e (S.E._i) - N_j \log_e (S.E._j)$. This statistic is distributed as Chi-square with one degree of freedom. The results are shown

[5]H. Gulliksen and S. S. Wilks, "Regression Tests for Several Samples," Psychometrica, 1950, 15, 91-114.

in Table 13.

TABLE 13.--Results of the Gulliksen Test for Differences in Standard Errors of Estimate between the predictor variables and criterion for Rural and Control comparisons and Urban Control comparisons

Variable	R vs. C	U vs. C
SAT-Verbal	0.02365	2.46891
SAT-Mathematical	0.09124	2.21241
Percentile Rank	0.02124	3.53904
Eng. Comp. Test	0.25906	2.62996
Ach. Test Avg.	0.06600	2.96200

Since Chi-square for one degree of freedom is 3.8 at the 5 per cent level of confidence, it is obvious that none of these differences is significant.

COMPARISON OF THE MULTIPLE REGRESSION PREDICTION EQUATIONS

The next step in the interpretation of the data presented is to look closely at the differences in prediction of the Freshman Grade-Point Average resulting when all or part of the predictor variables are used in a standard multiple regression equation. These step-wise regression equations are presented in Table 14.

The multiple correlations are first tested with the F ratio statistic, $F = R^2 (N-M-1) / M (1-R^2)$, where N is the total number of cases and M the number of variables. The results are F(rural) = 11.032, F(urban) = 11.667, and F(control) = 38.365. Since $F_{.95} = 2.30$, all of these results are

TABLE 14.--Step-wise regression constants and coefficients and the resulting Multiple Correlations and the Standard Errors of Estimate of the best-weighted combinations of predictors with the Criterion for Rural, Urban, and Control groups

Group	Constant	Rank	SAT-V	SAT-M	Eng. Comp.	Ach. Avg.	R	S.E.
Rural	0.19126	0.02163					.191	.72
	-0.64863	0.01699	0.00238				.331	.70
	-0.88914	0.01177	0.00169	0.00198			.399	.68
	-1.19280	0.01176	0.00076	0.00181	0.00169		.422	.67
	-1.40440	0.01189	0.00039	0.00127	0.00094	0.00207	.435	.66
Urban	-1.40603	0.04218					.441	.58
	-1.96297	0.03276	0.00252				.548	.54
	-2.01639	0.03179	0.00233	0.00042			.551	.54
	-1.91954	0.02849	0.00166	0.00037	0.00111		.561	.54
	-1.85921	0.02511	0.00115	-0.00059	-0.00069	0.00374	.597	.52
Control	0.08340	0.02669					.320	.72
	-1.16640	0.02083	0.00313				.471	.67
	-1.35157	0.01997	0.00279	0.00076			.479	.66
	-1.37364	0.01764	0.00179	0.00066	0.00153		.498	.66
	-1.62692	0.01707	0.00125	-0.00021	-0.00026	0.00376	.532	.64

significant, and we can reject the hypothesis that the multiple correlations of the entire population from which each of these samples is drawn is equal to zero.

In order to make some judgment about the comparability of the results obtained when predicting Freshman Grade-Point Average using separate regression equations for the various groups, a method proposed by Gulliksen and Wilks was followed.[6] The method considers tests for three hypotheses regarding the populations from which the different groups are drawn: (a) H_A, the hypothesis that all standard errors of estimate are equal; (b) H_B, the hypothesis that all regression lines are parallel, (assuming H_A), and (c) H_C, the hypothesis that the regression lines are identical, (assuming H_B).

Since the variables used in the selection of students at the University of Michigan are Secondary School Rank, SAT-V and SAT-M, because the Gulliksen-Wilks procedure is computationally laborious, and since including the English Composition Test and the Achievement Average would add very little to understanding of the relative usefulness of these prediction equations, it was decided to restrict the comparisons to those multiple regression equations which included only the variables Secondary School Rank and SAT scores.

In comparing both the Urban-Control groups and the Rural-Control groups, it was found that the standard errors of estimate do not differ significantly at the 5 per cent

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[6] Ibid.

level of confidence. For the Urban-Control comparison the test statistic $G_A = 3.132$ and for the Rural-Control comparison $G_A = 0.04$, Chi-square for one degree of freedom is 3.8.

Moving on to test H_B, significant differences are found indicating that it must be considered that the regression lines are not parallel. This also curtails the Gulliksen-Wilks test of comparison since it is obvious that H_C, the hypothesis that the regression lines are identical, is false.

Since it appears obvious at this point that the variable Secondary School Percentile Rank is the primary force acting on the prediction equations to cause them to be different, and because all other variables vary in the same direction and to a comparable degree for the three groups being studied, it seems reasonable to look at the regression equations for predicting Freshman Grade-Point Average based on Secondary School Percentile Rank alone. These equations are depicted in Figure 1.

It seems plausible to assume that multiple regression equations based on all variables, or on some combination of the other variables with Secondary School Rank, would have the same configuration as the lines of Figure 1. As a check on this assumption, a sampling of Predicted Freshman Grade-Point Averages was computed. These predicted grades were based on the regression equations using the Secondary School Percentile Rank and SAT-Verbal. (See Table 14.) The results of these computations are to be found in Table 15.

TABLE 15.--Predicted Freshman Grade-Point Averages using regression equations with variables SAT-V and Secondary School Percentile Rank for Rural, Urban, and Control groups and differences between the Control group and Rural and Urban groups

		PREDICTED FRESHMAN G.P.A.			DIFFERENCES	
RANK	SAT-V	Rural	Urban	Control	C-R	C-U
60	500	1,561	1,263	1.648	.087	.385
	550	1.681	1.389	1.805	.124	.416
	600	1.799	1.515	1.961	.162	.446
	650	1.918	1.641	2.118	.200	.477
	700	2.037	1.767	2.274	.237	.507
	750	2.156	1.803	2.431	.275	.538
70	500	1.731	1.591	1.856	.125	.265
	550	1.851	1.717	2.013	.162	.296
	600	1.969	1.843	2.169	.200	.326
	650	2.088	1.969	2.326	.238	.357
	700	2.207	2.095	2.482	.275	.387
	750	2.326	2.221	2.639	.313	.418
80	500	1.001	1.919	2.064	.163	.145
	550	2.021	2.045	2.221	.200	.176
	600	2.139	2.178	2.377	.238	.199
	650	2.258	2.297	2.534	.276	.237
	700	2.377	2.423	2.690	.313	.267
	750	2.496	2.549	2.847	.351	.298
90	500	2.071	2.247	2.272	.201	.025
	550	2.191	2.373	2.429	.238	.056
	600	2.309	2.506	2.585	.276	.079
	650	2.428	2.625	2.742	.314	.117
	700	2.547	2.751	2.898	.351	.147
	750	2.666	2.877	3.055	.389	.178
100	500	2.241	2.575	2.480	.239	-.095
	550	2.361	2.701	2.637	.276	-.064
	600	2.479	2.834	2.793	.314	-.041
	650	2.598	2.953	2.950	.352	-.003
	700	2.717	3.079	3.106	.389	.027
	750	2.836	3.205	3.263	.427	.058

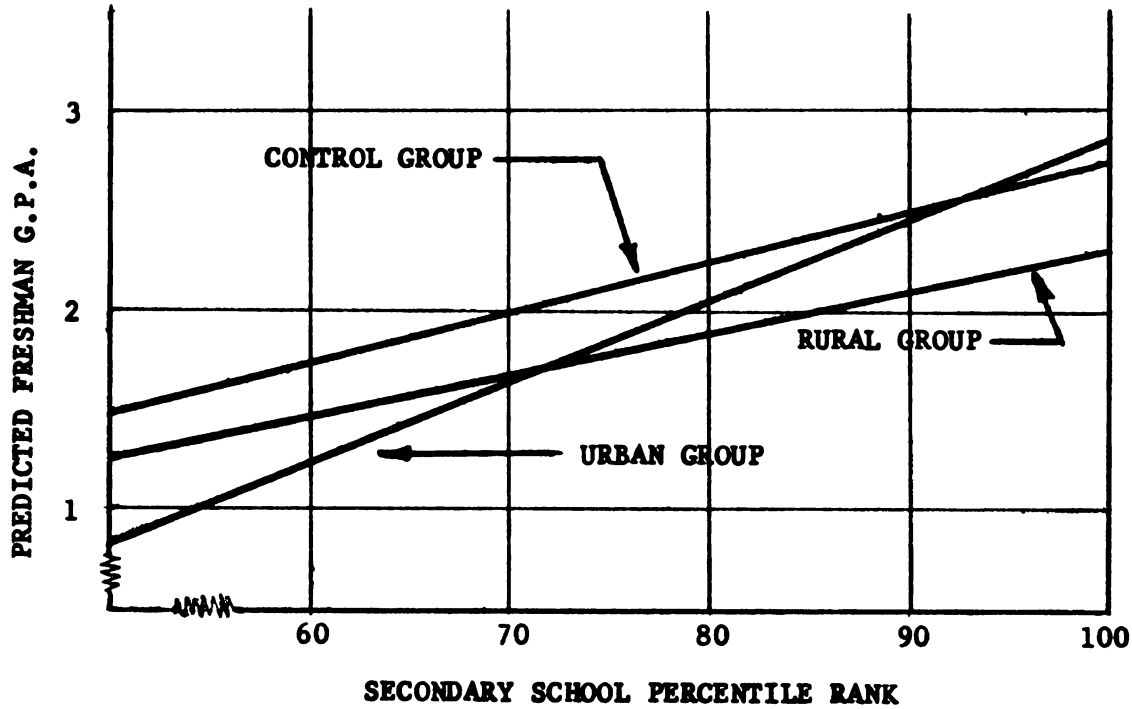

FIGURE 1.--Comparison of the regression equations for predicting the Freshman Grade-Point Average from the Secondary School Percentile Rank for Rural, Urban, and Control groups

For further clarification of the relationship of the regression lines representing each of the study groups, these lines have been presented graphically for SAT-V scores of 500 and 750 in Figures 2 and 3.

It becomes clear from Table 15 and Figures 2 and 3 that if a single prediction equation (the Control group) is used to determine the eligibility for admission of all students, the academic average for rural students of the type included in this study will be over-predicted. The amount of this over-prediction is minimized somewhat by the addition of the variable SAT-V to the Secondary School Percentile Rank, but the difference is still substantial. Table 15 indicates that this

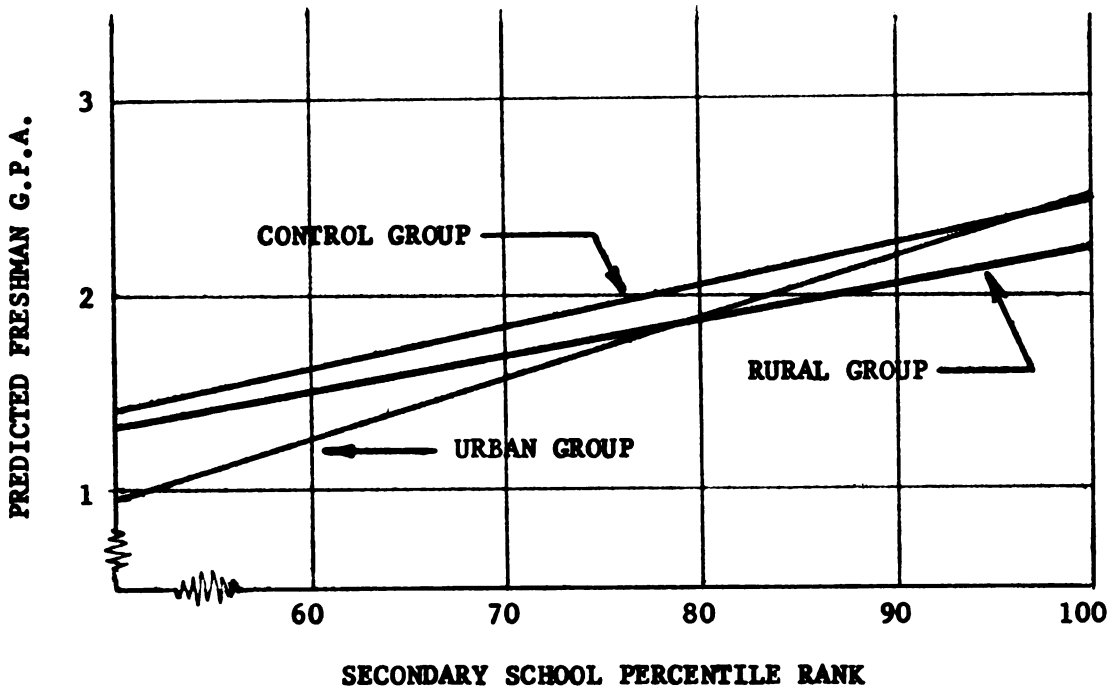

FIGURE 2.--Comparison of the regression equations for predicting the Freshman Grade-Point Average from the Secondary School Percentile Rank when the SAT-V equals 500 for Rural, Urban, and Control groups

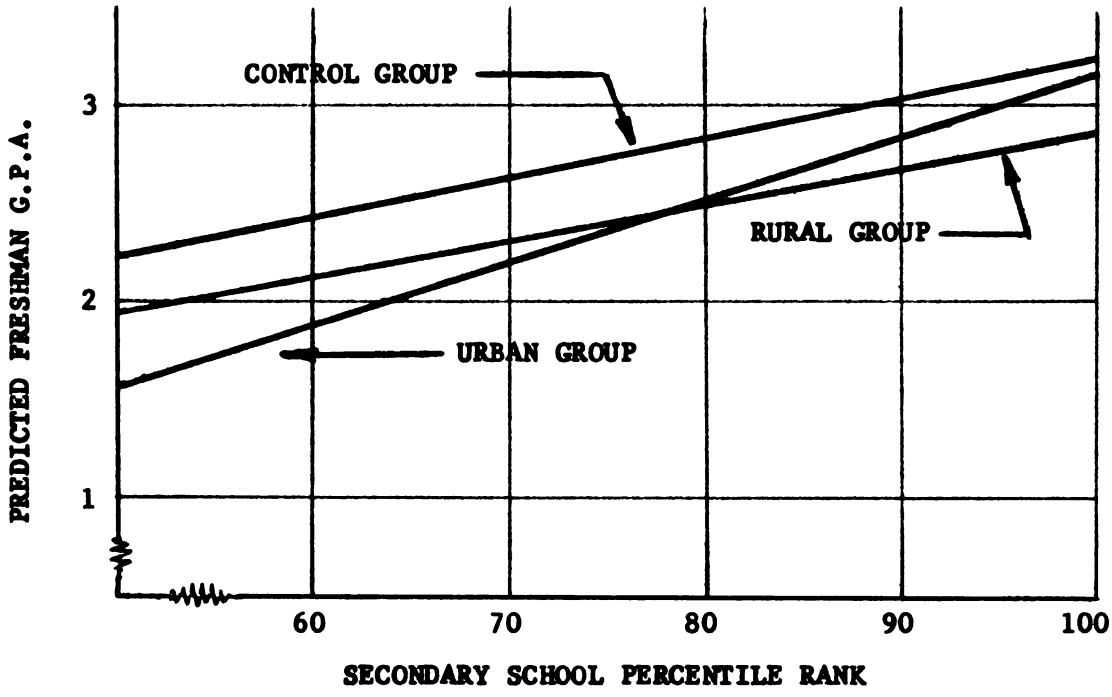

FIGURE 3.--Comparison of the regression equations for predicting the Freshman Grade-Point Average from the Secondary School Percentile Rank when the SAT-V equals 750 for Rural, Urban, and Control groups

over-prediction will be as much as .42 of a grade-point at the upper ability level where many of the University of Michigan students will be found.

Comparing, in a similar way, the prediction of grades for students from Large-Urban schools, it is clear that, except for students at about the 95 to 100 percentile rank, a single prediction equation developed for all students will over-predict their academic average. This over-prediction becomes greater as the percentile rank lowers. Using only the rank as a predictor, a single equation appears to over-predict by .72 of a grade-point at the 50th percentile rank. The use of the SAT-V as an added variable reduces this over-prediction since it can be shown that at the 50th percentile the difference ranges from .51 at SAT-V equals 500 to .63 at SAT-V equals 700.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

From the analysis and interpretation of the data in Chapter IV, it is now possible to draw some conclusions from the study. Before doing so, however, the reader's attention is drawn to certain limitations of the study. This is a study of the prediction of academic success at the University of Michigan. Although the results may have implications outside the population of students represented in the study, the uniqueness of the population must be considered. Since the University admits only the very able students, the range of abilities included in the study is quite restricted. Whether or not the conclusions reached could be applied to the full range of abilities is clearly not answered by the study. A more ideal study design (and a recommendation for further study) would have drawn its sample from a college or university which does not restrict admissions. Such a condition will be most difficult to obtain since institutions which have such "open-door" policies typically do not require tests for admission. The data might be obtained if some college or university was willing to administer such tests to all or a random sampling of those admitted soon after arrival.

A related limitation is represented in the variable Secondary School Percentile Rank. Most statistical procedures used in a study of this sort depend upon the assumption of normal distribution. All variable distributions in this study except the Secondary School Percentile Rank, are reasonably close to normal. Although certain non-parametric procedures are applied to this variable, the conclusions about it are open to some question. On the other hand, this is a statistic being used at the University of Michigan in its admissions operation, and to analyze that process it is important that the data be used as it is in the actual process if conclusions about its effect on the prediction of grades are to be adequately drawn.

A third limitation may be found in the fact that there are a varying number of sample cases from variable to variable and from group to group. Although this difference is small and believed to have a negligible effect on the conclusions it should be given consideration when comparing zero-order correlations in particular.

The conclusions which seem to be suggested by the study are as follows:

1. The population of students from Small-Rural high schools appears to be lower in level of ability on the SAT-V, the SAT-M, the English Composition Test, the Achievement Test Average and the population of students as a whole. At the same time students from Large-Urban schools seem to be

enough like the total population, on all of these variables, to be considered to have come from the total population.

2. On the variable Secondary School Percentile Rank, the population of Small-Rural students appears, again, significantly different from the population as a whole, but in this case they tend to present higher ranks than the students representing the entire class. The students from Large-Urban schools also appear to differ significantly in class rank and tend to present higher ranks than the population as a whole. Interestingly, the Large-Urban population does not seem to differ significantly from the Small-Rural population on this variable. The reader is again reminded that the derivation of the samples and their unusual distribution makes this conclusion less secure than it would be if these questions about the data did not exist.

3. It can be concluded from 1 and 2 that students of equal ability as measured by SAT-V, SAT-M, Achievement Tests, and by their Freshman Grade-Point Average tend to be ranked higher by the Small-Rural schools than those in Large-Urban schools and higher in Large-Urban schools than in all schools taken together. This is probably to be expected since (a) the Small-Rural schools have less competition for position in class standing than do larger schools and schools which tend to send large numbers to college, (b) in this study, a percentile rank was used as a measure of class standing and this makes no allowance for size of class, and (c) the Large-Urban group has missing from its population, as a result of the

sampling procedure used, the more homogeneous academically-oriented college-preparatory high schools which tend to be the source of a high percentage of the total freshman class. Since the Large-Urban schools in this sample are more comprehensive in nature, the college-bound in the schools tend to rank higher in their classes than would those in schools where more emphasis is placed on preparation for college.

4. Between the Small-Rural group and the population as a whole there are no significant differences in either the zero-order correlations or the errors of estimate between predictor variables and the criterion.

5. Between the Large-Urban group and the population as a whole there are no significant differences in either the zero-order correlations or errors of estimate except for the variable Percentile Rank. Here it was found that the Large-Urban group has a higher correlation of Percentile Rank with Freshman Grade-Point Average with a somewhat lower error of estimate.

6. From 4 and 5 it can be concluded that all variables except rank-in-class may be considered comparable predictors of academic success in college regardless of whether the school is Small-Rural or Large-Urban. Further, keeping in mind the concern for sampling and non-normality, it can be concluded that the rank in class presented by the Large-Urban comprehensive secondary school is a better predictor of academic success in college than are either the ranks presented by Small-Rural schools or by the schools in general. An explanation for this

might be that in the Small-Rural schools, as has already been indicated, the small number of college-bound students tend to rank high. In the total freshman class, however, but not represented by either of the samples studied, are large numbers of students from out of the state where only the top ranking students are accepted. Also not included in these samples are students from the suburban, college-oriented communities where the schools have high percentages of very able students.

7. The use of a multiple prediction equation, as opposed to depending only on rank in class appears to improve the University of Michigan's ability to predict academic success. This is especially true for students from Small-Rural secondary schools where the increase in correlation was much greater than for other students. Public institutions in general would do well to consider this aspect seriously. Public colleges have been reluctant to use tests in the admission process but have rather predominantly relied on secondary school rank-in-class. They have done this under the flag of Democracy--being fair to high school graduates by not being "selective" through the use of tests. It would appear that they will be more "unfair" to students when using only rank-in-class as a predictor than they would be if they added standardized aptitude and achievement tests to their admission criteria. The tests, as evidenced by this study, tend to equalize the disparity in ranking students.

8. The slopes and/or intercepts of the multiple prediction equations are enough different that for some students

in both the Small-Rural schools and the Large-Urban schools, the use of a single prediction equation may over-predict the academic average he can be expected to make during his first year in the University. Specifically, it appears that the Freshman Grade-Point average for students from Small-Rural schools is fairly uniformly over-predicted, possibly by as much as a half a grade point. Students from Large-Urban schools, who rank in the upper 5 per cent of their class, seem not disadvantaged by the use of a single predictor but students who rank nearer the middle of their class may be over-predicted by as much as three-fourths of a grade-point.

It is now possible to turn to the questions posed as the basis for this study. The results may be summarized as follows:

1. The results of the study suggest that, the Scholastic Aptitude Test of the College Entrance Examination Board is not biased as a predictor of academic success in college for applicants from either Small-Rural or Large-Urban type schools.

2. The results of the study suggest that, the Achievement Tests of the College Entrance Examination Board are not biased predictors of academic success in college for applicants from either Small-Rural or Large-Urban type schools.

3. The secondary school achievement record, at least as represented by a secondary school percentile rank is, apparently, affected by the cultural nature and size of the high school.

4. The combination of predictors used in the prediction of academic success do not appear to predict as well, or in the same way, for applicants from Small-Rural secondary schools or for applicants from Large-Urban secondary schools as they do for the applicant group as a whole.

RECOMMENDATIONS

There are certain recommendations which can be suggested to the University of Michigan and certain other recommendations for further study.

Those recommendations directed to the University of Michigan deal directly with the use of the predictor variable Secondary School Percentile Rank.

This variable, as it is now used, holds the potential of misleading those concerned with making judgments about the future academic success of applicants. Every attempt should be made to ameliorate this circumstance. This is not to say that admissions counselors do not take this factor into account now as a subjective factor in the admissions process. There are some statistical applications, however, which might improve prediction for these students. One way might be to use, as a measure of secondary school achievement, the grade average obtained from courses which could be considered strictly academic. A second approach, might be to make an allowance for the size of graduating classes. Such a technique was described on page 36 of this study. A third way,

might be to add an adjustment factor to the predicted grades of students from special secondary schools.

In order to accomplish the latter the University is encouraged to develop experience tables for other clearly defined groups i.e., the academically oriented secondary schools, private schools, large city schools, out-of-state schools, etc. There is a limit to this subdividing, of course, but since this seems to be such a key factor in admissions efforts in this direction would appear to be well worth the results.

Although this study substantiates the hypothesis that there is a lack of bias in the tests of the College Entrance Examination Board for students of rural or urban cultural backgrounds, it does not answer what may be a doubt about other cultural factors. Other studies need to be carried out to see if the hypothesis regarding the lack of cultural bias can be extended to other factors.

Finally, this study clearly suggests that a primary stumbling block to the improvement of prediction of academic success in college is the unreliable assessment of the applicant's secondary school achievement. Reliance on rank-in-class, as a measure of past achievement, appears to be quite "unfair" to some candidates even when this factor may be combined with such equalizing factors as aptitude and achievement test results. It may be "unfair" to applicants, such as have been identified in this study as Small-Rural type applicants, to assume on the basis of high school rank that

they can compete successfully with applicants from other schools with comparable class ranks. Such an assumption, coupled with what must be assumed to be great social adjustments could result in failures, which might be tragic for some individuals. It must be assumed that errors of a different nature occur when over-reliance on secondary school rank-in-class is part of the admission decision for applicants from such special groups as private schools, or public schools with high-average academic ability.

This study was based on the assumption that there was probably a tie between ruralism and small schools. The study suggests fairly clearly that ruralism at least, is not a contributing factor to the relative prediction of success. It seems clear, too, that the size of the school is only important in that it leads to misunderstanding about the relative ability of an applicant. Size of school does not, apparently, either add to or detract from the applicant's real ability to do college-level work.

What is needed, then, is additional research into ways of comparing the achievement record of applicants from various size and types of secondary schools in order not to either over-predict or under-predict college achievement on this basis.

APPENDIX

APPENDIX A

MICHIGAN HIGH SCHOOLS CLASSIFIED AS SMALL-RURAL

Post Office	High School
Alba	Alba High School
Alpha	Mastodon Twp. H.S.
Amasa	Hematite Twp. H.S.
Arcadia	Arcadia H.S.
Atlanta	Atlanta H.S.
AuGres	AuGres-Sims H.S.
Baldwin	Baldwin H.S.
Baraga	Baraga H.S.
Barryton	Barryton H.S.
Bear Lake	Bear Lake H.S.
Beaverton	Beaverton H.S.
Bellaire	Bellaire H.S.
Bergland	Bergland H.S.
Blanchard	Blanchard H.S.
Boyne City	Boyne City H.S.
Boyne Falls	Boyne Falls H.S.
Brethren	Brethren H.S.
Bremley	Bremley H.S.
Britton	Britton H.S.
Buckley	Buckley H.S.
Carney	Carney H.S.
Cedarville	Cedarville H.S.
Central Lake	Central Lake H.S.
Champion	Champion H.S.
Channing	Channing H.S.
Chassell	Chassell H.S.
Chatham	Chatham H.S.
Crystal Falls	Crystal Falls H.S.
Custer	Custer H.S.
De Tour	De Tour H.S.
Dollar Bay	Dollar Bay H.S.
Elk Rapids	Elk Rapids H.S.
Ellsworth	Ellsworth H.S.
Evart	Evart H.S.
Ewen	Ewen H.S.
Fairview	Fairview H.S.
Felch	Felch H.S.
Frankfort	Frankfort H.S.
Frederic	Frederic H.C.
Freesoil	Freesoil H.S.
Garden	Garden H.S.

Post Office	High School
Grand Marias	Burt Twp. H.S.
Grant	Grant H.S.
Grayling	Grayling H.S.
Gwinn	Gwinn H.S.
Hale	Hale H.S.
Harbor Springs	Harbor Springs H.S.
Harris	Bark River-Harris H.S.
Hart	Hart H.S.
Hermansville	Hermansville H.S.
Hesperia	Hesperia H.S.
Hillman	Hillman H.S.
Indian River	Inland Lakes H.S.
Johannesburg	Johannesburg H.S.
Kalkaska	Kalkaska H.S.
Kingsley	Kingsley H.S.
Kingston	Kingston H.S.
Lake City	Lake City H.S.
Lake Linden	Lake Linden
L'Anse	L'Anse H.S.
LeRoy	LeRoy H.S.
Luther	Luther H.S.
Mackinaw City	Mackinaw City H.S.
Mancelona	Mancelona H.S.
Manton	Manton H.S.
Maple City	Glen Lake H.S.
Marenisco	Marenisco H.S.
Marion	Marion H.S.
Mass	Mass H.S.
McBain	McBain H.S.
Merritt	Merritt H.S.
Mesick	Mesick H.S.
Michigamme	Michigamme H.S.
Mio	Mio H.S.
Morley	Morley-Stanwood H.S.
Nahma	Nahma H.S.
National Mine	National Mine H.S.
Newaygo	Newaygo H.S.
Northport	Northport H.S.
Norway	Norway H.S.
Onaway	Onaway H.S.
Onekama	Onekama H.S.
Ontonagon	Ontonagon H.S.
Painesdale	Jeffers H.S.
Paradise	Whitefish Twp. H.S.
Pellston	Pellston H.S.
Pentwater	Pentwater H.S.
Perkins	Perkins H.S.
Posen	Posen H.S.
Powers	Powers-Spalding H.S.

Post Office	High School
Rapid City	Rapid City H.S.
Rapid River	Rapid River H.S.
Remus	Remus H.S.
Republic	Republic H.S.
Rock	Rock H.S.
Rockland	Roger Clar H.S.
Roscommon	Gerrish-Higgins H.S.
Rose City	Rose City H.S.
St. Ignace	LaSalle H.S.
Stambaugh	Stambaugh H.S.
Stanton	Stanton H.S.
Suttons Bay	Suttons Bay H.S.
Trenary	Trenary
Trout Creek	Trout Creek H.S.
Tustin	Tustin H.S.
Vanderbilt	Vanderbilt H.S.
Vestaburg	Vestaburg H.S.
Vulcan	Vulcan H.S.
Wakefield	Wakefield H.S.
Walkerville	Walkerville H.S.
Watersmeet	Watersmeet H.S.
Weidman	Weidman H.S.
White Cloud	White Cloud H.S.
White Pine	White Pine H.S.
Whittemore	Whittemore H.S.
Wolverine	Wolverine H.S.

APPENDIX B

MICHIGAN HIGH SCHOOLS CLASSIFIED AS LARGE-URBAN

Post Office	High School
Adrian	Adrian H.S.
Allen Park	Allen Park H.S.
Battle Creek	Battle Creek H.S.
Benton Harbor	Benton Harbor H.S.
Berkley	Berkley H.S.
Dearborn Heights	Riverside H.S.
Dearborn Heights	Haston H.S.
Detroit	Redford Union
Detroit	Lee M. Thurston H.S.
East Detroit	East Detroit H.S.
Ferndale	Ferndale H.S.
Flint	Beecher H.S.
Flint	Ainsworth H.S.
Garden City	Garden City H.S.
Grand Blanc	Grand Blanc H.S.
Grand Haven	Grand Haven H.S.
Grand Ledge	Grand Ledge H.S.
Grosse Pointe	Grosse Pointe H.S.
Hamtramck	Hamtramck H.S.
Hazel Park	Hazel Park H.S.
Highland Park	Highland Park H.S.
Holland	Holland H.S.
Inkster	Inkster H.S.
Lansing	Waverly H.S.
Lapeer	Lapeer H.S.
Lincoln Park	Lincoln Park H.S.
Madison Heights	Madison Heights H.S.
Marshall	Marshall H.S.
Melvindale	Melvindale H.S.
Midland	Midland H.S.
Milford	Milford H.S.
Monroe	Monroe H.S.
Mount Clemens	Mount Clemens H.S.
Mt. Morris	Mt. Morris H.S.
Muskegon	Muskegon H.S.
Mona Shores	Mona Shores H.S.
Muskegon Heights	Muskegon Heights H.S.
Niles	Niles H.S.
Oak Park	Oak Park H.S.
Owosso	Owosso H.S.
Plymouth	Plymouth H.S.

Post Office	High School
Portage	Portage H.S.
Port Huron	Port Huron H.S.
River Rouge	River Rouge H.S.
Rochester	Rochester H.S.
Romulus	Romulus H.S.
Roseville	Roseville H.S.
Saginaw	Douglas MacArthur H.S.
St. Claire Shores	Lake Shore H.S.
St. Claire Shores	Lakeview H.S.
St. Claire Shores	South Lake H.S.
St. Joseph	St. Joseph H.S.
Southfield	Southfield H.S.
Southgate	Southgate H.S.
Southgate	Schafer H.S.
South Haven	South Haven H.S.
Sturgis	Sturgis H.S.
Taylor	Taylor Center H.S.
Trenton	Trenton H.S.
Troy	Troy H.S.
Walled Lake	Walled Lake H.S.
Warren	Fitzgerald H.S.
Warren	Lincoln H.S.
Wayne	Wayne H.S.
Wyandotte	Theodore Roosevelt H.S.
Ypsilanti	Ypsilanti H.S.

APPENDIX C

DATA SUMMARY

The Scholastic Aptitude Test-Verbal

TABLE 1A.--Frequency distributions, means, and standard deviations of the verbal section of the Scholastic Aptitude Test for Rural, Urban, and Control groups

Score Intervals	Rural N	Rural % Below Interval	Urban N	Urban % Below Interval	Control N	Control % Below Interval
750-799	0	100	1	100	4	99
700-749	4	96	14	94	31	93
650-699	6	90	36	80	60	81
600-649	13	77	48	61	94	62
550-599	26	51	49	43	106	40
500-549	19	33	52	23	78	25
450-499	14	19	25	13	82	8
400-449	14	5	26	3	24	3
350-399	3	2	7	0	15	0
300-349	2	0	0	0	0	0
250-299	0	0	0	0	1	0
Total N	101		256		495	
Mean	537		568		569	
S. D.	87		88		87	

The Scholastic Aptitude Test-Mathematical

TABLE 2A.--Frequency distributions, means, and standard deviations of the mathematical section of the Scholastic Aptitude Test for Rural, Urban, and Control groups

	Rural		Urban		Control	
Score Intervals	N	% Below Interval	N	% Below Interval	N	% Below Interval
750-799	0	100	11	96	23	95
700-749	6	94	33	83	60	83
650-699	12	82	32	70	81	67
600-649	14	68	48	52	103	46
550-599	21	48	50	32	89	28
500-549	18	30	38	17	61	16
450-499	16	14	28	6	43	7
400-449	12	2	12	2	21	3
350-399	1	1	4	0	11	1
300-349	1	0	0	0	2	0
250-299	0	0	0	0	1	0
Total N	101		256		495	
Mean	555		598		602	
S. D.	91		94		97	

The Secondary School Percentile Rank

TABLE 3A.--Frequency distributions, means, and standard deviations of the Secondary School Percentile Rank for Rural, Urban, and Control groups

Score Intervals	Rural N	Rural % Below Interval	Urban N	Urban % Below Interval	Control N	Control % Below Interval
95.00-99.00	52	49	118	54	189	62
90.00-94.99	26	23	62	30	117	38
85.00-89.99	8	15	44	13	73	24
80.00-84.99	10	5	18	5	60	11
75.00-79.99	3	2	8	2	25	6
70.00-74.99	2	0	4	1	16	3
65.00-69.99	0	0	2	0	9	1
60.00-64.99	0	0	0	0	2	1
55.00-49.99	0	0	0	0	1	1
50.00-54.99	0	0	0	0	1	1
45.00-49.99	0	0	0	0	0	1
40.00-44.99	0	0	0	0	2	0
35.00-39.99	0	0	0	0	0	0
30.00-34.99	0	0	0	0	1	0
Total N	101		256		496	
Mean	92.61		92.23		89.72	
S. D.	6.73		6.85		9.26	

The English Composition Test

TABLE 4A.--Frequency distributions, means, and standard deviations of the English Composition Test for Rural, Urban, and Control groups

Score Intervals	Rural N	Rural % Below Interval	Urban N	Urban % Below Interval	Control N	Control % Below Interval
800-800	0	100	1	100	2	100
750-799	0	100	2	99	7	98
700-749	1	99	6	96	28	91
650-699	3	95	27	84	38	82
600-649	11	83	43	66	59	68
550-599	19	60	47	45	86	47
500-549	24	33	47	25	89	26
450-499	16	14	26	13	70	9
400-449	6	7	20	5	28	3
350-399	5	1	8	1	10	0
300-349	0	1	3	0	1	0
250-299	1	0	0	0	0	0
Total N	86		230		418	
Mean	531		558		563	
S. D.	78		89		92	

The Achievement Test Average

TABLE 5A.--Frequency distributions, means, and standard deviations of the Achievement Test Average for Rural, Urban, and Control groups

Score Intervals	Rural N	Rural % Below Interval	Urban N	Urban % Below Interval	Control N	Control % Below Interval
800-800	0	100	0	100	1	100
750-799	0	100	1	100	4	99
700-749	0	100	6	97	19	95
650-699	4	96	25	86	50	83
600-649	13	82	46	67	70	68
550-599	18	63	56	43	108	44
500-549	24	37	51	22	112	19
450-499	26	10	36	7	61	5
400-449	9	0	12	2	19	1
350-399	0	0	3	0	4	0
300-349	0	0	1	0	0	0
250-299	0	0	0	0	0	0
Total N	94		237		448	
Mean	534		567		573	
S. D.	65		77		77	

The University Freshman Grade-Point Average

TABLE 6A.--Frequency distributions, means, and standard deviation of the University Freshman Grade-Point Average for Rural, Urban, and Control groups

Score Intervals	Rural N	Rural % Below Interval	Urban N	Urban % Below Interval	Control N	Control % Below Interval
4.00-4.00	0	100	4	98	4	99
3.75-3.99	0	100	4	97	16	96
3.50-3.74	4	96	8	94	26	91
3.25-3.49	2	94	18	87	23	86
3.00-3.24	8	86	20	74	44	77
2.75-2.99	7	79	27	68	66	64
2.50-2.74	12	67	36	54	54	53
2.25-2.49	12	55	42	38	79	37
2.00-2.24	22	33	47	20	79	21
1.75-1.99	9	24	17	13	39	13
1.50-1.74	7	17	20	5	30	7
1.25-1.49	8	9	7	2	8	5
1.00-1.24	2	7	2	2	5	4
0.75-0.99	1	6	0	2	4	3
0.50-0.74	4	2	2	1	6	2
0.25-0.49	0	2	1	0	2	1
0-0.24	2	0	1	0	7	0
Total N	100		256		492	
Mean	2.17		2.47		2.47	
S. D.	.74		.65		.74	

APPENDIX D

ANALYSIS OF VARIANCE SUMMARY TABLES

TABLE 7A.--Analysis of variance summary table for Scholastic Aptitude Test-Verbal

Source of Variation	d.f.	Sum of Squares	Mean Square	F[a]
Groups	2	90,232	45,116	5.91
Within-groups	849	6,484,961	7,638	
Total	851	6,575,193		

[a] $F_{.95(2,849)} = 3.00$

TABLE 8A.--Analysis of variance summary table for Scholastic Aptitude Test-Mathematical

Source of Variation	d.f.	Sum of Squares	Mean Square	F[a]
Groups	2	181,430	90,715	8.81
Within-groups	849	7,710,070	10,293	
Total	851	7,891,500		

[a] $F_{.95(2,849)} = 3.00$

TABLE 9A.--Analysis of variance summary table for Secondary School Percentile Rank

Source of Variation	d.f.	Sum of Squares	Mean Square	F[a]
Groups	2	1,435	717.5	10.36
Within-groups	850	58,894	69.3	
Total	852	60,329		

[a] $F_{.95(2,850)} = 3.00$

TABLE 10A.--Analysis of variance summary table for the English Composition Test

Source of Variation	d.f.	Sum of Squares	Mean Square	F[a]
Groups	2	72,619	36,309	4.52
Within-groups	731	5,867,512	8,026	
Total	733	5,940,131		

[a] $F_{.95(2,731)} = 3.00$

TABLE 11A.--Analysis of variance summary table for the Achievement Test Average

Source of Variation	d.f.	Sum of Squares	Mean Square	F[a]
Groups	2	115,349	57,675	10.04
Within-groups	776	4,457,724	5,744	
Total	778	4,573,073		

[a] $F_{.95(2,776)} = 3.00$

TABLE 12A.--Analysis of variance summary table for the University Freshman Grade-Point Average

Source of Variation	d.f.	Sum of Squares	Mean Square	F[a]
Groups	2	8.057	4.028	7.91
Within-groups	845	430.748	.509	
Total	847	438.805		

[a] $F_{.95(2,845)} = 3.00$

APPENDIX E

INTERCORRELATIONS OF ALL VARIABLES

TABLE 13A.--Correlation Matrix

Variable		Fr. G.P.A.	Rank	SAT-V	SAT-M	Eng. Comp.	Ach. Avg.
Fr.G.P.A.	Rural	1.000	0.191	0.296	0.337	0.319	0.390
	Urban	1.000	0.441	0.439	0.305	0.448	0.540
	Control	1.000	0.320	0.402	0.272	0.409	0.484
Rank	Rural		1.000	0.149	0.238	0.116	0.164
	Urban		1.000	0.289	0.290	0.410	0.442
	Control		1.000	0.200	0.184	0.283	0.271
SAT-V	Rural			1.000	0.358	0.634	0.632
	Urban			1.000	0.471	0.675	0.699
	Control			1.000	0.414	0.660	0.674
SAT-M	Rural				1.000	0.327	0.583
	Urban				1.000	0.392	0.622
	Control				1.000	0.343	0.569
Eng.Comp.	Rural					1.000	0.695
	Urban					1.000	0.815
	Control					1.000	0.798
Ach.Avg.	Rural						1.000
	Urban						1.000
	Control						1.000

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