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AN AIR FORCE SELECTION MODEL FOR THE ARMED FORCES
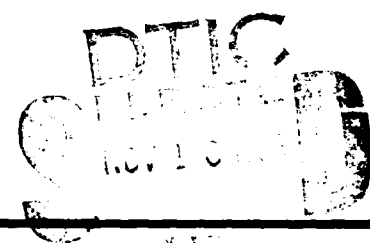HEALTH PROFESSIONS SCHOLARSHIP PROGRAM

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MANPOWER AND PERSONNEL DIVISION
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This report describes results of an effort to develop a decision aid that would assist the Air Force Military Personnel Center Surgeon General (AFMPC/SG) in selecting medical students for the Armed Forces Health Professions Scholarship Program. The purpose of the program is to select individuals capable of successfully completing medical school and serving as active duty Air Force officer-physicians.

Development of the decision aid was undertaken for two reasons. First, a review of the medical school selection research literature indicated that applicant entrance examination scores and undergraduate grade point averages (GPAs) were accurate indicators of an ability to succeed only in the academic portion of medical school. These measures did not reflect the applicant's ability to complete the internship portion of the program or predict how successful a physician the applicant would be. Also, a review of the selection procedure found the board tended to select a lower percentage of applicants as the selection cycle progressed. A policy model was developed to provide a greater amount of information for the selection board to use and to help the board maintain

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a consistent selection ratio by establishing a constant cutoff score. Analysis showed that differences between the policy model and the selection board were due to the greater amount and type of information in the policy model and a larger weight placed on GPA by board members. The research concluded with four suggested ways to use the model, with application as a tie-breaking aid being recommended. (SDW))

AN AIR FORCE SELECTION MODEL FOR THE ARMED FORCES
HEALTH PROFESSIONS SCHOLARSHIP PROGRAM

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EXECUTIVE SUMMARY

In 1983, the Air Force Military Personnel Center Surgeon General (AFMPC/SG) requested a review of their selection process for awarding medical school scholarships through the Armed Forces Health Professions Scholarship Program (AFHPSP). The purpose of the review was to investigate the selection procedures used, make recommendations, and develop decision aids to improve the selection process. A review of the selection procedures showed that fewer applicants were awarded a scholarship as the selection cycle progressed, due to a rise in the qualification standards for the scholarship. This meant that people were being rejected late in the selection cycle who might be more qualified than those given a scholarship earlier.

To help the AFHPSP selection board maintain a consistent selection policy and to provide for greater discriminability among candidates, a policy model was developed with aid from AFHPSP selection board members. The policy model was designed not to duplicate the selection board but to provide the board with an alternate view of each applicant. To gather information for use in the policy model, a questionnaire was also developed to be administered by the Air Force Recruiting Service.

Using data on FY87 AFHPSP applicants, two different rank-orderings were created, one using the selection board scores and the other using the policy model scores. A comparison of the rank-orderings showed that there was 60% agreement between the board and the policy model select/non-select decisions. Regression analysis on the difference between the two scores showed that the difference could be attributed to the information on the individual used by the policy model and not by the board and a greater weight given to Grade Point Average by the AFHPSP selection board. The report concludes with a list of possible uses of policy model rank-orderings and a recommendation to establish a long-range data base in order to analyze the selection process more effectively. AFMPC/SG has decided to use the Tie-Breaker approach to use the results from the policy model starting in the FY88 selection cycle.

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PREFACE

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I. INTRODUCTION

Personnel selection systems in organizations are generally managed by personnel specialists, with input from the functional managers for whom the newly accessed people will work. For admittance to educational programs that are funded by scholarships, often a selection committee composed of personnel specialists is tasked with the job of selecting scholarship winners. The committee selects individuals by evaluating the applicants' various attributes. Incorporated in this evaluation is the expectation of successful completion of training as well as success on the job. Analysis of such selection systems usually focuses on determining short-term performance or success as a function of easily measured input variables, and ignoring more abstract factors that may influence selection. The analysis technique discussed in this report focuses on specifying some of the abstract factors for use in a computer-based selection model.

The present effort addresses the manner in which the Air Force manages the selection of candidates for the Armed Forces Health Professions Scholarship Program (AFHPSP) and presents a methodology that establishes a ranking of AFHPSP applicants to aid the selection process. The lag between the time of selection and the time that job performance measures can be taken makes the identification of those AFHPSP scholarship applicants who will be successful as a career Air Force officer-physician a challenging task for Air Force decision makers.

The history of AFHPSP began in 1972, when Congress established the program in anticipation of the end of conscription. Through 1981, AFHPSP was in direct competition with the National Health Service Corps (NHSC) Scholarship Program, which was designed to place physicians in underserved areas. The increase in funding for AFHPSP in 1980 and the discontinuance of NHSC in 1981 gave the Air Force a favorable applicant-to-scholarship ratio (Hosek, 1983). For example, in 1983 and 1984, the Air Force had approximately three applicants for each available scholarship. This beneficial selection ratio created the opportunity to examine current selection procedures, to develop policies that capitalize on the favorable selection ratio, and to incorporate policy changes into a model that aids the selection process.

II. PURPOSE

In selecting AFHPSP scholarship winners, the Air Force has the following goals: (a) to maximize the expected length of service from persons in the Medical Corps (physicians in the Air Force), (b) to access high quality individuals for officers in the Medical Corps, and (c) to ensure the continued high quality of the Air Force medical service. The objective of this research effort as stated by the Air Force Military Personnel Center Surgeon General (AFMPC/SG) was to increase the retention rate of physician-officers while maintaining the standards expected of them. This objective served as a guide in developing the selection model discussed in this report. AFMPC/SG has stated that an improvement in the ability to select AFHPSP candidates could save the Air Force almost $3 million annually (FY88 dollars) through a reduction of 1% in student attrition rates.

In order to determine what characteristics available at the time of selection would best meet the objective established for AFHPSP, AFMPC/SG had suggested that a data base be developed to track the progress of selectees from their initial medical training phases, through subsequent career milestones, to the time they leave the service. Although not undertaken as part of the present effort, the future implementation of such a tracking system would provide feedback to the selection committee, who could then make improvements to the AFHPSP selection process based on analysis of the tracking system data.

III. BACKGROUND

Literature Review

A literature review was conducted to assess the existing body of medical school selection research. The bulk of the literature addressed the relationships among individual variables (cognitive, demographic, and personality), outcomes such as medical school success (course grades, clinical clerkship ratings, National Board of Medical Examiners' tests), and medical specialty preferences.

In general, it was found that cognitive indicators such as undergraduate grade point average (GPA) and scores on the Medical Curriculum Aptitude Test (MCAT) were predictive of success during the academic portion of medical school, but not predictive of success during the clinical portion (Carline, Cullen, Scott, Shannon, & Schaad, 1983; Kupfer, Drew, Curtis, & Rubinstein, 1978). This finding led to the attempt to identify other indicators which would better predict clinical performance. Although a number of studies found that varying combinations of demographic and personality factors were statistically significant in determining clinical success in medical school, no real consensus existed as to which specific noncognitive factors could effectively predict clinical performance.

The implications of these findings for the improvement of the AFHPSP selection procedures were twofold. First, the prominent role of cognitive factors in the AFHPSP selection process duplicated academic screening, which medical schools already do, and added little to determining if a person has the ability to become a successful career officer and physician. Second, the Air Force needed to explore the further use of noncognitive indicators, such as family background, not only to improve prediction of clinical success, but also to improve the ability of the Air Force to predict the success of the individual as a physician and as an officer, and the length of time that an individual would spend in the service.

Selection Board Composition and Procedures

Before discussing the evaluation of the selection board procedures, it is important to first describe the composition and the operation of the AFHPSP selection board. The selection board is composed of five Medical Corps or Medical Service Corps officers and meets approximately 12 times during a year's selection cycle beginning in January and ending in mid-April. Each board member individually reviews a candidate's application and scores it based on two objective measures (undergraduate GPA and MCAT scores) and four subjectively evaluated factors (work experience, extracurricular activities, letters of recommendation, and military career orientation). The board members' scores for each of the six selection factors are then added together to form a board score for each candidate. The candidates are then rank-ordered according to their board scores, and the selection of scholarship recipients is made based upon a predetermined cutoff score.

Selection Board Procedures Evaluation

Analysis of selection board procedures was accomplished by using the results from the 1983 selection board to examine two issues: (a) the level of interrater consistency across the selection board judges on the six selection factors, and (b) the ability of different influencing factors (which included the six selection factors) to discriminate between those individuals selected and those not selected.

Interrater consistency can be measured by two intraclass correlations (Guilford, 1965). One correlation, R_{11}, is a measure of the consistency of a single rater as compared to a hypothetically similar rater. The other correlation, R_{kk}, is a measure of the consistency of group judgment for all of the raters as compared to a hypothetically similar group of raters. (Both of the correlations range in value from 0 to 1. A value of 0 means that no correlation exists, whereas a correlation of 1 is interpreted as complete agreement.)

The R_{11} and R_{kk} breakdowns (based on five board members) by selection factor and board week were computed for the 1983 selection process. A correlation of .80 was preestablished as a criterion for adequate interrater consistency. Of the six selection factors, only GPA and MCAT (both having a 12 board weeks' average R_{11} = .88 and R_{kk} = .97) attained this level of consistency. These two factors were more reliable than the other four because they were quantitative measures and disagreement on the value of scores for these two factors was extremely rare. The other four factors did not fare well, with average R_{11} values between .14 and .26 and average R_{kk} values from .43 to .62. These findings had a direct impact on the policy model chosen, as discussed in the next section.

The second issue was to determine which factor or factors could be said to "drive" the selection process. GPA and MCAT were obvious candidates since they were the only reliable factors among the original six. In addition to GPA and MCAT scores, another influencing factor, scholarship fill, was uncovered in researching the board's selection process.

Scholarship fill is the percentage of scholarships awarded out of the total scholarships available. A problem which surfaced was that during the 12-week selection period, a progressively smaller percentage of scholarship applicants were selected as the AFHPSP selection process continued. This was attributed to the cutoff scores being raised as the selection process continued throughout the year. As a result, an individual selected in the early part of the selection cycle might not have been selected had that applicant met the board in the 11th or 12th week. The sensitivity of selection to scholarship fill can be seen in the FY83 selection board results. In the first week, the cutoff score was 475 (out of a possible 500) and the selection rate was 74%. By week 5, the cutoff score had risen to 480 and the selection rate had dropped to 22%. The problem has since been alleviated by the introduction of an AFHRL-recommended constant cutoff score. Since the introduction of this improvement, the cutoff score for selection into AFHPSP has been established as 480 out of a possible 500 points.

The three factors—GPA, MCAT, and scholarship fill—were evaluated using a stepwise discriminant procedure (Nie, Hull, Jenkins, Steinbrenner, & Bent, 1975) in order to determine their relative contributions to AFHPSP select/nonselect outcomes. All three of the factors were significant at the p = .0001 level. Scholarship fill ranked highest in contribution to the selection decision (with a standardized coefficient of 0.8276), followed by MCAT (0.6133), and GPA (0.2846), respectively (Martin, 1984).

IV. AFHPS. POLICY MODEL DEVELOPMENT

Approach

In order to assist the board in selecting AFHPSP recipients, a selection policy model was needed that would incorporate selected individual attributes along with board members' inputs. Ward (1977) discussed two techniques available for individual or group policy development: judgment analysis (policy capturing) and policy specifying. Policy capturing is appropriate when the predictor variables are quantifiable and the within-group correlation (R_{kk}) is high (above .80 in this case) for a majority of the variables. Policy specifying requires predictor variables also but is more flexible in structure than policy capturing and allows for the

development and specification of variables, model structure, and parameters. Weights are determined "by stating desired properties of and relations among the predicted values in sufficient detail that the numerical weights become known" (Ward, 1977). Due to low interrater agreement across several of the variables and the use by the board of difficult-to-quantify information such as letters of recommendation and work experience, the policy-specifying technique was selected as the primary research methodology.

The four steps of the hierarchical policy-specifying process have been defined by Ward, Pina, Fast, and Roberts (1979) as follows:

1. Select one or more experts who will specify the policy in a mathematical form.

2. Identify the dependent and independent variables. Implicit in this step is the identification of organizational goals and constraints, as well as a thorough review of available data associated with the organizational goals (Hendrix, Ward, Pina, & Haney, 1979).

3. Combine the independent variables into a hierarchy of logical pairs. Combine the functional results of these pairs into logical pairs until a pyramidal hierarchy is defined.

4. For each pair of variables and/or functions, assign scores or "payoffs" at selected value combinations over the range of possible values. Then, determine a mathematical model representing the pairwise hierarchical combination. After the completion of step 4, the policy model (decision making process) has been effectively specified.

Policy Model Formulation

In 1983, a working group was formed consisting of representatives from AFMPC/SG, Air Force Recruiting Service (AFRS), and the Air Force Human Resources Laboratory (AFHRL). This group developed a top-down structural model that was used to translate organizational goals into a hierarchy of logical pairs of variables and functions. The approach used here began at the "top" by identifying "AFHPSP Potential" as the final selection measure and then constructing a hierarchy below it. This allowed the working group to have complete control over the development of the structure of the policy model. Logical combinations of pairs of variables and functions were then assigned payoff values. The developed hierarchy expressed "AFHPSP Potential" as a function of physician and officer potentials reflecting the policy of selecting individuals with promise as career-oriented Air Force officers and as physicians. The hierarchy for the first policy model contained 36 input variables and 35 functions.

Data Collection

The large number of variables (36) developed for the policy model posed two significant data collection problems. One problem was that the information required by the policy model on the applicant was more extensive than that being collected by Air Force Recruiting Service at the time. In order to collect the needed data, a questionnaire was developed by AFHRL with input from the AFHPSP working group. The questionnaire was also designed to collect information that AFMPC/SG wanted to use in a later study in predicting success in medical school. (See Appendix A for further discussion and a copy of the questionnaire.) A second problem was that of missing data. For example, some data required by the policy model about the different medical schools accepting applicants were not available for use or were available for only a limited number of schools. Student-teacher ratios and the number of medical school graduates able to get their first job choice upon graduation from medical school are examples of the type of information that was missing.

Revised Models

Upon completion of the first policy model by the working group, analysts from AFHRL reviewed the model. This review, as well as the lack of available data for the model, resulted in a series of revisions that made the model more tractable. (In making any revisions, the structure of the original policy model was paralleled.) A number of variables were dropped due to data insufficiency. Additional revisions were made to eliminate redundancies. For example, the amount of time that the candidate spent working with patients had been broken into volunteer time and compensated time. In the later versions of the model, these two variables were combined into one variable that measured the amount of time spent working with patients.

To ensure that the revised policy model retained an adequate degree of strength, a correlation was calculated between payoffs from the original policy model and the final policy model using the data collected by questionnaires administered to students at the Health Professions Officer Indoctrination Course (HPOIC). Questionnaires were completed by 264 AFHPSP scholarship recipients in HPOIC. AFHPSP potential scores for each applicant were calculated by both models and then rank-ordered. The correlation calculated between the two policy models was .78. Based on this level of correlation, the working group agreed that the two policy models were not substantially different. Figure 1 shows the hierarchy used for the final policy model. Table 1 presents the variables included in the model, and Table 2 shows the functions that relate the variables to one another. The mathematical relationships between the pairs of variables and/or functions are shown in Appendix B.
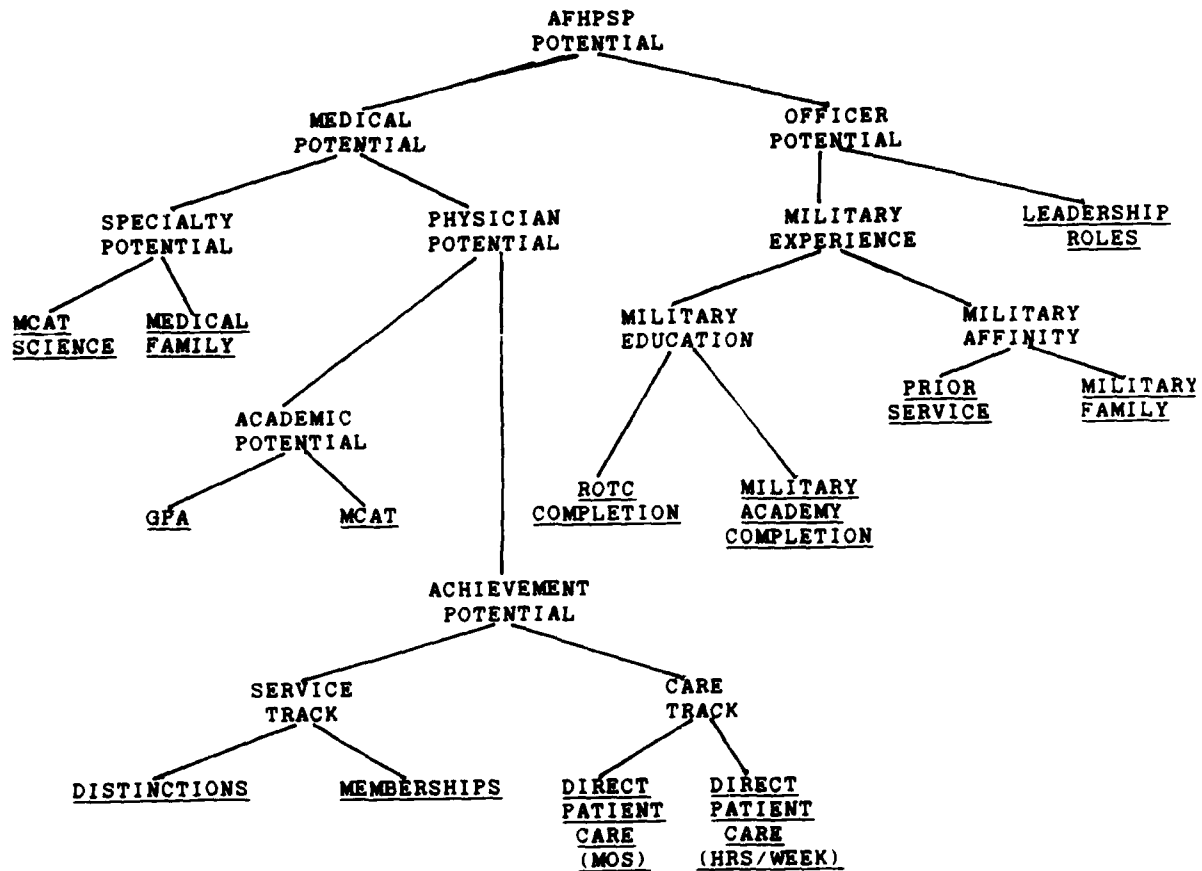
NOTE: Input variables are underlined.

Figure 1. Final Policy Model Hierarchy.

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Table 1. AFHPSP Variables

Variable	Range	Name	Description
X1	200-400	GPA	Applicant's undergraduate GPA.
X2	0-80	MCAT	Applicant's overall MCAT score.
X3	0-45	MCAT Science	Combination of the individual's subscores for Physics, Biology, and Chemistry to produce an "MCAT Science" score.
X4	0-1	Medical Family	Indication as to whether either parent of the applicant is a physician.
X5	0-48	Direct Patient Care (mos)	Number of months that the applicant has spent caring for patients.
X6	0-20	Direct Patient Care (hrs/wk)	Average number of hours spent weekly in direct patient care
X7	0-20	Distinctions	Any community, athletic, or academic distinctions the person might have. Includes any offices other than president or captain that were held in civic or community clubs.
X8	0-10	Memberships	Number of community or athletic memberships to which the person belongs.
X9	0-1	Military Academy Completion	Completion of one of the three U.S. military academies.
X10	0-1	ROTC Completion	Completion of an ROTC program.
X11	0-1	Prior Service	Indication of prior military service.
X12	0-1	Military Family	Indication as to whether the applicant has anyone of his/her immediate family who is on active duty or who has retired from active duty.
X13	0-4	Leadership Roles	Number of organizations or teams in which the person was a president or captain.

Note. For most of the variables, the range refers to the range of values found in the data collected (such as Variable X7, Distinctions) or a range that is implicit in the variable itself (such as Variable X2, MCAT scores). Those variables with a range of 0-1 are binary variables that correspond to a yes/no question. For example, Variable X11 asks if a person has had any prior military duty, and a "0" means "yes" and a "1" means "no."

Table 2. AFHPSP Functions

Function	Name	Functional inputs
F1	Military Affinity	Variables 11 and 12
F2	Military Education	Variables 9 and 10
F3	Military Experience	Functions 1 and 2
F4	Specialty Potential	Variables 3 and 4
F5	Service Track	Variables 7 and 8
F6	Care Track	Variables 5 and 6
F7	Achievement Potential	Functions 5 and 6
F8	Academic Potential	Variables 1 and 2
F9	Physician Potential	Functions 7 and 8
F10	Medical Potential	Functions 4 and 9
F11	Officer Potential	Function 3 and Variable 13
F12	AFHPSP Potential	Functions 10 and 11

V. POLICY MODEL VALIDATION

To ensure its utility, the model must be validated over both the short and the long terms. A short-term validation of the model was accomplished by comparing the rank-orderings of the applicants based on their AFHPSP board scores and the policy model scores. For purposes of short-term validation, it is important to realize that the model was never designed to simulate the board. Rather, it was simply meant to provide a more complete picture of the AFHPSP applicants that would aid in the selection process.

Short-Term Validation

Hit Table

Validation of the policy model was accomplished using the data collected during FY87. Over 800 applications were received and reviewed by the board. Of these applicants, approximately 500 had completed the questionnaire correctly and their data were used in the calculation of the hit table. Table 3 shows that the board and the policy model agreed in select/non-select decisions for 59.2% of the applicants, and disagreed on 40.8% of the applicants.

Table 3. Board versus Policy Model Decisions (N = 484)

		Board Selection Decision	
		Yes	No
Policy Selection Decision	Yes	29.4%	20.4%
	No	20.4%	29.8%

Regression Analysis

The next step in the short-term validation was to identify which characteristics received differential weighting from the board and the policy model and caused the 40.8% disagreement. Two multiple regression models were developed. The first regression used the board score minus

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the policy model score as the dependent variable and the 13 policy model variables as predictors (N = 484). The second regression also used the difference between board score and the policy model score as the dependent variable, but used the six board variables as independent variables (N = 484). The results of the two regressions are shown in Tables 4 and 5, respectively.

Table 4. Board Minus Policy Model Scores
and Policy Model Variables

Variable	Coefficient	"t" statistic
CONSTANT	385.624	54.646*
GPA	.1775	14.559*
MCAT	.1509	1.732
MCAT Science	-1.1636	-7.297*
Medical Family	-3.6712	-3.086*
Direct Patient Care (mos)	.0309	1.265
Direct Patient Care (hrs/wk)	.0547	1.102
Distinctions	-.0926	-1.295
Memberships	-.0790	-.637
Military Academy Completion	-6.5970	-3.734*
ROTC Completion	-7.2561	-2.465*
Prior Service	-3.0567	-1.866
Military Family	-3.4038	-4.716*
Leadership Roles	-3.0834	-9.340*
N = 484		R^2 = 0.4932

*significant at the .05 level.

Table 5. Board Minus Policy Model Scores
and Board Variables

Variable	Coefficient	"t" statistic
CONSTANT	237.6590	35.225*
GPA	1.0143	16.844*
MCAT	- .2808	-3.450*
Work Experience	.8800	7.028*
Extracurricular	.4753	3.388*
Letters of Recommendation	.9835	5.108*
Career Potential	.7541	7.238*
N = 484		R^2 = 0.5300

*significant at the .05 level.

In the regression of the dependent variable and the 13 policy model variables, only 7 of the variables had significant "t" scores at the p = .05 level. Of these seven, only GPA exhibited a positive relationship with the dependent variable. This relationship apparently existed because the AFHPSP selection board placed more emphasis on GPA than did the policy model. The opposite can be said for the other six significant variables. MCAT Science, Military Family, Medical

Family, ROTC Completion, Military Academy Completion, and Leadership Roles all received a greater emphasis from the policy model than they did from the selection board.

In the regression using the six board variables, all of the variables had significant "t" statistics. The MCAT score was the only variable that had a negative coefficient, indicating that the policy model placed a greater emphasis on that variable than did the selection board. Correspondingly, variables with positive coefficients indicated that the selection board placed a greater emphasis on those variables than did the policy model.

These results indicate that the primary driver of the disagreement was the information differences that existed between the two selection systems (the policy model and the board). The variables from the policy model (except for MCAT) that were not statistically significant were of little value in distinguishing between policy model selectees who were not selected by the board and board selectees who were not selected by the policy model; i.e., these variables were considered equally or not at all by the two selection systems. A further elaboration of differences and similarities between the selection systems may be found in Appendix C, which shows how policy model and board variables relate to corresponding (and cross-applied) selection score outcomes. That the MCAT variable was statistically insignificant in the policy model could very well be due to the influence of the MCAT Science score with which it was highly correlated. Although it was possible to identify which variables received the greater emphasis (either by the selection board or the policy model), the ability to state precisely which variables were the most useful in predicting the ability of a person to become a career officer-physician in the Air Force was hampered by the lack of a long-term data base. Despite this limitation, the working group believed that the policy model provided a usable decision aid, and a decision was made to implement the results of the policy model starting with the FY88 selection boards.

Long-Term Validation

Long-term validation requires the establishment of a data base tracking system that would follow an AFHPSP selectee throughout his/her career as an officer-physician. This collection of data such as the length of service, assignments, rate of promotion, etc. could be used to develop an indicator of how a person's career has progressed. This career indicator would then reflect how well the AFHPSP board made its selection. An analyst could maintain the selection input variables by cohort (year group) and gradually add performance data from medical school, residency program, and Air Force active duty assignments.

By reviewing the input variables of successful officer-physicians who were former AFHPSP candidates, a determination could be made as to which characteristics (available at the time of selection) best predict which recipients made successful career officer-physicians. This analysis would provide insight into the predictive abilities of the selection variables as well as a basis for modifying and refining the policy.

VI. POLICY MODEL APPLICATIONS

The policy model was designed to assist or complement the board in making selections of the best applicants for AFHPSP scholarships. This objective could be accomplished by using the policy model in one or more of the following ways:

1. Consistency Check. The policy model could be used to sort and rank individuals according to their final AFHPSP potential scores. This ranking could be used to check the board's selections for consistency. If desired, the board could reconsider nonselectees in the top percentage of this ranking as well as selectees in the bottom percentage (top and bottom cutoff percentages to be determined).

2. <u>Additional Board Member</u>. The greater variability in the model's scores could provide greater discriminability among the candidates and reduce the number of ties (which would save time since it is a lengthy process to rank-order applicants having the same board score). With six scores combined to arrive at the board's score, rather than five, the cutoff score for selectees and non-selectees would be adjusted accordingly. A slightly different benefit to be derived from model scores as a sixth board member would be as an aid in selecting the middle people. Selection board members tend to agree very easily on the top and the bottom groups of applicants but have a great deal of difficulty selecting people from the middle ranges. The policy model scores could be added to this middle group to aid in the selection decision.

3. <u>Applicant Sort</u>. The policy model's rank-ordered applicant listing could be used to screen out applicants prior to the start of the selection procedures. Individuals whose payoff value is less than some specified minimum score would not be considered for scholarship selection. This approach would allow board members more time to examine the files of those applicants who are competing for scholarships.

4. <u>Tie-Breaker</u>. The policy model could be used to aid the AFHPSP board in making select/non-select decisions in those cases where board members assign the same scores to two or more applicants. In this approach, ties could be broken by using applicant scores based on a model that considers factors the board does not address.

VII. CONCLUSIONS/RECOMMENDATIONS

This study developed a methodology and a data collection questionnaire to aid in the selection of AFHPSP recipients. A comparison between the computer-based selection system and the AFHPSP selection board showed disagreement in 40.8% of the select/non-select decisions. Regression analysis indicated the cause of the disagreement was that the policy model and the board placed different emphasis on certain variables and considered different types and numbers of decision variables. Without a student/officer career tracking system, it was not possible to make an objective comparison between the long-term effectiveness of candidates selected by either system.

Although this lack of longitudinal data for comparative purposes did prevent a determination as to which method makes the best selection decision, the following recommendations can be offered:

1. Continue to administer the data collection questionnaire through the Air Force Recruiting Service. This will allow data to be gathered on the personal characteristics of the applicant pool. These data will serve as the basis for a long-term data base and for future research to design the most effective selection system possible.

2. Establish a long-term tracking system that will maintain the results of both the AFHPSP selection board and the AFHPSP policy model. In addition, selected career information (as determined by AFMPC/SG) would be entered into the data base to provide career information on AFHPSP scholarship recipients.

By adopting these recommendations, the groundwork will be laid for a future study to demonstrate the most effective synthesis of both the AFHPSP selection board process and the AFHPSP policy model. Such a future study should demonstrate which of the demographic characteristics of AFHPSP applicants are most closely related to their becoming successful career physician-officers.

3. It is also recommended that the AFHPSP selection board use the results from the policy model as a tie-breaker to make more consistent and informed selections. The AFHPSP policy model

provides consistent applicant evaluation and incorporates information the AFHPSP selection board does not directly consider. Use of the AFHPSP policy model will be a significant improvement in selecting successful, career-minded officer-physicians.

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APPENDIX A: AFHPSP QUESTIONNAIRE

The AFHPSP questionnaire was designed by AFHRL with input from the AFHPSP working group and is currently administered by the Medical Recruiting Division, Air Force Recruiting Service (RS/RSHM). A questionnaire and corresponding scan sheet are completed by each AFHPSP applicant at a recruiting office. When an applicant completes his/her application package, it is mailed to RS/RSHM which has the scan sheet read with an optical scanner. Data resulting from the scanning process are then transferred to the Air Force Military Personnel Center's Surgeon General's office which compiles the data for its own use. Data from questions 1 through 99 are used to determine the values for the input variables. The results from the remaining questions are recorded to be used in the long-term validation.

Unless otherwise specified, the time frame considered when completing this questionnaire should be *from your freshman year* in high school through today.

Items 1 through 6. If you received a distinction listed below, mark response "A." Otherwise leave blank.

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1. Eagle Scout
2. Silver Beaver Award
3. Civic activity, honor, or award
4. Outstanding Young Man/Woman of America Award
5. Organizer of a college political group or campaign
6. American Legion Award

Items 7 through 21. If you were involved in any of the following community service activities for at least 1 year, mark response "A," "B," or "C" below to indicate the highest position you held in each activity. Leave blank if you did not participate in an activity for at least 1 year.

A. Member
B. Office holder
C. President

7. Red Cross
8. Political groups
9. Big Brother/Big Sister
10. Student government
11. Service oriented fraternities/organizations
12. Arnold Air Society
13. Elderly programs
14. Boy/Girl Scouts
15. Youth athletics
16. YMCA, YWCA Volunteer Work
17. Religious group
18. United Way
19. 4-H Club
20. Choir
21. Other (Please specify in the Comments section.)

Items 22 through 39. *If you attained an achievement listed below, mark response "A."* Otherwise leave blank.

22. Received research grant
23. Participated in an undergraduate research program
24. Presented scientific paper
25. Received project award
26. Published scientific paper
27. Won speech or debate contest
28. Received acting, playwriting, or other dramatic award
29. Published poems, stories, essays, or articles
30. Served as editor or feature writer for paper
31. Received literary award or prize
32. Received musical competition award
33. Participated in a public recital
34. Received art competition award
35. Received an athletic distinction
36. Received an outstanding employee award
37. Served as drill team or cheer leader captain
38. Served as a sports manager
39. Other (Please specify in the Comments section.)

Items 40 through 45. When answering items 40 through 45, consider only those periods when you were a full-time student (high school and college).

40. Approximately how many months have you worked in a paying job(s) requiring direct patient care?

A. 0-3	D. 12-15	G. 24-27	J. 36-39	M. 48 or more
B. 4-7	E. 16-19	H. 28-31	K. 40-43	
C. 8-11	F. 20-23	I. 32-35	L. 44-47	

41. On the average, how many hours per week have you worked in a paying job(s) requiring direct patient care?

A. 0-1	D. 6-7	G. 12-13	J. 18-19
B. 2-3	E. 8-9	H. 14-15	K. 20 or more
C. 4-5	F. 10-11	I. 16-17	

42. Approximately how many months have you done volunteer work requiring direct patient care?

A. 0-3	D. 12-15	G. 24-27	J. 36-39	M. 48 or more
B. 4-7	E. 16-19	H. 28-31	K. 40-43	
C. 8-11	F. 20-23	I. 32-35	L. 44-47	

43. On the average, how many hours per week have you done volunteer work requiring direct patient care?

A. 0	D. 3	G. 6	J. 9
B. 1	E. 4	H. 7	K. 10 or more
C. 2	F. 5	I. 8	

44. Approximately how many months have you worked in a job(s) not requiring direct patient care?

A. 0-3   D. 12-15   G. 24-27   J. 36-39   M. 48 or more
B. 4-7   E. 16-19   H. 28-31   K. 40-43
C. 8-11   F. 20-23   I. 32-35   L. 44-47

45. On the average, how many hours per week have you worked in a job(s) not requiring direct patient care?

A. 0-1   D. 6-7   G. 12-13   J. 18-19
B. 2-3   E. 8-9   H. 14-15   K. 20 or more
C. 4-5   F. 10-11   I. 16-17

Items 46 through 51. When answering items 46 through 51, consider only those periods when you were not a full-time student.

46. Approximately how many months have you worked in a paying job requiring direct patient care?

A. 0-3   D. 12-15   G. 24-27   J. 36-39   M. 48 or more
B. 4-7   E. 16-19   H. 28-31   K. 40-43
C. 8-11   F. 20-23   I. 32-35   L. 44-47

47. On the average, how many hours per week have you worked in a paying job(s) requiring direct patient care?

A. 0-1   D. 6-7   G. 12-13   J. 18-19
B. 2-3   E. 8-9   H. 14-15   K. 20 or more
C. 4-5   F. 10-11   I. 16-17

48. Approximately how many months have you done volunteer work requiring direct patient care?

A. 0-3   D. 12-15   G. 24-27   J. 36-39   M. 48 or more
B. 4-7   E. 16-19   H. 28-31   K. 40-43
C. 8-11   F. 20-23   I. 32-35   L. 44-47

49. On the average, how many hours per week have you done volunteer work requiring direct patient care?

A. 0   D. 3   G. 6   J. 9
B. 1   E. 4   H. 7   K. 10 or more
C. 2   F. 5   I. 8

50. Approximately how many months have you worked in a job(s) not requiring direct patient care?

A. 0-3   D. 12-15   G. 24-27   J. 36-39   M. 48 or more
B. 4-7   E. 16-19   H. 28-31   K. 40-43
C. 8-11   F. 20-23   I. 32-35   L. 44-47

51. On the average, how many hours per week have you worked in a paying job(s) not requiring direct patient care?

A. 0-1   D. 6-7   G. 12-13   J. 18-19
B. 2-3   E. 8-9   H. 14-15   K. 20 or more
C. 4-5   F. 10-11   I. 16-17

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52. Are either of your parents physicians?

A. Yes
B. No

Items 53 through 65. If you were involved in any of the following activities for at least 1 year, mark response "A," "B," or "C" below to indicate the highest position you have held in each activity. Leave blank if you did not participate in an activity for at least 1 year.

A. Member
B. Office holder
C. President

53. College debating team
54. Dramatic group
55. Social fraternity/sorority
56. Honor or recognition society
57. Departmental club
58. University Recreation Association/Organization
59. Theatrical groups
60. College/community band or orchestra
61. National Students Association
62. Junior Achievement
63. Radio or TV station
64. Professional organization
65. Other (Please specify in the Comments section.)

Items 66 through 70. If you have participated three times per week for at least one year in any of the following physical fitness methods then mark response "A." Otherwise leave blank.

66. Weight lifting
67. Jogging
68. Swimming
69. Aerobics
70. Other (Please specify in the Comments section.)

17

Items 71 through 85. Several college intramural sports you may have participated in are listed below. If you participated in a sport for at least two seasons mark response "A." Otherwise leave blank.

71. Football
72. Basketball
73. Baseball
74. Track
75. Hockey
76. Golf
77. Tennis
78. Volleyball

79. Swimming
80. Skiing
81. Wrestling
82. Crew
83. Soccer
84. Fencing
85. Other (Please specify in the Comments section.)

Items 86 through 100. If you were involved in any of the following college varsity sports for at least one season, mark response "A," "B," or "C" below to indicate highest level of achievement. Lease blank if you did not participate in a varsity sport for at least one season.

A. Member
B. Letter
C. Captain

86. Football
87. Basketball
88. Baseball
89. Track
90. Hockey
91. Golf
92. Tennis
93. Cross Country

94. Swimming
95. Skiing
96. Wrestling
97. Crew
98. Soccer
99. Fencing
100. Other (Please specify in the Comments section.)

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101. Have you had any prior military experience?

A. Yes, as an officer
B. Yes, enlisted
C. Yes, both enlisted and as an officer
D. No, not applicable

102. If you responded "A," "B," or "C" to question #101, then indicate the source of your experience.

A. Active duty
B. Reserves
C. National Guard
D. Active duty and Reserves
E. Active duty and National Guard
F. Reserves and National Guard
G. Other (Please specify in the Comments section.)

103. If applicable, indicate your source of commissioning.

    A. Academy
    B. ROTC
    C. OTS
    D. Other (Please specify in the Comments section.)
    E. Not applicable

104. If you are currently enrolled in a military training program, mark the appropriate response. Otherwise leave blank.

    A. College ROTC
    B. Air Force Academy
    C. West Point
    D. Naval Academy
    E. Other (Please specify in the Comments section.)

Items 105 through 110. If any of your relatives listed below are either retired from 20 years or more of active military service or presently on active duty status in the Armed Forces, then mark response "A." Otherwise leave blank.

105. Mother
106. Father
107. Brother
108. Sister
109. Aunt
110. Uncle

---

111. Did either of your parents serve on active duty at all during your lifetime?

    A. Yes
    B. No

112. Approximately, how many people live in or near the area (i.e., city, town, farm, etc.) where you spent the most time when you were growing up?

    A. 1 - 1,000   D. 50,001 - 200,000   G. 1,000,001 or more
    B. 1,001 - 10,000   E. 200,001 - 500,000
    C. 10,001 - 50,000   F. 500,001 - 1,000,000

113. Do you have a close family friend who is a physician?

    A. Yes
    B. No

114. Which studies are more interesting to you?

   A. Science
   B. Humanities
   C. Other (Please specify in the Comments section.)

115. Which studies are easier academically?

   A. Science
   B. Humanities
   C. Other (Please specify in the Comments section.)

Items 116 through 118. Use the options provided below to answer the following three questions.

A. Family Physician
B. Aerospace Medical Physician
C. Pediatrician
D. Internist
E. Surgeon
F. Urologist
G. Opthalmologist
H. Orthopedic Surgeon

I. Obstetrician/Gynecologist
J. Pathologist
K. Diagnostic Radiologist
L. Anesthesiologist
M. Neurologist
N. Psychiatrist
O. No Applicable/Other (Please specify in the Comments section.)

116. If you ever had any major injury or illness, indicate the type of specialist who treated you for it.

117. If a member of your immediate family had a major illness requiring extended contact with physicians or hospitals, indicate the type of specialist who treated him/her for it.

118. If you had to choose a medical specialty now, which one would you choose?

<u>APPENDIX B</u>: POLICY MODEL MATHEMATICAL RELATIONSHIPS

This appendix contains the functional relationships (in terms of variables and variable names), the mathematical formulas for the pairs of variables and/or functions and their payoff tables. The mathematical relationships established for the pairs of variables and/or functions were derived through the use of expert judges. The AFHPSP working group provided the expertise needed to develop the relationships. In each relationship the experts determined the values for each of the four corner points for each pair of variables as well as interactions between the variables. This information was used in a computer program to derive the mathematical equations shown in this appendix. Experts then reviewed each of the payoff tables to ensure that they were representative of the desired interactions among the pairs of variables and/or functions.

F1 = (X11,X12)
Military Affinity = (Prior Service, Military Family)
F1 = 90.00(X11) + 60.00(X12) - 50.00(X11)(X12)

F1   X12

X11	0	1
1	90	100
0	0	60

F2 = (X9,X10)
Military Education = (Military Academy Completion, ROTC Completion)
F2 = 100.00(X9) + 90.00(X10) - 90.00(X9)(X10)

F2   X10

X9	0	1
1	100	100
0	0	90

F3 = (F1,F2)
Military Experience = (Military Affinity, Military Education)
F3 = 0.80(F1) + 0.90(F2) - 0.007(F1)(F2)

F3

F1 \ F2	0	10	20	30	40	50	60	70	80	90	100
100	80	82	84	86	88	90	92	94	96	98	100
90	72	75	77	80	83	86	88	91	94	96	99
80	64	67	71	74	78	81	84	88	91	95	98
70	56	60	64	68	72	77	81	85	89	93	97
60	48	53	58	62	67	72	77	82	86	91	96
50	40	46	51	57	62	68	73	79	84	90	95
40	32	38	44	51	57	63	69	75	82	88	94
30	24	31	38	45	52	59	65	72	79	86	93
20	16	24	31	39	46	54	62	69	77	84	92
10	8	16	25	33	41	50	58	66	74	83	91
0	0	9	18	27	36	45	54	63	72	81	90

F4 = (X3,X4)
Specialty Potential = (MCAT Science, Medical Family)
F4 = 2.111(X3) + 5.00(X4) - 0.007(F1)(F2)

F4   X4

X3	0	1
45	100	100
40	89	94
35	78	83
30	67	72
25	56	61
20	44	49
15	33	38
10	22	27
5	11	16
0	0	5

F5 = (X7,X8)
Service Track = (Distinctions, Memberships)
F5 = 3.50(X7) + 2.00(X8) + 0.050(X7)(X8)

F5

X7		X8 0	1	2	3	4	5	6	7	8	9	10
	20	70	73	76	79	82	85	88	91	94	97	100
	19	67	69	72	75	78	81	84	87	90	93	96
	18	63	66	69	72	75	78	80	83	86	89	92
	17	60	62	65	68	71	74	77	79	82	85	88
	16	56	59	62	64	67	70	73	76	78	81	84
X7	15	53	55	58	61	64	66	69	72	75	77	80
	14	49	52	54	57	60	63	65	68	71	73	76
	13	46	48	51	53	56	59	61	64	67	69	72
	12	42	45	47	50	52	55	58	60	63	65	68
	11	39	41	44	46	49	51	54	56	59	61	64
	10	35	38	40	43	45	48	50	53	55	58	60
	9	32	34	36	39	41	44	46	49	51	54	56
	8	28	30	33	35	38	40	42	45	47	50	52
	7	25	27	29	32	34	36	39	41	43	46	48
	6	21	23	26	28	30	33	35	37	39	42	44
	5	18	20	22	24	27	29	31	33	36	38	40
	4	14	16	18	21	23	25	27	29	32	34	36
	3	11	13	15	17	19	21	23	26	28	30	32
	2	7	9	11	13	15	18	20	22	24	26	28
	1	4	6	8	10	12	14	16	18	20	22	24
	0	0	2	4	6	8	10	12	14	16	18	20

F6 = (X5,X6)
Care Track = (Direct Patient Care (mos), Direct Patient Care (hrs/wk))
F6 = 1.042(X5) + 1.50(X6) + 0.02083(X5)(X6)

F6

X5		X6 0	2	4	6	8	10	12	14	16	18	20
	48	50	55	60	65	70	75	80	85	90	95	100
	44	46	51	56	60	65	70	75	80	84	89	94
	40	42	46	51	56	60	65	70	74	79	84	88
	36	38	42	47	51	56	60	65	69	74	78	83
	32	33	38	42	46	51	55	59	64	68	72	77
X5	28	29	33	37	42	46	50	54	58	62	67	71
	24	25	29	33	37	41	45	49	53	57	61	65
	20	21	25	28	32	36	40	44	48	52	55	59
	16	17	20	24	28	31	35	39	42	46	50	53
	12	13	16	20	23	27	30	34	37	41	44	48
	8	8	12	15	18	22	25	28	32	35	38	42
	4	4	7	10	14	17	20	23	26	30	33	36
	0	0	3	6	9	12	15	18	21	24	27	30

F7 = (F5,F6)
Achievement Potential = (Service Track, Care Track)
$F7 = 0.950(F5) + 0.950(F6) - 0.009(F5)(F6)$

F7

F5	F6 0	10	20	30	40	50	60	70	80	90	100
100	95	96	96	97	97	98	98	99	99	100	100
90	86	87	88	90	91	93	94	95	97	99	100
80	76	78	81	83	85	88	90	92	94	97	99
70	67	70	73	76	79	83	86	89	92	95	99
60	57	61	65	69	73	78	82	86	90	94	98
50	48	53	58	63	68	73	78	83	88	93	98
40	38	44	50	56	62	68	73	79	85	91	97
30	29	35	42	49	56	63	69	76	83	90	97
20	19	27	34	42	50	58	65	73	81	88	96
10	10	18	27	35	44	53	61	70	78	87	96
0	0	10	19	29	38	48	57	67	76	86	95

F8 = (X1,X2)
Academic Potential = (GPA, MCAT)
$F8 = 100 - 0.0015(X1-400) - 0.04375(X2-80) + 0.0000004687(X1-400)^2(X2-80)^2$

F8

X1	X2 40	45	50	55	60	65	70	75	80
400	30	46	61	73	83	90	96	99	100
390	30	46	61	73	82	90	95	99	100
380	30	46	60	72	82	90	95	98	99
370	29	46	60	72	81	89	94	98	99
360	29	45	59	71	80	88	93	97	98
350	28	44	58	70	79	87	92	95	96
340	27	43	57	68	78	85	90	94	95
330	26	42	55	67	76	83	89	92	93
320	25	40	54	65	74	81	86	89	90
310	24	39	52	63	72	79	84	87	88
300	23	37	50	61	69	76	81	84	85
290	21	35	48	58	67	73	78	81	82
280	19	33	45	55	64	70	75	77	78
270	17	31	42	52	60	67	71	74	75
260	15	28	39	49	57	63	67	70	71
250	13	26	36	45	53	59	63	65	66
240	11	23	33	42	49	54	58	61	62
230	8	20	29	38	45	50	54	56	57
220	6	16	26	34	40	45	49	51	51
210	3	13	22	29	35	40	43	45	46
200	0	9	18	24	30	34	38	39	40

F9 = (F7,F8)
Physician Potential = (Achievement Potential, Academic Potential)
$F9 = 0.600(F7) + 0.400(F8)$

F9

F7	F8 0	10	20	30	40	50	60	70	80	90	100
100	60	64	68	72	76	80	84	88	92	96	100
90	54	58	62	66	70	74	78	82	86	90	94
80	48	52	56	60	64	68	72	76	80	84	88
70	42	46	50	54	58	62	66	70	74	78	82
60	36	40	44	48	52	56	60	64	68	72	76
50	30	34	38	42	46	50	54	58	62	66	70
40	24	28	32	36	40	44	48	52	56	60	64
30	18	22	26	30	34	38	42	46	50	54	58
20	12	16	20	24	28	32	36	40	44	48	52
10	6	10	14	18	22	26	30	34	38	42	46
0	0	4	8	12	16	20	24	28	32	36	40

F10 = (F4,F9)
Medical Potential = (Specialty Potential, Physician Potential)
F10 = 0.900(F7) + 0.100(F8)

F10

		F9										
		0	10	20	30	40	50	60	70	80	90	100
	100	90	91	92	93	94	95	96	97	98	99	100
	90	81	82	83	84	85	86	87	88	89	90	91
	80	72	73	74	75	76	77	78	79	80	81	82
	70	63	64	65	66	67	68	69	70	71	72	73
	60	54	55	56	57	58	59	60	61	62	63	64
F4	50	45	46	47	48	49	50	51	52	53	54	55
	40	36	37	38	39	40	41	42	43	44	45	46
	30	27	28	29	30	31	32	33	34	35	36	37
	20	18	19	20	21	22	23	24	25	26	27	28
	10	9	10	11	12	13	14	15	16	17	18	19
	0	0	1	2	3	4	5	6	7	8	9	10

F11 = (F3,X13)
Officer Potential = (Military Experience, Leadership Roles)
F11 = 0.700(F3) + 17.50(X13) - 0.100(F3)(X13)

F11

		X13				
		0	1	2	3	4
	100	70	78	85	93	100
	90	63	72	80	89	97
	80	56	66	75	85	94
	70	49	60	70	81	91
	60	42	54	65	77	88
F3	50	35	48	60	73	85
	40	28	42	55	69	82
	30	21	36	50	65	79
	20	14	30	45	61	76
	10	7	24	40	57	73
	0	0	18	35	53	70

F12 = (F10,F11)
AFHPSP Potential = (Medical Potential, Officer Potential)
F12 = 0.800(F10) + 0.200(F11)

F12

		F11										
		0	10	20	30	40	50	60	70	80	90	100
	100	80	82	84	86	88	90	92	94	96	98	100
	90	72	74	76	78	80	82	84	86	88	90	92
	80	64	66	68	70	72	74	76	78	80	82	84
	70	56	58	60	62	64	66	68	70	72	74	76
	60	48	50	52	54	56	58	60	62	64	66	68
F10	50	40	42	44	46	48	50	52	54	56	58	60
	40	32	34	36	38	40	42	44	46	48	50	52
	30	24	26	28	30	32	34	36	38	40	42	44
	20	16	18	20	22	24	26	28	30	32	34	36
	10	8	10	12	14	16	18	20	22	24	26	28
	0	0	2	4	6	8	10	12	14	16	18	20

APPENDIX C: REGRESSION EQUATIONS FOR PREDICTING
POLICY MODEL AND BOARD SCORES

This appendix presents the results of four regressions. Table C-1 contains the results of the policy model variables regressed against the policy model scores and board scores, while Table C-2 presents the results of the board variables regressed against both scores.

The R^2 values for the regressions of the policy model variables on policy model scores and the board variables on the board scores (0.979 and 0.895 respectively) show that each set of variables explain a large proportion of the variance in both the policy model and board scores. Lower R^2's for the other two regressions (policy model variables - board scores, 0.408, and board variables - policy model scores, 0.378) indicate that although the information used by the policy model or the board could explain a proportion of the ratings' variance from the other selection method, they primarily point to the fact that each method was designed for different purposes and considered different information.

Table C-1. Relationship of Policy Model Variables
to Policy Model and Board Scores

Variable	Policy model scores		Board scores	
	Coefficient	t-statistic	Coefficient	t-statistic
CONSTANT	-0.764	-0.668	384.860	55.106*
GPA	0.003	1.445	0.180	14.947*
MCAT	0.034	2.428*	0.185	2.147*
MCAT Science	1.567	60.640*	0.403	2.556*
Medical Family	3.369	17.478*	-0.302	-0.257
Direct Patient Care (mos)	0.018	4.676*	0.049	2.044*
Direct Patient Care (hrs/wk)	0.021	2.560*	0.075	1.534
Distinctions	0.133	11.467*	0.040	0.568
Memberships	0.070	3.493*	-0.009	-0.072
Military Academy Completion	8.610	30.078*	2.013	1.151
ROTC Completion	9.864	20.679*	2.607	0.895
Prior Service	6.942	26.163*	3.886	2.397*
Military Family	5.616	48.030*	2.213	3.098*
Leadership Roles	3.080	57.579*	-0.003	-0.010
N = 484	R^2 = 0.979		R^2 = 0.408	

*significant at the .05 level.

Table C-2. Relationship of Board Variables
to Policy Model and Board Scores

Variable	Policy model scores		Board scores	
	Coefficient	t-statistic	Coefficient	t-statistic
CONSTANT	-14.871	-2.409*	222.788	76.323*
GPA	0.007	0.125	1.021	39.193*
MCAT	1.236	16.600*	0.955	27.121*
Work Experience	0.132	1.151	1.012	18.675*
Extracurricular	0.355	2.768*	0.830	13.681*
Letters of Recommendation	-0.223	-1.265	0.761	9.131*
Career Potential	0.190	1.993*	0.944	20.941*
N = 484	R^2 = 0.979		R^2 = 0.408	

*significant at the .05 level.