

# Trends in Levels of Academic Achievement of Blacks and Other Minorities

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Race and ethnic differences in measures of achievement, information, and award of educational credentials are reviewed starting with 1960 Project Talent data. Data are more consistently available for blacks and whites than for other minorities, while accurate identification of the latter groups is made difficult by variability in terminology. Nevertheless, blacks, Mexican Americans, Puerto Ricans, and American Indians today still have substantial deficits in basic academic skills and information although small gains have been made. Asian Americans have small deficits in verbal skills and small advantages in quantitative skills in comparison to the white majority. Several kinds of evidence converge to support a description of the deficits as the inadequate learning syndrome (ILS). The ILS social epidemic is as serious in its way as the AIDS epidemic. Targeted support of at least the same magnitude as with AIDS is required for research and development with respect to ILS. Remedies that are typically discussed are superficial and ineffective.

## INTRODUCTION

In the fall of 1986 prime minister Nakasone of Japan created an international incident by remarks he made to a Japanese audience about American blacks and Hispanics. He stated, in translation, that Japan held an advantage over the US in economic competition because of the low intelligence (presumably on average) of the two minorities. His remarks were widely criticized as racist, and he shortly apologized.

It would be informative to inquire about the validity of the translation, but we can assume in the first instance that the translation was accurate and that the connotations of the terms are similar in Japanese and in English. Our connotations, at any rate, include an innate biological capacity. Most policy makers, shapers of opinion, and intellectuals have concluded that all races have equivalent biological capacities for intelligent behavior. Although the groups named are not habitually inclined to put this belief in statistical terms, the equality of

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means and standard deviations for all races in hypothetical measures of this biological capacity is presumably intended.

If we apply the usual canons for the acceptability of scientific evidence concerning cause and effect, there are no acceptable data that allow the rejection of the equality hypothesis. Differences in test scores could be entirely environmental. Following the same standards, however, leads to the conclusion that the hypothesis of an innate biological contribution to differences cannot be rejected. It does not matter whether the data are from biology, psychology, or the social sciences. Acceptable data that allow rejection of an important genetic contribution to race differences in test scores do not presently exist.

Gould (1981) suggested to his readers that the absence of a racial gene was a sufficient basis for equality. He stated that there had been insufficient time in the evolutionary history of homo sapiens to develop such a gene, but he neglected a plausible genetic alternative. There obviously had been sufficient time to develop different frequency distributions of genes for many physical characteristics. If the biological basis for human intelligence is polygenic, differential frequency distributions could develop for intelligence as they have for skin color. Given this alternative genetic hypothesis, different means among races on the dimension of human intelligence could be explained without involving a racial gene. Equivalent standard deviations are indicated by the comparability of variances of individual differences in the phenotypic trait.

Given two currently tenable but diametrically opposite hypotheses about causation, and contingent on a Japanese definition of intelligence as innate biological capacity, Nakasone's remarks were indeed racist. These qualifications, however, were given no consideration in the outcry that followed. Use of racist in our society is hardly precise. My conclusion that the genetic hypothesis cannot presently be rejected by acceptable evidence would be considered racist by many. Even descriptions of phenotypic intellectual differences between races are frequently considered racist.

### **An Alternative Interpretation**

How would Nakasone have fared at the hands of American opinion if, in place of the single word intelligence, he or the translator had substituted three words—basic intellectual skills? It is not inconceivable that this was Nakasone's intention. The simple substitution would have made the prime minister's statement unassailable. At the conclusion of secondary schooling, the means of blacks and Hispanics are widely separated from those of the white majority in reading, writing, arithmetic, and mathematics. In addition, American students generally are well below the Japanese in achievement levels (Lerner, 1982). Finally, although Hunter (1986) discusses his validity generalization studies in terms of general intelligence, competence in basic intellectual skills is also related to job performance. Perhaps the prime minister was guilty only of being tactless in

referring to our educational problems, but the American response was so monolithic and absolute that those problems were ignored.

It is not only reasonable but necessary if adequate attention is to be paid to the problem, to characterize mean American student achievement relative to the Japanese as deficits. In the same way, in spite of the avoidance by many social scientists of that terminology, it is reasonable and necessary to characterize the mean achievement levels of blacks and Hispanics as deficits. When a task requires a level of reading comprehension found generally among students in integrated institutions of higher education and a student, or the mean of a group of students, is well below that level, a euphemistic description as "merely different" serves no useful purpose. In the case of the mean of a group it is only necessary to recognize the wide range of individual differences about the mean in evaluating individual members of the group.

Shortly after conclusion of the Nakasone incident, I published a commentary (Humphreys, 1986) on several original articles in which I concluded that the black deficits in basic intellectual skills at the time young people enter the work force or higher education constituted a problem, in its way as serious as the AIDS epidemic. I suspect that many concluded that this was a racist remark. One line of reasoning is that deficits in academic achievement can hardly be serious when basic biological capacities are equal, but I challenge the belief that the conclusion follows from the premise. The premise may or may not be correct, but the conclusion is clearly false.

In my commentary I discussed blacks specifically because there are more descriptive data for them than for other minorities. Hispanics do show deficits almost as large, and a large number of majority whites are equally deficient, with only the proportion of whites being smaller. (Asians also contribute a share.) When all low achieving students are considered, my conclusion concerning the seriousness of the problem is strongly reinforced.

I also concluded that we are doing a great deal less about the "epidemic" of low levels of basic skills than about AIDS. For example, we are doing less, and are planning no increase, in research on the dimensions of the problem in the sense that public health officials study the dimensions of infectious diseases. The Center for Disease Control is working hard, and expending large sums, on the dimensions of the AIDS epidemic. We need an epidemiology of the inadequate Learning Syndrome (ILS). In addition, we are supporting less targeted research on causes and cures of that epidemic. The funds available and the number of qualified investigators for the two epidemics are not in the same ball park.

One critical difference between the two problems leads to the conclusion that AIDS is actually less serious. We do know how to prevent the spread of AIDS, namely, by abstaining from sexual contacts before marriage (or homosexual union) and practicing monogamy thereafter. But this knowledge may not be widely effective in modifying sexual practices. Nevertheless, it does seem rea-

sonable that an increasing proportion of our population will follow this course of action. In contrast, we do not know how to prevent ILS.

### **Documentation of the Deficits**

I now turn to some documentation of the deficits in information and achievement. There will be relatively little recourse to scores on intelligence tests. The evidence is about educational attainment and scores on tests of achievement and information, largely but not entirely in our black population. Deficits in young adults in listening and reading comprehension, writing, arithmetic and mathematics, and subject matter knowledge are my primary concerns. Whether it is reasonable to characterize these deficits as just as serious, in their way, as a major public health problem depends on their significance for performance in higher education and in occupations. This significance will also be documented. It is sufficient to note for the present, however, that the relative contributions to the variance of deficits of genetic and environmental factors do not need to be known to conclude that the ILS epidemic is as serious as AIDS. Dependable data linking genetic and environmental factors to adult performance could be used to guide the development of remedial programs.

***Project Talent.*** An overview of this project is available in Flanagan et al. (1962). It suffices to say here that more than 50 tests of information, academic achievement, and so-called aptitude were administered to high school students in a stratified random sample of the nation's high schools in 1960. There are a great many comparisons of blacks and whites on intelligence tests prior to 1960, but Talent tests contain more information about the knowledge and skill of students in secondary education than is available in any other source.

It was not possible to obtain information about the race of individual students in 1960, but high school principals did report the racial composition of the student body. Students in schools that were either 100% black or white can be compared. The size of race differences in these schools is probably too large, but not inflated as much as one might think. Largely white schools had higher means than those that were 100% white. One would also expect that the addition of black students from middle-class homes who were not in 100% black schools in 1960 would not change appreciably the ordering of the tests in the distribution of differences.

Humphreys, Lin, and Fleishman (1976) published comparisons of low SES whites with blacks, and low SES whites with high SES whites based on Project Talent cognitive measures in which sex of the student, area of the country, and grade in high school were held constant. The same data furnish information about differences between blacks and the entire sample of whites. Data for a selection of the many tests and composites available are presented in Table 1.

On one hand, the differences in this table are somewhat inflated by the selection of the samples. On the other hand, they are attenuated by measurement

**TABLE 1**  
**Standardized Differences Between Blacks and Whites on Selected Measures**  
**From Project Talent**

Information Tests	Difference	"Aptitude" Tests	Difference
Farming	1.10	Vocabulary	.94
Mechanical	1.05	Arithmetic Reasoning	.94
Social Studies	.92	Reading Comprehension	.91
Electricity	.82	Abstract Reasoning	.73
Literature	.81	Spatial Visualization	.66
Physics	.78	Memory for Words	.43
Biology	.63	<b>Composites</b>	
Bible	.63	Information II	1.07
Music	.61	Information I	1.06
Fishing	.48	Technical "Aptitude"	1.06
<b>Speeded—# Attempted</b>		Intelligence	1.00
Object Inspection	-.09	English	.86
Clerical Checking	-.28	Mathematics	.74

*Source:* Previously unpublished analyses of the data of Humphreys, Lin, and Fleishman (1976).

error which is an influential parameter in Talent data. Tests were kept short in order to administer as many as possible in a limited period of time. Differences are also attenuated by computing these standardized differences from the point biserial correlations between race and test score. (The variance of the marginal distribution in the point biserial is larger than the pooled within-group variance by an amount dependent on the size of the difference between groups.)

There is a wide range of race differences on the information tests, but all show a white advantage. Differences from test to test, however, must be interpreted cautiously. Reliabilities were not at a uniform level. Both farming and mechanical information show larger differences than the four tests that I have labelled "aptitude" or the composite designed to represent a standard test of intelligence. Information about fishing shows one of the smallest differences among all measures of information. In contrast, differences between the means of number of attempts on highly speeded tests composed of easy items are in the reverse direction. These are also the smallest race differences among all Talent tests that have right answers. When a formula score that places a premium on obtaining right answers is applied, white means become larger than the black ones.

The components of the composite scores were given positive a priori weights in order to measure broader constructs than those represented by individual tests. Because composites formed from many components tend to have higher reliability than those formed from fewer, the race differences obtained are not strictly comparable. Mathematics has only two components while English has five. Each of two information composites has many more. It is significant, however, that

mechanical and farming information are as highly correlated with race as either of the two highly reliable information composites.

Scores on almost all of the tests in Talent increased during the high school years, but the interactions between grade and race were trivial in size (Humphreys, Lin & Fleishman, 1976). In 1960, blacks were not falling further behind whites during the high school years by an appreciable amount. When blacks were compared with low SES whites, however, interactions of grade and race were larger. For example, race differences favoring whites narrowed a bit during high school in mathematics and increased in mechanical information.

Project Talent information tests are not exhaustive of all possible sorts of information. Williams (1972) and Medley and Quirk (1974) have demonstrated that information items can be found on which the race difference is reduced or even reversed, but such examples are few in number. To interpret such examples as evidence for quantitative equality of blacks and whites in some fundamental biological capacity is scientifically naive. Such a conclusion is also beside the point. The importance to society of a given cognitive performance is the key question. There is a general consensus that both aural and visual comprehension of standard English, ability to communicate in standard English both orally and in writing, and knowledge of arithmetic and mathematics are important. The regressions for whites and blacks of a given criterion performance on cognitive measures also distinguish degrees of importance. Such evidence demonstrates that mechanical knowledge is more important than knowledge of black argot used in St. Louis.

***The Coleman Report.*** The 1964 civil rights act mandated that the Office of Education prepare a report to the President and the Congress within two years on the availability of equal educational opportunities for minority individuals. Coleman et al. (1966) prepared the required report on the basis of tests administered to approximately 9,000,000 students in grades 1, 3, 6, 9, and 12. The sampling was done with great care including oversampling the smaller minority groups in order to have more stable statistics. So-called aptitude tests were administered in all five grades. Reading and arithmetic achievement tests were administered in grades 3, 6, 9, and 12. A test of general information was added in the latter two grades.

Means of the minorities in achievement and information were converted to the white standard score metric (a total standard deviation was not available) and appear in Table 2. Sample sizes are much smaller for minorities other than the blacks, so their means are not as stable. Sample size for whites who furnished the metric varied above 2 million in the early grades to below 2 million in the upper grades.

In the data for blacks there is a trend for the deficits to increase slightly with grade level. This was noted in the Coleman report and was attributed, on the basis of geographical breakdowns, to performance in schools in the southeast.

**TABLE 2**  
**Achievement Test Performance from the Coleman Report by Race and Ethnicity**  
**in the White Standard Score Metric**

	American Indian	Asian	Black	Mexican American	Puerto Rican
<b>Grade 3</b>					
<i>N</i>	998	999	516,332	999	999
Reading	-.61	-.28	-.86	-.70	-1.05
Mathematics	-.60	-.28	-.85	-.66	-1.05
<b>Grade 6</b>					
<i>N</i>	999	998	441,282	999	999
Reading	-.81	-.34	-.87	-.94	-1.29
Mathematics	-.93	-.39	-.98	-1.00	-1.35
<b>Grade 9</b>					
<i>N</i>	998	999	484,171	999	999
Reading	-.68	-.19	-.95	-.77	-1.06
Mathematics	-.72	-.04	-.98	-.80	-1.04
Information	-.83	-.26	-1.18	-.95	-1.30
<b>Grade 12</b>					
<i>N</i>	998	999	316,915	998	999
Reading	-.84	-.35	-1.05	-.85	-1.03
Mathematics	-.70	-.07	-1.13	-.72	-.91
Information	-.82	-.36	-1.27	-.98	-1.17

*Source:* Office of Education, Department of Health, Education, and Welfare, (1966). Supplemental Appendix to the Survey on Equality of Educational Opportunity. U.S. Government Printing Office.

Averaging across all minorities, differences in grade 6 are larger than those in either grade 3 or grade 9. At least some of the variability in means from grade to grade can be attributed to the characteristics of the measuring instruments. Standard scores cannot correct for differences in reliability or skewness.

Puerto Ricans in these data tend to have means as low as or lower than blacks. Above these two minorities the remaining three generally maintain quite consistent positions. American Indians perform at a slightly higher level than Mexican Americans, and Americans of Asian heritage are quite substantially higher with means only a little smaller than those for the white majority.

***Growth Study of the Educational Testing Service (ETS).*** This research was started in 1961 and one segment of the total group was retested at 2-year intervals through 1967, (Hilton, Beaton, & Bower, 1971). Seventeen communities were in the sample and represented a wide range in area of the country, size of the school system, percentage of seniors attending college, rural-urban residence, and SES of the community. Means and variances of the standardized tests were close to those obtained in random samples of the population and the distribution

of SES was highly similar to the carefully controlled sample in the Coleman report (Coleman et al., 1966). The numbers of members in the total sample vary from test to test. The range in blacks is from 388–515, in whites 2473–2849. Blacks comprised about 14% and whites 80% of the total sample.

Standardized differences between whites and blacks for each of 16 tests and for four grade levels of a longitudinal sample are presented in Table 3. The first six tests in the table are included in the Scholastic Tests of Educational Progress (STEP). The following two tests form the School and College Aptitude Test (SCAT), though it is difficult to find functional differences between the achievement and so-called aptitude tests. The next eight tests were not nationally standardized and were designed to test relatively narrow categories of information. They formed the Test of General Information (TGI). Total standard deviations were again used in the standardization.

Although there are differences within the body of the table in the size of the race differences, as well as differences from test to test in the row means and from grade to grade in the column means, the overall impression is one of homogeneity of differences. Reading, Writing, Physics, and Industrial Arts have little in common other than showing the smallest race differences. The latter two are short tests and are less reliable than Reading and Writing. The variability

**TABLE 3**  
**Standardized Differences Between Blacks and Whites**  
**in Longitudinal Samples from the ETS Growth Study**

		Grade in School				Mean
		5	7	9	11	
Mathematics	1	.91	1.02	1.03	1.05	1.00
Science	2	.94	.83	.84	.92	.88
Social Studies	3	.90	.82	.94	.89	.89
Reading	4	.86	.80	.82	.86	.84
Listening	5	.98	.99	.83	.84	.91
Writing	6	.78	.81	.88	.80	.82
Verbal	7	.85	.90	1.01	.86	.91
Quantitative	8	.81	.77	.91	.94	.86
Industrial Arts	9	.88	.83	.76	.88	.84
Home Arts	10	1.02	.81	.88	.85	.89
Physics	11	.94	.74	.83	.81	.83
Biology	12	.96	.80	.99	.98	.93
Music-Arts	13	.88	.86	.87	1.00	.90
History-Literature	14	.87	.81	.85	.88	.86
Recreation	15	.93	.92	.93	1.01	.95
Government	16	.70	.74	.89	.87	.80
Mean		.89	.84	.89	.90	.88

*Source:* Hilton, Beaton, and Bower (1971).



**TABLE 4**  
**Grade Equivalent Approximations of Black Scores in the White Distribution**  
**from the ETS Growth Study**

	Black Means in Two Grades		White Means in Four Grades			
	9	11	5	7	9	11
Mathematics	257.10	260.81	248.44	261.16	271.91	278.30
Science	263.54	270.80	256.50	267.37	275.36	282.84
Social Studies	260.10	266.34	252.98	262.99	274.40	279.79
Reading	270.75	280.03	260.61	272.98	284.43	295.57
Listening	274.85	280.20	270.23	280.20	287.37	292.94
Writing	265.05	275.63	258.80	267.52	280.97	290.30
Verbal	263.93	271.83	251.21	265.00	278.02	284.60
Quantitative	276.86	279.68	258.21	276.34	291.91	296.66

*Source:* Hilton, Beaton, and Bower (1971).

from grade to grade for these tests, however, suggests caution in forming conclusions about the importance of the smallest overall differences.

Differences and similarities among the means for the four grades reinforce the note of caution. Looking only at grades 5 and 11, the change in size is trivial, while grade 7 shows the smallest race difference. These, as well as the earlier remarks about variability from grade to grade for a given test, strongly suggest that the explanation lies, in part at least, in differences in the size of the units of measurement from form to form of the various tests. State-of-the-art vertical equating was done for the first eight tests in the table, but the problem is a difficult one and results are not completely trustworthy.

Because vertical equating was used for the first eight tests, it is useful, in spite of certain measurement qualifications, to relate black performance to white on the growth scale. Grade units convey the social significance of differences more accurately to many persons than standard score units. The means of blacks in grades 9 and 11, which overlap the white means, and the means of whites at all grade levels appear in Table 4.

The average performance of blacks in grade 11, after interpolating for grade 8 in the white data, is between grades 7 and 8 of the white majority. The size of the deficit in these grade equivalent units shrinks a little when the average performance of blacks in grade 9 is placed in the white distribution. This is, of course, the expectation for either grade or age equivalent units. Extrapolating to black performance relative to the grade 5 performance of whites, the deficit would probably be about two grade equivalent units.

Turning now to individual tests, it is not surprising that standard score deficits predict the size of grade equivalent deficits. Thus, Mathematics shows the largest deficit in both sets of units, with blacks being more than four grades behind

whites. For both Reading and Writing the white equivalent means are closer to grade 9 than grade 7, representing less than three grade units. Degree of familiarity with standard English is not the problem from which all others stem. Also, although inference is required from the standard score differences, it seems probable that the black deficit on the eight narrow information tests in the 11th grade is also about 3 years of chronological age.

**National Assessment of Educational Progress (NAEP).** The NAEP program was started in the late 60s and is continuing. Assessments in basic skills are made approximately every 4 years in 9-, 13-, and 17-year-olds. The skill assessed is rotated from year to year. The program is funded by the Department of Education and is conducted by a contractor. For the first several years the contractor was the Educational Commission of the States. It is now the ETS.

Reading has been assessed four times. While all basic skills have shown mildly encouraging increases in the performance of black and Hispanic minorities (Jones, 1987), the results for reading have been most encouraging. Results for the four reading assessments are shown in Table 5 in an IRT metric introduced by ETS and applied to earlier assessments for which ETS was not responsible. The scale is supposedly interval in its properties and has a constant zero.

It is seen that blacks especially have gained relative to the white majority. The largest gain for 9-year-olds occurred between the first and second assessments, for 13-year-olds between the second and third, while the 17-year-olds did not gain appreciably until the fourth. These data are for approximately the same birth-year cohort. Given a little sampling variability from one assessment to another, an interpretation that an early gain is required if there is to be a gain later

**TABLE 5**  
**Black and Hispanic Deficits Relative to Whites in an IRT Metric**  
**in Four NAEP Reading Assessments**

	1970-71	1974-75	1979-80	1983-84
<b>Age 9</b>				
<b>Black</b>	-45.1	-34.0	-30.8	-31.7
<b>Hispanic</b>	<sup>a</sup>	-33.0	-30.6	-27.1
<b>Age 13</b>				
<b>Black</b>	-39.8	-36.5	-30.6	-26.6
<b>Hispanic</b>	<sup>a</sup>	-29.8	-27.1	-24.2
<b>Age 17</b>				
<b>Black</b>	-49.8	-46.7	-44.9	-31.1
<b>Hispanic</b>	<sup>a</sup>	-36.0	-29.3	-25.9

<sup>a</sup>Not reported

Source: The Reading Report Card (1985). Report No. 15-R-01 National Assessment of Educational Progress, Educational Testing Service.

in development is reasonable. Various suggestions have been made concerning possible causes, but compensatory basic skills educational programs and school integration are generally favored. A missing fact that would shed light on the problem is rarely considered. Had black 5-year-olds in 1970–71 reduced the race difference in English vocabulary?

The data in this table suggest that the Hispanic deficit at age 9 is affected more by problems with the English language than it is later. This also appeared to be true in the Coleman report. On average, the difference between blacks and Hispanics decreases from age 9 to 17. Hispanic samples are smaller than the black ones and the reported standard errors are, of course, larger. (Standard deviations are not reported.)

There is one disturbing feature of the data in Table 5. If the 9-year-old blacks and whites who were assessed in 1970–71 are compared to the 13-year cohort 4 years later and to the 17-year cohort 5 years later, one notes that the race difference first decreased and then increased back to the initial level for essentially the same birth-year cohort. Both changes are highly significant statistically, but the reversal is difficult to believe. Reading comprehension is a highly robust skill. Change does not come easily. The differences among the three age groups (and different years of birth) in 1970–71 show the same pattern and are also statistically significant, but the pattern disappears in the birth-year cohort measured at 9 in 1974–75. I conclude that something was wrong with the sampling in the early assessments or that the IRT metric does not have the attributes expected of it.

The gain by 9-year-old blacks came to a halt between the third and fourth assessments, while the Hispanic gain continued. The Reagan administration, by reducing federal funding for education, has been blamed for the former, but given no credit for the latter. Perhaps, however, it was the Congress that helped Hispanic children by its insistence about 10 years ago that bilingual Spanish maintenance programs be changed to bilingual English transition programs.

*Levels of Achievement of College Applicants.* The subject matter of the American College Test (ACT) appears under different names that suggest achievement, on the one hand, or aptitude, on the other. This ambiguity tells one more about the minimal differences between measures of the two constructs than about the content of the ACT. The test includes English, mathematics, social science reading, and natural science reading. It is taken by almost a million high school seniors who plan to enter higher education. Students who elect to take it are not randomly distributed across the nation. Not only do the scores not reflect the achievement of all high school seniors, but they are not a random sample of those planning to enter college. The scores do represent the applicants to a large number of quite diverse institutions.

Data on applicants for the freshman class of 1982 are presented in Table 6 in the white standard score metric. Standard score differences in Table 5 cannot be

TABLE 6  
Means by Race and Ethnicity in 1982 on the American College Test  
in the White Standard Score Metric

	American Indian	Asian	Black	Mexican American	Puerto Rican
English	-1.00	-.42	-1.16	-.88	-.66
Mathematics	-.91	.22	-1.09	-.79	-.50
Social Science	-.77	-.36	-1.09	-.77	-.44
Natural Science	-.79	-.22	-1.24	-.88	-.53
Composite	-1.06	-.19	-1.33	-.96	-.61

Source: The American College Testing Program (1983). College Student Profiles: Norms for the ACT Assessment.

equated with those in Table 2 because the latter were based on a range of talent that was wider by an unknown amount. Adequate data are not available to approximate a correction, but one thing is clear: Four minorities aspiring to higher education start with substantial deficits in academic achievement. Blacks have the largest deficit. Asians have little deficit overall, and their pattern of scores suggests a specific language handicap.

College Board tests are taken by more than a million high school seniors, but the achievement tests are required by only a fraction of the institutions requiring the Scholastic Aptitude Test (SAT). Both the SAT and the achievement tests are taken by seniors who are not a random sample of those applying for college admission but still represent applicants to a large number of different institutions. The population sampled by the SAT is probably abler than the one sampled by the ACT, because the SAT is required by most of the highly selective private institutions of higher education. Standard score units of SAT and ACT are not equal, but they probably are more similar to each other than to those in the Coleman report.

In order to control in some degree for differential selectivity in taking the achievement tests, the 1985 statistics in Table 7 include the ratio of the minority  $N$  to the white  $N$ , the standardized difference on the achievement test in the white metric, the Verbal (V) and Mathematics (M) SAT scores for each minority in the same metric, and those same scores for each subsample defined by the achievement test.

The black deficits are the largest. Even so, blacks are more highly selected in the applicant group than whites. Relative to whites the former constitute 10% of the applicant population but about 15% of the total population of 18-year-olds. That race and ethnic differences are larger on V and M than on achievement tests for blacks does not mean that their achievement is higher than their aptitude. A smaller proportion took the achievement tests, and this rate is differential with respect to subject matter. It is noteworthy that they are close to whites in Span-

TABLE 7  
Means by Race and Ethnicity in 1985 on the College Board Achievement Tests in the White Standard Score Metric

	English	Math 1	Math 2	American History	Spanish	Biology	Chemistry	Physics	V	M
<b>American Indian</b>										
N <sup>a</sup>	.004	.004	.003	.004	.004	.003	.002	.002	.006	.006
M	-.54	-.53	-.53	-.27	-.25	-.59	-.39	-.35	-.55	-.55
Verbal	-.45	-.35	-.53	-.31	-.45	-.41	-.58	-.36		
Math	-.54	-.51	-.68	-.36	-.41	-.66	-.61	-.43		
<b>Asian</b>										
N	.115	.112	.188	.114	.098	.121	.168	.199	.059	.059
M	-.56	.21	.16	-.28	-.14	-.09	.12	-.01	-.43	.25
Verbal	-.55	-.59	-.72	-.57	-.59	-.37	-.53	-.82		
Math	.14	.05	.02	.05	-.03	.16	.15	.05		
<b>Black</b>										
N	.045	.047	.033	.038	.058	.043	.038	.040	.103	.103
M	-.68	-.74	-.91	-.59	-.44	-.76	-.64	-.85	-.99	-1.01
Verbal	-.70	-.67	-.78	-.71	-.60	-.63	-.66	-.79		
Math	-.95	-.85	-1.05	-.97	-.85	-.96	-.89	-.99		
<b>Mexican American</b>										
N	.024	.027	.018	.018	.098	.011	.009	.002	.025	.025
M	-.78	-.69	-.71	-.37	1.11	-.59	-.53	-.52	-.64	-.38
Verbal	-.80	-.77	-.79	-.47	-1.00	-.61	-.53	-.65		
Math	-.77	-.79	-.71	-.51	-.86	-.62	-.50	-.46		
<b>Puerto Rican</b>										
N	.066	.006	.004	.004	.022	.006	.005	.007	.011	.011
M	-.52	-.37	-.46	-.18	1.15	-.34	-.19	-.59	-.73	-.75
Verbal	-.44	-.41	-.40	-.28	-.53	-.46	-.45	-.67		
Math	-.54	-.41	-.45	-.40	-.73	-.53	-.44	-.66		

<sup>a</sup>Here and elsewhere in this and other tables, N is proportionate to the size of the white majority.  
Source: Ramist, L. and Arbeiter, S. (1986). Profiles, College-Bound Seniors, 1985. Admissions Testing Program, The College Board.

ish, for which they are least highly selected, and furthest removed from whites in Mathematics 2, for which they are most highly selected.

With one exception other minorities fall in line with their performance levels on the ACT. Puerto Ricans sampled by the SAT have larger deficits than the population sampled by the ACT. Both Hispanic groups are well above the white mean in Spanish, but that option was substantially more attractive to Mexican Americans than to Puerto Ricans. Asians again have a pattern of scores that suggests a specific language deficit. Most striking is the incidence among Asians of taking achievement tests. On each achievement test the Asian sample is less selective than any other, including the white, but Asians do well on the test in spite of this handicap. Do Asian students apply more largely to the most selective institutions, or do they elect to take achievement tests in order to demonstrate their achievement at the highest possible level and in the broadest possible manner?

Table 8 presents the reported number of courses in mathematics and science taken in high school by members of five minority and the white majority groups. Errors in the number of courses reported and in defining courses like remedial arithmetic as mathematics would make interpretation impossible if every applicant took every achievement test. On the average, however, the best students elect to take achievement tests. It is reasonably certain that they are also the best qualified to do so in terms of their course preparation. Furthermore, with the exception of Asians, self-selection is more rigorous for the minorities than for majority whites. Qualifications aside, Asians reported that they took more courses in mathematics, physical science, and biological science than whites. Failure to take proper courses cannot explain the differences in means on the tests.

The data in Table 9 show that low scores in mathematics and science are not associated with below-average aspirations. Although the time lag between the statement of aspiration and the degree awarded is not 4 years, this has little effect on the results. All groups, with blacks showing the largest effects, have a drop from intent to degree in physical science and engineering and a rise in life and social sciences. The changes reflect differences in the rigor in evaluation of students that is characteristic of these disciplines. Students in all groups having low levels of achievement as beginning freshmen move to disciplines in which evaluation is not as rigorous.

Table 10 presents the proportion of intended majors who leave high school with an "A" average. For Asians these data are more nearly in line with their scores on mathematics and quantitative tests than on verbal tests. Even so, it appears that their high school grades would have been underpredicted, relative to the white majority, by those tests on which they have their highest scores. Their "A" averages are also based on a large number of mathematics and science courses. Asian students apparently work harder. Blacks have the smallest proportion of "A" students in spite of the fact that large numbers graduate from

**TABLE 8**  
**Mean Years of Mathematics and Science Courses Taken by College Bound Seniors, and Their Proportion**  
**in the Academic Curriculum by Race and Ethnicity**

	1981				1984			
	Math	Physical Science	Biological Science	Proportion Academic	Math	Physical Science	Biological Science	Proportion Academic
American Indian	3.31	1.67	1.46	.680	3.42	1.70	1.43	.666
Asian	3.74	1.99	1.50	.728	3.86	2.09	1.48	.747
Black	3.26	1.57	1.44	.618	3.40	1.65	1.43	.635
Mexican American	3.25	1.46	1.31	.658	3.44	1.50	1.34	.680
Puerto Rican	3.22	1.60	1.39	.646	3.35	1.66	1.41	.637
White	3.55	1.81	1.39	.789	3.69	1.89	1.39	.803

*Source:* National Science Foundation (1986). Women and Minorities in Science and Engineering.

**TABLE 9**  
**Academic Major Intention at College Entrance in 1981 Compared with Degree Awarded in 1983 in Science and Engineering**

	Physical Science		Engineering		Life Science		Social Science	
	Intent	Degree	Intent	Degree	Intent	Degree	Intent	Degree
American Indian	.223	.155	.330	.156	.135	.198	.313	.491
Asian	.302	.234	.453	.326	.098	.190	.146	.251
Black	.293	.163	.304	.112	.070	.145	.332	.580
Mexican American	.209	.148 <sup>a</sup>	.360	.201 <sup>a</sup>	.094	.198 <sup>a</sup>	.337	.453 <sup>a</sup>
Puerto Rican	.246	.148 <sup>a</sup>	.286	.201 <sup>a</sup>	.100	.198 <sup>a</sup>	.367	.453 <sup>a</sup>
White	.235	.183	.319	.210	.143	.190	.303	.417

<sup>a</sup>Reported as Hispanic which also includes Central and South Americans.

Source: National Science Foundation (1986). Women and Minorities in Science and Engineering.

largely black high schools in which grades are affected by the level of the student body. Teachers in all schools at all levels tend to assign grades relative to the performance of the group rather than to an absolute standard.

The data in both Tables 9 and 10 show that high school students planning to attend college recognize that some majors are more demanding than others. The best students in all groups aspire to major in physical science, mathematics, and engineering. The poorest intend to major in business and education. Among the sciences the social sciences attract the poorest students.

**Recent Trends in Undergraduate Education.** Achievement test results are not readily available over time, but differences on the SAT in Table 11 indicate expected trends. My sources did not report standard deviations, so a standard score metric was approximated by using the standardization *SD* of 100. Two minorities showed little change, two showed small gains, and blacks showed the

**TABLE 10**  
**Proportion of Intended Majors with an "A" Average in High School by Race and Ethnicity**

	Physical Science	Math	Engineering	Biological Science	Social Science	Business	Education
American Indian	.500	.279	.415	.255	.209	.166	.182
Asian	.676	.664	.561	.578	.454	.277	.231
Black	.319	.268	.239	.175	.115	.055	.029
Hispanic <sup>a</sup>	.469	.269	.503	.369	.318	.142	.139
White	.485	.527	.426	.397	.286	.215	.210

<sup>a</sup>Hispanic also, includes Central and South Americans.

Source: National Science Foundation (1986) Women and Minorities in Science and Engineering.



TABLE 11  
Trends in Performance on the SAT-V and M Ability Tests by Race and Ethnicity

	1976		1980		1984		1987	
	Verbal	Math	Verbal	Math	Verbal	Math	Verbal	Math
American Indian	-.68	-.73	-.52	-.56	-.59	-.63	-.54	-.57
Asian	-.37	.25	-.46	.27	-.51	.29	-.42	.32
Black	-1.19	-1.39	-1.12	-1.22	-1.07	-1.17	-.96	-1.12
Mexican American	-.80	-.83	-.70	-.69	-.73	-.70	-.68	-.65
Puerto Rican	-.87	-.92	-.92	-.88	-.83	-.90	-.87	-.89

Source: National Science Foundation (1986). Women and Minorities in Science and Engineering for 1976 to 1984 data. The 1987 means were published in a local paper.

largest gains. During this same time period, the percentage of black high school graduates entering higher education dropped by about 7% (Hauser, 1986) while the percentage of blacks graduating from high school continued to increase to a level less than ten percentage points below the white. The drop in the college attendance rate started in the Carter administration and continued in the Reagan administration. The increase in high school graduation rate also occurred under both administrations.

If the black gains in test scores are real, a reasonable explanation of the reduction in college-going, and one favored by Hauser (1987), is lack of financial aid. Supporting this explanation is a small degree of correspondence between the black gain in reading on the fourth NAEP assessment of 17-year-olds and their gains on the SAT. Although not shown, the major portion of their gain on V occurred between 1981 and 1982. The majority of the third assessment cohort would have taken the SAT for college admission in 1981. If black 17-year-olds gained year by year between the third and fourth assessments, those gains did not show up on SAT-V. Also, the NAEP gain appears to be a good deal larger than the gains that appeared among SAT test takers.

It is also possible that college admission for blacks has become more selective on academic grounds. During the first few years following the passage of civil rights legislation and the death of Martin Luther King, the belief that test scores were invalid for blacks was more widespread even than it is today. Institutions accepted many blacks without regard to their academic achievement in high school, and black enrollment rose steadily. However, college graduation rates did not keep pace with college entrance rates. Not only may institutions have become more selective of black applicants, but there may have been more self-selection as well. Some of the latter could be based on reports of academic difficulties experienced by black students in earlier high school classes. Teachers in largely black high schools could also have developed a more accurate feel for the level of achievement of their students relative to the demands of the colleges and advised their students accordingly.

**TABLE 12**  
**Trends in Undergraduate Enrollment and Degrees Awarded in All Fields**  
**for Minorities Relative to Majority Whites**

	1976-77	1978-79	1980-81	1982-83	1980-81 Education	1980-81 Physical Science
Black enrollment	.114	.115	.112	.110	b	b
degrees	.073	.074	.075	b	.101	.043
Hispanic enrollment	.042	.045	.048	.052	b	b
degrees	.023	.025	.027	b	.030	.018
Other <sup>a</sup> enrollment	.054	.062	.069	.077	b	b
degrees	.041	.046	.056	b	.023	.066

<sup>a</sup>Includes American Indians, Asians, and Nonresident aliens

<sup>b</sup>Not available

*Source:* Thomas, G. E. (1986). The access and success of blacks and Hispanics in U.S. graduate and professional schools. A working paper for the Office of Scientific and Engineering Personnel, National Research Council.

The trends in total undergraduate enrollment in Table 12 follow the expectation based on the decrease in black freshman enrollment referred to above. Undergraduate enrollment also serves as a base line for the trends in degrees earned. The very small increase in the proportion of black degrees relative to whites from 1976-77 to 1980-81 corresponds to a period 4 to 5 years earlier during which the proportion of black high school graduates entering college was increasing. Hispanics had a somewhat larger increase in the proportion of undergraduate degrees, but their proportion in the total population was also increasing. The larger increase in the Other category is uninterpretable without a count of the nonresident aliens.

Table 12 also illustrates the ordering of perceived (and real) difficulties of academic majors. Education and physical science define the range. In 1981, blacks received degrees at the highest rate in education, but, even so, this rate was smaller than their numbers in the population. The ordering is also apparent in Table 13, which is restricted to the sciences and engineering. Asians, who have the highest achievement levels, tend to avoid the social sciences, while students with the lowest achievement levels gravitate to the social sciences. This does not indicate, incidentally, that the subject matter of the social sciences is intrinsically less difficult, but faculties in the various disciplines do have different standards.

Both Tables 12 and 13 show that gains by minorities relative to majority whites in undergraduate degrees have been small during the late 70s and early 80s. Hauser's (1986) graphs extend the time period. They show little variation in number of black college graduates overall in the appropriate age range from 1973 on. There was a substantial increase to 1973 from the number in 1967. The

**TABLE 13**  
**Trends in Bachelor's Degrees in Science and Engineering Awarded to Minorities**  
**Relative to the White Majority**

	American Indian		Asian		Black		Hispanic <sup>a</sup>	
	1979	1983	1979	1983	1979	1983	1979	1983
Physical Science	.003	.003	.027	.049	.048	.056	.026	.029
Engineering	.003	.003	.035	.034	.034	.034	.030	.035
Biological Science	.004	.004	.028	.038	.044	.048	.033	.038
Social Science	.005	.005	.019	.023	.095	.088	.044	.039

<sup>a</sup>Hispanic also includes Central and South Americans

Source: National Science Foundation (1986). Women and Minorities in Science and Engineering.

obvious explanation for the change following 1973 is the level of black academic achievement at high school graduation, but other explanations are more acceptable politically. The initial increase was due to widespread acceptance of the need for equal rights and white guilt at the long delay in granting those rights, while the leveling off was imposed by the small proportion of black high school graduates who could understand typical college lectures and college reading assignments. The guilt was highly appropriate, but guilt alone is inadequate as a basis for policy.

**Levels of Achievement of College Graduates.** I now turn to measured levels of achievement in their chosen disciplines of various minority groups. Advanced test data from the Graduate Record Examination (GRE) program are available for only one year, 1978–79, and are shown in Table 14. The control for selectivity is not quite as good as it was for the achievement tests of the College Board because the V and Quantitative Aptitude (Q) subgroups could not be aligned perfectly with the Advanced Test Subgroups. Both sample sizes and means of three to five minorities relative to majority whites are presented in Table 14 for six subject matter areas and for a composite of mathematics, computer sciences, and physics. Because many *Ns* were small, means were not made available for some minorities in some of the areas.

There is again a problem associated with the size of the units of measurement. GRE units are not equal to SAT units, but the two are more similar to each other than either is to Coleman report units. One can conclude with confidence that minorities applying for entrance to graduate schools leave their undergraduate institutions with deficits in subject matter competence that vary from mostly trivial for Asians to very substantial for blacks. As in data obtained earlier in the academic career American Indians and Mexican Americans are in an intermediate position while Puerto Ricans have deficits about as large as those for blacks. There are too many uncertainties to conclude anything about whether deficits

**TABLE 14**  
**Means by Race and Ethnicity on the GRE Advanced Tests in 1979 in the White Standard Score Metric**

	Political								
	Math <sup>a</sup>	Chemistry	Engineering	Biology	Psychology	Science	Education	Verbal	Quantitative
<b>American Indian</b>									
N	.004	.006	.003	.004	.007	.007	.008	.007	.007
M				-.59	-.40	-.44			
Verbal	-.39	-.56	-.49	-.71	-.42	-.33	-.51	-.47	
Quantitative	-.12	-.57	-1.09	-.87	-.52	-.49	-.50		-.56
<b>Asian</b>									
N	.048	.053	.119	.032	.015	.022	.010	.018	.018
M	-.14	-.19	-.23	-.07	-.17	-.13	-.44		
Verbal	-.55	-.43	-.67	-.26	-.23	-.31	-.32	-.28	
Quantitative	-.24	.19	.00	.27	.13	-.02	.12		.34
<b>Black</b>									
N	.047	.049	.032	.045	.092	.131	.167	.081	.081
M	-1.38	-1.36	-.93	-1.80	-1.22	-1.53	-1.46		
Verbal	-1.56	-1.42	-1.23	-1.57	-1.31	-1.40	-1.29	-1.33	
Quantitative	-2.11	-1.75	-1.61	-1.81	-1.35	-1.46	-1.35		-1.37
<b>Mexican American</b>									
N	.006	.007	.012	.008	.011	.019	.012	.015	.015
M			-.56	-.44	-.49	-.69	-.54		
Verbal	-1.05	-.31	-.92	-1.10	-.76	-.74	-.90	-.83	
Quantitative	-1.03	-.39	-.83	-1.16	-.79	-.76	-.95		-.84
<b>Puerto Rican</b>									
N	.007	.016	.015	.018	.012	.015	.007	.009	.009
M		-.48	-1.01	-1.31	-1.11	-1.20	-1.49		
Verbal	-1.46	-1.16	-1.36	-1.18	-1.19	-1.20	-.99	-1.10	
Quantitative	-1.42	-1.06	-.96	-1.14	-1.15	-1.08	-1.04		-.88

<sup>a</sup>This is a composite of advanced tests in mathematics, computer science, and physics.

Source: Graduate Record Examination (1979). Background information analysis, Statistical Memoranda. Princeton: Educational Testing Service.

have been reduced or widened, but it is probably safe to conclude that there was little change.

Also, as before, there are differences in selectivity from one subject matter area to another. Blacks elected political science and education at close to their representation in the GRE population. The number of examinees in engineering was lowest for this minority, but their mean was their best performance. Asians, in contrast, apply in engineering in relatively large numbers, but their mean performance is only slightly lower than for the composite, chemistry, biology, and psychology. Samples of Asians in political science and education were small so that means are less stable. Nevertheless, the low prestige of those disciplines among members of the Asian minority is clearly evident.

**Trends in Graduate Education.** Trends on the GRE-V and Q for the five minorities and the white majority are presented in Table 15 for all undergraduate

**TABLE 15**  
Trends in Performance on GRE-V and Q by Undergraduate Major by Race and Ethnicity in the White Standard Score Metric

	American Indian		Asian		Black		Mexican American		Puerto Rican	
	1979	1984	1979	1984	1979	1984	1979	1984	1979	1984
<b>Verbal Score</b>										
Total	-.47	-.35	-.28	-.24	-1.33	-1.25	-.83	-.80	-1.10	-1.15
Physical Science	-.56	-.37	-.43	-.06	-1.42	-1.21	-.30	-.42	-1.16	-1.38
Mathematics	-.39	-.65	-.55	-.65	-1.56	-1.56	-1.05	-.88	-1.46	-1.54
Engineering	-.49	-.08	-.67	-.65	-1.24	-.95	-.92	-.56	-1.36	-1.22
Biological Sciences	-.71	-.39	-.26	-.17	-1.57	-1.22	-1.10	-.71	-1.18	-1.55
Behavioral Science	-.42	-.31	-.23	-.12	-1.31	-1.28	-.72	-.70	-1.19	-1.11
Social Science	-.33	-.38	-.31	-.31	-1.40	-1.34	-.74	-.76	-1.20	-1.22
<b>Quantitative Score</b>										
Total	-.56	-.53	.34	.48	-1.37	-1.31	-.84	-.80	-.88	-.87
Physical Science	-.57	-.25	.19	.38	-1.75	-1.55	-.39	-.71	-1.06	-1.14
Mathematics	-.12	-1.12	-.24	-.08	-2.11	-2.31	-.94	-1.12	-1.42	-1.69
Engineering	-1.09	-.06	.00	-.05	-1.60	-1.56	-.83	-.64	-.96	-1.21
Biological Science	-.87	-.48	.26	.35	-1.81	-1.64	-1.16	-.78	-1.14	-1.35
Behavioral Science	-.52	-.49	.13	.26	-1.35	-1.32	-.79	-.72	-1.15	-1.05
Social Science	-.49	-.74	-.02	.14	-1.46	-1.42	-.76	-.79	-1.08	-.94

Source: National Science Foundation (1986). *Woman and Minorities in Science and Engineering*.

majors and for those in the sciences and engineering. (The Analytical score is omitted because it adds little information.) Unfortunately, my source did not publish sample sizes or standard deviations, so the degree of selectivity cannot be determined and the size of a deficit can only be approximated by the standard deviation of 100 used in the original standardization of the tests. Means in engineering increased for all groups, but psychology and the social sciences did not fare as well. Differences between V and Q in the physical sciences and engineering are large and in the expected direction, while V generally is a little higher than Q for psychology and the social sciences. Asians, however, have higher quantitative scores in those disciplines, but far below their level in the physical sciences and engineering.

Enrollment trends and degrees in graduate school are shown in Table 16. Black enrollment in graduate school dropped by almost one percentage point by 1982 and was approximately flat in professional school. Hispanics showed a small increase from 1976 to 1982 while the enrollment of "others" in graduate school increased markedly. Presumably both Asians and nonresident aliens shared in that increase.

Between 1977 and 1981 the proportion of degrees awarded to blacks and Hispanics relative to majority whites stayed at a low constant level. Blacks were somewhat more likely to drop out after the masters degree than Hispanics. Data on others is, of course, uninterpretable. Also included in the table are graduate degrees awarded in education and the physical sciences. The proportions in these two disciplines define the range. It is again seen that the discipline in which

**TABLE 16**  
**Trends in Graduate School Enrollment and Degrees in All Fields for Minorities**  
**Relative to the White Majority**

	1976-77	1978-79	1980-81	1982-83	1980-81 Education	1980-81 Physical Science
Black enrollment	.065	.063	.066	.057	b	b
masters degrees	.080	.077	.071	b	.104	.026
doctors degrees	.047	.049	.049	b	.096	.013
Hispanic enrollment	.024	.025	.029	.029	b	b
masters degrees	.023	.022	.027	b	.034	.013
doctors degrees	.020	.016	.018	b	.022	.009
Other <sup>a</sup> enrollment	.168	.193	.228	.265	b	b
masters degrees	.088	.105	.122	b	.050	.229
doctors degrees	.168	.185	.200	b	.118	.262

<sup>a</sup>Includes American Indians, Asians, and nonresident aliens

<sup>b</sup>Not available

Source: Thomas, G. E. (1986). The access and success of blacks and Hispanics in U.S. graduate and professional schools. A working paper for the Office of Scientific and Engineering Personnel, National Research Council.

**TABLE 17**  
**Trends in Graduate Degrees in Science and Engineering for Minorities**  
**Relative to the White Majority**

	American Indian		Asian		Black		Hispanic	
	1979	1983	1979	1983	1979	1983	1979	1983
<b>Master's Degrees</b>								
Physical Science	.006	.002	.046	.080	.025	.032	.014	.020
Engineering	.002	.003	.084	.144	.024	.033	.021	.032
Biological Science	.002	.004	.035	.034	.033	.029	.018	.030
Social Science	.004	.005	.019	.028	.071	.068	.027	.036
<b>Doctor's Degrees</b>								
Physical Science	.001	.002	.083	.073	.018	.011	.017	.015
Engineering	.003	.004	.265	.219	.017	.026	.021	.026
Biological Science	.001	.005	.056	.055	.013	.016	.015	.014
Social Science	.004	.005	.029	.025	.043	.041	.023	.031

*Source:* National Science Foundation (1986). *Women and Minorities in Science and Engineering.*

evaluation is least rigorous attracts students with lower levels of precollege and undergraduate college achievement.

Over a somewhat different time period Table 17 portrays the graduate degrees awarded in the sciences by appropriate groupings of the scientific disciplines. If colleges and universities were able to hire the entire population of black and Hispanic Ph.D.s, it would not be possible to come close to affirmative action goals in any scientific or engineering discipline. Reducing the standard for hiring to a masters degree would increase the pool of possible hires by a small amount relative to majority whites, but would increase the total number by a factor of about 3 in the sciences, of 8 in engineering. An action of this sort would be no more drastic essentially than court-ordered proportional representation has been elsewhere in our society.

The availability of financial support in graduate school is certainly expected to affect enrollments and degrees awarded. I did not find a systematic study of this problem, but data should be available. Such a study would require an analysis of sources of support, discipline by discipline, because the availability of financial aid varies widely within a university and from one university to another. Minorities who are found more frequently in education, the social sciences, and, presumably, the humanities, than in the physical sciences, biological sciences, or engineering are likely to be awarded less aid. The same problem is encountered in comparisons of financial aid available to men and women.

### **Documentation of the Importance of the Deficits**

There are two approaches to documenting the importance of the achievement deficits of individuals and of the minority groups whose means differ substan-

tially from the mean of the white majority that fall within the purview of a psychologist concerned with individual differences. The first is a logical, rational approach, the second is statistical. A third approach concerns the divisiveness that is produced in a society, whose traditional ethos stresses the importance of individual merit, when group membership is given priority in access to education and jobs. Of course, the ideal has been violated in the past in many ways, not the least being widespread refusal to recognize individual merit in the members of groups currently profiting from actions taken by legislative bodies and the courts contrary to that traditional ethos. This reversal, nonetheless, is divisive, but a different kind of psychologist with access to a different literature is needed to discuss this approach to the importance of ILS.

***Rational Documentation.*** The citizens of this country value achievement in the basic intellectual skills of aural and reading comprehension of the English language, the ability to speak and write that language with some degree of fluency, knowledge of elementary arithmetic computations and use of that knowledge in solving everyday computational problems, and a minimum knowledge of history and science. Public education has been supported at a high level for many years, perhaps not as high a level as educators believe is needed, but high in terms of the status of public education in this country compared to most other nations of the world.

The term “functional illiteracy” has received wide currency to describe deficits in basic academic skills, but this term does not convey the full extent of the problem. An individual who falls in this category has typically acquired these skills at a low level which does not allow him or her to function adequately as a productive citizen in a technological society. Furthermore, the low level of achievement of these individuals is the outcome in most cases of 10–12 years of educational experience, and a relatively large proportion have been awarded a high school diploma. Only a few persons in this category are immigrants from countries in which educational opportunity was lacking. Failure to acquire basic skills at an acceptable level under the circumstances described is justifiably disturbing.

Another aspect of failure to acquire adequate levels of basic skills enlarges the problem. Measures of basic skills are substantially correlated with each other. If a person is quite low in reading comprehension, one’s best bet is that he or she will not be quite as low, but still well below average, in aural comprehension, writing, arithmetic, and knowledge of history and science. The deficits even include industrial and home arts. The poor reader who is average or better in other areas is the exception. The degree of generality of the deficits in basic skills when added to the years spent in school without acquiring minimum competence makes my use of ILS highly appropriate.

ILS has a higher incidence in the black population than in the white. Hispanics also have a high incidence, but the amount of data available for the black



population allows me to discuss their problem with more confidence. Table 18 represents, on average, any basic skill. It quantifies at age 18 when students leave high school for work or for postsecondary education the meaning of ILS for both individuals and the white and black groups. It quantifies the importance of black deficits at the other end of the distribution as well. Basic to the formation of the table is the assumption that the two groups have means separated by one standard deviation of the white distribution, that the two variances are approximately equal, and that the distributions are normal. An additional assumption is that the standard deviation of grade or age equivalent scores is three at age 18.

The information in this table is correct in essentials, but minor qualifications must be introduced before applying it to the measurement of any one basic skill. The equation of standard scores with grade and age equivalents, as was seen in Table 4, varies somewhat from one test to another. Proportions at the low end of the distribution of ability must be modified by the incidence of low scores made by persons with identifiable organic deficits. The black/white ratio for familial retardation does not apply to those with organic deficits. The black variance may also be a little smaller than the white, thus affecting the proportions.

Looking first at the proportions below the negative standard scores, it is clear that the incidence of ILS is substantially higher within the black population. With approximately 15% of the black population at age 18 achieving in basic academic skills at the 6th-grade level or below, the problem is obviously important. Jobs that require little reading or arithmetic still require comprehension of oral instructions by supervisors or oral communications with coworkers or the public. A young person cannot use a keyboard to copy English text with competitive speed and accuracy if that person has little knowledge of spelling, capitalization, punctuation, and the structure of sentences in the English language. High unemployment rates for black youths are regrettable but understandable. Too many are essentially unemployable.

**TABLE 18**  
**Proportions of Blacks and Whites Below and Above Several Standard Scores**  
**of a White Distribution in Grade 12**

Standard Score	-3.00	-2.00	-1.00	.00	+1.00	+2.00	+3.00
Grade Equivalent	3	6	9	12	a	a	a
Age Equivalent	9	12	15	18	a	a	a
White Proportion Below	.0013	.0227	.1587	.5000	.8413	.9773	.9987
Black Proportion Below	.0227	.1587	.5000	.8413	.9773	.9987	1.0000
White Proportion Above	.9987	.9773	.8413	.5000	.1587	.0227	.0013
Black Proportion Above	.9773	.8413	.5000	.1587	.0227	.0013	.0000

<sup>a</sup>Not applicable

Turning now to the proportions above the positive standard scores in the table, the difficulty of finding blacks in appreciable numbers with undergraduate, graduate, and professional degrees of competitive quality is obvious. Achievement tests do not have esoteric content that bears no obvious relationship to educational or job performance. Tests of aural and reading comprehension are essentially job sample tests for students at every level of instruction. Students with low scores in Mathematics 1 of the College Board are not ready for the calculus. Students with undergraduate degrees in the sciences who have little grasp of their subject are not ready for graduate work in their discipline. The problem is not the small number of degrees awarded to blacks, but the inadequate learning of those presently in degree programs. Until facts like these are acknowledged, it is unlikely that effective social action will be taken.

The preceding statements do *not* depend on an assumption that the race differences in basic skills are, after all, genetically determined. The statements *do* depend on the observation that remediation is not now taking place at age 18 and beyond. Although our inability to place all nationally used tests on the same scale of measurement, having a constant zero and equal units requires caution in interpreting the various sources of data, it appears that the black deficit in achievement is at about the same level after 4 (or more) years in college as it was at the time of high school graduation. Black law school graduates fail the bar examination at about the rate expected from their deficit in high school achievement. Remediation may not be impossible at age 18, but it is not occurring in any noticeable amount.

The problem of little remediation is compounded by the fact that we do not know how to improve on what is now being tried. A great deal of job retraining as well as initial job training for adults is now going on in this country. This training is widely touted as the way to reform the welfare system. It may be effective, but to the best of my knowledge no one knows. This includes both politicians and administrators of programs who give optimistic accounts to the media. A careful evaluation of these programs should be a top priority for psychological and social scientists. Economists and other social scientists who participate should discard their blinders concerning the significance of individual differences in achievement at the time training or retraining is started. Pretesting constitutes an essential control if there is to be a contribution to knowledge.

The relationship between whites and blacks portrayed in Table 18 also represents scores on intelligence tests. Such tests can legitimately be viewed as measures of achievement in basic skills acquired in the preschool years in the home and neighborhood. The mean difference between the races is approximately one standard deviation in the preschool period. The scope of remediation must be extended to the very young and broadened beyond formal schooling.

**Statistical Documentation.** There is widespread acceptance among psychologists who construct and use tests of a definition of test bias based on a comparison of the regressions of important social criteria on test scores. The question

answered is whether the same prediction of educational or job performance can be made from a given test score without regard to group membership, or whether the significance of the score for criterion performance depends on group membership.

At this point in time one can conclude with confidence that overprediction of black performance from tests measuring maximum performance occurs when whites and blacks compete in a criterion situation in which both groups are assessed on their proficiency on the same measurement scale. Linn (1982) surveyed and evaluated the data basic to this generalization, but his report is now several years old. More recent data merely add support to the generalization. The amount of overprediction is typically small and does not require a deficit on a second dimension. A small amount of overprediction is what one would expect from measurement error in the predictor. There is no bias against blacks in terms of this definition.

The preceding generalization introduced several qualifications that must be respected in attempting to see how it fits with any specific statistical outcome, while one qualification, the uncertainty introduced by sampling error, should be taken for granted. The generalization does not apply to self-report tests that attempt to measure typical performance. It does not apply in situations in which the measurement scales have the same name but are different. Grade point averages obtained in different schools, in different curricula or over different courses in the same curriculum are not on the same measurement scale. Finally, the generalization applies to criterion measures of proficiency. Other criteria have not been extensively studied from this point of view.

Statistical criteria of importance are compelling, but will always be incomplete. Present data, however, make it unreasonable to require a new regression comparison for each new test, or for each new proficiency criterion. There is a great deal of validity generalization of the new-test new-criterion sort (Hunter, 1986). Predictive validity may not be quite as general as Hunter believes (Humphreys, 1986), but the generality is sufficient for one to expect similar regression differences in good data for new test/criterion relationships. A more important gap in our knowledge is the absence of regression comparisons over much longer time periods than have been investigated to date. Will blacks who had lower test scores at every educational level prior to entering law school, lower law school grades, and lower scores on bar exams also perform at somewhat lower levels 10 years after starting their practice? How will black Ph.D.s in the sciences and engineering perform 10 years after their degrees? Careful quantitative research of this sort is at best difficult, but it should be attempted. A qualitative analysis of a random sample of 100 case histories would be an important contribution.

### **Frequently Proposed Remedies**

I shall discuss only those solutions expected to have trivial effects. Because of my inability to discuss more useful possibilities, I shall leave to persons con-

cerned with research and development in child development and education the selection and investigation of more important variables. My discussion is not well documented, but I challenge critics to find dependable data to support an opposite conclusion concerning any given proposal.

***More Role Models.*** American Jews of Eastern European heritage had few role models in the universities at the beginning of WW II. Asians had few role models until more recent times. Women had few role models in the sciences and engineering in the late 60s when their relatively rapid increase had its feeble start. This is a rationalization, not a remedy.

***More Student Financial Support.*** More blacks could be encouraged to enter higher education with more support, but the highest achievers are now doing so and are achieving at lower levels than their white counterparts. Level of achievement is a more important criterion than the number of degrees.

***More Money for Schools.*** The effectiveness of education can be improved, but simply providing more money for the schools is not the answer. It is also less than adequate to focus on kindergarten through grade 12, let alone 9 through 12. Attention to the preschool years is also required.

***Improve Test Taking Skills.*** Some who advance this proposal discuss the issues as if minority students rarely encounter a multiple choice test prior to the ACT or SAT. This is nonsense.

***Learning from the Traditionally Black Institutions.*** These institutions do produce a large share of black undergraduate degrees and an appreciable share of graduate and professional degrees. Their secret, however, is not in their educational methodology or in the ambience of the institution, but in lower standards of achievement. I hasten to add that a large number of largely white institutions share the same secret. The variability in scores on predictor tests among any select major group such as engineers tells at least as much about the variability in standards of the institutions granting the degrees as it does about the fallibility of the test's predictions of future performance.

***Short-term Remedial Efforts.*** Many institutions have summer programs for special admission students that are supposed to "bridge" the transition from high school to college. There are also special courses and special sections of courses for minorities. For students who cannot read college text books or listen to college lectures or discussions with understanding these programs have a trivial effect on achievement. Nonetheless, as the Division 1 schools of the NCAA have amply demonstrated, such programs in conjunction with careful selection of snap courses and a great deal of tutoring can keep athletes in school for four years or more.

**Require More Solid Courses in High School.** This will do little to increase the number of minorities qualified for science and engineering degrees although it should increase minority achievement. The problem is that the highest achieving minority students are now taking solid courses. The mean on Mathematics 2 of the College Board will be reduced if more students take the requisite courses and elect to take the test.

**Remove Test Bias.** By the definition based on predictive bias, existing bias favors blacks (less is known about Hispanics). If the definition is the superficial one based on a difference in means on the test, the task is an impossible one if, simultaneously, the predictive validity of the test is to be preserved. A decrease in the mean difference accompanied by a decrease in validity will increase the predictive bias of the test favoring blacks.

**Remove Item Bias.** This is not a trivial problem psychometrically. As a matter of fact, it is more complex than many users of the IRT methodology believe it to be. It is, however, legitimately characterized as a trivial matter with respect to qualifying more minorities for jobs and higher education while maintaining levels of achievement.

**Strong Forms of Affirmative Action Generally.** By strong forms of affirmative action I refer to selection and promotion decisions made on the basis of goals or quotas based on proportionate representation. When undertaken at age 18, the effects of such policies on increasing the pool of talent are trivial. This conclusion does not deny the importance of finding and supporting talent aggressively, which was the original definition of affirmative action.

**Psychology of Individuals.** My last proposed remedy brings this paper to a pessimistic conclusion. It seems highly probable that breakthroughs in the psychology of individual development, learning, and motivation cannot solve the problem. ILS in an individual student is affected by the prevalence of ILS among parents and other relatives, neighborhood adults, and peers. It is embedded in a complex of problems that include teen pregnancy, illegitimacy, female-headed families, welfare, drugs, prostitution, and violent crime. ILS covers a broader spectrum of social issues than AIDS.

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