

Science Majors and Nonscience Majors Entering Medical School: Acceptance Rates and Academic Performance

Norma E. Sorenson, *University of Alabama, Birmingham*

James R. Jackson, *University of Alabama, Birmingham*

As undergraduate students, most applicants to medical schools have majored in a natural science area. This study compared rates of acceptance and medical school academic performance of science and nonscience majors applying to 13 classes of The University of Alabama School of Medicine. There was no significant difference in acceptance rates between the two types of majors. Upon matriculation, medical students with nonscience majors performed as well as those with science majors on most standard measures of medical school academic performance.

The majority of students who enroll in a United States medical school have majored in a natural science at their undergraduate institutions; only 19% of applicants to medical schools are nonscience majors (Association of American Medical Colleges, 1994). Almost half of the previous applicants at The University of Alabama School of Medicine majored in biology (37.3%) or chemistry (7%) (University of Alabama School of Medicine, 1994), even though the University of Alabama at Birmingham catalog states that suitable major areas include social and behavioral sciences, humanities, and biological and physical sciences. The catalog states that the Committee on Admissions places more importance on the quality of the applicant's undergraduate work than on the subject matter studied.

Determining whether or not the type of undergraduate major affects admission to and academic performance in medical school would help advisors who are guiding students toward appropriate majors. Little research has been done to compare students' academic performances in the basic sciences and clinical years after they have enrolled in medical school. We compared the acceptance rates and academic performances of science majors and nonscience majors entering The University of Alabama School of Medicine from 1978 through 1990.

Method

The authors compiled applicable data on 10,232 applicants to determine the acceptance rates of science majors and nonscience majors and to study preadmission characteristics. All of the 1,873 stu-

dents who matriculated were studied in regard to preadmission characteristics, academic performances, and attrition rates. In the applicants group, 51% were Alabama residents with 43% attending Alabama colleges. In the matriculants group, 94% were Alabama residents with 73% attending Alabama colleges.

The classifications, described by the American Association of Medical Colleges, for undergraduate majors were utilized for coding undergraduate majors. They include biological sciences, physical sciences, math and statistics, specialized health sciences, social sciences, and humanities. These were categorized further by the following designations:

1. Science major—biological sciences, physical sciences, math and statistics, or specialized health sciences.
2. Nonscience major—social sciences or humanities.

The SPSS statistical package was used to perform the analysis of the data. The data for all 13 yearly classes were pooled in order to have sufficient numbers of subjects in each group; however, subjects who transferred into the program were not added to the data.

Results

Acceptance Rates

Is there a difference in the acceptance rates of science majors and nonscience majors? The percentage of applicants offered acceptance was calculated for science majors and nonscience majors. The difference between the percentages was tested for statistical significance using chi-square analysis. An alpha level of 0.05 was used as the criterion for statistical significance in all tests. This and all other tests were two-tailed t-tests.

The acceptance rate was 24.8% for science majors (2,253/9,082) and 27.5% for nonscience majors (316/1,150). This difference is statistically significant ($\chi^2 = 3.87$, $df = 1$, $p = 0.049$).

Applicants' Preadmission Data

Is there a difference in the preadmission aca-

Table 1 Comparison of MCAT Scores for Science Majors and Nonscience Majors Applying to The University of Alabama School of Medicine From 1978 Through 1990

MCAT Scores						
MCAT and Major	<i>n</i>	Mean	<i>SD</i>	<i>t</i> *	<i>p</i>	Effect Size**
Science Problems						
Science Majors	9,082	7.7	2.1	1.27	0.203	.04
Nonscience Majors	1,150	7.6	2.1			
SA: Reading						
Science Majors	9,082	7.8	2.2	5.18	<0.001	.16
Nonscience Majors	1,150	8.1	2.2			
SA: Quantitative						
Science Majors	9,082	7.5	2.2	4.27	<0.001	.13
Nonscience Majors	1,150	7.8	2.2			
Total						
Science Majors	9,082	46.5	10.9	.94	0.345	.03
Nonscience Majors	1,150	46.9	10.9			

Note. MCAT scores are based on the average of the two most recent tests.

**df* = 10,230

**Difference in means divided by pooled *SD*

ademic performance or the undergraduate college selectivity of science majors and nonscience majors who apply? Descriptive statistics were calculated for science majors and nonscience majors who applied, based on each of the following preadmission variables:

1. MCAT scores—Science Problems, Reading, Quantitative, Total.
2. Cumulative undergraduate GPAs—science, nonscience, total.
3. Astin index of undergraduate college selectivity (Astin, 1965).

The t-test for independent groups was used to test the difference between group means for statistical significance on MCAT scores and the Astin Index. An index of practical significance, effect size, was used for the t-tests with the following conventions: Small = 0.20 to 0.49, Medium = 0.50 to 0.79, and Large = 0.80 and greater (Cohen, 1988).

As noted by Jones and Adams (1984), since similar undergraduate GPAs from different colleges may reflect differing levels of achievement, the Astin index was used as a measure of college selectivity. The index is based upon the average combined Scholastic Aptitude Test scores of entering freshmen at each college or university and was used to classify the colleges into groups of low, medium, and high selectivity. This categorical variable was used as a control variable when comparing the groups on

GPA. A two-factor analysis of variance (ANOVA) was used for this analysis. The two factors were type of major and Astin category. An index of practical significance, effect size, was used for the main effects and interaction of the ANOVAs with the following conventions: Small = 0.01 to 0.05, Medium = 0.06 to 0.13, Large = 0.14 or greater (Cohen, 1988). Tests of simple main effects determined statistical significance of the differences between the groups at each selectivity level.

Table 1 shows the mean MCAT subtest and total scores by type of major. For applicants who had taken the MCAT more than once, the average of the two most recent tests was used. The MCAT total score includes the three additional subtest scores (Biology, Chemistry, and Physics). Statistically significant differences were found in scores for Skills Analysis: Reading and Skills Analysis: Quantitative with nonscience majors achieving higher means. A statistically significant difference ($t = 15.24$, $df = 10,230$, $p < 0.001$, Effect Size = 0.47) was found in the Astin index means, which were used as a measure of college selectivity by providing the average Scholastic Aptitude Test score of entering freshmen at each undergraduate institution. The Astin index was 972 ($SD = 133$) for applicants with science majors and 1,035 ($SD = 141$) for applicants with nonscience majors, which indicates that those with nonscience majors attended more highly selective institutions.

Table 2 Comparison of Undergraduate Grade-Point Averages by College Selectivity for Science Majors and Nonscience Majors Applying to the University of Alabama School of Medicine From 1978 Through 1990

Undergraduate College Selectivity				
	Low	Medium	High + Very High	Total
Science GPA				
Science Majors				
Mean	3.20	3.23	3.16	3.20
SD	0.51	0.47	0.48	0.49
n	2,420.00	3,817.00	2,845.00	9,082.00
Nonscience Majors				
Mean	3.01	3.06	3.04	3.05
SD	0.62	0.58	0.51	0.55
n	157.00	439.00	554.00	1,150.00
All Majors				
Mean	3.19	3.21	3.14	3.18
SD	0.52	0.49	0.49	0.50
n	2,577.00	4,256.00	3,399.00	10,232.00
Nonscience GPA				
Science Majors				
Mean	3.41	3.49	3.35	3.42
SD	0.45	0.39	0.39	0.41
n	2,420.00	3,817.00	2,845.00	9,082.00
Nonscience Majors				
Mean	3.29	3.37	3.31	3.33
SD	0.42	0.47	0.39	0.43
n	157.00	439.00	554.00	1,150.00
All Majors				
Mean	3.40	3.47	3.34	3.41
SD	0.45	0.40	0.39	0.42
n	2,577.00	4,256.00	3,399.00	10,232.00
Total GPA				
Science Majors				
Mean	3.28	3.34	3.23	3.29
SD	0.44	0.40	0.40	0.41
n	2,420.00	3,817.00	2,845.00	9,082.00
Nonscience Majors				
Mean	3.17	3.23	3.18	3.20
SD	0.40	0.45	0.39	0.42
n	157.00	439.00	554.00	1,150.00
All Majors				
Mean	3.28	3.32	3.23	3.28
SD	0.44	0.41	0.40	0.42
n	2,577.00	4,256.00	3,399.00	10,232.00

Note. GPAs are based on a 4-point scale.

Table 2 shows the mean undergraduate GPAs for applicants with science majors and those with nonscience majors by kind of selectivity. The interaction between type of major and selectivity was not significant for science and total GPAs, but the main effect of major type was significant (see Table 3). The means for science and total GPAs were significantly higher for science majors across all levels of

selectivity. For the nonscience GPA, the major and selectivity interaction was significant. Tests of simple main effects showed statistically significant differences between science and nonscience majors from Low ($F = 19.32$, $df = 1, 10229$, $p < 0.001$) and Medium ($F = 165.64$, $df = 1, 10229$, $p < 0.001$) levels of selectivity, but not for the High + Very High selectivity category ($F = 0.57$, $df = 1, 10229$, $p = 0.451$).

Table 3 Analysis of Variance Tables for Undergraduate Grade-Point Averages of Applicants to the University of Alabama School of Medicine From 1978 Through 1990

Source	SS	df	MS	F	p	ES*
Science GPA						
Major Type (M)	18.94	1	18.94	77.87	0.000	.008
Selectivity (S)	2.10	2	1.05	4.32	0.013	.001
M x S Interaction	.93	2	.46	.90	0.150	.000
Error	2,486.81	1,0226	.24			
Nonscience GPA						
Major Type (M)	7.03	1	7.03	41.70	0.000	.004
Selectivity (S)	8.73	2	4.37	25.89	0.000	.005
M x S Interaction	1.38	2	.69	4.10	0.017	.001
Error	1,724.35	1,0226	.17			
Total GPA						
Major Type (M)	6.00	1	6.00	35.18	0.000	.003
Selectivity (S)	4.99	2	2.49	14.63	0.000	.003
M x S Interaction	.68	2	.34	2.00	0.135	.000
Error	1,743.28	1,0226	.17			

*Effect Size = $\eta^2 = SS_{source} / SS_{error}$

Table 4 Comparison of MCAT Scores for Science Majors and Nonscience Majors Entering The University of Alabama School of Medicine From 1978 Through 1990

		MCAT Scores				
MCAT and Major	<i>n</i>	Mean	<i>SD</i>	<i>t</i> *	<i>p</i>	Effect Size**
Science Problems						
Science Majors	1,642	8.6	1.8	3.50	<0.001	.25
Nonscience Majors	231	8.1	1.6			
SA: Reading						
Science Majors	1,642	8.6	1.7	1.61	0.108	.11
Nonscience Majors	231	8.8	1.6			
SA: Quantitative						
Science Majors	1,642	8.4	1.9	1.04	0.298	.07
Nonscience Majors	231	8.5	1.8			
Total						
Science Majors	1,642	51.6	8.2	1.80	0.072	.13
Nonscience Majors	231	50.5	7.5			

Note. MCAT scores are based on the average of the two most recent tests.

*df = 1,871

**Difference in means divided by pooled SD

Major as Predictor of Acceptance

In addition to preadmission academic performance and undergraduate college selectivity, does type of major contribute to the prediction of acceptance? Discriminant analysis was used to derive two linear models for predicting acceptance. The first model contained the preadmission academic measures only (Astin index, MCATs, and GPAs, exclud-

ing totals). The second model contained these preadmission variables plus type of major. The influence of major was determined by noting the amount of variance accounted for by each model and whether the amount added was statistically significant.

The preadmission measures alone predicted 15.784% of the variance in acceptance; adding the type of major increased the percentage to 16.015%,

an improvement of only 0.141%. This increase, while statistically significant ($p < 0.001$), is of little practical significance. Model 1 correctly classified 68.48% of the cases, and model 2 correctly classified 68.52%.

Matriculants' Preadmission Data

Is there a difference in the preadmission academic performance or the undergraduate college selectivity of science majors and nonscience majors who matriculate? Qualitative and quantitative difference is similar to difference in the preadmission academic performance or the undergraduate college selectivity of science majors and nonscience majors who apply, except that the analyses were based on matriculants rather than applicants.

Table 4 shows the mean MCAT subtest scores of matriculants by type of major. The mean score for science majors on the Science Problems subtest was higher and the difference statistically significant. There were no significant differences between the groups for the other two subtest mean scores or in the total mean scores.

Table 5 shows a comparison of mean undergraduate GPAs for matriculants with different types of majors by selectivity level. All mean GPAs were higher for science majors regardless of selectivity level. The interaction of type of major and selectivity level was not significant for science and total GPAs (see Table 6). The difference between means for science and total GPAs was statistically significant with science majors demonstrating the higher GPAs. For nonscience GPAs, the interaction was significant, and tests of simple main effects showed statistically significant differences between the groups for Low ($F = 15.36$, $df = 1, 1870$, $p < 0.001$) and Medium ($F = 67.60$, $df = 1, 1870$, $p < 0.001$) selectivity, but not for High + Very High ($F = 0.34$, $df = 1, 1870$, $p = 0.561$). Again, science majors demonstrated the higher GPAs for all selectivity levels.

A statistically significant difference ($t = 6.97$, $df = 1,164$, $p < 0.001$, Effect Size = 0.49) was found in the means of the Astin index. The mean Astin index was 978 ($SD = 116$) for matriculants with science majors and 1,036 ($SD = 132$) for matriculants with nonscience majors, which indicates that those with nonscience majors attended more highly selective institutions.

Medical School Performance

Is there a difference in the medical school performance of science majors and nonscience majors? Descriptive statistics were calculated for science majors and nonscience majors on each of the following:

1. GPA for years 1 and 2—Basic Sciences,
2. GPA for years 3 and 4—Clinical Sciences,
3. total score on National Board of Medical Examiners Part I and Part II, and
4. total score on the United States Medical Licensing Examination, Step 1 and Step 2.

The t-test for independent groups was used to test the difference between group means for statistical significance.

Table 7 shows the mean medical school GPAs for science majors and nonscience majors. The difference in the mean GPAs is statistically significant for the basic sciences but not for the clinical sciences. Science majors achieved higher GPAs in the basic sciences.

Table 8 shows the mean total scores on the National Board of Medical Examiners (NBME) Part I and Part II examinations and the United States Medical Licensing Examinations Step 1 and Step 2 for science majors and nonscience majors. There was a statistically significant difference in the mean scores on NBME Part I for the two types of majors with science majors achieving the higher scores.

Major as Predictor of Performance

In addition to preadmission academic performance and undergraduate college selectivity, does type of major contribute to the prediction of medical school performance? Multiple regression analysis was used to derive two linear models for predicting each of the medical school performance measures. For each measure, the first model contained the preadmission academic measures only (Astin index, MCATs and GPAs, excluding totals). The second model contained the preadmission variables plus type of major. The influence of major was determined by noting the amount of variance accounted for by each model and whether the amount added was statistically significant. As shown in Table 9, the change in accounted variance due to type of major is not statistically significant for any of the performance measures.

Attrition Rates

Is there a difference in the attrition rates of science majors and nonscience majors? The percentage of students who left school before graduation was calculated for science majors and nonscience majors. The difference between the percentages was tested for statistical significance with chi-square analysis.

Although 1,873 students matriculated, six died and one resigned for health reasons; these seven were not included in the study of attrition rates. Of

Table 5 Comparison of Undergraduate Grade-Point Averages by College Selectivity for Science Majors and Nonscience Majors Entering the University of Alabama School of Medicine From 1978 Through 1990

Undergraduate College Selectivity				
	Low	Medium	High + Very High	Total
Science GPA				
Science Majors				
Mean	3.45	3.45	3.37	3.43
SD	.39	.37	.40	.38
n	357	767	518	1642
Nonscience Majors				
Mean	3.23	3.33	3.18	3.25
SD	.28	.42	.41	.41
n	18	104	109	231
All Majors				
Mean	3.44	3.44	3.34	3.41
SD	.39	.38	.41	.39
n	375	871	627	1873
Nonscience GPA				
Science Majors				
Mean	3.58	3.65	3.47	3.57
SD	.37	.29	.35	.34
n	357	767	518	1642
Nonscience Majors				
Mean	3.24	3.53	3.39	3.44
SD	.48	.41	.39	.42
n	18	104	109	231
All Majors				
Mean	3.56	3.63	3.45	3.56
SD	.39	.31	.36	.35
n	375	871	627	1873
Total GPA				
Science Majors				
Mean	3.50	3.53	3.41	3.49
SD	.35	.30	.35	.33
n	357	767	518	1642
Nonscience Majors				
Mean	3.22	3.44	3.29	3.35
SD	.33	.36	.34	.36
n	18	104	109	231
All Majors				
Mean	3.48	3.52	3.39	3.47
SD	.35	.31	.35	.34
n	375	871	627	1873

Note. GPAs are based on a 4-point scale.

the remaining 1,866 subjects, 5.4% ($N = 100$) did not graduate due to resignation, termination, or transfer. The percentage of science majors who did not graduate was 5.3% ($n = 86$), and the percentage of nonscience majors who did not graduate was 6.1% ($n = 14$). The difference is not statistically significant ($\chi^2 = 0.27$, $df = 1$, $p = 0.601$).

Major as Predictor of Attrition

In addition to preadmission academic performance and undergraduate college selectivity, does type of major contribute to the prediction of attrition? Discriminant analysis was used to derive two linear models for predicting attrition. The first model contained the preadmission academic mea-

Table 6 Analysis of Variance Tables for Undergraduate Grade-Point Average of Matriculants to the University of Alabama School of Medicine From 1978 Through 1990

Source	SS	df	MS	F	p	ES*
Science GPA						
Major Type (M)	3.56	1	3.56	24.11	0.000	.013
Selectivity (S)	2.40	2	1.20	8.10	0.000	.009
M x S Interaction	.29	2	.14	.97	0.381	.001
Error	276.21	1868	.15			
Nonscience GPA						
Major Type (M)	3.45	1	3.45	29.47	0.000	.016
Selectivity (S)	5.31	2	2.65	22.65	0.000	.024
M x S Interaction	1.02	2	.51	4.35	0.013	.005
Error	218.92	1868	.12			
Total GPA						
Major Type (M)	3.02	1	3.02	27.62	0.000	.015
Selectivity (S)	3.54	2	1.77	16.23	0.000	.017
M x S Interaction	.50	2	.25	2.29	0.102	.002
Error	203.92	1868	.11			

*Effect size = $\eta^2 = SS_{\text{source}} / SS_{\text{error}}$

Table 7 Comparison of Grade-Point Averages in the Basic Sciences and Clinical Sciences for Science Majors and Nonscience Majors Entering the University of Alabama School of Medicine From 1978 Through 1990

Medical School GPA						
MCAT and Major	<i>n</i>	<i>Mean</i>	<i>SD</i>	<i>t</i>	<i>p</i>	Effect Size***
Courses and Major						
Basic Sciences						
Science Majors	1,622	1.92	.56	3.18*	0.001	.22
Nonscience Majors	229	1.80	.54			
Clinical Sciences						
Science Majors	1,557	2.29	.40	.90**	0.370	.07
Nonscience Majors	217	2.31	.41			

Note. GPAs are based on a 3-point scale.

*df = 1,849

**df = 1,772

***Difference in means divided by pooled SD

tures only (Astin index, MCATs and GPAs, excluding totals). The second model contained the preadmission variables plus type of major. The influence of major was determined by noting the amount of variance accounted for by each model and whether the amount added was statistically significant.

The preadmission measures alone accounted for 1.572% of the variance in prediction of attrition; adding the type of major increased the percentage to 1.579%. This improvement is not statistically significant ($p = 0.712$). Model 1 correctly classified 62.27% of the cases, and model 2 correctly classified 62.59%.

This study has the following limitations:

1. The study was confined to a local population with 91.6% of the matriculants being residents of Alabama; therefore, the results should not be generalized to other medical schools without cross-validation.
2. Most of the study was based on matriculating students who were a highly select group, thus restricting the range.
3. Because of the small numbers of subjects with nonscience majors in each entering class, the study was not replicated for each of the 13 years; therefore, it is not known whether these results would have had the same pattern for each separate year.

Table 8 Comparison of Scores on the National Board of Medical Examiners Part I and Part II and the United States Medical Licensing Step 1 and Step 2 Examinations for Science Majors and Nonscience Majors Entering The University of Alabama School of Medicine From 1978 Through 1990

NBME and USMLE Examination Scores						
	<i>n</i>	<i>Mean</i>	<i>SD</i>	<i>t</i>	<i>p</i>	Effect Size***
Examination and Major						
NBME Part I†						
Science Majors	1,354	502	98	2.74*	0.006	.22
Nonscience Majors	180	481	96			
NBME Part II†						
Science Majors	1,226	505	97	.16**	0.871	.01
Nonscience Majors	155	507	89			
* <i>df</i> = 1,532						
** <i>df</i> = 1,379						
† Through 1990 test date						
USMLE Step 1‡						
Science Majors	217	204	16	.70*	0.482	.12
Nonscience Majors	42	202	14			
USMLE Step 2‡						
Science Majors	329	207	21	.82**	0.414	.11
Nonscience Majors	63	205	17			
* <i>df</i> = 257						
** <i>df</i> = 390						
***Difference in means divided by pooled <i>SD</i>						
‡ Beginning with 1991 test date						

Table 9 Influence of Preadmission Academic Performance, Undergraduate College Selectivity, and Type of Major on the Prediction of Medical School Performance

Performance Measure	Variance Accounted for by			Significance* of Change
	Model 1	Model 2	Change	
Basic Sciences GPA	28.714%	28.764%	.049%	.270
Clinical Sciences GPA	13.292%	13.406%	.114%	.128
NBME, Part I	31.813%	31.889%	.076%	.191
NBME, Part II	31.812%	31.954%	.142%	.090
USMLE, Step 1	31.287%	31.443%	.156%	.450
USMLE, Step 2	22.927%	22.935%	.008%	.846

Note. Model 1 contained preadmission academic measures only (Astin index, MCAT scores and undergraduate GPAs, excluding totals); Model 2 contained the preadmission measures and type of major.

*None are statistically significant at the $p < 0.05$ level

- The study did not address the issue of whether a student's choice of undergraduate major is associated with personal characteristics that may influence academic outcome.

Discussion

This study produced the unsurprising result that the majority of applicants and matriculants to The University of Alabama School of Medicine from 1978 through 1990 had majored in a science area at their undergraduate institution. The small percentage of nonscience majors who applied to medical

school may have represented a highly motivated, science-oriented sample of the population.

Since the acceptance rate was higher for applicants with nonscience majors than for those with science majors, this study indicated that there was no apparent bias against nonscience majors in the admissions process. An implication of these results is that it may encourage some motivated and qualified students to apply to medical school even though they have pursued nonscience majors. In addition to preadmission measures such as MCAT scores, undergraduate GPAs, and undergraduate college selectivity, type of major added such a small amount to the variance in the prediction of acceptance that it was not meaningful in terms of practical importance.

The fact that nonscience majors entered medical school with lower undergraduate GPAs than did science majors is unimportant because GPAs of both groups were high. Even though the differences in undergraduate GPAs were statistically significant, they may not be meaningful in a practical sense.

Even though the MCAT is composed of six subtests, most of which test science knowledge, the total mean score was similar for matriculants with science majors and nonscience majors. While science majors scored higher in the science area, nonscience majors had higher reading and quantitative skills scores.

The results indicated that once an applicant with a degree in a nonscience field was accepted, he or she could successfully compete with other medical students as determined by standard measures of achievement in medical school. Type of major did not contribute a statistically significant amount toward the prediction of medical school performance over what could be predicted by preadmission measures such as MCAT scores, undergraduate GPAs, and undergraduate college selectivity. Generally speaking, medical school performance was not adversely affected by having majored in a nonscience area. While having an extensive background in science may have contributed to a higher mean GPA for science majors in the basic sciences, there was not a consistent and significant trend in superiority of one type of major over another on measures of academic performance in medical school as a whole.

The results of one measure of academic performance in medical school, the basic sciences GPA, indicated that science majors as a group achieved a significantly higher mean GPA in the basic sciences than did nonscience majors. Contrary to the findings of Dickman, Sarnacki, Schimpfhauser, and Katz (1980), who reported no statistically significant differences in basic sciences course performance

between the two types of majors, science majors at this institution achieved a higher mean GPA in basic sciences. Like the findings of Dickman, et al., however, there were no statistically significant differences between science majors and nonscience majors in mean clinical sciences GPA.

The results of a second measure of academic performance in medical school, the clinical sciences GPA, indicate that the two types of majors performed equally well. In the calculation of students' cumulative GPAs at The University of Alabama School of Medicine, clinical sciences GPAs were weighted more heavily than basic sciences GPAs; therefore, these results take on an important meaning in medical school academic achievement. Another meaningful aspect of this part of the study is that these results may contribute information to the small body of current literature that concerns the comparison of clinical performance of science majors and nonscience majors in medical school.

The results of a final measure of academic performance in medical school, the National Board of Medical Examiners Examinations and the United States Medical Licensing Examinations (USMLE), indicate no significant difference in mean total scores for NBME Part II, USMLE Step 1, and USMLE Step 2 for different types of majors. However, the difference in mean total scores for NBME Part I was statistically significant.

The attrition rate was independent of type of major and did not contribute a statistically significant amount toward the prediction of attrition beyond that which could be predicted by preadmission measures such as MCAT scores, undergraduate GPAs, and undergraduate college selectivity. Since the attrition rate was low and was similar for the two types of majors, one generalization is that the selection process was effective because students who were capable of successfully completing the program were admitted and that the medical school curriculum was one in which students with a heterogeneous group of majors could successfully compete.

In the general interpretation of this study, note that medical school academic performance, not clinical performance as a practitioner, was used as the criterion measure. No correlation of medical school academic achievement and performance as a practitioner is implied.

Recommendations

To improve communication regarding selection and academic performance of medical students with different types of majors, results of this study should

be made available to premedical advisors, academic advisors, and admissions personnel who assist students with college and career planning. Universities may wish to examine admission procedures and advising practices that tend to send premed students to advisors in the sciences. A study should be undertaken to ascertain the relationship between type of major and the personal characteristics that enable students to compete successfully in medical school. Individuals with nonscience majors should not be discouraged from applying to medical school if they are qualified and motivated.

References

- Association of American Medical Colleges, Section for Student and Educational Programs. (1994). *Medical College Admission Test, 1988 summary of score distributions*. Washington, DC: Association of American Medical Colleges.
- Astin, A. W. (1965). *Who goes where to college?* Chicago: Science Research Associates.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Hillsdale, NJ: Lawrence Erlbaum Associates.

- Dickman, R. L., Sarnacki, R. E., Schimpfhauser, F. T., & Katz, L. A. (1980). Medical students from natural science and nonscience undergraduate backgrounds. *Journal of American Medical Association*, 243, 2506-2509.
- Jones, R. F. & Adams, L. (1984). The relationship between MCAT science scores and undergraduate science GPA. *Medical College Admissions Test, Interpretive Studies Series* (Report No. 84-3). Washington, DC: Association of American Medical Colleges, Division of Educational Measurement and Research.
- SPSS. [computer software]. (1990). Chicago: SPSS, Inc.
- University of Alabama School of Medicine at Birmingham. (1994). [Admissions statistics]. Unpublished Raw Data.

Authors' Notes

Dr. Sorenson is Director of Student Services, School of Engineering; Dr. Jackson is Associate Professor of Education in Medicine, School of Medicine; both are at the University of Alabama at Birmingham, Birmingham, Alabama. For more information about this article, contact the authors at: NSorenso@eng.uab.edu or JJackson@uab.edu.