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13. ABSTRACT *(Maximum 200 words)*

Between 1976 and 1998, 580 USAFA (USAFA) graduates have gone to medical school as their initial assignment (USAFA Institutional Research, 1998). The AF sends approximately 20 cadets annually to medical, dental, and nursing schools and spends 4 to 5 million dollars on scholarships yet there was little feedback to the Academy on how their graduates faired in medical school verses national pre-medicine programs. How did USAFA graduates do in medical school?" This retrospective descriptive study, which defined specific characteristics of Academy graduates, went on to answer the following: 1. Was there a difference in the performance of Academy graduates versus non-Academy graduates in medical school? and 2. Were Academy selection requirements good predictors of the performance of Academy graduates in medical school? This study concludes that based on the population, there were some differences between the Academy cohort and all other medical students at the USUHS-SOM. The Academy graduates have an average medical school gradation GPA of 3.11(/4.0); that is slightly higher than all other graduates 3.01(/4.0), but is not statistically significant. Over 23 years, the Academy graduates had slightly lower premedical GPAs than non-Academy matriculants. However, the Academy matriculants were less likely to have delayed graduation (more than 4 years) and had a tendency not to experience academic difficulty (statistically significant). Secondly, the selection requirements were good predictors of performance for Academy graduates. Out of the 12 variables studied, undergraduate science GPA was the strongest predictor of success in medical school. Despite not having a premed program at the Academy, the graduates who go on to USHUS-SOM are well-prepared

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Assessing USAFA's Effectiveness in Preparing Graduates for the Uniformed Services University of the Health Sciences School of Medicine (USUHS-SOM)

Lourdes Rivera, CHE

Army-Baylor University Masters in Healthcare Administration

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Abstract

Between 1976 and 1998, 580 USAFA (USAFA) graduates have gone to medical school as their initial assignment (USAFA Institutional Research, 1998). The AF sends approximately 20 cadets annually to medical, dental, and nursing schools and spends 4 to 5 million dollars on scholarships yet there was little feedback to the Academy on how their graduates faired in medical school verses national pre-medicine programs. How did USAFA graduates do in medical school?" This retrospective descriptive study, which defined specific characteristics of Academy graduates, went on to answer the following: 1. Was there a difference in the performance of Academy graduates versus non-Academy graduates in medical school? and 2. Were Academy selection requirements good predictors of the performance of Academy graduates in medical school?

This study concludes that based on the population, there were some differences between the Academy cohort and all other medical students at the Uniformed Services University of the Health Sciences School of Medicine (USUHS-SOM). The Academy graduates have an average medical school gradation GPA of 3.11(/4.0); that is slightly higher than all other graduates 3.01(/4.0), but is not statistically significant. Over 23 years, the Academy graduates had slightly lower premedical GPAs than non-Academy matriculants. However, the Academy matriculants were less likely to have delayed graduation (more than 4 years) and had a tendency not to experience academic difficulty (statistically significant). Secondly, the selection requirements were good predictors of performance for Academy graduates. Out of the 12 variables studied, undergraduate science GPA was the strongest predictor of success in medical school. Despite not having a premed program at the Academy, the graduates who go on to USHUS-SOM are well-prepared do better than average.

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Assessing USAFA's Effectiveness in Preparing Graduates for the Uniformed Services University of the Health Sciences (USUHS-SOM)

CHAPTER 1 INTRODUCTION

Statement of the Problem or Questions

This study addresses the question, "How did USAFA graduates (Academy) do in medical school?" More specifically, I wanted to know information about the cadets who graduated from both the Academy and medical school to include matriculation and outcome data. Since 1976, 580 USAFA graduates have gone to medical school as their initial assignment (USAFA Institutional Research, 1998). The AF sends approximately 20 cadets annually to medical, dental, and nursing school and spends 4 to 5 million dollars on scholarships (H. Pigage, personal communication, May 11, 1999). Other than raw numbers of graduates, however, the Academy gets little feedback on how the cadets performed. This study represents a unique opportunity to retrospectively evaluate both Academy selection criteria and overall outcomes of Academy graduates versus graduates from pre-medicine programs throughout the country.

To answer the question, I chose to study a single medical school that provided a large enough sample size of Academy graduates. Interestingly, of the 580 graduates identified as having gone to medical school, 20 percent or more attended (or are currently enrolled in) the USUHS-SOM. Realizing that both the Academy and USUHS-SOM are federally funded institutions with a common goal of producing high quality military officers, I saw that the benefits of this study could potentially benefit both schools. This retrospective, descriptive study defines specific characteristics of Academy graduates who go on to the USUHS-SOM and answers the following questions: 1. Is there a difference in the performance of Academy graduates versus non Academy graduates at USUHS-SOM? and 2. Are selection requirements

for medical school i.e. undergraduate Grade Point Average (GPA), MCATs, science GPA and others good predictors of the performance of Academy Graduates?

Conditions Which Prompted the Study

In 1995, an Academy Health Professions Program Tiger Team identified several key areas needing improvement. A specific recommendation made by the team included the creation of a mechanism to gather historical data of Academy physician graduates. "Without information from our graduates during medical school, residency, clinical, and the administrative phases of their careers, it is impossible for us to accurately assess the impact of the USAFA program on future performance" (USAFA Tiger Team Report, 1995, no pagination). Additionally, in a point paper written for the Air Force Surgeon General, entitled "Possible Clinical Health Professions Advisor (CHPA) Position," Colonel Ronald Reed, Biology Department Head, proposed the creation of a CHPA who would, among other duties, lead a 4-year analysis on the Academy's medical career tract; evaluate MCAT preparation programs available to cadets and recommend improvements; and conduct a program review to include national benchmarking of the Department of Biology (DFB) program and candidate selection criteria (personal communication, Helen Pigage, 1999). In response to DFB's point paper, Brigadier General Michael Wyrick, Deputy Surgeon General, concurred with the proposal to establish a CHPA position (Wyrick, 1996). Although the department wasn't successful in obtaining a funded CHPA position, the Deputy Surgeon General did approve the assignment of an Army-Baylor Graduate Student in Healthcare Administration in 1998 specifically to conduct an analysis of the Academy graduates who go on to have careers in the medical field.

Value of Studying Academy Graduate Performance for DFB, USAFA, USUHS and AFMS

In addition to the conditions that prompted this study, there are several other reasons why this study is important to the Academy's Biology Department, USAFA, USUHS-SOM, the Air Force Medical Service (AFMS), and the Air Force including: accreditation, outcome measures, recruitment, and retention.

Value of the study to the Biology Department

Nearly 50 percent of Academy graduates who have attended medical school have majored in Biology. The DFB, Health Professions Advisory sub-Committee (HPAC) and health professions advisors devote much time and energy to educating, advising, and supporting those cadets involved in the medical school application process. Despite this tremendous effort, there are few specifics from the medical schools that are fed back to the program and personnel involved to allow them to make changes to the curriculum, advice and medical school selection criteria.

Value to the Academy's accreditation process

This study supports the Dean's emphasis on continuous improvement. In the first Dean's Call (meeting held 14 August 1998 with the faculty and the dean) for the 1998-1999 academic year, the Academy's Dean, General David A. Wagie, discussed continuing items of emphasis to include curriculum review and assessment (Wagie, 1998). This study not only supports the Dean's emphasis on assessment, but also supports the DFB's Unit Self-Assessment goals 3, 6, and 7: (DFB, 1998) strategic and operational planning, performance results and student focus, and student and stakeholder satisfaction. As stated previously, his study provides the data to assess and improve curriculum, and ultimately leads to the continuous improvement of the Academy Health Professions Program.

Value of the study to USUHS-SOM

The Dean of the USUHS-SOM saw great value and supported the efforts associated with this study (V. Hemming, personal communication, 22 Sep 1998). Because the USUHS-SOM has been continually scrutinized within the Department of Defense, the outcome is an important measure of the value of the medical education to DoD. This study gives USUHS-SOM data about one of their "supply" houses (Military Academies). For example, one possible value of this study is that USUHS could determine student profiles to enable them to see which students are more likely to graduate on time, and experience less academic difficulty. Additionally, it could give the SOM ideas on whether premedical factors such as undergraduate grade point average (UGPA), and Medical College Admissions Test (MCAT) determined the success of their applicants.

Value to the Air Force Medical Service

While the USUHS-SOM and the USAFA benefit from this study so does the Air Force Medical Service. It is important the Air Force Surgeon General receives information regarding the annual investment in scholarships for medical school. Each year the Surgeon General of the spends $22 million educating medical professional through the Air Force Health Professions Scholarship Program (HPSP) (Matos, 1999). Federal law delineates the specifics of the HPSP program and the purpose of this law is to obtain adequate numbers of qualified and trained physicians in the "active forces to ensure quality medical care in peace and wartime mission" (Matos, 1999). Selection of qualified Academy graduates is part of this equation and the risk of selecting them for medical school must be periodically evaluated.

Changes in the method of healthcare delivery affect Medical Corps

Changes in the method of healthcare delivery in the military through managed care (TRICARE) combined with reengineering of the armed forces has driven military medical leaders to work in an environment where doing more with less is commonplace. A briefing by Lt. General Roadman, the Air Force Surgeon General, provided an update to the Air Force's Right Sizing Strategy. Four years into it, he says, the strategy is to optimize health and healthcare clinical outcomes; service to the customer; to achieve a cost-effective system (C. Roadman, personal communication, presentation made during weekly AFMS/SG video teleconference, 1999).

To gain a perspective from an Academy graduate who also went on to medical school, I interviewed Lt Colonel Kent Murphy, Director, for the Center of Excellence for Medical Multimedia. He shared his concerns as a military physician: (a) maintaining currency in specialty with declining patient base; (b) AF job requirements; and (c) operational commitments. He continued by posing several questions: 1) Will the downsizing of medical facilities to super clinics compromise clinical experience of some medical specialties? 2) What is the Air Force Medical Service going to look like in the future? 3) What assurances can be provided to military physicians? (K. Murphy, personal communication, 16 Sep 1998).

Therefore, the future of the Medical Corps begins with medical school and right-sizing includes all aspects of recruitment of physicians, availability of residencies, and retention.

Value in determining educational outcomes

Clinical outcomes such as postoperation infection rate, 72-hour return to the emergency room are to the healthcare profession as educational outcomes such as graduation rates, academic difficulty, and delayed graduation are to educational institutions. By identifying a profile

(educational outcomes) of Academy graduates who also go on to medical school, personnel at all levels, from the DFB to the AFMS, can decide where best to apply resources where to apply resources to ensure the stability of the Medical Corps.

Literature Review

Institutional Assessment

Purpose of Assessment

Institutional assessment has become an increasingly important aspect of educational programs during the past decade. In an attempt to evaluate the value and utility of their educational programs, many institutions of higher learning construct and conduct institutional assessments. The results of such organizational assessment serve many purposes: (a) provide a basis for budget and hiring decisions; (b) conducting program review;: (c) monitoring student satisfaction level, and; (d) evaluating the effects of change and contributing to improvements in the institution (Miller, 1996 ; Terenzini, 1997; CPEC, 1995).

Assessment Measures Used by Institutions of Higher Learning

How do academic institutions know if they are doing well? With the emphasis placed on the assessment of higher education within the last decade (Miller, 1996; Reed, 1998; Terenzini, 1997), many institutions have developed metrics to evaluate and measure the educational effectiveness. They include metrics such as the number of degrees awarded to minority students (CPEC, 1995), the transfer rate (Miller, 1996), proportion of undergraduate degrees (CPEC, 1995), post baccalaureate employment rates (Terenzini, 1997), and the surveys of graduate satisfaction (CPEC, 1995; Leber & Gibson, 1995, 1998).

Both the Air Force Academy and USUHS-SOM have had to defend their existence to Congress. Measuring their effectiveness is one way these institutions can defend themselves

against those in Congress who don't see the value of having military academies and medical schools.

Outcome Measures

Patrick Terenzini (1997), professor and senior scientist at the Center for the Study of Higher Education prepared a study for the National Postsecondary Education Council (NPEC) on student outcomes. This report first identified a range of policy issues currently facing American higher education. It then presented a taxonomy of student educational outcomes, a procedure for linking outcomes to policy, and concluded with a series of recommendations for further development of useful outcomes information for policy-making. Besides providing a framework on outcome measures, Terenzini's study also described a number of forces that have combined to increase pressure on administrators and faculty members in public institutions. Three of the most pressing include: (a) "increased competition for public funds from other public services; (b) state appropriations that fail to keep pace with inflation; and (c) legislative demands for accountability and increased productivity" (Terenzini, 1997, p. 1). This report can be ordered on the National Center for Education Statistics' web page http://www.nces.ed.gov/NPEC/products.html.

Availability of outcome measure information on the web

Comprehensive reports, such as assessments and outcomes are ways to compare processes. However, it is necessary that today's educators are aware of the prevalence of information available on the world-wide-web concerning outcome measures. This may lessen the often laborious and time-intensive research process. Some examples, are the State Council for Higher Education for Virginia's (http://www.schev.edu)) and the California Postsecondary Education Commission (http://www.cpec.ca.gov)) web pages. Along with Terenzini (1997),

these sources emphasized that outcome measures in education are important because they provide the accountability for state and federal spending on higher education.

The required outcome measures are becoming more sophisticated. In California, for example, the state legislature is calling for other measures to include assessments of improvements in student knowledge, capacity, and skills between entrance and graduation (CPEC, 1995). An example of the detailed measures include the provision of productivity data such as annual information on cost per unit of lower-division and upper-division instruction. This is intended to measure how efficiently the systems are providing services. The California state legislature is also asking for information linking productivity to outcomes such as the cost per student who graduates (CPEC, 1995).

Information regarding the Air Force's Institute of Technology (AFIT) Graduate Programs and civilian medical programs is available via the web. Program officials said that they collected many data elements on each of their students and graduates. However, few studies regarding actual outcome measures have been published (C. Keeling, B. Jefferson & S. Restivo, personal communication, April 1999). As with other postsecondary educational institutions, military medical schools and other programs have proceeded to develop outcome measures. Like Virginia and California, AF educational outcomes will soon be available on the world-wide-web. These measures are significant to the Medical Service and the Air Force and can be used to provide student profiles and, at a minimum, to assess recruitment and retention in military medicine.

Literature on Assessing Medical School Matriculants and Graduates

The literature on assessing medical school graduates and matriculants falls into several categories: (a) cognitive and noncognitive models; (b) predicting performance; (c) use of the

preadmission interview; (d) use of the MCAT and (e) predicting performance of students in military medical programs.

<u>The Use of Cognitive and Noncognitive Performance for Medical School Students Selection</u>

The development of reliable, comprehensive outcome measures is critical, both for focusing efforts of higher education segments and for providing the federal legislature with practical tools for assessing the return on health program spending. These measures include both cognitive and noncognitive performance. Cognitive performance is defined as "those skills, behaviors, attitudes, and attributes that, while seldom susceptible to the usual objective examination and evaluation procedures are judged by the faculty to be important for success as a physician" (Wittman, 1998, p. 26). Examples of cognitive skills include the ability to memorize, compute, and read, whereas noncognitive skills are the more difficult to measure attributes. Some of the noncognitive areas cited included honesty, professional and academic integrity, reliability, perception, sensitivity, balanced judgment, personal insight, and the ability to relate to others (Nemshick-Triggs & Sheppard, 1996; Sentell & Finstuen, 1998).

Few studies used both cognitive and noncognitive characteristics when looking at performance. Nemshick-Triggs and Shepard (1996) suggest a student-clinical instructor model of clinical education that identified both cognitive and noncognitive factors, which promote or interfere with a successful clinical education experience. Although this study relates to physical therapy, some of the student characteristics they chose included: previous clinical experiences, education, expectations of the clinical rotations, personal traits, and attitude toward teamwork (Nemshick-Triggs & Shepard, 1996). Their model also utilized the same characteristics along with organizational factors. The three areas that affected the instructor-student interaction, which

produced the overall clinical education experience included a) organizational factors; b) student characteristics; c) clinical instructor characteristics.

While Nemshick-Triggs and Shepard's (1996) study primarily focused on cognitive criteria, Mavis and Doig (1998) studied noncognitive factors in predicting a student's first year academic probation using Sedlacek's Noncognitive Questionnaire. Their prediction among first-year students was based solely on noncognitive variables and was slightly less accurate than results achieved using "the more readily available academic measures" (Mavis & Doig, 1998, p. 5). However, when they combined both measures, Sedlacek's noncognitive factors did not add to the predictive accuracy of the academic factors that were used: MCAT biological sciences scores and undergraduate total grade point average (Mavis & Doig, 1998).

Within the past decade, baccalaureate education of physicians included studies in humanities and social sciences. Studies such as Koenig's (1992) and Shen and Comrey (1997) refer to the consideration of personal qualities during the selection process and urge medical schools to identify applicants with the potential to become warm, caring physicians.

Currently, the only consistent mechanism that provides a measure of nonacademic assessment in the literature is the pre-admission interview (Elam & Johnson, 1992). In their study, Strategies for Refining the Admission Process, Elam and Johnson (1992) suggest that various groups of interviewers are differentially sensitive to various personal qualities elicited in the interview. "Particular interviewers may be better able to pick up on personal characteristics indicative of the ability to succeed in the classroom . . . discipline, breadth of knowledge, work habits, self-control, introversion, and motivation to study" (p. S30). On the other hand, they continue by saying that other interviewers may better evaluate characteristics that contribute to

the success in a clinical setting. These factors include maturity, motivation, rapport, empathy, integrity, personal manner, communication ability, and independence (Elam & Johnson, 1992).

The USUHS-SOM specifies consideration of noncognitive measures during its admissions process. DoD Instruction 6010.20, Admission Procedures for the USUHS clearly delineates the prerequisites for medical school application. The instruction specifically provides the academic and test requirements, and evidence of character and motivation. To clearly define what is meant by evidence of character and motivation, the instruction states: "Judgments about character and motivation shall be based on letters of reference, personal statements, evaluation reports, personality inventories, interviews, and such other credentials and/or techniques necessary to assess thoroughly the noncognitive nature and potential of the aspirant. The USUHS-SOM shall take the initiative in gathering data upon which to make noncognitive assessments of applicants." (DoDI 6010.20 1997, p. 7).

Literature on Predicting Performance of Medical Students

In an attempt to identify students who may be at risk for failure, many researchers have studied the prediction of performance at various stages throughout a medical student's career. (Cariaga-Lo, 1998; Koenig, 1998; Mavis & Doig, 1998; Nowacek, 1997; Silver, 1997; Wiley 1997). The most common mechanism for predicting performance in medical school is the use of academic measures to include undergraduate performance averages (UGPA), and the Medical College Admissions Test (MCAT).

Lt Col. William Wittman, Director, Office for Student Affairs, USUHS-SOM has conducted several studies on predicting performance on the United States Medical Licensing Examination (USMLE) Step 1 (which covers material taught during the first 2 years) and on the National Board Medical Exam (NBME) Step 1 Examinations (Wittman, 1998). In an early

USMLE study , Wittman (1998) used five factors to develop a prediction model accounting for 65 percent variance in the Step 1 scores of the graduating class of 1997 and 1998. The factors included the biological and physical sciences scores from the MCAT, the undergraduate science GPA, and first and second-year medical school GPA. In a later study, Wittman used "refined" measures of second year performance and his new four-factor model accounted for 70.9 percent of the variance (Wittman, 1998). Predicting performance is important in order to help students before they get into academic difficulty. Although, the study of other medical schools is limited to what is available in the current literature, the USUHS-SOM has a very intricate support network to ensure their students graduate once they are matriculated, see appendix B, USUHS-SOM Profile .

Literature on Using the Preadmission Interview to Predict Performance

Medical School Admissions Committees commonly use an interview to measure nonacademic abilities (Nowacek, 1997) . Although admissions committees expect the use of their selection measures, particularly the interview to be validated by commensurate academic performances, they recognize that student selection differs from the prediction of students' levels of achievement. Selection involves a choice based on preference or perceived value, whereas prediction involves a forecast about future achievement. "While quantitative selection variables have been used most often to predict students' academic performances, there is widespread acknowledgment that nonacademic characteristics of medical students and physicians are important features of professional competency" (Elam, 1992). In spite of a student's strong academic record, admissions committees need the interview process to assess applicant's suitability to practice medicine (Nowacek, 1997) .

In a National Association of Advisors for the Health Professions Advisors January 1998 Newsletter, Between Issues, refers to an article which appeared in the Oct 8, 1997 JAMA; this study shows students with lower GPAs still make good doctors. The authors of the JAMA article, Robert Davidson, M.D., M.P.H. and Ernest Lewis, M.D., from University Davis, School of Medicine studied students admitted to medical school between 1968 and 1987. During this 20-year period the school admitted students with less than a 3.0 on a 4.0 scale and with an MCAT score of less than 10 (on a 1-to-15 scale) for the four subscores. According to the Health Professions Advisors, Between Issues, editor, Jennifer Davis, "the unique qualities that influenced the admission committee to accept a candidate with lower test scores and GPAs included unique life experiences, leadership qualities, evidence of overcoming barriers such as poverty or physical disability, fluency in multiple languages and ethnicity" (Davis, 1998, p.14). Although there were differences in these two groups during medical school, following graduation the experience of the special consideration admission students was similar to the regular students (Davis, 1998). There was no difference in residency completion rates, evaluation of training by residency directors, choice of primary care discipline rates, and the practice characteristics of both groups. Several quotes worth emphasizing, appeared in the same volume of the Health Professions Advisor, Between Issues in an accompanying editorial to the study conducted by Davidson and Lewis (Davis, 1998), entitled American Medical News, Michael Scotti, Jr., M.D., from the AMA's Department of Medical Education writes:

> If the highest MCAT scores and GPAs are not predictive of these outcomes, they are not meaningful admission factors. . . This opportunity will complicate the task of admissions committees. If the pool of fully qualified applicants is larger and numerical data are an insufficient discriminator, then selection will need to rely

> much more on other criteria, perhaps criteria relevant to the needs of patients and the communities in which they live. Should we select more underrepresented minorities (recognized as African-Americans, Native Americans, Mexican-Americans, and mainland Puerto Ricans) because they will be more likely to influence favorably the health status of those segments of our population that have gained least from the great strides of American Medicine? I hope so. That such selections have an impact has been documented. (Davis, 1998, p. 15)

Literature on How the MCAT is Used to Predict Performance

Swanson, Case and Killian's (1996) study compared the relative accuracy of the new and old MCATs in predicting Step 1 performance and school-to-school variability. They concluded that the new MCAT provides more accurate predictions of USMLE Step 1 performance than undergraduate information alone. "...the increase in accuracy alone is sufficiently large that MCAT scores should continue to have substantial utility in the admission process, particularly in screening applicants to be interviewed." (Swanson, Case, & Killian, 1996, p.) The current trend in research is to use more noncognitive and clinically oriented criterion measures to predict success (Swanson, Case & Killian, 1996). Swanson et al. (1996) also found that the MCAT was especially useful where the proportion of applicants accepted (selection ratio) was fairly small.

Organizations Which Currently Provide Performance Research

The AAMC and National Association of Advisors for the Health Professions (NAAHP) publish reports and studies to help advisors and premedical students assess their own performance. Information available in reports such as "The MCAT Interpretive Manual: A guide for understanding and using the MCAT scores in admission decisions"; "Characteristics of

MCAT Examinees 1994-1995"; and "The validity of the MCAT for predicting performance in the first two years of medical school," provide descriptive statistics and other comparison data that both the Academy and USUHS-SOM may find useful. In spite of the availability of such literature, little empirical data concerning the assessment of postgraduate medical education or the assessment of Academy graduates is available.

Performance of Military-Sponsored Medical Students

USUHS-SOM study

The USUHS-SOM recently published a study in the journal "Military Medicine", describing the status of USUHS-SOM after 25 years (Gardner, Harmon & Stavish et al, 1998) , and compared USUHS-SOM to other U.S. medical schools. Gardner et al. (1998) showed that when USUHS-SOM students were compared to other medical students, the students MCAT and undergraduate grade point average (UGPA) were generally higher. Gardner et al concluded that USUHS-SOM provides an excellent medical education and prepares students for uniformed public service, (see Appendix B, USUHS-SOM Profile).

This unique preparation enhances military performance of the medical school graduate. The impact of an education on military performance was seen as extremely positive. "USUHS-SOM graduates have been selected for military promotion at a higher rate than their contemporary military physician colleagues, have fewer reported adverse clinical privileging actions, and fill a disproportionately larger share of military operational leadership positions" (Gardner, Harmon and Stavish, 1998, p.288). James A. Zimble, M.D., President, USUHS-SOM, proudly describes USUHS-SOM alumni in his message by saying, "Since our first graduating class in 1980, our alumni have become integral to operation medicine and are assuring significant leadership positions throughout military medicine. Whether serving as the personal physician to

the President, leading emergency medical assistance teams in response to terrorism, disasters, and life-threatening disease epidemics, or providing emergency surgery in war-torn Somalia and Bosnia, our graduates have, and will continue to have, a direct impact on the future of military medicine and public health" (Zimble, 1997, p.1,).

USUHS Graduate School of Nursing and Baylor study

The Graduate School of Nursing (GSN) was established at the USUHS-SOM in 1993. The article titled: "The first four years of the Uniformed Services University of the Health Sciences Graduate School of Nursing" describes the initial steps and the outcomes of establishing a new program. The demand for advanced practice nurses (APNs) has increased. According to the article, an assessment of needs for APNs in the uniformed services conducted in 1993 revealed that the "steady demand for these nurses justified the establishment of an educational program run by the military to prepare them. Although the GSN program is in its infancy, it serves as an early documentation of assessing the needs of the military healthcare delivery system and developing future outcome measures.

Another study of military healthcare programs is the study on Army-Baylor University graduate program in Healthcare Administration (HCA). Graduate students conducted a study in 1997 to assess the utility of the Masters in HCA. This retrospective study used a self-reported cross-sectional survey to question previous graduates to determine if they were still employed in the field of healthcare administration. The results showed that the graduates of the Army-Baylor Masters in Healthcare Administration were very likely to be using their healthcare administration education therefore, achieving a significant level of utility. In their study, Korody, Novakowski, and Bewley noted that institutional or program assessment has become an increasingly important aspect of educational programs in the past decade.

AF Academy assessment studies

As with the graduate medical studies, there are limited assessments of Air Force Academy graduates. The studies assessing the performance of Academy graduates include, "Assessing Officer Potential: Lessons learned from doing I/O in the "real world" (Leber, 1994), and "Assessing Academy Effectiveness" (Leber, 1995). These studies serve to validate the Academy's goal: to make good Air Force Officers. The survey instrument used by Lt. Col. Laurence Leber provided behavioral word pictures to address a dozen of USAFA's most critical military, academic, athletic, and character outcomes. In 1995 the Air Force distributed the survey to over 700 supervisors. The information gathered became a "report card" to assess Academy programs and performance. However, no studies to date have investigated performance of Academy graduates in specific postgraduate programs and/or career fields.

Literature on statistics

Besides the different assessment categories of performance, a literature review was completed to determine the best methodologies and statistical techniques to use. Interestingly, few studies of student performance use qualitative methodologies; a few expectations were seen in the noted studies (Nemshick-Triggs & Sheppard, 1996; Graham, 1996). Of quantitative studies, the majority used statistical techniques to include correlation and regression.

Purpose

The purpose of this study is to assess the performance of the Academy graduates at USUHS-SOM. The two primary questions that this study answers: 1. Was there a difference in the performance of Academy graduates versus non-Academy graduates in medical school? and 2. Were Academy selection requirements such as GPA and MCAT scores good predictors of the performance of Academy graduates in medical school? The objective is to provide the Academy,

DFB, and USUHS-SOM with a profile of USAFA medical school graduates. This profile can then be used to develop metrics and outcome measures, which in turn could be used continuously to improve the Academy's curriculum. Secondary to the study is identification of key variables, which may be used in the future development of a survey instrument.

Each year up to 7% of graduating Academy cadets may enter health professions including dentistry, medicine, nursing, health services administration, and the Biomedical Sciences Corps. This study serves as the groundwork for the development of metrics and the creation of databases to allow more accurate assessment of Academy graduates in medical school and in military health professions (see appendix A, Academy Profile specific information concerning location, mission, history, and the four pillars of development).

Working Hypothesis

The first part of this study creates a profile of the Academy graduate who goes on to medical school. The descriptive statistics provide information about the matriculant. The second part of this study determines which variables predict success at USUHS-SOM. The third and final area will determine if there is a difference in the outcome (GGPA) between Academy graduates and other matriculants to the USUHS-SOM. Therefore, the null hypothesis is that there is no difference between the graduating GPA of Academy verses all other USUHS-SOM graduates from other undergraduate programs.

Study Variables

The specific quantitative performance measures and variables chosen to examine were academic and nonacademic performance measures. Gender and ethnicity were also used. The performance measures I considered studying included: 1. undergraduate grade point average (UGPA); 2. Medical College Admissions Test (MCAT) scores; 3. National Board of Medical

Examiners (NBME) scores; 4. Interview scores; 5. USMLE scores; 6. Records of academic difficulty; 7. Class rank; 8. Graduate grade point average (GGPA); 9. Leadership positions held; and 10. delayed graduation rate. However, the only variables I was able to analyze included: 1. UGPA; 2. GGPA; 3. MCAT; 4. Delayed graduation rate; 5. Academic Difficulty; 6. Gender; and 7. Ethnicity. USUHS-SOM requires that all students pass the NBME part 1 and part 2 prior to graduation; the only information available on the transcripts concerning this variable was pass/fail classification. Therefore, this variable could not be used. The data on leadership positions held was not available. Information regarding other degrees held, reapplicants, was noted, but not analyzed.

CHAPTER 2 METHOD AND PROCEDURES

Subject Recruitment and Selection

Procedure

The population consisted of USAFA graduates who attended medical school as a first assignment upon graduation. Information was gathered in accordance with the regulations governing privacy and Freedom of Information Act.

Population Size

The study examined the entire population of Academy graduates who matriculated at USUHS-SOM from 1976-1998, N=155 and those who graduated from 1980-1998 N=128. The average performance measures (GGPA, delayed graduation rate, and academic difficulty) were compared to the average performance measures of the USUHS-SOM graduates for the graduating class of 1980-1998, N=2723. Although matriculation information is available for all graduates, there are 27 incomplete records at the time of the data gathering. As an example graduate gpa was not available because 23 students were enrolled at the time of the study, 3 had disenrolled and 1 student died prior to completing.. With the exception of matriculation data, the comparison study includes 128 completed records.

Validity and Reliability

By choosing to study cognitive variables for students within the USUHS-SOM, reliability was ensured. Cognitive variables such as MCAT scores, and UGPA are measured for all Academy graduates in the same manner. Measures such as UGPA, GGPA, and MCAT for a population that attended the same undergraduate institution and medical school, avoids the issue of school-to-school variability. Because this is a population study and the entire subgroup, Academy graduates, is being profiled, there are no inferences to be made.

The reliability of this study is strengthened by its design. The retrospective design of this study limits the error reported in the different variables because the information was gathered from various third party sources to include the AMCAS application, USUHS-SOM records, and transcripts.

In conducting this study, I needed to consider the practicality of the design. Because the data was not available through a database, I had to negotiate with the USUHS-SOM to gain access to the information. Because I was able to present information concerning my study directly to the Dean of USUHS-SOM, the data collection method (individual record search) became a strength of the study. Because many of the variables used in this study are similar to those used in other studies of the medical school student/graduate performance the profile can be reliably interpreted by an individual researcher.

The self-reported nature of the data for ethnicity leads me to conclude there may be a small percent of error due to respondents. According to Cooper and Emory, "opinion differences will come from relatively stable characteristics of the respondent that affect the scores" (Cooper, 1995, p.147). Some of the characteristics described by Cooper and Emory included ethnic group membership.

Two major areas I considered when approaching the study design were content and criterion-related validity. Cooper and Emory define content validity as the extent to which a measuring instrument provides adequate coverage of the topic under study, while criterion-related validity "reflects the success of measures used for prediction." Similar data elements contained in the different sources were cross-referenced ensuring content validity for the database elements. Because the primary objective of this study is to provide a profile of Academy graduates who are also graduates of a medical school, there are several ways I am

looking at the validity of the variables. First, the design of the study, i.e., looking at all Academy graduates as a first step prevents issues related with school-to-school variability. The use of standard test scores available such as the MCAT and NBME scores provide face validity.

Experimental Design

After an initial review of Academy graduates who had gone on to medical school, I identified the sample size. Since 1976, 580 Academy graduates have been identified as accepting medical school as a first assignment; of that number nearly 20 percent have matriculated to USUHS-SOM. Along with those Academy graduates who have had their initial assignment to medical school, there exists a small percentage that went on to other assignments prior to applying to medical school. Additionally, by studying the Academy graduates who went on to the USUHS-SOM, I was able to capture a small percentage of students who applied and were accepted to medical school after they were commissioned into the service.

The study of Academy graduate performance is descriptive and retrospective. This study defines specific characteristics of USAFA medical students and graduates. This study is a retrospective analysis of several variables beginning with the USAFA graduating class of 1976. Academy medical students equate to graduates whose initial assignment was medical school or who entered medical school within the age limits allowed by the USUHS-SOM-SOM. Minority and ethnic information is self-reported through the American Medical College Application Service (AMCAS). Additionally, this study has some exploratory aspects to it since the majority of the analysis were completed following the document analysis to evaluate historical and/or confidential records, reports, and government documents.

In gathering data for the study, I chose to use the sum of the three equally weighted, multiple choice sections of the MCAT, to do direct comparisons, and to use in regression

analysis. For the regression analysis on graduate GPA, based on the literature review, I chose the following variables: matriculation age, ethnicity, gender, science GPA, undergraduate GPA, undergraduate degree, additional education, and academic difficulty.

Data gathering

Graduates from the Academy were identified by the USUHS-SOM and the admissions staff retrieved archived records. Data were gathered from several sources to include transcripts, personal interview sheets, and AMCAS applications. The data used for the comparison with nonAcademy graduates and US medical schools was provided by the admissions director and is comprised of the USUHS-SOM internal reports, "Summary of Admissions Process: Comparison of Applicants and Matriculants to the classes of 1980-2002," and the "AMCAS Annual Admissions Action Summary Reports USUHS-SOM and U.S. Association of American Medical Colleges, 1976-1998.

Each candidate's application provided data relevant to preadmission academic and demographic characteristics: undergraduate college and major, UGPA, science and nonscience GPA, MCAT subscale scores, and total, gender, age, and minority status. Student records provided NBME part I and II were identified as pass/fail, class ranking, and medical school academic performance data. Independent variables examined included applicants academic measures including MCAT score, UGPA, and science GPA. These independent variables represent inputs or determinants to the dependent variables, GGPA, academic difficulty, and delayed graduation rate. The schedule of procedures (Appendix 4) contains information regarding the initiation of the study, the agreement with USUHS-SOM, research funding, and areas addressed in the USAFA protocol.

Ethical safeguards were employed to ensure that the confidentiality of identities and records were maintained. I worked with a partner in the data-gathering phase to ensure data elements requested were not linked to individuals. The individuals identified by USUHS-SOM were alphanumerically coded. Following the coding process, I transposed the data elements requested. Furthermore, all records are maintained on a computer disk in a secured and restricted access filing cabinet.

Because this was a population study, direct comparisons could be made between the Academy cohort of medical students and the entire USUHS-SOM. More specifically, to be useful to the HPAC, I did a further analysis of the Academy graduate medical students only using forward step-wise regression to determine potential predictors of success. I performed the multiple linear regression analysis using Microsoft Excel (Bonini, Hauseman & Bierman, 1997).

CHAPTER 3 RESULTS

Descriptive Statistics

The following descriptive statistics basically answer two questions: 1. What is the typical profile of Academy graduates who attended, see Appendix A, Academy Profile? 2. How do cadets do at USUHS-SOM?

Thirty percent of entering students are married (J. Stearman, personal communication Dec 7, 1998) while the typical percent of entering married medical students nationally is 5-15 (Kaplan, 1998 #22). By the time the medical students graduate, two-thirds of them are married as compared with one-third of U.S. medical students (Gardner, Harmon & Stavish, 1998). While the American Medical Association estimates women will make up a third of the profession by the year 2010 (Miller, 1995), the total percentage of female graduates graduating from the USUHS-SOM is 11 percent. In 1995 the national percentage of women in medical school was 19 (Miller, 1995). Of the total USUHS-SOM graduates including currently enrolled students through the class of 2001 52 percent had no military experience prior to matriculation. (USUHS-SOM Admissions Office, 1998) The class sizes have ranged from 32 students in 1980 to nearly 165 students per year since 1989. (USUHS-SOM Admissions Office, 1998)

Academy Graduate Matriculation Statistics

The Academy graduates' average academic performance indicators are highlighted in Table 2, Premedical GPA (undergraduate and science) and Average Medical College Admission Test Scores (MCAT) for Academy Graduate Matriculants, to USUHS-SOM and U.S. Medical Schools, 1976 to 1998.

Population Comparisons

Matriculation statistics

USUHS-SOM medical students' average performance scores compare favorably to medical schools nationwide. How do Academy graduates compare to other and U.S. medical students? The premedical GPA for all new students admitted to the U.S. medical schools from 1976-1998 ranged from 3.40 to 3.57; at USUHS-SOM, the premedical GPA ranged from 3.37 to 3.55; whereas the range for the Academy graduates at the USUHS-SOM ranged from 3.30 to 3.73 (Table 2). Out of the 155 Academy graduates, 4 have withdrawn from the program from 1976-1998. None of the withdrawls were due to academic difficulty; 3 out of 4 withdrawls were due to personal reasons and the other was due to death. Of the 151 graduates who successfully completed the program or are currently enrolled, 7 were identified as having academic difficulty. Of those experiencing difficulty, the average premedical GPA was 3.27; science GPA was 3.36; and other medical school graduate GPA was 2.54. None of those experiencing academic difficulty were classified as minorities. According to the 1998 USUHS-SOM study (Gardner, Harmon, & Stavish, 1998), delayed graduation (beyond 4 years) exceeded 10 percent for those entering in 1986 and 1987. Out of the population of Academy graduates studied, less than 1 percent (1 out of 155) have been categorized as a delayed graduate. This compares with more than 20 percent nationally (Gardner, Harmon, & Stavish, 1998].

Regression Analysis

A step-wise forward regression analysis was performed to identify the predictors as listed in Table 3. Output of Multiple Forward Regression Analysis included: matriculation age,, ethnicity, gender, science gpa, undergraduate gpa, undergraduate degree, additional education and academic difficulty in the order of importance in accounting for the variance in medical

school GPA. The regression used the completed records of 128 students. The standard error of the regression is .31. The adjusted R Square is .256 which indicates a poor fit of these data points, therefore, this model, in and of itself, does not serve as a good forecast for graduate GPA. However, the model does bear out what is intuitively obvious and discussed in the literature review. Undergraduate science GPA is a good predictor for GGPA. Out of the 12 variables in this model, science GPA is the strongest predictor of GGPA. Another variable known as difficulty is also a strong predictor of GGPA. Obviously, if a student experiences difficulty which is defined as achieving D or an F in a course, it affects the GGPA drastically. Those with academic difficulty had to repeat the course work. The average of the initial and repeated course grades were used in the computation for the particular semesters GPA.

Also noted are the t-statistics for the regression coefficients. A t-statistic greater than 2.0 indicates statistical significance (Bonini et al, 1997 p.494) whereas t-values less than 2.0 indicate the true value of the coefficient may actually be zero with reasonable probability. In this analysis, the t-values for science GPA (2.01) and difficulty (-3.90) indicate statistical significance. The results indicate that the regression equation accounts for a low percentage of the shared variance 32 percent. In order to make the results of this multiple regression more useful as a forecasting tool future studies, a correlation matrix would tell how each one of the variables affect one another. Although the multiple regression was complete, a correlation matrix cannot be done due to loss of the original data set. The data set could easily be recreated in the future when the USUHS-SOM installs new information management programs to maintain the data. Although the percentage of the variance cannot be separated, a p-value less than .05; p = .047 for science GPA and a p-value of .0001 for difficulty show that undergraduate science GPA and academic difficulty make a difference when it comes to predicting graduate GPA. All

information regarding the multiple regression analysis can be found in Table 3., Output of Multiple Regression Analysis.

Comparison of USAFA subset to the population

I used SPSS for this portion of the study. Because the information on GPA was available for the entire population I chose to include all of the data as given in the SPSS program see Tables 7-10 and figure 1. The analysis shows that there is no significant difference between graduate GPA scores of Academy graduates and non-Academy graduates ($p=.522$). Mean scores for Academy Grads are 3.11 compared to 3.09 for all other graduates. table 9. Univariate Analysis of Variance and Table 10. Test of Between Subject Effects compares average GPA of Academy graduates to their non-Academy peers within all year groups again shows no significant difference in scores $p = .433$. Over the 23 years, the Academy had slightly lower premedical GPAs than the USUHS-SOM and the National population. However, the Academy matriculants were less likely to have delayed graduation (more than 4 years) and had a lower tendency to experience academic difficulty

Discussion

National Trends on Medical School Admissions

In 1995, the nation's 124 medical schools saw 46,312 applicants for approximately 17,000 spaces. Since 1998, applicants have increased by 73 percent. Consequently, the national acceptance rate has plummeted from 64 percent in 1988 to the 1995 projected rate of 37 percent (Bhatt, 1995). Dr Helen Pigage, Academy Health Professions Advisor provided additional data from the AAMC concerning the number of applicants for 1996-1998; 1996=46,497 applied; 1997=43,053 applied; 1998=41,003 applied (H. Piggage, personal communication, 15 April 1999). Medical school application remains a very competitive process. Joan Stearman, Director

of Admissions for the USUHS-SOM gives an example—The class of 2002 had over 2,900 people apply for 165 positions (J. Stearman, personal communication, 18 October 1998)

Retention of Physicians in the Military

In the 1998 Hearings on Military Medical Programs, the service Surgeon Generals expressed their concerns regarding retention and recruiting. As a part of this testimony, USUHS-SOM President, James Zimbel, told Chairman, US Senate Committee on Appropriations, Subcommittee on Defense, Senator Ted Stevens, about the retention rates. USUHS-SOM graduates number 2,740 of which 92.5 percent remain on active duty. He went on to say that roughly 17 percent of the DoD physicians are graduates of USUHS-SOM. In the same testimony, Lt General Charles Roadman, Surgeon General (SG) for the Air Force, pointed out that the retention rate for USUHS-SOM trained physicians was higher than from any other program; followed by in-house Graduate Medical Education (GME). Civilian-trained physicians are the least likely category to remain on active duty (Stevens, 1998).

The Academy and USUHS-SOM have detailed processes on selection to medical school. In order to determine if any changes need to be made to the systems, this study provides the framework to assess outcomes. Because Academy graduates do as well as others based on GPA it validates the Academy's medical school candidate selection process. The strength of the study is that it is a population study, therefore, no inferences need to be made about the sample.

Narrowing scope of military health care affect retention

A part of the study anticipated being able to find data on noncognitive areas such as retention. With the changing civilian and military healthcare system the question of retention will be a question the medical service has been and will continue to deal with. As military hospitals across the services convert from inpatient facilities to "super clinics," medical recruiters need to

be cognizant of how the possibility of the narrowing scope of military healthcare affects retention.

Recruitment and retention of healthcare professionals is a critical issue because the active duty force is still being reduced. Healthcare professionals may not see the military as an attractive career during this period and be reluctant to join. Therefore, it is important to think beyond the present and look toward providing new incentives for physicians.

Possible incentives to retain physicians

Consider the reengineering of processes that increase physician productivity. The crux of this issue is the argument concerning physician-leaders. As the physician increases rank, it is expected that he/she assume leadership roles. In 1992, Richard Southby, author of an article entitled "Military Healthcare in the 21st Century," suggested that the focus be on appropriate qualifications for managers and management structure at all levels within the system is absolutely necessary. "Being an outside healthcare provider does not necessarily translate into being an outstanding manager." (Southby, 1993 , p.639). All too often, the healthcare providers themselves, are moved into senior leadership positions without appropriate education and experience. These leadership roles increase the administrative workload and decrease the amount of time the physician has to see patients.

Study Limitations

My study has several limiting factors. Most significant and limiting to the overall results to this study was the fact that the original data set gathered from individual archived records was lost prior to completing the data analysis. Although the initial information and regression is contained in this study, it is limited by the nonexistence of a correlation matrix. Therefore, the degree of the relationship between the variables cannot be determined due to the absence of

original data. Secondly, the MCAT scores were not included in the regression equation; during the period of this study (1980-1998), the MCAT measurement changed on two different occasions. Therefore, the MCAT scores were used descriptively and can be viewed in Table 2, Premedical Grade Point Averages (GPA) and Average Medical College Admission Test Scores for Matriculants to USAFA, USUHS-SOM, and U.S. Medical Schools.

I found three additional areas, which I would highlight as limitations: 1. The decision to use a summation of MCAT subscores versus using the individual subscores; 2. Little data available concerning nonacademic measures of performance; and 3. Lack of robust information systems.

As discussed in the experimental design, the choice to sum the sections of the MCAT score results in a selection index which emphasizes science preparation and devalues the measurement of critical thinking and logical reasoning. Therefore, future studies assessing Academy graduate performance should consider the MCAT sub-components separately. However, this should not diminish the value that studies such as this could add to the body of knowledge needed to make adjustments to the use of MCAT information in local selection to medical schools.

This type of study leaves out a full-range of information sources available for assessing selection procedures. It does not include nonacademic preadmission and school performance data such as healthcare, leadership skills, potential and experience. Medical performance data of this sort does not reference attributes that the faculty considers critical. Although the Academy maintains an ongoing database of its graduates, it was difficult to assess specific characteristics for the entire population of cadets into medical school. Therefore, future study of the Academy

graduate who also pursues a medical doctorate should also include the cohort of Academy graduates who attend civilian universities.

A lack of robust information systems at USUHS-SOM and the AFIT Health Professions Scholarship program make it difficult to efficiently study medical students. For example, specific data about the individuals participating in the HPSP program is difficult to access. USUHS-SOM's admissions and Registrar's offices are working with a civilian contractor to integrate all of the data they maintain on individual students (Joan Stearman, December 11, 1998, personal communication).

Expected Findings and Utility of Results

Expected Findings

When I began this study, I expected to find differences among Academy graduates based on gender and ethnicity, however, this did not bear out following the analysis. I expected that the students having academic difficulty would be minorities based on my own bias. Growing up as a Puerto-Rican American, I had several people assume that most likely I had been accepted into the Air Force Academy because I filled a quota for Hispanic and female. In this study those experiencing academic difficulty (4) were male and self-identified as white. I expected that matriculation age would make a significant difference in GGPA primarily because these matriculants had experienced living on their own and were outside of the "protection" afforded to cadets, i.e., shelter, food, and schedules are provided. Additionally, I expected those with additional education prior to matriculating were more likely to have higher GGPAs and the analysis did not show this either.

Expected Contributions to AF Mission

The ultimate outcome measure one hopes to derive is how Academy graduates, who also graduate from the USUHS-SOM, perform throughout their Air Force careers. With their extensive exposure to airmanship and summer training, they are more knowledgeable about the operational Air Force than their civilian counterparts. These graduates should make ideal candidates for military medical careers. A recent study published in Military Medicine (Gardner, Harmon & Stavish, 1998) stated, "USUHS-SOM graduates have been selected for military promotion at a higher rate than their contemporary military physician colleagues, have fewer reported adverse clinical privileging actions, and fill a disproportionately larger share of military operational leadership positions" (p.2880).

What I did find was that although Academy graduates matriculant statistics, for example undergraduate gpa, was lower they graduated with similar and for most years slightly higher GPAs than all other USUHS-SOM students. Additionally, an Academy graduate was also less likely to experience academic difficulty and delayed graduation. Other statistics show that over 85 percent of USUHS-SOM graduates who have served their "commitment" (obligation of time served in the uniformed services) in return for a tuition-free education are still on active duty (Gardner, 1998).

Conclusion

As I conducted this study, I divided this section by considering general conclusions first for both the Academy and USUHS-SOM and then specific conclusions. More studies would be helpful that quantify the share of the Academy and graduates that are in or have been in operational leadership positions. Although previous studies and testimony (Stavish, 1998; Stevens, 1998) indicate that the graduates have higher retention and serve in more leadership positions, I was unable to find empirical data. I recommend the development of a questionnaire

that can be administered to all Academy graduates entering (and/or graduating from) the health professions. This enables future and ongoing tracking of data elements and allows continuous study of Academy graduate health professionals. The Association of Medical Colleges provides specific avenues through the "AAMC Annual Medical School Graduation Questionnaire," that the Academy HPAs may find useful in making future assessments.

"How were USAFA graduates doing in medical school?" This retrospective descriptive study which defined specific characteristics of USAFA graduates went on to the USUHS-SOM answered the following: 1. Was there a difference in the performance of Academy graduates versus non Academy graduates at USUHS-SOM? and 2. Were selection requirements good predictors of the performance of Academy graduates?

Based on the USUHS population studied, I cannot say there were any significant in their grade performance but there were differences in the areas of academic difficulty and on time graduation rates. Over the 23 years, the Academy had slightly lower premedical GPAs than the USUHS-SOM and the National population. However, the Academy matriculants were less likely to have delayed graduation (more than 4 years) and had a lower tendency to experience academic difficulty. To answer the second question, the entrance requirements were seen as good predictors of performance for Academy graduates. The only students who experienced academic difficulty were found to be below the average premedical requirements and the national medical schools. Future studies should consider comparing students who have previous military experience to those who enter directly as civilians.

Despite not having a premed program at the Academy, the graduates who go on to USUHS-SOM are well prepared and graduate with a slightly higher graduation GPA of 3.11 vs. 3.09, have less academic difficulty and graduate on time. Preparation factors that allow for

higher scores at USUHS-SOM are the next area of focus for the department of biology since the univariate analysis of variance definitely shows that there are some years that students are more prepared than others. If USUHS-SOM wants students who can finish their medical programs and do it in 4 years then they should continue to recruit Academy graduates. Despite the fact that generally Academy graduates are accepted into USUHS-SOM with lower undergraduate grade point average (UGPA), and Medical College Admissions Test (MCAT), Academy graduates graduated with a slightly higher GPA than the rest of the USUHS-SOM population.

Some may be asking, "why should studies be conducted on military medical students?" Although there were 13,000 physicians at the end of fiscal 1996, 97% of the authorized strength, the number has not been declining (Funk, 1997). Options other than offered through the Armed Forces Health Professions Scholarship Program have been explored within the last 2 years. One of these options considered is offering to repay doctors' loans in exchange for military service. "If the department is to remain competitive with the private sector for quality healthcare providers, it must have a meaningful direct recruitment incentive program to complement the long-term accession approach of the Armed Forces Health Professions Scholarship Program," Defense Department officials wrote in an August 5 letter to Congress (Funk, 1997).

In their study, entitled Executive Skills 21: A forecast of Leadership Skills and Associated competencies required by Naval Hospital Administrators into the 21st Century, Sentell and Finstuen conclude by saying, "Professional skills such as patience, listening, conflict management, team-building, negotiations, and motivational leadership are but a few of the skills important to collaboration. Competency in all of these areas will be necessary for successful management of a uniform and stable healthcare benefit for all military members and their families" (Sentell & Finstuen, 1998)

Conclusions pertaining specifically to the Academy

As a direct response to the 1989 NCA Team Report, Col Ronald Reed, Permanent Professor and Department Head, Department of Biology and author of the 1999 NCA Team report, this study directly supports a concern regarding graduate assessment. According to the 1989 report "In light of the Academy's own commitment to demonstrated cost-effectiveness in support of the Air Forces' staffing needs, there should be additional development of the database on characteristics and achievements of graduates in the Air Force . . ." (Reed, 1999).

In response to this report, Colonel Reed highlights the targeting of one specific group for more objective performance and achievement measures. The Academy, in cooperation with the military graduate program in Medical Administration at Baylor University, began to assess our graduates' performance in medical school (Reed, 1999).

The HPAC may benefit from the purchase of several publications available through the American Association of Medical Colleges (AAMC) publications and information resources. These are maintained on the following web site: http://www.aamc.org. The reports may be requested using different variables and one of the ones available is undergraduate institution. AAMC has a database that house descriptive data reported by 125 U.S. medical schools; it is known as an institutional Profile System. Additionally, it maintains the AAMC Data Book that provides specific information about applicants and students nationwide. The "Kaplan first year Perspective" provides continuously updated information for prospective medical students about a host of subjects to include MCAT, school selection, and admissions. Through my research I found that Kaplan was one of the most comprehensive sites available on the Internet at URL http://www1.kaplan.com.

Should the Academy have specific questions dealing with its premed curriculum, the AAMC could provide information for Academy graduates by using the undergraduate institution as an identifier. A similar survey could be used following the 2nd year in medical schools (studies show that performance in undergraduate science courses is directly linked to performance during the first 2 years of medical school) (Koenig, 1992). A future study that looks at specific course grades for Academy graduates could be more useful in providing DFB with specific ideas on courses which may need modification and/or emphasis.

Conclusions specific to the USUHS-SOM

As noted in the literature review, the dynamic healthcare environment is leading the MHSS to change because it has to do more with less. Keeping this in mind, the curriculum in medical schools is changing also. In Michael Tibbits' article "Leadership education for medical students," academic medicine is challenged to meet the future needs of graduates by providing courses that traditionally have been ignored in medical schools. Training should include practice management, legal medicine, methods of assessing quality assurance, and the physician's role in directing utilization review with patients (Tibbits, 1996).

One outcome of this study was that if USUHS-SOM wants students who can finish their medical programs and do it in 4 years, then they should continue to recruit Academy graduates. Conversely, if the SOM interview committee selected students based solely on premedical factors such as undergraduate grade point average (UGPA), and Medical College Admissions Test (MCAT), they would likely choose from a different subset of their applicant pool than Academy graduates.

Shift in medical paradigm

As mentioned in the literature review, selection criteria for medical school entry may have to rely on other factors besides numerical data i.e. MCAT scores and GPA. Some suggest that the criteria may be more relevant to the patients needs and the communicaties in which they live. Today's healthcare consumers are increasingly well educated and their health-related attitudes and behavior are changing. This change is related extremely well by Charles Longino in "Beyond the Body" (Longino, 1997). As the population continues to get older and live longer, the culture of medicine will change; the medical community is moving toward a new paradigm that combines scientific knowledge with a humanistic approach. "In the 15 decades between 1900 and 2050, the proportion of the U.S. population aged 65 and older will have increased from 4 percent to 20 percent. The population aged 75 to 84 will have increased from 1 to 7 percent. The oldest Americans aged 85 and older in 2050 will represent nearly 5 percent of the population, up from .2 percent in 1900 (Longino, 1997, p.2). He gives credit for this impressive growth curve to public health initiatives that have vastly increased the odds that people will reach old age. Having said that, it is not surprising that medical school admissions committees seem to be emphasizing the "whole person" concept. Although undergraduate performance in the science and the MCAT score are both used, writing assessments, the breadth of the undergraduate courses taken, and the interview are also being carefully studied. As future studies are undertaken the shift in the medical paradigm will certainly impact the variables chosen.

Appendix A. Academy Profile

The USAFA, the nation's newest federal service Academy established in 1954, has graduated more than 31,000 cadets in 40 classes (Reed, 1999). Currently accredited by the Commission on Institutions of Higher Education of the North Central Association of Colleges and Schools (NCA). The Engineering Accreditation Commission of the Accreditation Board approves its engineering programs for engineering and technology, and the Computer Sciences Accreditation Board approves its computer courses. The chemistry and biochemistry majors fulfill the requirements of the Commission on Professional Training of the American Chemical Society (Anonymous, 1997). The Academy has awarded undergraduate degrees since 1959. The objective of the curriculum was then and still is now, to provide a broad general education with a balance between the sciences and humanities.

The USAFA, located north of Colorado Springs, is a 4-year, federal service Academy. Maximum enrollment limits are set by congress. Current legislation limits enrollment to 4,000. The student body is composed of 12 percent women and 16 percent minorities (USAFA Institutional Research Statistics, 1998). Cadets are appointed from all 50 states. Cadets may choose to major in one or more of 31 academic areas. To gain admission, applicants must be unmarried, U.S. citizens, have no dependent children, and meet specific medical standards. Additionally, to qualify for admission, the applicant must be between 17 and 23 on July 1st of the year of admission. A distinguishing feature of the USAFA is the four "conceptual" pillars of cadet development: professional military training, academics, athletics, and character development.

The Four Pillars of Cadet Development

The pillars provide the framework for the Academy mission as it prepares cadets to assume the role of officers in the U.S. Air Force. The Academy mission is to "Inspire and develop outstanding young men and women to become Air Force officers with knowledge, character, and discipline; motivated to lead the world's greatest aerospace force in the service to the nation." (Reed, 1999, Ch.3, p.18) the following brief description of the four pillars provides necessary insight into this unique institution of higher learning.

Three components make up the military training programs at the Academy, which help cadets to develop the techniques and attributes of successful leadership. They gain this insight through participation in the Cadet Wing, structured very much like an Air Force unit. Professional Military Education is a second component, which serves as the formal mechanism to study the profession of arms, officership, and Air Force heritage. Finally, airmanship programs provide additional leadership opportunities and training. These activities include parachuting, navigating, soaring, and piloting light aircraft.

Academically the Academy is designed to provide cadets with a broad educational background. The core curriculum consists of 32 required courses that are a mixture of engineering, basic sciences, humanities, and social sciences (Reed, 1999). The cadets may choose to major in one of more than 31 academics areas.

The third pillar is athletics. Through the athletic program, cadets develop good physical conditioning while working as a team. The program fosters self-confidence, aggressiveness, a can-do attitude, courage, and teamwork. Cadets must participate in intramural or intercollegiate sports throughout the academic year.

The final pillar focuses on character development. The Academy has an institution-wide character development program focusing on the Air Force Core Values: "Integrity First, Service

Before Self, and Excellence in All We Do." Character, as defined in Chapter 2 of the Academy Self Study (1999) includes "ethical behavior, respect for human dignity, and a sense of honor that transcends self interest" (p. 6). While focusing on the AF core values, each cadet is also bound to abide by the Cadet Honor Code "We will not lie, steal, or cheat, nor tolerate among us anyone who does." In addition to a formal course in ethics, cadets receive honor, ethics, human relations, and other character development instruction throughout their 4 years at the Academy.

The balanced approach amongst the four pillars of cadet development make the Academy different and sets it apart from most of the approximately 3,600 institutions of higher learning in the U.S. (Reed, 1999).

Appendix B. Profile USUHS-SOM

The Uniformed Services University of the Health Sciences and the F. Edward Hebert School of Medicine were established by Congress in 1972 to train healthcare professionals for the Department of Defense (DoD) and the United States Public Health Service (Unknown, 1997). Congress enacted the Uniformed Health Services Professions Revitalization Act authorizing the establishment of USUHS-SOM. This act stipulated the school's organization under the DoD, its location, and its governance. The Board of Regents, appointed by the President of the U.S. with the advice and consent of the Senate, is responsible for the governance of the institution (Anonymous, 1997).

The USUHS-SOM is a joint services medical school where members of the Air Force, Army, Coast Guard, Public Health Service, and Navy attend medical school together. Civilian, service Academy, ROTC, Active Duty, and Reserve personnel may apply. USUHS-SOM is a tuition-free institution. Required books, instruments, and equipment are furnished without charge. Students receive a monthly salary from which they can pay for their housing, food, and other expenses.

The curriculum at USUHS-SOM focuses on primary medicine, public health, preventative medicine, mental health and wellness. The curriculum is 20 weeks longer than other U.S. medical schools (DoDI 6010.20 1997). This additional time is spent emphasizing areas such as combat casualty care, tropical medicine, disease prevention, health promotion, and providing care in a managed care setting. Students also participate in various military field exercises and leadership training to prepare them for careers in military medicine.

Appendix C. Schedule of Procedures

Initiation of Study

The study began in August of 1998 and the results were provided within 1 year with a completion date of June 1999. As a part of this study, certain research procedures as stipulated in the protocol outline and informed consent guidance as provided by the Human Environmental Research Center, Protection of Human Subjects in research Air Force Instruction 40-402 were followed. The USAFA Institutional Review Board (IRB) recommended the study as "exempt' from the Common Rule and requiring annual review. Basically, this meant that the informed consent document would not be required for this study. Additionally, LtCol Bernard Asiu, IRB Administrator, sent the researcher a memo for the record stating that the final approving authority for my study would be HQ AFMOA (Air Force Medical Operations Agency) see appendix 1, IRB Review. USUHS-SOM reviewed the protocol and I received a letter from the Dean, Dr. Val G. Hemming, with encouragement to proceed with the research, see appendix 2, letter from the Dean, dated 5 October 1998.

Agreement With USUHS-SOM

Each year medical schools accept Academy graduates across the nation. Approximately 27 percent of Academy graduates pursuing a medical degree have matriculated to the USUHS-SOM . Realizing this study could benefit both the Academy and USUHS-SOM, I had the opportunity to meet with the Dean of USHUS-SOM, Dr. Val Hemming. After the meeting in September 1998, the Dean agreed to sponsor the data-gathering portion of the study. The research protocol formalized the study and there was a 60-day period-spent waiting for approval. The approval was necessary to gather data. While waiting for the approval, I contacted the admissions and registrars offices at the USUHS-SOM and began working on an agreement to

gain necessary data and procedural information regarding the admissions process. USUHS-SOM did not have an integrated information system. Therefore, the data needed to be gathered by conducting an individual records search. In addition, transcripts for all Academy graduates gleaned for performance measures.

Research Funding

As the agreement with the USUHS-SOM was being worked, the researcher sought funding for the project. The formal Academy process for funding research was through the DF/AFSOR selection committee. Because this process was not an absolute guarantee, I also sought funding directly through the USAFA (see appendix 3), "FY 1999 DF and AFOSR Funding." In order to gain access to needed data, I not only submitted a research protocol through the Academy, but also made a presentation to the Dean of USUHS-SOM, Dr. Val G. Hemming (Colonel USAF retired) in September 1998. Prior to his visit, I had read a USUHS-SOM study in the May 1998 issue of "Military Medicine" profiling the medical school and its students for the past 25 years (Gardner, Harmon, & Stavish, 1998). The timing of my study happened to coincide with the recent USUHS-SOM publication, which ultimately enhanced my chances of obtaining funding outside of Academy channels.

The simultaneous submission of the research protocol to both the Academy and the USUHS-SOM aided immeasurably in expediting this study. On 6 Nov 1998, Dr. Hemming approved and funded a TDY for me to gather data in Bethesda, Maryland. The trip was tentatively planned for early December despite the lack of approved protocol. In late November, I received the go ahead via electronic message from the Director of the IRB. Following this breakthrough, I established several points of contact at both the Academy and the USUHS-SOM to answer questions regarding data. Initially, I used assignment following graduation as an

indicator; this information was available through the USAFA Institutional Research and Assessment Division. Additionally, the health professions advisors agreed to provide necessary insight and oversight of this project. Finally, I made contacts in the mathematics department at the USAFA, Dr. Jihan Williams and Capt Don Hanks, who offered to help me with the statistical analysis and management of the database.

Areas Addressed in the USAFA Protocol

As a part of the research protocol, I submitted a risk-benefit assessment. The primary risk in conducting this study dealt with confidentiality issues. In order to ensure confidentiality, the data elements were collected and coded to avoid linking specific data elements to individuals. As mentioned in the section "study variables," the private data to be acquired from subjects included self-reported information about ethnicity, gender, and student performance measures to include: Undergraduate GPA (UGPA), medical College Admissions Test (MCAT), National Board of Medical Examiners (NBME) scores, interview scores, USMLE scores, any record of indices of academic difficulty, class rank, and leadership positions held.

Some of the indirect benefits of this study can be seen as the groundwork for tracking Academy graduates who go on to become physicians. Profiling could help determine personal characteristics and cognitive abilities, which serve as predictors of performance in medical school and in the future. Although personal data protected by the privacy act is used in this study, it is protected through the use of a student identification code. The individuals studied are each assigned a student number and I worked with a partner to ensure the individual's data elements could not be linked to the individual. The data were secured via password and the disks were maintained in a locked filing cabinet in a secured office. The benefits far outweigh the risks of using the personal data.

Appendix D. Timeline for USAFA Research Project

The major difference in providing information for this study is that there were no databases which provided the necessary information. Although at first glance it seemed as if this information would be easy to obtain through archived databases at USAFA or USUHS-SOM such information did not exist.

In order to gain access to necessary information I not only submitted a research protocol through the USAFA but I also presented information to the Dean of USUHS-SOM. The detailed process is submitted in a 23-page document and the documents basically follow the timeline provided:

1) Request for Funding 4 September 1998

2) Met with Dean September 1998

3) Received Approval from Dean, to conduct research 5 October 1998

4) FY 1999 DF and AFOSR Funding Denied 21 Oct 1998

5) Submitted protocol to the IRB Administrator 24 Sep 1998

6) Approved by Deputy for Research Dept of Biology 1 Oct 1998

7) Approved by Head, Department of Biology 1 Oct 1998

8) IRB considered the protocol Oct 1998

9) IRB Protocol FAC1998007 H categorized as exempt, annual review 27 Oct 1998

10) Information Gathering Protocol Sent to director of Admissions for 4 Nov 1998

11) TDY Approved and Funded by . 6 Nov 98

12) Gathered data 7-11 December 1998

Appendix E. Admission Requirements

Admission requirements for the USUHS-SOM are similar to those of other U.S. medical schools. Matriculants must have a baccalaureate degree, must be between the ages of 18 and 30, U.S. citizens, and must meet physical and personal qualifications for commission in the uniformed services (DoDI 6010.20, 1997). For Academy graduates, the undergraduate courses required to enter any medical service are a part of the institutions core curriculum and the courses include general biology (with lab), general inorganic chemistry (with lab), calculus, and English. Table 1, USAFA Minimum Requirements to Apply for Medical School, serves as a guideline for cadets and Academy graduates applying for entry into any medical school including . Finally, matriculants must have a baccalaureate degree. How do Academy graduates become eligible to attend medical school either immediately after graduation or during their Air Force careers?

Table 1. USAFA Minimum Requirements to Apply for Medical School

Preadmission Variables	**USAFA Minimums**
GPA	3.25 (3.00 if average 9 on MCAT)
Medical College Admissions Test	9.0/15
MPA	2.75
Other	1 year organic chemistry w/lab 1 year biology w/lab

*Based on past USAFA experience, these are the numbers it takes to be a strong candidate.

Source: Frequently Asked Questions (FAQs) on Going to Medical and Dental School After USAFA.Scholarships for Medical School

The Air Force offers USAFA cadets two medical school scholarship programs, USUHS-SOM and the Armed Forces Health Professions Scholarship Program. Although this study focuses on USAFA graduates attending, it is important to realize that the Armed Forces Health Professions Scholarship Program (AFHPSP) offers three and four year Air Force sponsored scholarships as well. The Air Force sponsors approximately 50 students to attend USUHS-SOM annually (Gardner, 1998). Medical Students accepting appointments to attend USUHS-SOM are commissioned in the rank of Second Lieutenant (2Lt), for the Army and Air Force, and ensign for the Navy in the Medical Service Corps (MSC) on active duty. If individuals elect to attend civilian medical school through the HPSP they are commissioned 2Lts in the Medical Service Corps (MSC), inactive reserves. The AF pays all tuition, books, most fees, and provides a monthly stipend. USUHS-SOM students receive the same pay and benefits as any active-duty 2Lt (approximately $2,600 a month) (DoDI 6010.20, 1997).

Table 2.

Premedical Grade Point Averages (GPA) and Average Medical College Admission Test Scores for Matriculants to USAFA, USUHS-SOM and U.S. Medical Schools

Entry Year	Cummulative GPA			Science GPA			MCAT SUM*		
	USAFA	USUHS	U.S	USAFA	USUHS	U.S.	USAFA	USUHS	U.S
1976	3.32	3.47	3.5	3.08	3.45	3.49	2400	2456	2373
1977	3.65	3.43	3.52	3.52	3.41	3.49	2457	2449	2414
1978	3.59	3.46	3.52	3.62	3.43	3.49	64.6	56.4	56.6
1979	3.59	3.41	3.51	3.53	3.37	3.48	55.8	57.4	56.5
1980	3.30	3.42	3.51	3.18	3.37	3.48	58.2	55.7	55.8
1981	3.49	3.4	3.5	3.66	3.35	3.46	59.4	58.3	56.6
1982	3.36	3.43	3.5	3.38	3.4	3.46	55.3	58.3	56.9
1983	3.50	3.47	3.49	3.52	3.45	3.44	57.0	60.9	57.4
1984	3.73	3.54	3.48	3.79	3.53	3.43	63.9	61.6	57.9
1985	3.34	3.47	3.47	3.29	3.43	3.42	58.6	61.2	57.5
1986	3.65	3.48	3.46	3.68	3.44	3.4	57.8	59.7	56.9
1987	3.60	3.48	3.44	3.56	3.43	3.38	54.0	57.8	56.3
1988	3.45	3.41	3.42	3.48	3.37	3.34	55.7	56.9	55.1
1989	3.56	3.45	3.4	3.66	3.4	3.33	56.5	55.4	54.7
1990	3.38	3.45	3.41	3.34	3.42	3.34	54.2	56.2	54.8
1991	3.29	3.38	3.42	3.32	3.34	3.35	55.5	55.3	55.4
1992	3.45	3.38	3.45	3.55	3.35	3.38	25.6	27.9	27.7
1993	3.38	3.38	3.47	3.48	3.34	3.41	28.2	28.9	28.2
1994	3.37	3.38	3.48	3.54	3.4	3.43	28.5	29.4	28.4
1995	3.5	3.38	3.51	3.35	3.46	3.47	28.6	30.2	29
1996	3.59	3.38	3.54	3.45	3.52	3.5	29.7	30.5	29.5
1997	3.64	3.38	3.56	3.61	3.54	3.52	27.3	30.4	29.5
1998	3.48	3.38	3.57	3.42	3.51	3.52	23	39.9	39.6

*Sum of individual test scores (four tests from 1976 to 1977, six test from 1978 to 1991, three test from 1992 to 1998

Table 3. Output of Multiple Forward Regression Analysis

Predictor	*Coefficients*	*Standard Error*	t stat	P-value
Intercept	.9755	.6579	1.48	.141
Matric Age	.0177	.0155	1.14	.257
White	-.1345	.1017	-1.32	.189
Hispanic	-.0929	.2049	-.454	.651
Black	-.0607	.2048	-.296	.768
Gender	-.1147	.0928	-.1.23	.219
Science GPA	.2989	.1491	2.01	.047*
U GPA	.2385	.1763	1.35	.178
U degree	.0470	.1131	.416	.678
Add. Educ	.1017	.0711	1.43	.155
Int 2	-.0265	.0299	-.886	.377
Difficulty	-.4782	.1226	-3.90	.0001*

Relationship of predictors to graduate gpa * p value<.05

TABLE 4. The Mean Scores of Academy Graduates Who Completed USUHS-SOM_

Graduated	MCAT	Grad GPA	Sci. GPA	U GPA
1980	0	3.26	3.08	3.32
1981	*2457	3.07	3.52	3.65
1982	65	3.19	3.62	3.59
1983	56	2.97	3.53	3.59
1984	58	3.14	3.18	3.30
1985	59	3.10	3.66	3.49
1986	55	3.03	3.38	3.36
1987	57	3.09	3.52	3.50
1988	64	3.14	3.79	3.73
1989	59	3.07	3.29	3.34
1990	58	3.31	3.68	3.65
1991	54	3.03	3.56	3.60
1992	56	2.97	3.48	3.45
1993	57	3.28	3.66	3.56
1994	54	3.11	3.34	3.38
1995	56	2.98	3.32	3.29
1996	*26	3.50	3.55	3.45
1997	28	3.08	3.48	3.38
1998	29	3.19	3.54	3.37

*MCAT Scoring system changed

Table 5. Numbers Air Force Academy Undergraduates Graduated From USUHS-SOM

Year of Graduation	Number of Graduates
1980	1
1981	3
1982	6
1983	4
1984	5
1985	8
1986	10
1987	9
1988	7
1989	11
1990	5
1991	3
1992	5
1993	13
1994	8
1995	7
1996	5
1997	11
1998	12

TABLE 6 Range of Graduation GPA for USUHS-SOM Graduates by Year

Graduation Year	Upper GGPA	Lower GGPA
1980	3.54	2.72
1981	3.80	2.29
1982	3.91	2.15
1983	3.84	2.22
1984	3.81	2.12
1985	3.81	2.26
1986	3.92	2.31
1987	3.91	2.14
1988	3.93	2.39
1989	3.92	2.26
1990	3.92	2.35
1991	3.97	2.05
1992	4.00	2.32
1993	3.95	2.47
1994	3.83	2.29
1995	4.00	2.43
1996	3.93	2.36
1997	3.95	2.28
1998	4.00	2.28

Information for this table taken from email response given by the USUHS-SOM Regristrar's Office

TABLE 7. Comparison of Academy Graduates to USUHS-SOM

Descriptives

Descriptives

	ACADEMY			Statistic	Std. Error
GPA	0	Mean		3.0903	7.207E-03
		95% Confidence Interval for Mean	Lower Bound	3.0761	
			Upper Bound	3.1044	
		5% Trimmed Mean		3.0880	
		Median		3.0700	
		Variance		.131	
		Std. Deviation		.3622	
		Minimum		1.88	
		Maximum		4.00	
		Range		2.12	
		Interquartile Range		.5230	
		Skewness		.120	.049
		Kurtosis		-.430	.097
	1	Mean		3.1128	3.310E-02
		95% Confidence Interval for Mean	Lower Bound	3.0472	
			Upper Bound	3.1784	
		5% Trimmed Mean		3.1154	
		Median		3.1205	
		Variance		.121	
		Std. Deviation		.3471	
		Minimum		2.31	
		Maximum		3.89	
		Range		1.58	
		Interquartile Range		.5120	
		Skewness		-.025	.230
		Kurtosis		-.400	.457

0

Identifies USUHS-SOM Others;1 Identifies Academy graduates

Table 8. Mean Graduate GPA USUHS-SOM (0) and Academy Graduate (1)

Report

GPA

ACADEMY	Mean	N	Std. Deviation
0	3.0903	2526	.3622
1	3.1128	110	.3471
Total	3.0912	2636	.3616

ANOVA Table

			Sum of Squares	df	Mean Square	F	Sig.
GPA * ACADEMY	Between Groups	(Combined)	.054	1	.054	.410	.522
	Within Groups		344.442	2634	.131		
	Total		344.495	2635			

Oneway

Descriptives

GPA

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
0	2526	3.0903	.3622	7.207E-03	3.0761	3.1044	1.88	4.00
1	110	3.1128	.3471	3.310E-02	3.0472	3.1784	2.31	3.89
Total	2636	3.0912	.3616	7.043E-03	3.0774	3.1050	1.88	4.00

ANOVA

GPA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.357E-02	1	5.357E-02	.410	.522
Within Groups	344.442	2634	.131		
Total	344.495	2635			

Table 9. Univariate Analysis of Variance

Between-Subjects Factors

		Value Label	N
ACADEMY	0	Non Academy Graduate	2526
	1	Academy Grad	110
YEAR	1980		29
	1981		66
	1982		105
	1983		122
	1984		121
	1985		152
	1986		153
	1987		154
	1988		149
	1989		151
	1990		156
	1991		150
	1992		179
	1993		155
	1994		155
	1995		159
	1996		157
	1997		165
	1998		158

Descriptive Statistics

Dependent Variable: GPA

ACADEMY	YEAR	Mean	Std. Deviation	N
Non Academy Graduate	1980	3.1465	.2463	28
	1981	3.0012	.3645	63
	1982	2.9437	.3942	99
	1983	2.9678	.3545	118
	1984	2.9845	.3909	116
	1985	3.0290	.3657	144
	1986	3.0886	.3451	143
	1987	3.0952	.3657	145
	1988	3.1530	.3473	142
	1989	3.1140	.3665	141
	1990	3.0515	.3321	151
	1991	3.0706	.3488	147
	1992	3.1026	.3692	173
	1993	3.1364	.3507	155
	1994	3.1045	.3332	149
	1995	3.1812	.3323	152
	1996	3.1178	.3737	153
	1997	3.1361	.3632	154
	1998	3.1792	.3724	153
	Total	3.0903	.3622	2526
Academy Grad	1980	3.2610	.	1
	1981	3.0890	.6827	3
	1982	3.2665	.4324	6
	1983	2.9633	.3761	4
	1984	3.1400	.4468	5
	1985	3.1010	.2788	8
	1986	3.0213	.3703	10
	1987	3.0888	.2185	9
	1988	3.1359	.3329	7
	1989	3.1012	.3220	10
	1990	3.3122	.3562	5
	1991	2.9247	.4478	3
	1992	2.9732	.1800	6
	1994	3.1253	.2886	6
	1995	2.9829	.2351	7
	1996	3.5250	.2409	4
	1997	3.0753	.4882	11
	1998	3.2426	.2435	5
	Total	3.1128	.3471	110
Total	1980	3.1505	.2428	29
	1981	3.0052	.3760	66
	1982	2.9622	.4014	105
	1983	2.9676	.3535	122
	1984	2.9909	.3925	121
	1985	3.0328	.3613	152
	1986	3.0842	.3459	153
	1987	3.0949	.3583	154
	1988	3.1522	.3455	149
	1989	3.1132	.3627	151
	1990	3.0599	.3349	156
	1991	3.0677	.3498	150
	1992	3.0982	.3649	179
	1993	3.1364	.3507	155
	1994	3.1053	.3308	155
	1995	3.1725	.3306	159
	1996	3.1282	.3759	157
	1997	3.1320	.3712	165
	1998	3.1812	.3686	158
	Total	3.0912	.3616	2636

Table 10. Test of Between-Subject Effects

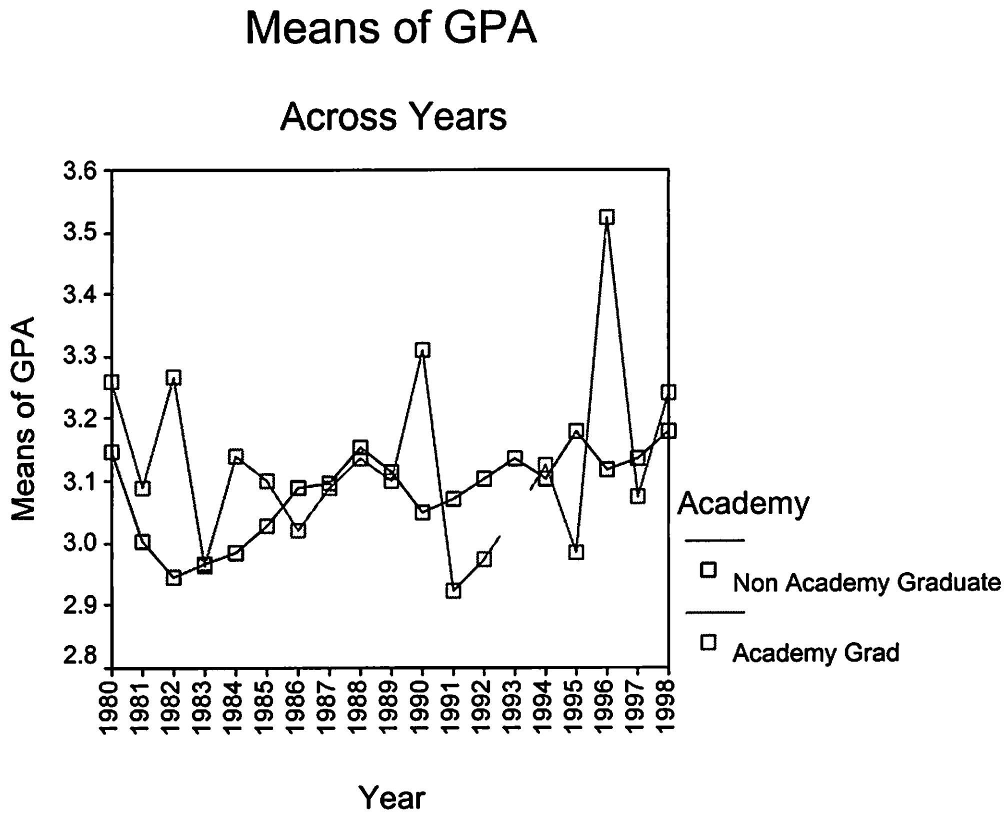
Tests of Between-Subjects Effects

Dependent Variable: GPA

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Eta Squared
Corrected Model	12.272[a]	36	.341	2.667	.000	.036
Intercept	2968.002	1	2968.002	23218.801	.000	.899
ACADEMY	.175	1	.175	1.369	.242	.001
YEAR	2.348	18	.130	1.021	.432	.007
ACADEMY * YEAR	2.215	17	.130	1.019	.433	.007
Error	332.224	2599	.128			
Total	25533.086	2636				
Corrected Total	344.495	2635				

a. R Squared = .036 (Adjusted R Squared = .022)

Figure 1. Profile Plots Mean GPA for Academy Graduate and USUHS-SOM GGPA



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