Title
Factors that Influence Medical Students' Choice of Specialty: A Composite Analysis of the Literature

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Publication Date
1991-04-01

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A Composite Analysis of the Literature

By

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B.S. (Massachusetts Institute of Technology) 1988

THESIS

Submitted in partial satisfaction of the requirements for the degree of

MASTER OF SCIENCE

in

HEALTH AND MEDICAL SCIENCES

in the

GRADUATE DIVISION

of the

UNIVERSITY OF CALIFORNIA at BERKELEY

Approved:

Chair: 5/14/91
Date

..... 5/13/91

..... 5/17/91

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FACTORS THAT INFLUENCE MEDICAL STUDENT SPECIALTY CHOICE

A Composite Analysis of the Literature

by

Victor Kochi Lin

ABSTRACT

The threat of a primary care physician shortage has led to considerable interest in the factors influencing the medical student specialty choice decision process. Numerous studies have been conducted in an attempt to better understand these factors in hopes of finding manipulable elements to reverse the dangerous decline of medical student interest in the primary care fields. Unfortunately, this immense volume of information is not easily deciphered.

The purpose of this study is to analyze the existing literature that examines factors that influence the medical student specialty choice decision process in order to: 1) determine whether or not the field has provided any consistent results, 2) present these results in the context of alleviating the impending primary care physician shortage, 3) establish the strengths and weaknesses of research in this this field to indicate specific guidelines for future direction, and 4) create a factor definition framework upon which future research may be based.

This study found that the state of the existing literature is characterized by: 1) a lack of uniform

methodology, 2) an absence of standardized factor definitions, 3) inconsistent statistical evaluations, 4) limited scope in terms of number of factors studied, and 5) study populations too small and localized to adequately represent national findings.

Factors found by this study to have the most important influence on the medical student specialty choice decision process include primarily student personal characteristics such as age, gender, personality, and parent occupation, and specialty characteristics such as the elements unique to the primary care specialties (continuity of care, patient contact, etc.), lifestyle and salary, and patient population characteristics. Some of the factors that can be affected by the medical schools, however, were also found to have some impact on the medical student specialty choice process. These factors included: faculty role models, clinical rotations, and general elements of the medical school experience.

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Dedication

To my family. Mom, Dad, Margaret, and Andrew.

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Acknowledgements

Special thanks to the following people for their time, energy, and consideration. Their help towards the completion of this work was invaluable.

Dr. Kevin Grumbach: For the time, the motivation, the encouragement, the ideas, and the vision.

Dr. Carol D'Onofrio: For the kindness, the keen insights, and the clear, understanding explanations.

Dr. Helen Schauffler: For the technical acumen, the energy, and the instruction.

The Health and Medical Sciences Staff: Ronnie, Dyanna, Maggie, and Mary Rita. The unsung heroines behind the JMP. Their efforts kept this thesis, and this department, afloat.

Chapter One: INTRODUCTION

For at least three decades, there has been an interest in determining which factors influence medical students to choose their particular specialty. At first, this interest was largely confined to the medical community for the purposes of scientific interest. Were personality stereotypes for different medical specialties, for example, in fact accurate assessments of those students choosing that specialty? More recently, this interest has grown considerably, expanding beyond scientific curiosity as need for this information grew in economic and administrative areas. Specifically, an understanding of which factors most influenced medical students in their specialty choice decisions became widely recognized as important in helping to resolve various emerging physician supply problems including, in particular, a possible primary care physician shortage.

The purpose of this study is to aid this endeavor, with special regard to the selection of a primary care field. By performing a composite analysis on the existing literature analyzing factors that influence medical student specialty choice, this study hopes to: 1) determine whether or not the field has provided any uniform results, 2) present any largely agreed upon results regarding specific factors that influence medical student specialty choice, 3) establish a factor definition framework on which to base future analyses, and 4) establish the strengths and the weaknesses in this field of

study in order to recommend specific guidelines for future direction. In particular, the goals of this study are to determine whether or not the most influential factors affecting medical student specialty choice decisions are those factors that can be easily manipulated by medical schools without compromising their admissions standards or quality of education.

Background

In the past two decades, the question of physician oversupply relative to demand has become a cause for increasing concern. In fact, the development of this issue has resulted in a number of massive studies sponsored by the Federal government[1], and, more recently, other studies sponsored by private sources such as the American Medical Association (AMA)[2]. One of the principal reasons for this concern is the cost of training physicians (particularly medical residents) that are not needed. The cost to Medicare alone for graduate medical education is three billion dollars annually.[3] In addition, the expense of supporting an excess of practicing physicians is also reflected in medical care

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[1] for example: United States Graduated Medical Education National Advisory Committee; "Summary Report of the GMENAC to the Secretary, Department of Health and Human Services", Vol. 1; 1981.

[2] for example: Marder, WD, et. al., "Physician Supply and Utilization by Specialty: Trends and Projections", American Medical Association, 1988.

[3] Weiner, JP, "Forecasting Physician Supply: Recent Developments", Health Affairs 8:173-179, 1989.

costs, if it isn't already. Physician expectations for income in an environment where the patient supply per physician is dwindling may mean an increasing cost of services per patient to keep the physician operational.

Defining the Physician Supply Problem

The early Federal studies mentioned above all arrived at the same conclusion, although they differed in their assessment of magnitude: the United States would have a surplus of physicians by the year 1990. One of the earliest Federal studies was the Graduate Medical Education National Advisory Committee (GMENAC) Report published in 1981.[4] It predicted a physician oversupply of 69,750 physicians in 1990, and a 144,700 physician surplus by the year 2000. In particular, this predicted oversupply was concentrated heavily in surgery, surgical subspecialties, and many of the internal medicine subspecialties. Specialties such as family practice, pediatrics, and general internal medicine were predicted as being in "near-balance" between supply and demand by 1990. Only child psychiatry, oncology, emergency medicine, preventive medicine, and general psychiatry were predicted to demonstrate any shortages.

Another federal study used a different means to compute demand. The Bureau of Health Professions (BHPr) developed a

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[4] United States Graduated Medical Education National Advisory Committee; "Summary Report of the GMENAC to the Secretary, Department of Health and Human Services", Vol. 1; 1981.

model of demand based on actual demand rather than on the health- care-needs model employed in the GMENAC study.[5] It, however, still arrived at a similar conclusion. The most recent predictions of this ongoing study, published in 1988, estimate a surplus of 27,000 physicians in 1990, and a surplus of 72,000 physicians by the year 2000-- considerably less than the GMENAC model, but a surplus nonetheless.[6]

In the private sector, a study by the AMA[7] came to the same conclusions as its Federally-sponsored counterparts. It predicts an increase of 23.8% in the physician supply levels between 1985 and the year 2000. Concurrently, it estimates that the increase in demand for physicians during that same period would be just 14.5%.[8] While actual numbers were not computed, such a computation from the data provided in this study leads to a physician surplus of approximately 189,000 by the year 2000.[9] The AMA study, however, notes a modest deficit in the relative rates of supply and demand for general/family practice and psychiatry, and a relatively large

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[5] United States Congress Office of Technology Assessment, "Forecasts of Physician Supply and Requirements", 1980.

[6] Bureau of Health Professions, "Sixth Report to the President and Congress on the State of Health Personnel in the U.S.", 1988.

[7] Marder, WD, et. al., "Physician Supply and Utilization by Specialty: Trends and Projections", American Medical Association, 1988.

[8] Marder, WD, et. al., "Physician Supply and Utilization by Specialty: Trends and Projections", American Medical Association, 1988.

[9] Weiner, JP, 1989.

deficit for general surgery. General internal medicine shows a gain of only 2.4% over projected increases in demand.[10]

In the past several years, however, a new twist has been added to the issue of physician supply. In a report published in 1987 by the Federated Council for Internal Medicine (FCIM), formed by the American College of Physicians, the GMENAC model was updated to account for clinical, social, and financial changes that have taken place in the last decade.[11] For example, the FCIM model attempted to take into account the changing incidence of disease in the elderly population, the advent of AIDS, the decrease in average physician productivity due to the increase in physician "employees", and updated information on the supply of physicians. The revised model, retaining all the same parameter definitions of the old GMENAC model, predicted a surplus of physicians in 1990 of fully 12,000 less than the original GMENAC estimate (or +57,750 physicians). In addition, it concluded that the overall surplus in internal medicine alone would reach 21,000 by the year 2000. In contrast, however, it predicted a deficit of 5,000 general internists by the year 2000.

It is this last statistic that is at the heart of the matter. While at the same time predicting an overall surplus of physicians in internal medicine (including both general

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[10] Marder, WD, 1988.

[11] Needleman, J, et. al., "Projected Requirements for and Supply of Physicians in Internal Medicine: 1990 to 2020", FCIM, 1987.

internal medicine and the internal medicine subspecialties), the FCIM study estimates a deficit of general internists by themselves, thus indicating that all the surplus is within the internal medicine subspecialties. In fact, over the past few years, apprehension has continued to mount that not only is there a potential, if not actual, shortage of general internists, but that this undersupply extends to all the primary care fields, not just internal medicine alone. In 1988, the Council on Graduate Medical Education (COGME) mandated by Congress reported that "the nation has a shortage of family physicians and probably one of internists, as well."[12]

Statistics support the contention of an impending, if not already present, shortage in primary care physicians. If one defines a primary care doctor as one whose specialty is either family practice, general practice, internal medicine, or pediatrics, then the percentage of primary care physicians in America has declined from 43.04% of all physicians in 1965 to 34.36% of all physicians in 1986.[13] (While many sources also include obstetrics/gynecology among primary care sources, many others do not. For the purposes of uniformity of data in this report, all statistics regarding primary care physicians will

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[12] Committee on Labor and Human Resources, United States Senate. Statement by NA Vanselow, MD, Chairperson, Council on Graduate Medical Education. April, 1988.

[13] Roback, G, et. al., AMA Report "Physician Characteristics and Distribution in the U.S. 1987 Edition".

not include the OB/GYN specialty unless otherwise specifically noted.) In particular, the proportion of family and general practitioners declined from 24.43% of all doctors in 1965 to 11.89% in 1986.[14] This decline occurred despite the advent of a certified family practice field in 1971 via Section 767 of the Comprehensive Health Manpower Training Act. Family practice physicians accounted for 21.73% of all primary care physicians in 1986.[15]

In fact, the primary care physician resources of this country may be even less than these numbers would indicate. Much of the care provided by general internists and pediatricians is not, in actuality, true primary care. Schroeder, for example, used 100% of family and general practitioners, 65% of internists, and 75% of pediatricians in his estimation of the proportion of actual primary care physician equivalents.[16] His results based on this model indicate that only 27% of all U.S. physician equivalents are involved in the administration of primary care. Schroeder then points out that general practitioners alone (not including the internist or the pediatrician) make up 73% of all physicians in the United Kingdom, over 50% of physicians

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[14] Ibid.

[15] Ibid.

[16] Schroeder, SA, "The making of a medical generalist", Health Affairs, 4:22-46, 1985.

in Belgium and West Germany, and 38% of all Dutch physicians.[17] Taking into consideration quality of care, cost efficiency, patient satisfaction, and physician satisfaction, Schroeder argues that far more than 27% of U.S. physician equivalents should be in primary care.[18]

Projections for the future foresee an acceleration in this trend of declining primary care physicians. Selection of primary care specialties by graduating medical student seniors as indicated on their Association of American Medical Colleges (AAMC) Graduate Questionnaires (GQ) exhibited a steady decline from 38.8% in 1981 to 25.4% in 1989.[19] The decline in general/family practice interest alone was from 17.3% in 1981 to 13.7% in 1989.[20] Even more dramatic has been the recent loss of interest in general internal medicine, from 12.7% in 1981 to 5.3% in 1989.[21]

The problem is further compounded by the number of students who, after choosing a primary care specialty residency, change their minds and choose a field outside of the primary care fields. One AAMC study determined that for medical school graduates between 1978 and 1984, only 78.7% of those students intent on pursuing primary care upon entering

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[17] Ibid.

[18] Schroeder, SA. 1985.

[19] AAMC DATA Book: "Statistical Information Related to Medical Education"; May, 1990.

[20] Ibid.

[21] Ibid.

their residencies chose to remain and practice in those fields.[22] Just 53.5% of students who stated an intention of practicing in general internal medicine upon beginning their residencies actually chose to remain with that field. Many chose to specialize in one of the internal medicine subspecialties, or go into another specialty altogether. Comparable statistics for family practice and general pediatrics were 91.5% and 85.2%, respectively.[23]

The projected shortage of primary care physicians entering the field is exacerbated by the departure of retiring primary care physicians. Even the GMENAC[24], and AMA[25] studies cited above, while projecting an overall physician surplus by the year 1990, note that the figures for the primary care fields are an exception. With the more drastic decline in primary care interest of 1989, 1990, and 1991, graduating medical students as reported by the AAMC, the prospect for the future is even less favorable.

Finally, a recent study by Schwartz, et. al.[26] has given cause to re-evaluate even the reports projecting a surplus in

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[22] AAMC Report: "Practice Patterns of Young Physicians Outcomes of Graduate's Plans In Three Areas: Primary Care, Geographic Locations, and Socio-Economically Deprived Areas"; August, 1990.

[23] Ibid.

[24] GMENAC, 1981.

[25] Marder, et. al., 1988.

[26] Schwartz, WB, et. al.; "Why There Will Be Little Or No Physician Shortage Between Now and the Year 2000"; NEJM 318: 892-897, 1988.

the total number of physicians, much less those in primary care. Using a conservative model for predicting future supply and demand that includes the affect of new technologies (the effective utilization of which demands new physician subspecialties), an aging population, the growth of competitive medical plans, the growing proportion of female physicians (who generally care for fewer patients than male physicians), and the growing number of physicians going into non-patient care fields (administrative, teaching, research, etc.), Schwartz concluded that a near balance between physician supply and demand was probable by the year 2000.[27] In another study, Schwartz and Mendelson[28] analyzed recent trends in physician workload and income as a measure of physician demand. They noted that overall, between 1982 and 1987, physician patient care work hours increased by 21%, and real net income increased by 30% between 1982 and 1987, during which the supply of physicians grew by only 16%.[29] Schwartz and Mendelson concluded that demand is increasing at a far faster rate than supply.[30] In light of these new analyses, the problem of a shift in interest away from the primary care fields by potential physicians is compounded, especially as

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[27] Ibid.

[28] Schwartz, WB and Mendelson, DN, "No Evidence of an Emerging Physician Surplus: An Analysis of Change in Physicians' Work Load and Income", JAMA 263:557-560, 1990.

[29] Ibid.

[30] Ibid.

new and exciting fields continue to open up novel opportunities for the ambitious medical student.

Some Implications of a Primary Care Physician Shortage

A shortage of primary care physicians is a concern for several reasons. Primary care physicians represent the initial stage of health care for the public. With the increasing number of gatekeeper systems throughout the country, they are also becoming the only means of access to specialty care services. This not only threatens the welfare of the patient population, but also the medical specialists and the hospitals. Without enough primary care physicians to make referrals and/or admissions, both the hospital and the medical specialist suffer.

In addition, the primary care physician-- general and family practitioners in particular-- are at the heart of the physician maldistribution problem that adversely affects rural populations. Because of the nature of their specialties, primary care physicians play a critical role in bridging the gap towards providing medical care in underserved areas. A pathologist in a small, rural community, for example, is relatively useless without a supporting hospital and/or extensive lab facilities. A family physician, however, requires no such extensive facilities, and also possesses the expertise to determine whether or not referral to a far-away

hospital's facilities is necessary. Rabinowitz[31] indicates that two variables are predictive of practice in a non-metropolitan area: rural background and family medicine specialty. Combining these two factors has a cumulative effect: two-thirds of family physicians with rural background practice in rural areas.[32] Cullison, et. al. had similar findings.[33]

The problem of inadequate primary care has been a concern for an extended period of time. Beck, et. al.[34], in a 1977 article, stated that "The shortage of physicians delivering primary care reached crisis proportions in the 1950s." Rosenblatt and Alpert[35] stated that it was the 1966 publication of the Millis[36] and Willard[37] reports that

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[31] Rabinowitz, HK; "A Program to Recruit and Educate Medical Students to Practice Family Medicine in Underserved Areas."; JAMA 249:1038-1041, 1977.

[32] Ibid.

[33] Cullison, S, et. al., "Medical School Admissions, Specialty Selection, and Distribution of Physicians", JAMA 235:502-505, 1976.

[34] Beck, JD, et. al.; "The Effect of the Organization and Status of Family Practice Undergraduate Programs on Residency Selection"; J. of Fam. Pract. 4(4):663-669, 1977.

[35] Rosenblatt, RA and Alpert, JJ; "The Effect of a Course in Family Medicine on Future Career Choice: A Long-Range Follow-Up of a Controlled Experiment in Medical Education"; J. of Fam. Pract. 8(1): 87-91, 1979.

[36] Millis, WR, AMA Report: "The graduate education of the physician. Report of the Citizens Commission on Graduate Medical Education", 1966.

[37] Willard, WR, AMA Report: "Meeting the challenge of family practice. Report of the Ad Hoc Committee on Education for Family Practice of the Council on Medical Education", 1966.

initiated the development of academic departments of family medicine in medical schools to satisfy a growing need for more family doctors. With the help of the 1971 Comprehensive Health Manpower Training Act, the number of such family practice departments increased from zero to 91 in a single decade. By as early as 1977, 83% of US medical schools had identifiable family medicine units.[38]

Potential Solutions to the Physician Supply Problem

The solution to an impending physician surplus seems rather simple on the surface: reduce the number of available positions in entering medical school classes. In fact, this has already been occurring as costs force several medical schools to cut back. First-year medical school enrollment has been declining slowly but steadily since 1982 (from a peak in 1981 of 17,268 down to 16,756 in 1990).[39] Still, any forced reduction in enrollment at specific medical schools, unless minor, would force some changes in operating procedures as service roles are redefined to fill in the ensuing labor vacuum caused by a decreased number of third- and fourth-year medical students on clinical rotations (possibly alleviated by a decline in teaching responsibilities for smaller classes).

The solution to a potential shortage of primary care physicians would appear to be quite different. The object

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[38] Baker, RM, et. al.; "Undergraduate education in family medicine."; J. Fam. Pract. 5:37, 1978.

[39] AAMC Data Book; "Statistical Information Related to Medical Education"; May, 1990.

here cannot be met by simply reducing positions, but to encourage existing students to choose one field over another. One could simply create more primary care residency positions and decrease the number of subspecialty residency positions, and this might work. But, there is no guarantee that the new positions would be filled, even with a concomitant decrease in non-primary care residency positions. In 1987, for example, internal medicine residencies failed to fill all their openings.[40] Moreover, radically changing the distribution of residency positions would likewise affect the health care delivery systems at teaching hospitals were such policy was implemented; most teaching hospitals rely heavily on their specialist residents to take up a good proportion of the work load. Such policy would have to be implemented very carefully, and on a hospital-by-hospital basis.

Possible alternative solutions involve interventional programs such as the Washington, Alaska, Montana, and Idaho Program in Regionalized Medical Education (WAMI) at the University of Washington School of Medicine[41] and a program at the University of Illinois College of Medicine[42]. These programs were created in an attempt to increase the number of

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[40] Graettinger, JS; "Internal Medicine in the NRMP 1987: The Ides of March"; Ann. Intern. Medicine 108:101-115, 1988.

[41] Carline, JD, et. al.; "Career Preferences of First- and Second- Year Medical Students: The WAMI Experience"; J. of Med. Educ. 55:682-691, 1980.

[42] Mattson, DE, et. al.; "Evaluation of a Program Designed to Produce Rural Physicians"; J. Med. Educ. 48:323-331, 1973.

family and rural physicians. Some of these programs increased exposure to the family practice field and rural practice settings in hopes of having an impact on medical student specialty choice.

Still other potential solutions involve countless other studies that attempt to characterize the factors that influence medical student choice of specialty, often with the intent of providing a clue as to how medical students can best be swayed towards the primary care fields and away from the overloaded subspecialties.

Although some of the aforementioned efforts have been largely successful in increasing the proportion of family/general physicians that practicing in underserved areas, they are still somewhat controversial. For example, the Physician Shortage Area Program (PSAP) at Jefferson Medical College in Virginia[43] selectively admits applicants with slightly less competitive academic credentials in exchange for an expressed interest in family medicine and in practicing in an underserved area. Other medical school programs seeking to improve their output of primary care physicians are reluctant to alter their admissions policies in order to do so, especially in an era of declining medical school applicants. (Since a peak of 42,621 applicants in 1974, the number of medical school applicants declined to just

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[43] Rabinowitz, HK; "Evaluation of a selective medical school admissions policy to increase the number of family physicians in rural and underserved areas"; NEJM 319(8):480-486, 1988.

26,915 in 1989.[44] The most recent numbers, however, indicate that this trend has stabilized, if not reversed: over 33,600 applicants were recorded for 1991, a 15% increase over the 29,243 applicants for 1990.[45])

The alternative to such programs as the PSAP is for medical schools to change the "medical school experience" for its entering and continuing students, as is the case in the WAMI Experiment. Primarily, such modifications could be expected to consist of, but not be limited to, changing curriculum and clinical rotation formats and requirements. Many of the hundreds of studies conducted to ascertain which factors influence medical student specialty choice were designed to address this perspective, including looking at such factors as the affect of a mandatory family practice rotation, of differing faculty attitudes towards primary care, of the order of clinical rotations, and of positive role models on medical student specialty choice.

In all, a large variety of factors have been analyzed with regard to their influence on medical student specialty choice, with particular emphasis on choice of the primary care fields. Such factors range from student characteristics (age, gender, socio-economic class of family, hometown characteristics, personality factors, etc.) to medical school

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[44] AAMC Data Book: "Statistical Information Related to Medical Education May, 1990"

[45] New York Times Article; "Medical School Applications Up Steeply After Drop in 80's"; 1991.

factors (curriculum, opportunity for experiences, public vs. private, location, etc.), to characteristics of the specialty field itself (practice patterns, patient population, length of residency, expected compensation, procedural vs. interactive care, etc.).

Unfortunately, most of these studies are limited, inconsistent, and blind to any format that may have been established by its predecessors. Mowbray's review article "Research in Choice of Medical Specialty: A Review of the Literature 1977-1987"[46] concluded that:

> "...there are a number of inadequacies in the investigations reported in this field. The research is not based on any theoretical model, focuses on only one or a few of the many possible factors and uses different study populations. Greater consistency and applicability of the findings could be achieved by a central organizations conducting appropriately designed multivariate studies using defined populations at a large number of centers."

Purpose of Study

In an effort to surmount these inadequacies, this study has been initiated with the purpose of analyzing the existing literature in a more critical, systematic fashion in order to generate a more coherent, conceptual model for understanding the factors that influence medical student choice of specialty, focusing on primary care. A major question to be explored is whether or not the most significant factors

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[46] Mowbry, RM, "Research in the choice of medical specialty: a review of the literature 1977-1987"; Australian and New Zealand J. of Medicine 19:389-399, 1989.

influencing medical students' decisions regarding the choice of a primary care field are the ones that can be manipulated by medical schools without compromising their admissions standards or quality of education. Specifically, such factors as the influence of faculty role models, exposure to primary care fields, curriculum content, faculty attitudes towards primary care, and the presence/absence of an officially recognized department representing the various primary care fields (e.g. a family practice department) will be examined to understand their importance in the decision process. The findings have policy implications for medical schools which may be able to manipulate them in order to favorably affect a potential primary care physician supply problem.

Overview

"Chapter Two: Methods" provides a detailed explanation of the processes employed in conducting this study. This includes data collection procedures, data screening, data analysis methodology, and a descriptive explanation of presentation format.

"Chapter Three: Results" is a critical analysis of all results obtained in this study. These include impressions of the field (e.g. rigor of existing studies, or uniformity of methods and/or results), factors studied, and which factors have been studied the most, with the ensuing results regarding those factors.

"Chapter Four: Discussion" discusses the findings of this

study in the context of the potential solutions to the primary care physician supply problem.

"Chapter Five: Conclusion" is a very brief overview summary of this study's major findings, and a short commentary on the implications of these findings.

Appendices I through IV present much of the initial data for convenient reference outside the body of the main text of this work.

METHODS

This study was conducted in four major steps. The first involved a comprehensive search of the existing literature regarding factors that influence medical student choice and a broad, cursory examination of all references that could be retrieved. The second step was a more comprehensive, detailed analysis of selected studies that successfully met a number of criteria to establish appropriateness and quality. Third, these studies were then subjected to a series of six discriminating criteria to select those studies best suited to the more comprehensive analysis part of this work. Finally, the studies that survived the screening process were subject to a more intensive analysis regarding the factors studied and the results achieved.

What follows is a more detailed explanation of each step taken towards the completion of this work.

Search of the Literature

The first step of this study consisted of an exhaustive literature search for all the studies regarding medical student specialty choice. The search began with a MEDLINE computerized subject search for the most recent journal articles regarding the topic "medical student specialty choice". The initial MEDLINE search was conducted in September, 1990, and gave references from 1986-1989. A

follow-up MEDLINE search was performed in January, 1990, to update this work. This search provided references from 1987 to Summer, 1990.

The MEDLINE searches were augmented by additional computer subject searches in the GLADIS and MELVYL computer data bases at the University of California at Berkeley. These computer systems collectively provide access to references throughout the University of California system, including all books and dissertations on the topic. As many of the references as could be obtained were gathered in forays to the University of California at San Francisco Library and from the University of California at Berkeley Library System. Of these references, those that were retained were only those that specifically analyzed factors influencing medical student choice of a medical specialty, or those that compiled statistics that could be used to arrive at conclusions regarding factors influencing medical student specialty choice (e.g. a gender/geographic location breakdown of which students chose which specialties) were retained.

Next, each study from the literature search was examined for its references. These references were examined to determine whether or not they looked at factors that influence medical student choice of specialty. Those that did were retrieved, if possible, from the same libraries indicated above. This procedure was repeated with each

subsequent group of studies retrieved, until the latest group of studies revealed no other references than those that had already been obtained.

The initial literature search and reference check revealed 176 total references. All the references represented journal articles. No books were found on the subject of medical student specialty choice. No dissertations at the University of California at Berkeley were found on the subject.

A bibliographical timeline of all 176 of these references is presented in Appendix I of this work. Appendix I is organized into yearly headings, under which all the articles published in that year are arranged in alphabetical order by author. Some of the references have small notes (indicated by the symbol =>) associated with them. These notes are the results of an initial survey/review of some of the articles early in the research period. They represent a summary of various findings and conclusions of those studies. This note-taking was only done for a few of the references listed, with the particular studies chosen at random. The comments were included for interest's sake, with consideration that Appendix I will be used as a quick-reference.

The initial 176 references represent a conglomeration of works on the general topic of medical student specialty choice. Populations sampled include medical students,

interns, and residents. A number of the articles include statistical analysis of physician supply and demand numbers. Others look at attrition rates among residents, as well as rates at which residents switch from one specialty to another. Still others examine trends in medical student decisions without coming to any real conclusions regarding what factors might be affecting these trends.

Twenty of the 176 references were excluded from the Initial Batch for one of four of the following reasons:

1. The study simply looked at the numbers of students entering various specialties over the past years, and were completely unrelated to any analysis of specific factors that might have an influence on medical student specialty choice. These references are labeled as "macrotrend studies" (1-macrotrends) in the Appendix I Key, because they represent analyses of medical student specialty choice trends over a number of years.

2. The reference represented a study that was simply a frequency analysis of such items as the number of males vs. females, minorities vs. non-minorities, and low-socio economic scale (SES) vs. high-SES students that chose various specialty fields. Articles which made no real conclusions regarding factors influencing medical student specialty choice, were not included. These articles are labeled "general frequency studies" (2-general frequency) in the Appendix I Key.

3. The study analyzed the number of students that were interested in various specialties as they progressed from their pre-medical school years through each year of medical school without drawing any conclusions regarding factors affecting these choices. These are labeled "microtrend studies" (3-microtrends) in the Appendix I Key. The more recent, comprehensive studies that represented "microtrends" from which possible conclusions regarding factors that influence medical student specialty choice were not excluded, but those that were relatively limited in their analyses were excluded.

4. The study looked at post-graduate medical school students (i.e. interns and residents) and the factors that influenced their choice of career specialty after they had already chosen their residency. These studies are labeled in Appendix I as "post-graduate specialty choice studies" (4-post-graduate specialty choice).

Eight studies were excluded via reason 1. Three via reason 2. Six via reason 3, and three via reason 4.

Of the 156 remaining references, twenty-one could not be retrieved from the University of California at San Francisco Library, either because the journal was not carried by the library (14 references), or because the articles simply could not be recovered after numerous attempts (9 references). Thus, 133 journal articles were retrieved and retained, and collectively called the "Starting Batch". The 133 articles of the Starting Batch are listed in a modified version of Appendix I, in Appendix II.

The Starting Batch/Initial Analysis

Each study composing the Starting Batch was assigned an identification number for easier management. This was done via a collating process organizing the studies first by year of publication, and then by alphabetical order of the study's primary author. The numbering scheme accompanies the listing of Starting Batch articles in Appendix II.

The Starting Batch was then subject to an initial, cursory examination to identify which factors were analyzed by each of these studies. These results were compiled to

generate a list of the different types of factors studied. The compilation process consisted of combining factors from different studies that were essentially the same, but not quite identical in definition. For example, different types of pre-medical clinical experience-- e.g. hospital vs. private practice-- as an influence on specialty choice were treated as the same factor under the heading of "Pre-Medical Clinical Experience". Also, certain quasi-redundant factor categories were created to contain factors that crossed the definition boundaries of several of the categories established in this work. For example, a general "GEOGRAPHIC LOCATION" factor was created for factors involving the geographic location of a student's hometown that were not precisely defined. More specifically, if, for example, a study defined a generic hometown geographic location factor that included elements of the hometown's socio-economic scale, population, and location (each of which has its own separate factor listing in this work), it was counted under the general category "GEOGRAPHIC LOCATION" only, rather than in one of the more precise factor categories. In other words, these general categories, which also serve as general headings, provide a place for "Some or all of the above"-type factors.

These 64 factor categories were then used as row headings in the construction of a summary matrix that assessed which factors each study analyzed. General factor

category headings demarcate the beginning and ending of each class of factors. Column headings are simply each reference's identification number. Each cell of the matrix is either marked or not with a '+', depending on whether or not that study analyzed that specific factor's affect on medical student specialty choice. This initial examination of the starting group did not assess the nature of these factors (whether the factors were found to be important or not, or whether these factors were positive in their affect or not). It only noted which factors were analyzed in each study.

In a few cases, some factors studied were so specific that their definition could not be accurately described by any single factor category. Since such highly specific factors did not qualify as "general category" factors, and since this part of the study was a cursory analysis only, these unusual factors were marked in more than one category to better represent their true definition. Note that it was rare for an unusual factor to require more than two different categories definitions, and never did a factor need more than three separate categories. This seemingly liberal assignment was carried out in deference to the potential use of this matrix as a quick-reference. It was felt that over-representation was better than under-representation for the purposes of quickly obtaining any studies specifically addressing a certain type of factor.

The results of this initial examination are summarized in Tables A1-A13, B1-B13, and C1-C13 presented collectively in Appendix III. Each of the three series of tables (A, B, and C) represent different sets of factors. For example, the A series tables look at factors related to the nature of the student's hometown, characteristics of the student's medical school and his/her experiences therein, and the nature of the patient population of a specific specialty. The B series tables look at personal characteristics of the medical student and various pre-medical factors. The C series tables look at characteristics inherent in the medical specialty, at the affect of role models, and the influence of timing and stability of decision, and manpower needs as factors. Each individual factor is listed in its own separate row heading. While much of this organization is largely a logical derivation of putting the various factors into the most easily understandable, and simply presented format, it is hoped that, at the very least, the major category headings will provide a framework for future investigations.

Each series of tables consists of thirteen separate tables where column headings indicate the number of the specific study in question. These numbers correspond with the numbering of the studies in the Starting Batch listed in Appendix I. Thus, study number 1 represents CF Schumaker's article "Personal characteristics of students choosing

different types of medical careers" in the Journal of Medical Education Volume 38, Pages 932-942, 1963. Because of space and presentation constraints, the tables were constructed as shown, rather than presented in a single table. Table A1, for example, provides an examination of studies numbered 1 through 10, regarding factors concerning the student's hometown, medical school, and specialty patient population.

Factor categories were grouped together under major headings, listed in capitals (e.g. GEOGRAPHIC LOCATION). The individual factor categories are listed in the more standard print beneath their corresponding heading labels. The major headings in capitals are themselves factor categories for those factors that could not be completely described by its subordinate factor categories, or that are defined as a factor so broad that its definition overlaps the more specific factor categories. Again, this is different from a very specific factor whose definition cannot be accurately quantified by any one specific factor. In such a case, a factor received marks in all the categories that bear a resemblance to this factor's definition. For example, a factor that specifically correlates rural vs. urban city status with socio-economic scale would receive marks in both categories. A factor that referred to something on the order of "hometown population density and regional classification", would receive a mark

under "GEOGRAPHIC LOCATION"; the distinguishing operative here being the word "and" in this factor's definition.

Factor Category Definitions

Descriptions of each of the factor categories listed in Tables A1-C13, moving in order from the Table A series through the Table C series, follow (the factor category titles are in bold type):

A Series Table Factor Categories

"GEOGRAPHIC LOCATION" is the more general factor whose definition overlaps several definitions under this heading, or that simply do not apply to any of the more specific factor categories.

"Hometown" refers to characteristics of the student's town of origin (e.g. location, AIDS prevalence, major ethnic groups, etc.) not covered by the other two factors in its group.

"Hometown SES" is specifically an assessment of the student's hometown by some measurement of socio-economic scale (SES). It can also refer to the socio-economic class of the student's family.

"Hometown Rural/Urban" refers to the status of the student's hometown rural or urban status, its size, or its population or population density.

"MEDICAL SCHOOL" is the general heading category that refers to any combination of medical school characteristics and/or experiences that influence medical student choice of specialty.

"Academic Performance" is a sub-heading for unspecified, general, or combined measures of academic performance in medical school.

"Classroom" and **"Clinical Rotations"** refer to the student's specific medical school performance in those environments, respectively.

"Experience with Residents" and **"Experience with Faculty"** refer to any type of experience, personal, clinical or otherwise, with those respective types of

individuals.

"Faculty Attitudes" deals with the expressed or perceived attitudes of the medical school faculty towards the various specialties as viewed by the medical student.

"Peer Group Attitudes" refers to the impact of what a student's peers feel about the various specialties.

"Location" is the location of the medical sch^^ * ttended, whether it be simply a geographic assessment, or one that implies socio-economic status.

"Public vs. Private" includes attempts to appraise the affect of public vs. private medical schools on specialty choice.

"Research Experience" is the affect of any research experience in medical school on specialty choice.

"Year I/II Curriculum" and **"Year III/IV Curriculum"** refer to the affect of the medical school curriculum in the indicated years.

"+/- Course", **"+/- Rotation"**, and **"+/- Department"** point to the existence or not of certain courses, rotations, or specific departments in the medical school, and how this affects medical student specialty choice. Such factors involve both direct intervention studies and indirect analysis studies (e.g. specialty choice statistics at schools with the different characteristics being studied). Some redundancy in these last factors exist, and in cases whose factor definitions involve elements of both categories, both categories are marked. For example, an interventional study that analyzes the affect of a required rotation in family practice compared with a control without this requirement receives marks in both "Year III/IV Curriculum" and in "+/- Rotation".

"PATIENT POPULATION" is its own separate category, without any sub-headings. Any factors involving characteristics of the patient population of a particular specialty are collected under this major heading. Thus, AIDS prevalence, age, SES, etc. of the patient population are all included under this one category heading, even if the specific aspects of each of the factor definitions varied significantly from study to study.

<u>B Series Table Factor Categories</u>

"PERSONAL CHARACTERISTICS" is a major/general category heading that includes all types or manners of characterizations or quantifications of the medical student. Age, ethnicity, gender, personality, religion, etc..

"Age", **"Ethnic Background"**, **"Gender"**, **"Marital Status"**, and **"Religious Affiliation"** are all self-explanatory specific factor categories regarding the student.

"Children" refers to whether or not a medical student's children or dependents affect his/her choice of specialty.

"Indebtedness" is a category that includes the degree and type of debt and its affect on specialty choice.

"Self-Perception Correlation" is a category in which factors ask how the student's personal self-perception correlates with the characteristics of the various specialties, and how this relates with subsequent medical specialty choice.

"Personality" includes any type of assessment of personality, whether a formal psychiatric exam, or casual, informal self-assessment, and how personality relates to specialty choice.

"Physician-In-Family" involves any factors that examine the affect of a physician in the student's family on specialty choice.

"SES" refers specifically to the socio-economic status of the medical student's family.

"Parent Occupation" is often also an assessment of SES, and marks in both categories are given when this is the case as defined by each particular study. This factor category also includes measurements of degrees of professionalism, etc. of the parents as factors affecting medical student choice of specialty.

"PRE-MED FACTORS" is the major/general heading for any factors that took place or had an influence during the pre-medical school years.

"Academic Performance", **"GPA"**, and **"MCAT"** refer to pre-medical (college) measures of achievement.

"Public vs. Private" refers to whether or not the attendance of a public or a private college had any affect on subsequent specialty choice several years

later.

"Clinical Experience" includes anything from visits to the local family physician to volunteer work at the local hospital to research to previous clinical experience in the pre-medical years.

"Student Preconception" includes factors that study whether or not differences in pre-medical perception of the different specialties have any subsequent affect on specialty choice.

"Pre-Med Selection" refers to whether or not a student's pre-medical preferences or decision to study a specific specialty affects the final choice of specialty.

"Science Correlation" asks whether students with science college majors differ in their choices from those whose college majors are not science related.

C Series Tables Factor Categories

"SPECIALTY CHARACTERISTICS" is the major/general heading relating to any aspect of a specialty that might influence a student's decision to choose that specialty or not.

"Residency Call Schedule" refers to the affect of the intensity of the residency on-call schedule for each of the different specialties on medical student specialty choice.

"Continuity of Care" includes whether or not the opportunity to provide continuous care to the same patients over extended periods of time affects specialty choice selection. It also includes whether or not the opportunity to treat a patient throughout the whole course of a specific disease episode affects medical student specialty choice. (Some specialties like anesthesiology provide virtually no personal care, while others like radiology, surgery, and other procedural-based specialties provide only "spot" care. Both types of factors are included under the "Continuity of Care" category.)

"Dx Uncertainty" consists of the nature of the diseases and problems encountered in each of the various specialties. Family practice, for example, is a high uncertainty field because of the extensive diversity of illnesses encountered. Other specialties such as neurology and immunopathology, while relatively lacking

in diagnostic diversity, are also possessed of a high degree of diagnostic uncertainty because of the very similar presentations of many very different conditions that are not easily distinguished even after extensive testing. Any study that attempted to analyze either type of diagnostic uncertainty was given a mark in this category.

"Peer Group" refers to how the student feels about associating with other members in each of the specific fields. Perceived stereotypes of status, prestige, personality, affluence, and comraderie could all be part of such a factor.

"Job Opportunity" is simply the employment opportunities for physicians of specific fields.

"Residency Length" looks at how length of residency affects specialty choice.

"Malpractice" refers to the relative risk of malpractice litigation and its affect on medical student specialty choice.

"Dx vs. Procedural" is whether a specialty emphasizes making diagnoses and thinking through problems or is based primarily on cut-and-dry procedures. This also includes the differences between specialties that are primarily "people-oriented" and those that are primarily "technology-oriented".

"Status/Prestige" includes both the status among fellow medical professionals and the prestige as perceived by the general populace.

"Tx People" is the increased opportunity in specific specialties to treat the person rather than the disease. This factor category is similar to the "Dx vs. Procedural" factor listed above, but is more specific to the treatment of people as human beings rather than as biophysiological machines.

"Tx Variety" is similar to the factor titled "Dx Uncertainty", but refers more specifically to the opportunity in certain specialties to treat a wide variety of different conditions.

"Controllable Lifestyle" relates to the ability of the physician in that field to control his/her lifestyle, including work hours, predictable time off and on-call hours, income, fringe benefits, and flexibility of job opportunity and location.

"Salary and Benefits" refers to the differences in income and benefits among the various specialties as an influence on specialty selection.

"Specialty Personality" is the perceived nature of those physicians in the different specialties. For example, surgeons often have a stereotyped reputation for being cold and impersonal.

"ROLE MODELS" is a general category for factors that assess the influence of role models on medical student specialty choice. In this case, the heading category refers more specifically to all different types of non-faculty role models, from parents, to local family doctors, to clinical/research experience supervisors, to random physicians around the medical school that are not on the faculty.

"Faculty" refers specifically to the influence of faculty role models.

"OTHER" is not a factor category, only a heading to provide a distinction for those miscellaneous factor categories listed below it. That is why it has no mark for any of the 133 studies in Tables A1-C12.

"Time of Specialty Selection" is a category more for a correlation analysis than an actual factor of influence. Most studies marked in this category studied the relationship between the time of the student's choice of specialty and the specialty chosen.

"Stability of Selection", like "Time of Specialty Selection", this factor category indicates studies that look at the correlation between stability over time (e.g. through medical school) of a medical student's choice of specialty (assuming a choice was made earlier on), and the actual choice of specialty. It also refers to studies that analyze specialty choice change over periods of time, and in which direction those changes took.

"Desire to Meet Manpower Needs" simply looks at whether a sense of social responsibility to fulfill the medical manpower needs of this country influences the medical student to choose (or not to choose) certain specialties.

<u>Sorting The Starting Batch</u>

The next step was that of searching through the Starting Batch for the studies that would best fulfill this work's primary purpose. To this end, the Starting Batch was subjected to a multi-phase screening process, in which each of the references was forced to meet the following criteria or be excluded from the remainder of the analyses of this work:

1. The study must either directly address or provide the means to distinguish between primary care and non-primary care with respect to medical student specialty selection, such that primary care includes:
    a. family practice
    b. general practice
    c. internal medicine
    d. pediatrics

2. The study that addresses the factors that influence the selection of family practice and/or internal medicine without completely fulfilling criterion number 1 above, is kept, but held in a separate group hereafter referred to as the "Singles Batch". These studies were then subject to screening via criteria 3-6 below in order to remain in the "Singles Batch".

3. The study has, as its primary focus, the explicit analysis of factors that influence medical student specialty choice. That is, the study does not address factors that influence medical student specialty choice selection as a "by-product" of a study with another focus, or as part of a larger study that focuses on a large number of subjects. Nor is the study simply a numerical/statistical analysis of medical student numbers and specialty choice trends that leads to an inference regarding the factors that influence medical student specialty choice.

4. The study provides some clear, distinct means of distinguishing between factors that were determined, by that particular study, to be very important, marginally important, or not important at all in influencing medical student choice of specialty. (For example, a scaled survey or an

acceptable control group.)

5. The study sample size involved at least one hundred subjects. It was felt that this minimum number was required for purposes of reliability of data and validity of findings.

6. Studies that met each of the five criteria above were then carefully analyzed to determine whether or not their findings would contribute to this work. Since this study focuses on factors that influence the medical student's initial choice of a medical specialty, studies that analyzed such factors as stability of early preference choices over time or recognition of internal medicine as a specialty were simply non-contributory to this work.

The sorting process was cyclical in nature. All the studies from the Starting Batch were subject to the screening via criterion 1. Those that did not fulfill this criterion were removed. Then, the remainder of the starting batch was subject to criterion 2, and so on through all six criteria. Thus, some studies may have been excluded based on a different criterion had the order of the criteria listing above been different.

Fifty-one studies did not meet criterion 1, and were excluded from the Starting Batch, leaving 82 articles. Twenty-seven studies failed to meed criterion 3 and were discarded, leaving 55 articles in the Starting Batch. Twelve articles did not meet criterion 4, leaving 43. Eight articles did not meet criterion 5, and zero did not meet criterion 6, leaving 35 articles remaining in the Starting Batch. Six articles qualified for the Singles Batch. The remaining 29 of the studies were placed in a group that will

be hereafter referred to collectively as the "Final Batch". A more detailed summary is provided in Table 1 located at the end of this chapter.

It is interesting to note that a seventh criterion: "The study must stratify its analyses by gender and/or analyze the relationship of gender to medical student specialty choice", was initially included in the list of criterion above. It was initially felt that stratifying by gender, especially with the growing number of females entering the medical profession, would help differentiate any confounding elements the changing gender ratio might add to studies conducted at different points in time. Unfortunately, including this seventh criterion reduced the Starting Batch to just five Final Batch studies and just one Singles Batch study. Since this excluded too much relevant information, the seventh criterion was not implemented in the sorting methods.

Factor Category Condensation

The factor categories used in the Starting Batch Tables were simply too numerous to be manageable for the more intense analytic scrutiny to which the studies in the Singles and Final Batch were subjected. In order to facilitate this work, and provide more meaningful data, the above factor categories were condensed into fewer, more general categories. This action allowed each factor category to have at least a few entrants, thereby increasing

the meaningfulness of the proportions derived from the analyses of this study. It also enabled this work to more confidently suggest that certain types of factors (as opposed to certain specific factors) may be either important or not in the medical student specialty choice process.

The consolidation process was performed in two phases. The first phase was simply a review of the factor categories established above. Related factors were then logically condensed into broader categories, with primary consideration for the purpose of this study. Because of the immense variation of methods and results, factor categories were condensed only where doing so would not compromise the general nature of the factor category.

For example, two factor categories such as hometown rural vs. urban status and hometown socio-economic scale are both characteristics of the medical student's hometown. Condensing these two categories into a single, broader category would not only be a more justifiable interpretation of this work's results, it adds a certain degree of power to it. One can now say that various elements of a medical student's hometown are either, overall, important or not in the influence of medical student specialty choice. Since combining categories increases the number of studies that look at elements of the medical student's hometown as a factor in specialty choice, the conclusions drawn for this category derive more meaning. The only difficulty with this

approach, of course, is in the event of specific factors not fitting into any of the general headings. This pitfall is avoided as much as possible by the preventive measures inherent in phase two.

Phase two of the factor condensation process involved taking the factor categories from phase one above, and then sorting through the Singles and Final Batch studies and making sure that all of the factors analyzed by each of the studies fit under one of the factor categories. The results were charted on a list of the phase one factor categories. Thus, study by study, factor results were plotted against factor categories. If specific factors demonstrated any ambiguity regarding their classification, then factor categories were added or deleted or modified to eliminate such conflicts.

Finally, after this process was finished, those factor categories that had no entries from the Singles and Final Batches were eliminated from the list of factor categories.

Condensed Factor Definitions

The actual condensation process is summarized in the following:

> First Phase: Under **"GEOGRAPHIC LOCATION"**, the "Hometown", "Hometown SES", and "Hometown Rural/Urban" categories were all condensed under the more general category of **"Hometown"**. This category would include all elements of the medical student's hometown.
>
> Under **"MEDICAL SCHOOL"**, the "Academic Performance", "Classroom", and "Clinical" factor categories were all condensed as the more generic factor **"Academic**

Performance".

"Medical School Experiences" was a new factor formed from a merger of "Experience with Residents" and "Experience with Faculty".

"Faculty Attitudes", **"Peer Group Attitudes"**, and **"+/- Department"** were left unchanged.

"Location", **"Public vs. Private"**, and **"Research Experience"** were each eliminated.

"Year I/II" and "+/- Course" were combined into one heading: **"Year I/II"**.

"Year III/IV" and "+/- Rotation" were joined into one category entitled **"Year III/IV"**.

"PATIENT POPULATION" was left unchanged.

"PERSONAL CHARACTERISTICS", "Age", "Children", and "Religion" were all linked together under the heading **"PERSONAL CHARACTERISTICS"** to represent some of the less important personal characteristics factors.

"Ethnicity", **"Gender"**, and **"Marital Status"** were retained as their own factor categories.

"Indebtedness" and "SES' were combined under a joint heading of **"Indebtedness/SES"**, and also included the influence of scholarships.

"Physician In Family" and "Parent Occupation" were combined under a single heading entitled **"Parent Occupation"**.

"Self-Perception Correlation" and "Personality" were combined under a single heading labeled **"Personality/Correlation"**.

Under the **"PRE-MED FACTORS"** heading, "Academic Performance", "GPA", and "MCAT" were all condensed into one heading entitled **"Academic Performance"**. Each of the other factor categories under this major heading were retained as is.

Under the **"SPECIALTY CHARACTERISTICS"** major heading, "Residency Call Schedule" and "Residency Length" were condensed into a factor category named **"Residency Characteristics"**.

"Continuity of Care", "Dx vs. Procedural", "Tx People",

and "Tx Variety" were all connected into a single category designated **"Primary Care Elements"**.

"Dx Uncertainty", **"Peer Group"**, **"Job Opportunity"**, **"Malpractice"**, and **"Status/Prestige"** were all retained unchanged.

"CL vs. NCL" and "Salary and Benefits" were condensed into a single factor termed **"CL/NCL/Salary"**.

"Specialty Personality" was eliminated as redundant with its equivalent factor under "PERSONAL CHARACTERISTICS": "Personality/Correlation".

"ROLE MODELS" and "Faculty" were combined under a single heading: **"ROLE MODELS"**, with the intent that it would represent the affect of faculty role models on medical student specialty choice only.

Under **"OTHER"**, "Time of Specialty Selection" and "Stability of Selection" were combined into a single heading entitled **"Trends"**.

"Desire to Meet Manpower Needs" was eliminated as a factor category in this phase.

Second phase: None of the Starting Batch or Singles Batch studies looked at hometown characteristics, so both **"GEOGRAPHIC LOCATION"** and **"Hometown"** were **eliminated**.

"Age" under "PERSONAL CHARACTERISTICS" was **reinstated** as a factor because several of the studies examined this variable.

"Public vs. Private", **"Clinical Experience"**, and **"Pre-Med Selection/Perception"** under "PRE-MED FACTORS" were **eliminated** because none of the studies in the two Batches looked at such factors.

The factor category **"Other"** was **added** under "ROLE MODELS" to indicate non-faculty role models and their influence on medical student specialty choice, since a number of Final Batch and Singles Batch studies looked at such factors. **"ROLE MODELS"** remained strictly a factor category for the influence of faculty role models on medical student specialty choice.

Final Analysis Methods

Each reference in the Singles Batch and the Final Batch

was evaluated for a number of characteristics. First, the design of the study was rated by determining whether it was an intervention, prospective or observational, or retrospective study. Then, each study was ranked according to its method of determining statistical significance. A study was assigned a rating of 0 (zero) if it exhibited no formal statistical methods. A 1 (one) was assigned if it used a form of stratification to assess importance or correlation, but used no formal test for determining statistical significance. A 2 (two) was entered in this study characteristic if the study used a basic statistical method such as a Chi-square or Student's t-test. The last, a 3 (three), was given if a study used multiple regression techniques or some other multivariate form of statistical analysis. No form of statistical manipulation or effect size assessment utilizing these number assignments was attempted because uniformity of data and/or results did npt permit it. This rating scale was used strictly for the purposes of easier presentation in a tabular form. Next, the sample size was noted and recorded for each study.

Finally, the factors analyzed by each study were examined. Because of the highly variable nature of the methodologies of the studies of the Singles Batch and Final Batch (despite the conforming effects of the criteria they were forced to fulfill in qualifying for their respective categories), no formal statistical analysis of the influence

levels of specific factors in the aggregate or the statistical signficiance of pooled results could be performed.

Within the framework of this work, however, the degree of each factor's influence on medical student specialty choice (specifically primary care and/or family practice or general internal medicine) as expressed by the study's results could be assessed. Each factor in each study was evaluated for its relative "importance" or relationship to the medical student specialty choice decision process. Each factor was labeled either as a factor with a high degree of influence on or relationship to medical student specialty choice, or one with little or no influence on or relationship to medical student specialty choice.

Because of the extremely variable nature of the definition of analyzed factors, even if given the same name by different studies, factors were not graded on a numerical scale (as the design of the study was earlier). This was done to avoid any possibility of confusion regarding the relative strength of said factors. In fact, this study recognizes that even the designation of important vs. non-important is somewhat arbitrary considering the extreme diversity of study methodology and means for determining the impact of specific factors employed by the different studies.

Because of this ambiguity, the assignment of such

labels as 'important' or 'not-important' were strictly controlled: a factor was labeled 'important' only if the corresponding study found that factor was very definitely a factor with a strong influence on or a statistically significant relationship to the medical student specialty choice process. Marginally, or even moderately important factors were not counted as "important". If a formal statistical analysis was used by a study to establish a factor's degree of relationship, factor results classified in the "important category" in this work were forced to make this distinction relative to the other factors analyzed in that study. For example, if levels of significance via a student's t-test were computed in a particular study's assessment of factor relationship to medical student specialty choice, p-values of $p < 0.05$ were absolutely necessary.

Since the studies under analysis exhibited a broad range of methods, in terms of data collection, interpretation, and presentation, the so-called "direction" of a factor's influence was not assessed by this work. More specifically, some of the studies indicated that the factors analyzed 'positively' or 'negatively' influenced medical students regarding their choice of a primary care specialty. A 'positive' factor might indicate that X factor increased the probability that a medical student would choose a primary care field. Different factor definitions, or

different result interpretations, however, obscure such conclusions in a composite analysis. A simple example is the study that concludes that encouraging faculty attitudes towards primary care have a positive affect on medical student choice of primary care vs. the study that concludes that ambivalent faculty attitudes towards primary care have a negative affect on medical student choice of primary care vs. the study that concludes that faculty attitudes are important factors in the medical student specialty choice decision process. With too many degrees of freedom in such a composite analysis, assessing direction would yield meaningless results.

For the same reason, a stratification of results based on "direction" is 1) extremely difficult, 2) involves interpretation beyond the intent of the original study, and 3) reduces the numerical values involved even farther than what just 35 Singles and Final Batch studies allows.

In a similar vein, it is important to note at this point that many of the studies subject to this composite analysis did not, in fact, assess "influence" of specific factors on medical student specialty choice. In a number of cases, studies instead established a relationship between a specific factor and the medical student specialty choice decision process, but not a specific specialty choice. For the purposes of the composite analysis of this study, however, these, two differing results were treated in a

similar factor, combining "important" factors with those factors found to have a very statistically significant relationship to the medical student specialty choice decision process.

Description of Final and Singles Batch Presentation Tables

Once this series of assessments was complete, the results were tabulated and compiled. Again, because of the extensive medley of methodology involved in the studies analyzed, no formal statistical methods could be employed in this work, although such meta-analysis techniques have been defined for more uniform data by Glass, et. al.[1] among others. For the purpose of this particular work, a proportion was used in the assessment of the various factors analyzed. The proportion was that of the number of studies that analyzed each factor in the denominator, to the number of studies that found that specific factor to be one of important value in the influence of medical student specialty choice in the numerator. Those factors with the largest proportions were then judged to be factors with the highest probability of being the truly important factors influencing medical student choice of specialty.

Tables D1-D11 at the end of the RESULTS chapter summarize all the information regarding the Singles Batch and Final Batch Articles as defined above. Table D1 is a

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[1] Glass, GW, et. al.; "Meta-Analysis in Social Research"; Sage Publications, Inc., 1981.

table that outlines all the non-factor information regarding the studies in the Final and Singles Batch. Two sets of numbers in the first column indicate the study number of those journal articles comprising the Final Batch and Singles Batch, respectively. Each article number is accompanied by the name of its primary author. Each row in the "IPR" column is marked either with an I, a P, or an R, to indicate if the study was interventional ("I"), prospective ("P"), or retrospective ("R"), respectively. Studies that did not completely fit the billing of prospective, but were nonetheless studies of current medical students yet to decide upon their medical specialty, were still designated prospective (P).

The "SIG" column refers to the means by which each study determined statistical significance. As outlined, a "0" (zero) indicates no means of determining significance. A "1" (one) indicates some form of stratification or correlation to make conclusions, but no formal statistical means of determining significance. A "2" (two) indicates the use of some formal, but basic means of testing for statistical significance (e.g. Chi-square, Student's t-test). A "3" (three) indicates a multi-variate analysis for determining statistical significance (e.g. multiple regression analysis). "N" was the column for sample size, in terms of number of medical students studied.

Tables D2-D9 are similar in format to Tables A1-C13.

In this case, however, the corresponding marks had different meanings. Unlike Tables A1-C13, in which the "+" indicates only that that study looks at the factor indicated, a "+" in Tables D2-D9 indicates that that study found that particular factor to be of relatively large importance in the medical student specialty choice decision process or with a statistically significant relationship to medical student specialty choice. Along that line, a "0" indicates that that study determined that particular factor to be of unrelated or of relatively little importance in medical student specialty choice. An "X" was an indication that that study was "ambiguous" in its conclusions regarding that specific factor's relationship to medical student choice of specialty. In such "ambiguous" cases, the intra-study results conflicted within the framework of this work. For example, a study that finds a certain factor to bear a strong relationship with choice of pediatrics might at the same time bear no relationship with choice of general internal medicine. Or, as another example, a factor is found to be of importance in influencing medical students to choose both family medicine and surgical subspecialties. These factors, at the same time both are and are not important in influencing medical student specialty choice, and so are "ambiguous".

Table 1:

Article Exclusion for Starting Batch by Sorting Criteria

Criterion #1: Excluded articles number 1, 3, 6, 8, 9, 10, 11, 12, 13, 18, 22, 25, 28, 35, 37, 42, 43, 50, 51, 54, 55, 61, 64, 65, 66, 72, 73, 76, 77, 80, 83, 84, 85, 86, 87, 88, 92, 93, 95, 98, 104, 110, 114, 115, 116, 119, 126, 127, 130, and 132.

Criterion #3: Excluded articles number 2, 5, 20, 21, 24, 29, 31, 41, 47, 48, 49, 62, 63, 70, 71, 75, 78, 79, 82, 96, 97, 101, 109, 112, 123, 125, and 129.

Criterion #4: Excluded articles number 4, 14, 57, 69, 90, 94, 100, 102, 103, 107, 124, and 133.

Criterion #5: Excluded articles number 23, 26, 30, 38, 39, 45, 56, and 59.

Criterion #6: No articles excluded based on these criterion.

Final Batch: Includes articles #'s 7, 15, 16, 17, 19, 27, 32, 33, 34, 36, 40, 44, 52, 58, 60, 68, 74, 91, 99, 106, 107, 111, 117, 118, 120, 121, 122, 128, and 131.

Singles Batch: Includes articles #'s 53, 81, 89, 105, 108, 113.

Chapter Three: RESULTS

This chapter begins with some general observations about the studies recovered for this work. This includes rates of studies conducted per year, trends in terms of the popularity of various factors studied over time. Next, this chapter comments on the state of the literature based on an analysis of those studies recovered. This looks at such aspects as the consistency of methodology, and statistical rigor employed in the field. Finally, this chapter presents the cornerstone of this work: an overall analysis of the results of the studies recovered, and their collective determination as to which factors most influence medical student specialty choice. The chapter has been written in a step-by-step organization closely following the methodological processes decribed previously.

General Observations

Simple inspection of the Appendix I timeline reveals that factors influencing medical student specialty choice has been a subject of interest over at least the past three decades. Table 2 presented at the end of this chapter outlines the number of studies per year as listed in Appendix I. Studies appear to have been conducted at a steadily increasing rate over the past thirty years, examining a vast range of different factors that have been considered at one time or another to be possible elements in

the medical student specialty choice decision process. Interest in this subject appears to have skyrocketted within the past decade, resulting in especially high rates of related studies into the double digits occurring consistently within just the past five years. As summarized in Appendix II, of the Starting Batch studies, nine were from the 1960s, 35 were published during the 1970s, and 82 were printed in the 1980s.

The data collection methodology of this study, however, requires two very important considerations. First, the retrospective reference searching nature of data collection is severely biased against an accurate sampling of studies from past years. In fact, this study acknowledges that the upward trend in number of studies per year analyzing medical student specialty choice decision factors could quite possibly be entirely explained by incomplete listings in the various computer data bases employed, and/or in the studies' references. Second, it is also important to remember that the figure for 1990 represents only those studies published through August of that year, and so that rate for an entire year is incomplete.

Starting Batch General Observations

Table 3 and Table 4, presented at the end of this Chapter, indicate the number of studies from the Starting Batch that look at each particular factor. These results, compiled from Tables A1-A13, B1-B13, and C1-C13 in Appendix

III, indicate the immense diversity of this field of study. At best, in the case of "Stability of Selection", less than one fourth of all the studies (30 of 133) looked at the same or similar factors. Among the other more popular factors studied in this field, only approximately one-sixth of all the studies in the Starting Batch looked at the same or similar factors. For example, "Time of Specialty Selection" was analyzed by 25 of 133 studies, "Gender" was examined by 24 of 133 studies, and "Controllable Lifestyle" and "Personality" were examined by just 22 of 133 studies in the Starting Batch. The two most popular factors, in fact, "Stability of Selection" and "Time of Specialty Selection", are more trend-like numerical analysis of the process of medical student specialty choice rather than direct factors that influence the medical student decision. At most, if an important relationship is found between these two factors and medical student specialty choice, these results can only be used to infer that something about the medical school experience, or something during that time frame, was closely related to the medical student decision process. The three other most popular factors, "Controllable Lifestyle", "Personality", and "Gender" are beyond any real control of the medical school to manipulate to affect the outcome of the their student body's specialty choice decisions.

Of those factors that are most subject to the medical school's control (those factors under the MEDICAL SCHOOL

heading and "Faculty" ROLE MODELS), each factor is looked at only by an average of 8.0 studies (136 marks divided by 17 total factors). Despite this, a more encouraging statistic is that the most popular factors under medical school control are "Faculty ROLE MODELS", "Year III/IV Curriculum", and "Faculty Attitudes Towards Specialty". These factors would appear to be the most easily malleable (along with the other curricular and staff attitudinal factors) by medical schools seeking to affect their output of primary care physicians.

State of the Literature

The Starting Batch was subject to six rather lenient selection criteria to provide a certain degree of uniformity and a modicum of methodological rigor to the studies that would compose the Final and Singles Batches. As was noted in the Methods Chapter earlier, a seventh criterion, demanding stratification of results by gender, was impossible to implement because it would have reduced the Starting and Singles Batches to just six total studies.

Also, it is important not to overlook the number of studies that survived each cyclical stage of sorting. Clearly, the largest number of articles were excluded because of criterion #1. The purpose of the first criterion and criterion #2 were to provide a small degree of uniformity towards the goal of this work: an analysis of studies that examined factors that influenced medical

student choice of a primary care specialty. The contribution of those studies that did not survive the first two criteria, then, would have been from a pool of articles with a very diverse range of approaches with such diverse perspectives adding too diffuse an input to this study's primary focus.

Still, of the 82 articles that did survive the first two criteria, all but thirty-five were selected out by four simple, undemanding criteria selected to represent a minimum standard for study strength. Clearly, this meager survival rate is also an indication of the state of the field. Obviously, some minimum standard regarding research methodology would greatly benefit efforts in this area.

At the same time, some degree of factor definition uniformity would also appear to benefit the quality of any conclusions hoped to be derived from these types of studies. For example, in Article #16, Geertsma and Grinols (1972) found that a science concentration major in college was positively related with the choice of pediatrics, but negatively related with the choice of psychiatry. No significant relationships could be found with any of the other primary care fields, nor any of the subspecialties. Such a conclusion, for the purposes of this study, was ambiguous with regards to direction of influence of various factors. At the same time, in Article #32, Herman and Veloski (1977) determined that a social sciences or

humanities college major was not related statistically to medical student choice of family practice. It is difficult to combine such results into a simple conclusion.

The Final Batch

The Final Batch of 29 articles that survived the six sorting criteria are indicated with an asterisk (*) preceding their entry number in Appendix II for quick reference. An abtracts-like summary of the findings pertinent to this study for each of the Final Batch articles is presented in Appendix IV. This information is more succinctly and comprehensively presented in Tables D1-D11 at the end of this chapter.

The Singles Batch

Studies in the Single Batch, sorted out of the Starting Batch by Criterion #2 as defined in the Methods section earlier, are indicated by a double asterisk (**) in Appendix B. As for the Starting Batch, an abstracts-like report of each of the six Singles Batch articles is presented in Appendix IV, directly following the equivalent reports for the Starting Batch studies. These results have been summarized in Tables D1, D5, D9, D10, and D11.

The Final Analysis

Looking at Table D1 reveals once again a very diverse field. Population samples vary from just over one hundred (as designated by the sorting criteria), into the tens of

thousands. This extensive range is primarily the result of two different approaches in this field: 1) a survey of local medical students, or 2) use of AAMC, AMA, or other such national data bases. Only one of eight studies with a sample size of 1,000 or greater (Article #81, Hadac, 1986) used a data source other than a recognized national data pool (Hadac used graduates from a single medical school over a ten-year period to distinguish any differences in residency choices between genders.) None of these eight studies provided a cross-section of more than one medical school without relying on national data base data. However, national data bases would appear to be unable to provide information regarding such factors as peer or faculty attitudes, medical experiences, role models, or other important medical school factors on medical student specialty choice.

The small sample sizes in those studies that do employ local, tailored surveys as their data sources is ominous for a number of reasons. One, these small sample sizes are often further reduced by stratification for specialty, medical student class, comparing one type of student to another, and/or a number of other means. Two, because so many studies use such small sample sizes, it is difficult to lend credence to any of their results, especially if those results conflict from study to study. Three, small sample sizes imply a localized, micro-environment which may

potentiate numerous confounding factors inherent in that population.

Table D1 also reveals the astonishing statistic that less than one-third (10 of 35) of the Singles and Final Batch studies employed some multiple regression, multivariate analysis of variance, or other high-powered statistical analysis to check for such problems as confounding. Seven of 35 studies failed to employ any means of assessing statistical significance at all. In a field in which factors are highly inter-related (and thus confounding is a rampant concern), such lack of statistical analysis seems a dangerous proposition in deriving any definite conclusions. For example, how do faculty attitudes affect the medical school experience? How do role models affect an assessment of faculty attitudes? How do SES, parent occupation, ethnicity, or hometown interact?

Tables D10 and D11 are a summary of Tables D2-D9 in a form more easily read to get a feeling for the overall results. In Table D10, each of the factor categories is listed in **bold-faced type** on the left of the table. Following each factor category title is a sequence of numbers with a symbol in parenthesis for each number. Here, the numbers are those originally assigned to the journal articles from the Starting Batch (listed in Appendix B). The parenthetical symbols correspond exactly to the symbols used to designate relative importance in Tables D2-D9.

Thus, for example, under **"MEDICAL SCHOOL" (in bold)**, Article #91 and Article #113 both found some element under this general factor category to be related to medical student specialty choice. Articles listed in normal type (e.g. Article #91) are from the Final Batch, and Articles listed in <u>underline type (e.g. Article #113)</u> are from the Singles Batch.

<u>Final Results</u>

The final, composite results are presented in Table D11, presented after Tables D1-D9 at the end of this chapter. The proportion is, simply, the number of studies that found that specific factor important in influencing the decision of medical student specialty choice compared with the total number of studies that analyzed that factor. Thus, the proportion is: important/total. Ambiguous studies were counted as unimportant, but the number of such studies in each factor category are indicated in parenthesis next to the proportion.

Some of the more popular categories analyzed were Gender (10), Indebtedness/SES (8), CL/NCL/Salary (8), Year III/IV (7), Status/Prestige (7), Trends (7), Personal Characteristics (6), Personality/Correlation (6), Patient Population (5), Pre-Med Factors (5), Residency Characteristics (5), Primary Care Elements (5), Pre-Med Academic Performance (4), Faculty Role Models (4), Medical School Experience (4), and Year I/II (4).

The final composite analysis identifies the following factors as most important: MEDICAL SCHOOL (2/2), Medical School Experiences (3/4), Year III/IV Curriculum (7/10), PATIENT POPULATION (5/5), Age (3/3), Gender (7/10), Personality/Correlation (5/6), Parent Occupation (3/3), Primary Care Elements (5/5), CL/NCL/Salary (6/8), Role Models (4/4), Non-Faculty Role Models (2/3), and Trends (7/7). All these results indicate a factor category in which a large proportion of the studies that analyzed them found the category to be highly related to the medical student specialty choice. Four of thirteen of these factor categories (MEDICAL SCHOOL, Medical School Experiences, Year III/IV, and Role Models) are directly under the control of the medical school.

Medical School Faculty Attitudes (0/2), Peer Attitudes (1/3), Ethnicity (0/2), Indebtedness (2/8), Pre-Med Factors (1/5), Pre-Med Academic Performance (1/4), Residency Characteristics (0/5), Job Opportunity (1/3), and Status/Prestige (3/7) appear to be the factor categories most often designated as unimportant or unrelated to the medical student choice of a primary care specialty. None of these are under the control of the medical school seeking to change its proportion of primary care physician graduates.

Intervention Studies

Five studies were cited in the Introduction Chapter as reports on programs initiated at various medical schools

with the expressed intention of increasing their output of primary care and/or rural physicians. Of these five, only one, Article #46, Carline, (1980), survived the sorting process outlined in the Methods Chapter. The reasons for this, while all four of these other studies were fine reports, and important, are given in the following:

> In Article #18, Mattson, 1973, the Illinois program's preferential admissions made it difficult to assess a difference between pre-medical selection and rural background as distinct, separate factors, because the program utilized both as preferential qualities without distinguishing specific levels of either. Thus, this study was excluded by sorting criterion #4.
>
> In Article #41, Phillips, 1978, the new physician pathway involved so many changes to the medical school experience that it was impossible to distinguish the separate factors. While other studies that made it to the Final and Singles Batches possess a certain degree of confounding to their results, at least their factor definitions attempted to make a distinction between the different factors. In this program, unfortunately, wholesale changes were implemented without attempt to ascertain the separate affect of each one. Thus, this article was excluded based on sorting criterion #3.
>
> Article #100, Ebbesson, 1988, was excluded based on criterion #4 because, while it attempted to ascertain the affect of separate changes implemented in the WAMI Experiment, it did so by student interview, reporting various student quotations as support in essay form. There was no real means to distinguish actual importance or not because of the selective nature of citing quotations, and because of the qualitative vs. the quantitative nature of the data.
>
> Article #107, Rabinowitz, 1988, reported on the PSAP. Like the Illinois program, both rural or underserved practice and family practice intention were intertwined, and impossible to resolve. Thus, the PSAP study was excluded via criterion #4.

Nonetheless, as interventional studies, their results, from a general analysis perspective, are important to the

field. These results are used to create a context for this work, and are documented in more detail in the Discussion Chapter.

Table 2: Rate of Studies Per Year

Year	# of Studies Published That Year
1956	1
1957	0
1958	0
1959	0
1960	2
1961	0
1962	0
1963	1
1964	2
1965	3
1966	0
1967	1
1968	1
1969	1
1970	3
1971	2
1972	4
1973	4
1974	3
1975	7
1976	4
1977	10
1978	6
1979	4
1980	9
1981	7
1982	10
1983	9
1984	8
1985	5
1986	14
1987	12
1988	17
1989	19
1990	9

Table 3

Number of Studies That Analyze Each Factor

Factor Category Title	# of Studies that Look At It
GEOGRAPHIC LOCATION	0
Hometown	5
Hometown SES	1
Hometown Rural/Urban	8
MEDICAL SCHOOL	4
Academic Performance	8
Classroom	5
Clinical Rotations	7
Experience with Residents	9
Experience with Faculty	10
Faculty Attitudes Towards Specialty	14
Peer Group Attitudes	9
Location	3
Public vs. Private	2
Research Experience	3
Year I/II Curriculum	10
Year III/IV Curriculum	16
+/- Course	7
+/- Rotation	10
+/- Department	7
PATIENT POPULATION	14
PERSONAL CHARACTERISTICS	4
Age	5
Children	4
Ethnic Background	9
Gender	24
Indebtedness	11
Marital Status	18
Self-Perception Correlation	7
Personality	22
Physician In Family	6
Religious Affiliation	4
SES	5
Parent Occupation	7

Table 4:

Number of Studies that Analyze Each Factor (cont'd)

Factor Category Title	# of Studies That Look At It
PRE-MED FACTORS	3
Academic Performance	3
GPA	6
MCAT	7
Public vs. Private	2
Clinical Experience	7
Student Preconception	4
Pre-Med Selection	5
Science Correlation	2
SPECIALTY CHARACTERISTICS	7
Residency Call Schedule	4
Continuity of Care	8
Dx Uncertainty	7
Peer Group	4
Job Opportunity	12
Resdency Length	8
Malpractice	4
Dx vs. Procedural	18
Status/Prestige	18
Tx People	17
Tx Variety	11
Controllable Lifestyle	22
Salary and Benefits	19
Specialty Personality	4
ROLE MODELS	9
Faculty	12
OTHER	
Time if Specialty Selection	25
Stability of Selection	30
Desire to Meet Manpower Needs	8

Tables D1-D11: Final Analysis

TABLE D1: Final Batch, Study Characteristics

Study #	IPR	SIG	N
Final Batch			
7, Kritzer (1967)	R	2	120
15, Fishman (1972)	P	2	166
16, Geertsma (1972)	P	2	140-204
17, Herrman (1972)	I	0	180
19, Otis (1973)	P	3	152
27, Zimet (1975)	P	2	141
32, Herman (1977)	P	3	891
33, Matteson (1977)	P	2	350
34, McGrath (1977)	P	3	261
36, Yancik (1977)	R	1	641
40, Gough (1978)	R	2	933-1026
44, Rosenblatt (1979)	I	1	894
46, Carline (1980)	I	3	458
52, Weil (1981)	R	3	340
58, Paiva (1982)	P	2	144
60, Zimny (1982)	P	2	380
68, Fadem (1984)	P	3	628
74, Bazzoli (1985)	P	3	3855
91, Dial (1987)	R	2	8667
99, Babbott (1988)	R	1	10321
106, Onady (1988)	P	1	173
111, Babbott (1989)	R	1	1113
117, Greer (1989)	I	2	439
118, Lieu (1989)	P	3	113
120, Ness (1989)	R	2	39301
121, Nieman (1989)	P	1	251
122, Potts (1989)	R	2	569
128, Psykoty (1990)	P	2	102
131, Schwartz (1990)	P	2	346
Singles Batch			
53, Brearley (1982)	R	1	194
81, Hadac (1986)	R	2	1273
89, Allen (1987)	I	2	346
105, Montano (1988)	P	2	136
108, Rabinowitz (1988)	R	3	123
113, Outcalt (1989)	R	3	15169

Key
R= retrospective
P= prospective
I= interventional
0= no statistical methodology used
1= statistical methods used, but none that determined statistical significance
2= basic statistical significance methods employed
3= multi-variate type analyses

TABLE D2: Final Batch Analysis									
First Group of Factors, Studies 7-34									
	7	15	16	17	19	27	32	33	34
HOMETOWN									
MEDICAL SCHOOL									
Academic Performance							X		
Medical School Experiences									
Faculty Attitudes									
Peer Attitudes									
Year I/II									
Year III/IV				+					
+/- Department									
ROLE MODELS									
Non-Faculty									
PATIENT POPULATION									
PERSONAL CHARACTERISTICS	X						0		
Age		+					+		
Ethnicity									
Gender							0	+	+
Indebtedness/SES									
Personality/ Correlation		+			+	+		+	
Parent Occupation	+		+						
PRE-MED FACTORS			X				0		
Academic Performance		+							
OTHER- Trends	+	+							

TABLE D3: Final Batch Analysis									
First Group of Factors, Studies 36-74									
	36	40	44	46	52	58	60	68	74
HOMETOWN				+					
MEDICAL SCHOOL				0					
Academic Performance								+	
Medical School Experiences						0			
Faculty Attitudes									
Peer Attitudes									
Year I/II			0						
Year III/IV						+		0	
+/- Department									
ROLE MODELS					+	+			
Non-Faculty									
PATIENT POPULATION									
PERSONAL CHARACTERISTICS					+				+
Age									
Ethnicity									
Gender							+	+	0
Indebtedness/SES					0	0			0
Personality/ Correlation						0			
Parent Occupation									+
PRE-MED FACTORS	+								
Academic Performance		x			0				
OTHER- Trends	+				+				

TABLE D4: Final and Singles Batch Analysis									
First Group of Factors, Studies 91-122									
	91	99	106	111	117	118	120	121	122
HOMETOWN									
MEDICAL SCHOOL	+								
Academic Performance									
Medical School Experiences		+				+		+	
Faculty Attitudes					0			0	
Peer Attitudes								0	
Year I/II					+				
Year III/IV						+			0
+/- Department									
ROLE MODELS									
Non-Faculty									
PATIENT POPULATION					+	+	+	+	
PERSONAL CHARACTERISTICS	+								
Age						+			
Ethnicity				0					
Gender				+		+			
Indebtedness/SES	0					0		0	
Personality/ Correlation			0						
Parent Occupation									
PRE-MED FACTORS						0			
Academic Performance	0					0			
OTHER- Trends	+				+	+			

TABLE D5: Final and Singles Batch Analysis									
First Group of Factors, Studies 128-131, 53-113									
	128	131		53	81	89	105	108	113
HOMETOWN									
MEDICAL SCHOOL									+
Academic Performance									
Medical School Experiences									
Faculty Attitudes									
Peer Attitudes	0			+					
Year I/II				+		0			
Year III/IV		+		+		0		+	+
+/- Department									+
ROLE MODELS	+	+							
Non-Faculty	0	+		+					
PATIENT POPULATION						+			
PERSONAL CHARACTERISTICS				0					
Age									
Ethnicity									
Gender					0				
Indebtedness/SES	0								+
Personality/ Correlation									
Parent Occupation									
PRE-MED FACTORS				0					
Academic Performance									
OTHER- Trends									

TABLE D6: Final Batch Analysis									
Second Group of Factors, Studies 7-34									
	7	15	16	17	19	27	32	33	34
SPECIALTY CHARACTERISTICS									
Residency Characteristics									
Primary Care Elements									
Dx Uncertainty									
Peer Group									
Job Opportunity									
Malpractice									
Status/Prestige	+	+				+			
CL/NCL/Salary								+	

TABLE D7: Final Batch Analysis									
Second Group of Factors, Studies 36-74									
	36	40	44	46	52	58	60	68	74
SPECIALTY CHARACTERISTICS									
Residency Characteristics					0	0			
Primary Care Elements									
Dx Uncertainty									
Peer Group									
Job Opportunity									
Malpractice									
Status/Prestige									
CL/NCL/Salary					+				

TABLE D8: Final and Singles Batch Analysis									
Second Group of Factors, Studies 99-122									
	91	99	106	111	117	118	120	121	122
SPECIALTY CHARACTERISTICS			0						
Residency Characteristics						0			
Primary Care Elements					+	+		+	
Dx Uncertainty						0			
Peer Group						+			
Job Opportunity					+	0			
Malpractice									
Status/Prestige					0	0			
CL/NCL/Salary					0	+		+	

TABLE D9: Final and Singles Batch Analysis									
Second Group of Factors, Studies 128-131, 53-113									
	128	131		53	81	89	105	108	113
SPECIALTY CHARACTERISTICS									
Residency Characteristics	0					0			
Primary Care Elements	+					+			
Dx Uncertainty	+								
Peer Group									
Job Opportunity	0								
Malpractice	0								
Status/Prestige	0								
CL/NCL/Salary	0	+				+			

TABLE D10: Final and Singles Batch Analysis

Factor-Study Correlation Analysis Summary

HOMETOWN: 46(+)
MEDICAL SCHOOL: 46(0), 91(+), 113(+)
Academic Performance: 32(X), 68(+)
Medical School Experiences: 58(0), 99(+), 118(+), 121(+)
Faculty Attitudes: 117(0), 121(0)
Peer Attitudes: 121(0), 128(0), 53(+)
Year I/II: 44(0), 117(+), 53(+), 89(0)
Year III/IV: 17(+), 58(+), 68(X), 118(+), 122(0), 131(+), 53(+), 89(0), 108(+), 113(+)
+/- Department: 113(+)
PATIENT POPULATION: 117(+), 118(+), 120(+), 121(+), 89(+)
PERSONAL CHARACTERISTICS: 7(X), 32(0), 52(+), 74(+), 91(+), 53(0)
Age: 15(+), 32(+), 118(+)
Ethnicity: 91(0), 111(0)
Gender: 32(0), 33(+), 34(+), 60(+), 68(+), 74(0), 91(+), 111(+), 118(+), 81(0)
Indebtedness/SES: 52(0), 58(0), 74(0), 91(+), 118(0), 121(0), 128(0), 113(+)
Personality/Correlation: 15(+), 19(+), 27(+), 33(+), 58(+), 106(0)
Parent Occupation: 7(+), 16(+), 74(+)
PRE-MED FACTORS: 16(X), 32(0), 36(+), 118(0), 53(0)
Academic Performance: 15(+), 40(X), 52(0), 118(0)
SPECIALTY CHARACTERISTICS: 106(0)
Residency Characteristics: 52(0), 58(0), 118(0), 128(0), 89(0)
Primary Care Elements: 117(+), 118(+), 121(+), 128(+), 89(+)
Dx Uncertainty: 118(0), 128(+)
Peer Group: 118(+)
Job Opportunity: 117(+), 118(0), 128(0)
Malpractice: 128(0)
Status/Prestige: 7(+), 15(+), 27(+), 117(0), 118(0), 128(0), 89(0)
CL/NCL/Salary: 33(+), 52(+), 117(0), 118(+), 121(+), 128(0), 131(+), 89(+)
ROLE MODELS: 52(+), 58(+), 128(+), 131(+)
Non-Faculty: 128(0), 131(+), 53(+)
OTHER- Trends: 7(+), 15(+), 36(+), 52(+), 117(+), 118(+)

TABLE D11: Final and Singles Batch Analysis

Final, Composite Analysis Results

Factor	N	Influence	No Influence
HOMETOWN:	2	1	1
MEDICAL SCHOOL:	5	2	3
Academic Performance:	2	1	0(1)
Medical School Experiences:	4	3	1
Faculty Attitudes:	2	0	2
Peer Attitudes:	3	1	2
Year I/II:	4	2	2
Year III/IV:	10	7	2(1)
+/- Department:	1	1	0
PATIENT POPULATION:	5	5	0
PERSONAL CHARACTERISTICS:	6	3	2(1)
Age:	3	3	0
Ethnicity:	2	0	2
Gender:	10	7	3
Indebtedness/SES:	8	2	6
Personality/Correlation:	6	5	1
Parent Occupation:	3	3	0
PRE-MED FACTORS:	5	1	3(1)
Academic Performance:	4	1	2(1)
SPECIALTY CHARACTERISTICS:	1	0	1
Residency Characteristics:	5	0	5
Primary Care Elements:	5	5	0
Dx Uncertainty:	2	1	1
Peer Group:	1	1	0
Job Opportunity:	3	1	2
Malpractice:	1	0	1
Status/Prestige:	7	3	4
CL/NCL/Salary:	8	6	2
ROLE MODELS:	4	4	0
Non-Faculty:	3	2	1
OTHER- Trends:	6	6	0

Note: Number in parentheses under "No Influence" heading indicates # of articles from which no conclusion could be derived for factor category indicated.

Chapter Four: DISCUSSION

The potential for a shortage of primary care physicians has many people concerned. In particular, many medical professionals are worried about a possible lack of general internists and family practitioners. There is also a concern about pediatrics, psychiatry, and obstetrics/gynecology. But, potential shortages in certain specialty fields such as physical medicine and rehabilitation, emergency medicine, and various pediatric subspecialties are also causing some concern. This is indicated by the abundance of studies analyzing factors that influence medical students to choose not just any specialty, but certain, specific specialties. What, precisely, these studies ask, influences the medical student to choose X specialty?

Some studies, such as the WAMI Experiment at the University of Washington School of Medicine, or the PSAP at Jefferson Medical College in Virginia, report on interventional programs that have already been initiated in an attempt to affect the number of students choosing a specific specialty (e.g. the primary care specialties--family practice in particular). Some of these programs, such as the PSAP[1], preferentially admit students who state

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[1] Rabinowitz, HK, "Evaluation of a Selective Medical School Admissions Policy to Increase The Number of Family Physicians in Rural and Underserved Areas", NEJM 319:480-486, 1988.

a preference for family medicine and an intention to practice in rural areas, even if their academic credentials are somewhat lower than those students normally admitted. While academic performance has been significantly lower for the PSAP students during medical school, their post-graduate evaluations (National Board of Medical Examiners Part III and clinical evaluations) have not been significantly different.[2] Moreover, PSAP graduates are fives times as likely to practice family medicine, and three times as likely to practice in rural areas as non-PSAP students.[3]

A similar program at the University of Illinois College of Medicine[4] noted similar results as the PSAP. In addition to preferential admission, it also provides PSAP students with special funds from a specially designed loan program, enabling these students, often from poorer, rural areas, to finance their way through medical school. The study found that while academic performance and rate of failure of these students was substantially greater than the normal students at this school (an average of twenty failures compared with an average of nine failures), the number of resulting family physicians has been over twice the normal rate, comprising nearly the entire output of the

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[2] Ibid.

[3] Ibid.

[4] Mattson, DE, et. al., "Evaluation of a Program Designed to Produce Rural Physicians", J. Med. Educ. 48:323-331, 1973.

resulting rural physicians from the entire medical school over the period studied.[5]

A number of issues that are raised in the Illinois study, however, are valid with respect to any similar programs. First, in terms of monetary investment, the potentially higher failure rate represents more irrecoverably lost time and resources. Second, is the question posed in the Illinois study:

> "Faced with an abundant number of qualified candidates for admission, committees would like to make choices which reflect the needs of society rather than small differences in academic credentials. The difficulty is that it is seldom possible to demonstrate objectively that there is any benefit to society from such an attempt."[6]

This difficulty is further compounded by the, as yet, uncertain status as the "abundant number of qualified candidates" condition. This uncertainty can no longer guarantee that such admission policies as employed in Illinois will not adversely affect the quality of the resulting physicians.

A different approach begun in 1968 at the University of Washington School of Medicine[7] is to establish a new family physician curriculum pathway that involves such modifications as developing Family Medical Centers at the

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[5] Ibid.

[6] Ibid.

[7] Phillips, TJ, et. al., "Family Physician Pathway and Medical Student Career Choice: Ten Years After Curriculum Change at the University of Washington", JAMA 240:1736-1741, 1978.

university hospital and affiliated teaching hospitals, creating a family practice department within the medical school, establishing new family practice residencies at the post-graduate level, providing effective role models of family physicians working within the teaching hospitals, affiliating with models of rural practice, and providing the opportunity for students to take courses outside the health sciences and to interact with models of interprofessional teams (nurse practitioners, dentists, pharmacists, social workers, etc.). This report indicates that approximately half of the entering medical students at the University of Washington School of Medicine now choose this pathway, and that of those students, 73% pursue family practice as a specialty. Overall, the report states that the University of Washington now sees one third of its graduates enter family practice and one third enter internal medicine (but did not indicate to what extent "internal medicine" meant "internal medicine subspecialization"), both significant increases over previous rates.[8]

Begun in 1971, a different effort at the University of Washington, the WAMI Experiment, enabled 75 of 175 students at the University of Washington School of Medicine the opportunity to train in their first year outside of Seattle, in more rural areas with greater exposure to family practitioners. Participating campuses include Washington

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[8] Ibid.

State University, University of Alaska, Montana State University, and the University of Idaho.[9] A study of graduates of the WAMI program practicing in Alaska[10] found that 52% are currently practicing in small towns, and 91% are in family practice. This was compared with an 8% figure cited as the national average for medical school graduates that are family practitioners practicing in rural areas.[11]

The Washington approach, if universally successful, is much more desirable than such programs as the PSAP and the Illinois program because it lacks the disadvantage of preferential admissions. By manipulating the medical experience, the University of Washington successfully increased its output of primary care physicians with two different programs. Moreover, the success of these programs illustrates that, in fact, medical schools can effectively act to deal with any existing or impending maldistribution or shortage of specific types of physicians. Thus, the other option-- federal intervention, such as reducing the number of specialty residency positions and simultaneously mandating the creation of more primary care residency positions-- may not be required. If the federal government

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[9] Carline, JD, et. al., "Career Preferences of First- and Second-Year Medical Students: The WAMI Experience", J. Med. Educ. 55:682-691, 1980.

[10] Ebbesson, SOE, "The Alaska WAMI Program: A Preliminary Study of Factors Affecting Specialty Choice and Practice Location", Alaska Medicine 30:55-60, 1988.

[11] Ibid.

were to arbitrarily command the sudden addition/reduction of various departments at various schools, it would demand potentially adverse changes at the medical school and/or teaching hospital level. Medical schools would have to adjust suddenly to unexpected, even unacceptable changes in their health care delivery systems, their management organization structures, and their budgets, among other things. Moreover, there is no guarantee that such positions would be filled. In 1987, for example, many internal medicine residencies were left unfilled for lack of interest.[12] Giving medical schools the go-ahead to effect their own changes to address physician supply problems grants them the freedom to implement these changes without adversely affecting either the medical school structure, organization, and curriculum format, or the physician quality outcome.

In light of this, it is very important to assess which elements regarding the medical student specialty choice decision process exert prominent effects. This importance is two-fold: first, it helps establish whether or not changes in the medical school environment are practical (in that they represent forces that would effect a substantial change in medical student specialty choice), and second, if indeed this approach is practical, it helps to pinpoint

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[12] Graettinger, JS; "Internal Medicine in the NRMP 1987: The Ides of March"; Ann. of Intern. Med. 108:101-115, 1988.

which specific elements of the medical school experience may be manipulated to have the maximum effect. The extreme portent of this assessment issue is reflected in the considerable number of studies designed to answer some of the questions raised by this issue.

The purpose of this study is to address this assessment issue. Despite a general lack of consensus on methodology, formal definitions of these factors, or the conclusions regarding the importance of these factors, this study has attempted to draw some overall judgments from an extensive review of the existing literature.

Some of the general trends noted over the years can be gathered by the inspection of Tables A1-C13. In general, it shows a relative increase in the number of this type of study conducted per year. This may be attributed to the growing concern over the past years with physician supply and distribution. Also, one can detect a slight increase over time in the percentage of studies that address elements of the medical school experience as factors. However, overall, the content of these types of study has remained relatively consistent since the early 1960s.

It is important to note that a number of excellent studies were excluded from this work's more detailed analysis by the various sorting criteria noted in the Methods Chapter. In particular, the sorting process was primarily a means of instilling some small degree of

consistency to a very diverse field. Just as importantly, the sorting criteria reduced the number of studies to a manageable total.

If anything, the work done in conducting this study has revealed one very clear reality: if a real consensus regarding the factors that influence medical student specialty choice is to be had, some consensus regarding factor definitions and analysis methodology must be conducted so that results across many medical schools and large populations of medical students can be derived. This was clearly demonstrated by 1) the broad range of factors studied, 2) the variable ways in which similar factors were defined, 3) the numerous different methodological methods employed, 4) the relative lack of formal, multi-variate statistical methods for analyzing results, and 5) the predominant confinement of studies to small populations from local areas.

Indeed, if the primary care physician shortage becomes severe, and measures must be taken, then only a study of such coordination and magnitude will be acceptable to guide the policy of medical schools across the country. Even so, a set of such studies now might go a long way towards preventing any primary care shortage at all, by providing this guidance. Or, they might provide a ready source if future considerations become necessary.

In the present, however, there is no such uniformity.

Understanding the limitations of this study due to a lack of any real formal statistical methodology, as well as somewhat arbitrary factor category definitions and somewhat loose assignments, it is possible to state, with reservations, some conclusions derived from this analysis. The predominant types of factors that emerged as important in the medical student specialty choice decision process were certain personal characteristics and characteristics of the specialties themselves. Those factors with the best consensus regarding their importance, as well as a large number of studies looking at them, were controllable lifestyle and salary, characteristics of primary care specialties, personality of the student and correlation with the perceived personality of the specialty, gender of the medical student, the timing of the medical student specialty choice decision and its stability through medical school, the patient population particular to each specialty, and the clinical curriculum in medical school.

It is this last factor category that provides a focus for the purpose of this study. Although the majority of the important factors did not deal with the medical school experience, some did. One of the factors pertinent to the medical school experience/environment determined to be "important" to the medical student specialty process was the general category "MEDICAL SCHOOL". In this case, however, the two "important" marks in this category included one mark

for public vs. private and another mark for medical school location, rendering the analysis in this case relatively useless. The others, "Medical School Experiences" and "Faculty Role Models" also ranked high in a large majority of the studies that looked at this factor, despite the fact that only four of the final studies analyzed them. These results, combined with the results regarding "Year III/IV" indicate that there is a certain potential, particularly in the clinical experiences areas, for medical schools to influence the outcome of medical student specialty choice. However, the relative lack of the other medical school characteristics factors to rate this high in importance is rather disappointing. (Faculty attitudes, peer group opinions, and Year I/II curriculum failed to qualify as important by the standards of this study, and indicate that any medical school efforts to change the environment along these lines might prove relatively unrewarding.)

Chapter Five: CONCLUSION

This study has a number of findings. First and foremost, is that the field analyzing factors that influence medical student specialty choice would benefit greatly from some means of formal standardization in terms of methodology (including both a standard theoretical model and appropriate multivariate analyses), factor definitions, and study population (i.e. a standardized sample size and formalized procedure for ascertaining a representative national sample). Second, which derives from the first, is that the field of study as it exists currently, lacks any real uniformity in terms of a collective attempt to assess those factors with important relationships in the medical student specialty choice decision process. All the needs as outlined in the first finding previously have been found to be deficiencies in the state of the existing literature.

Finally, it has been determined from this existing literature that, overall, the majority of factors important in influencing the medical student choice of specialty are those inherent in the specialty, or inherent in the medical student. This may explain why such interventional programs as the PSAP and the Illinois programs have proven successful in their goals to increase the number of rural family physicians. If medical schools are to increase their production of primary care physicians without compromising their admissions standards, however, then the results of

this study indicate that they should emphasize changes in the clinical curriculum and environment emphasizing the specialty in question, and seek to influence the medical school experience by providing strong role models in the field of interest.

In conclusion, then, it seems that programs like those at the University of Washington School of Medicine are "on the right track". Nonetheless, even these successful programs would benefit from a uniform, collective effort of determining precisely which factors have the greatest influence on medical student specialty choice decisions and in which way these factors may be manipulated in order to have a specific affect. In addition, the existence of such a database, would enable medical schools across the nation to more confidently address any potential physician shortages and/or surpluses that may threaten in the future.

Appendix I

KEY
1- macrotrends
2- general frequency
3- microtrends
4- post-graduate specialty choice

Literature Search Time Line

1956

Monk, MA and Terris, M.; "Factors in Student Choice of General or Specialty Practice"; NEJM 255: 1135-1140.

1960

Coker, RD; "Patterns of Influence: Medical School Faculty Members and the Values and Specialty Interests of Medical Students"; J. Med. Educ 35: 518-527.

1-Weiskotten, HG, et. al.; "Trends in medical practice: an analysis of the distribution and characteristics of medical college graduates 1915-1950."; J. Med. Educ. 35: 1071-1121.

1963

Schumaker, CF; Interest and Personality Factors as Related to Choice of Medical Career"; J. Med. Educ. 38: 932-942.

1964

Bruhn, JG and Parsons, OA; "Medical Student Attitudes Toward Four Medical Specialties"; J. Med. Educ. 39: 40-49.

Schumaker, CF; "Personal characteristics of students choosing different types of medical careers"; J. Med. Educ. 39: 278-288.

1965

Boverman, H.; "Senior Student Career Choices in Retrospect"; J. Med. Educ. 40: 161-165.

Bruhn, JG and Parsons, OA; "Attitudes Toward Medical Specialties: Two Follow-Up Studies"; J. Med. Educ. 40: 273-280.

Livingston, PB and Zimet, CN; "Death Anxiety, Authoritarianism, and Choice of Specialty in Medical Students"; J. Nerv. Ment. Dis. 140: 222-230.

1967

Kritzer, H and Zimet, CN; "A Retrospective View of Medical Specialty Choice"; J. Med. Educ. 42: 47-53.

1968

Yufit, RI, et. al.; "Medical specialty choice and personality"; Arch. Gen. Psychiatry 20: 89-99.

1969

Wasserman, E, et. al.; "Medical specialty choice and personality. II. Outcome and post-graduate follow-up results"; Arch. Gen. Psychiatry 21: 529-535.

1970

Breed, JE; "The Plans of Our Doctors in Training"; Ill. Med. J. 138: 536-537.

Monk, MA and Thomas, CB; "Characteristics of Male Medical Students Related to their Subsequent Careers"; Johns Hopkins Med. J. 127: 254-272.

Slater, SB, Chyatte, SB; "Evaluation of effects on medical students of introductory course in rehabilitation medicine"; Arch. Phys. Med. Rehab. 51: 558-564.
=> While departments in PMR increase student selection of PMR residencies, a single course does not.

1971

Chyatte, SB and Slater, SB; "Medical student training in rehabilitation and career choice selection"; Arch. Phys. Med. Rehabil. 52: 306-310.

Paiva, REA and Haley, HB; "Intellectual, personality, and environmental factors in career specialty preferences"; J. Med. Educ. 46: 281-289.

1972

Donovan, JC, et. al.; "Studies in Medical Education: Career Choice Consistency in Medical Students"; Am. J. Obstet. Gynecol. 112: 519-526.

Fishman, DB and Zimet, CN; "Specialty Choice and Beliefs About Specialties Among Freshman Medical Students"; J. Med. Educ. 47: 524-533.

Geertsma, RH and Grinols, DR; "Specialty Choice in Medicine";

J. Med. Educ. 47: 509-517.
=> Timing and determinants of specialty choice.

Herrman, TJ; "Influence of 'all elective' fourth year on career goal selection"; J. Med. Educ. 47: 518-523.

1973

Bruhn, JG and Epstein, BS; "Senior Medical Students' Knowledge Of and Attitudes Towards Anesthesiology in Ten Medical Schools"; Anesthesiology 39: 94-103.

Mattson, DE, et. al.; "Evaluation of a program designed to produce rural physicians"; J. Med. Educ. 48: 323-331.
=> Successful.

Otis, GD and Weiss, JR; "Patterns of Medical Career Preference"; J. Med. Educ. 48: 116-1123.

Schroeder, SA and Schliftman, A; "The influence of medical school on selection of career specialties"; Med. Ann. DC 42: 339-343.

1974

Oates, RP and Feldman, HA; "Patterns of Chnage in Medical Student Career Choices"; J. Med. Educ. 49: 562-569.

4-Paiva, RE, et. al.; "Factors in Internship Choice"; J. Med. Educ. 49: 343-350.

Zimny, GH and Senturia, A; "A Longitudinal Study of Consisitency of Medical Student Specialty Choice"; J. Med. Educ. 49: 1179-1181.

1975

Anderson, RBW; "Choosing Medical Specialty: Critique of Literature in Light of 'Curious Findings'; J. Health Soc. Behavior 16: 156-162.
=> Attitudies, orientation to and image of, intellectual ability, age, sex, race, and personality all identified as factors influencing specialty choice.

Collins, F and Roessler R; " Intellectual and Attidudinal Characteristics of Medical Students Selecting Family Practice"; J. Fam. Practice 2: 431-432.
=> MCAT and ideals were higher in 1975 among family practicioners compared with 1989.

1-Gough, HG; "Specialty Preferences of Physicians and Medical Students"; J. Med. Educ. 50: 581-587.

Held, ML and Zimet, CN; "A longitudinal study of medical specialty choice and certainty level"; J. Med. Educ. 50: 1044-1051.

Mitchell, WD; "Medical Student Career Choice: A Conceptualization"; Soc. Sci. Med. 9: 641-653.

Weinstein, P and Gipple, C; "Some Determinants of Career Choice in the Second Year of Medical School"; J. Med. Educ. 50: 194-198.

Zimet, CN and Held, ML; "The development of views of specialties during four years of medical school"; J. Med. Educ. 50: 157-166.

1976

Beering, SC; "Should the Medical Curriculum Be Modified to Influence Career Choice and If So, How?"; Bull. NY Acad. Med. 52: 1091-1108.

Cullison, S, et. al.; "Medical school admissions, specialty selection, and distribution of physicians"; JAMA 235: 502-505.
=> Recommends intervention in the admissions process to increase redistribution, since those that come from rural areas more likely to return to those areas.

1-Lehmann, JF, et. al.; "Undergraduate education in RM: trends in curriculum development and impact on specialty manpower and delivery of service"; Arch. Phys. Med. Rehabil. 57: 497-503.
=> Inferred decline in PM&R with decline in exposure during medical school by statistically looking at existence/non-existence of RM courses, departments, etcetera.

Schwartz, LE and Cantwell, JR; "Weiskotten survey class of 1966: A profile of physicians' locations and specialty choice"; J. Med. Educ. 51: 533.

1977

Beck, JD, et. al.; "The Effect of the Organization and Status of Family Practice Undergraduate Programs on Residency Selection"; J. Fam. Pract. 4: 663-669.
=> Stronger departments correlate to higher percentages of students selecting family practice.

Gough, HG and Ducker, DG; "Social Class in Relation to Medical School Performance and Choice of Specialty"; J. Psychol. 96: 31-43.

Hadley, J; "An Empirical Model of Medical Specialty Choice";

Inquiry 14: 384-401.

Herman, MW and Veloski, J; "Family medicine and primary care: trends and student characteristics"; J. Med. Educ 52: 99-106.

Matteson, MT and Smith, SV; "Selection of medical specialties: preference versus choices"; J. Med. Educ. 52: 548-554.

McGrath, E and Zimet CN; "Female and male medical students: Differences in specialty choice selection and personality"; J. Med. Educ. 52: 293-300.

Nieman, LZ, et. al.; "Career preferences and decision-making habits of first-year medical students"; J. Med. Educ. 52: 78-81.

Skipper, JK and Gliebe, WA; "Forgotten Persons: Physicians' Wives and their Influence on Medical Career Decisions"; J. Med. Educ. 52: 764-765.

Yancik, R; "Time of decision to study medicine: It's relation to specialty choice"; J. Med. Educ 52:78-81.

Zuckerman, HS; "Evaluation of the Literature on Career Choice Within Medicine"; Med. Care Rev. 34: 1079-1100.

1978

Asken, MJ and Strock, BK; "Expressed Reasons for the Choice of Residency in Family Practice"; J. Fam. Pract. 6: 809-813.

Eagleson, BK and Tobolic, T; "A Survey of Students Who Chose Family Practice Residencies"; J. Fam. Pract. 6: 111-118.

Gough, HG; "Some predictive implications of premedical scientific competence and preferences"; J. Med. Educ. 53: 291-300.

3-Holden, WD and Levit, EF; "migration of physicians from one specialty to another: a longitudinal study of US medical school graduates"; JAMA 239: 205-209.

Phillips, TJ, et. al.; "Family Physician Pathway and Medical Student Career Choice."; JAMA 240: 1736-1741.
=> Special tracks emphasizing family practice increase the yield of students choosing that field.

Zuckerman, HS; "Structural Factors as Determinants of Career Patterns in Medicine"; J. Med. Educ. 53: 453-463.

1979

Cuca, JM; "The specialization and career preferences of women and men recently graduated from US medical schools"; JAMWA 34: 425-435.

Dobmeyer, TW; "Rehabilitation medicine educational experiences: retrospective study of exposure to RM"; Evaluation Health Professions 2: 309-330.
=> Positive exposure increases tendency to choose specialty.

Oates, RP and Feldman, HA; "Longitudinal study of career choices of a SUNY-Upstate cohort of medical students"; J. Community Health 5: 131-139.

Rosenblatt, RA and Alpert, JJ; "The Effect of a Course in Family Medicine on Future Career Choice: A Long-Range Follow-Up of a Controlled Experiment in Medical Education"; J. Fam. Pract. 8: 87-91.

<u>1980</u>

Beil, et. al.; "A comparison of specialty choices among senior medical students using Bem Sex-Role Inventory Scale": JAMWA 35: 178-181.

2-Black, RR, et. al.; "Characteristics and practice patterns of family practice residency graduates in the US"; J. Fam. Pract. 11: 767-778.
=> Those from rural areas tend to practice there.

Carline, JD, et. al.; "Career Preferences of First- and Second-Year Medical Students: The WAMI Experience"; J. Med. Educ. 55: 682-691.

1-Cuca, JM; "1978 US Medical School Graduates: Practice Setting Preferences, Hometowns, and Spouses' Hometowns"; J. Med. Educ. 55: 220-222.

1-Cuca, JM; "1978 US Medical School Graduates: Practice Setting Preferences, Other Career Plans, and Personal Characteristics"; J. Med. Educ. 55: 465-468.

Cuca, J.; "1978 US Medical School Graduates: Career Plans by Racial/Ethnic Identity"; J. Med. Educ. 55: 721-724
=> Same as 1988 Babbott study, except for 1978.

Dallman, JJ, et. al.; "Factors affecting residency program dropouts. A longitudinal study."; J. Fla. Med. Assoc. 67: 833-835.
=> No difference in family practice dropouts in Fla. by sex, marital status, age, ethnic group, citizenship, chidlren, or living location.

Geyman, JP, et. al.; "Graduate follow-up in the U. of Washington family practice residency network"; J. Fam. Pract. 11: 743-752.
=> Male-female attrition rates aproximately equal.

Weisman, CS, et. al.; "Male and Female Physician Career Patterns: Specialty Choices and Graduate Training"; J. Med. Educ. 55: 813-825.
=> Gender difference significant.

1981

Burkett, GL and Kurz, DE; "A comparison of the professional values and career orientations of male and female medical students: Some unintended consequences of US public policy"; Health Policy Educ. 2: 33-45.

Crowder, MK and Hollender, M; "The Medical Student's Choice of Psychiatry as a Career: A Survey of One Graduating Class"; Am. J. of Psychiatry, 135: 505-508.

Davidson, RC, et. al.; "A review of resident dropouts from a family practice residency network"; Fam. Med. 13: 10-13.
=> Women a higher rate of attrition than men, although men's dissatisfaction levels higher.

Harris, MB and Conley-Muth, MA; "Sex role stereotypes and medical specialty choice"; JAMWA 36: 245-252.

Hutt, R, et. al.; "The Timing of and Reason for Doctors' Career Decisions"; Health Bull 39: 173-181.

Weil, PA and Schleiter, MK; "Mational Study of Internal Medicine Manpower: VI/ Factors Predicting Preferences of Residents for Careers in Primary Care or Subspecialty Care amd Clinical Practice of Academic Medicine"; Ann. Intern. Med. 94: 691-703.

2-Willoughby, TL; "Personal characteristics and achievements of medical students from urban and nonurban areas"; J. Med. Educ. 56: 717-726.

1982

Brearley, WD; "Family Practice as a Specialty Choice: Effect of Premedical and Medical Education"; J. Med. Educ. 57: 449-454.
=> Shows that EARLY exposure has little effect on specialty choice. 75% made choice during 3rd or 4th year.

Burkett, GL and Gelula, MH; "Characteristics of Students

Preferring Family Practice/Primary Care Careers"; J. Fam. Pract.
=> MCAT, GPA equivelent in students in 1980 selecting family practice/primary care compared with specialties.

Glasser, M., et. al.; "Career choice from medical school to practice: Findings from a regional clinical education site"; J. Med. Educ. 57: 442-448.

3-Goldsmith, G; "Medical Student Interest in Family Practice: How Is It Changing?"; Fam. Med. 14: 13-16.
=> Massive increase in family practice residency positions, as well.

Goldsmith, G; "Factors Influencing Family Practice Residency Selection: A National Survey"; J. Fam. Pract. 15: 121-124.
=> Stronger department means more students selecting.

Harris, DL, et. al.; "Impact of Participation in a Family Practice Track Program in Student Career Decisions"; J. Med. Educ. 57: 609-614.
=> Increase yield with special program.

Paiva, RE, et. al.; "The Effect of Clinical Experiences in Medical School on Specialty Choice Decisions"; J. Med. Educ. 57: 666-674.
=> Clinical experience a significant factor.

Seltzer, JL and Veloski, J; "Changing specialties: do anesthesiologists differ from other physicians?"; Anesth. Analg. 61: 504-506.

Stephens, GG; "Choosing Family Practice? Report of a Medical Student Survey Class of '81"; Ala. J. Med. Sci. 19: 76-80.
=> Proposes that negative influence of specialists in school must be countered by exposure to general practicioners.

Zimny, GH and Shelton, BR; "Sex differences in medical specialty preferences"; J. Med. Educ. 57: 403-405.

1983

Bowman, MA, et. al.; "Estimates of physician requirements for 1990 for specialties of neurology, anethesiology, nuclear medicine, pathology, PM&R, and radiology: further application of GMENAC methodology"; JAMA 250: 2623-2627.
=> 1990: 4200 PM&R required, 2400 available.

Czinkota, MR and Johnston, WJ; "Choosing a career and specialty: When do students decide?"; Health Care Manage. Rev. 1983: 43-51.

4-DiTomasso, RA, et. al.; "Factors Influencing Program Selection Among Family Practice Residents"; J. Med. Educ. 58: 527-533.

3-Markert, RJ; "Change in Specialty Choice during Medical School"; J. Fam. Practice 2: 295-300.
=> Summary of 12 studies 1967-1982 that show a dramatic decrease in student interest in family practice between first and last years of medical schools.

Markert, RJ; "Stability and change in medical specialty choice in US medical schools"; J. Med. Educ. 58: 589-590.
=> Evidence that many students make their choices early and do not change.

Ramsdell, JW; "The timing of career decisions in internal medicine"; J. Med. Educ. 58: 547-554.

Samra, SK, et. al.; "The Effect of Clinical Clerkship on Attitudes of Medical Students Towards Anesthesiology"; J. Med. Educ. 58: 641-647.

Scher, ME, et. al.; "Specialization in Psychiatry: What Determines the Medical Student's Choice Pro or Con?"; Compr. Psychiatry 24: 459-468.

Seltzer, JL and Veloski, J.; "Migration of physicians to and from anesthesiology"; Anesth. Analg. 62: 702.

1984

Cameron, PM and Persad, E; "Recruitment into psychiatry: a study of the timing and process of choosing psychiatry as a career choice"; Canadian J. of Psychiatry 29: 676-680.

Chandra, P and Hughes, M; "Factors Affecting the Choice of Anesthesiology by Medical Students for Specialty Training"; J. Med. Educ. 59: 323-330.

DeLeo, D, et. al.; "Eysenck Personality Inventory and choice of psychiatry as a career"; Psychological Reports 54: 18.

Fadem, BH, et. al.; "Predicting medical specialty choice: A model based on students' records"; J. Med. Educ. 59: 407-415.

Katz, LA, et. al.; "The Role of Negative Factors in Changes in Career Selection by Medical Students"; J. Med. Educ. 59: 285-290.
=> Some students change from family practice decisions because of negative impression given in medical school.

Markert, RJ and Rodin, AE; "Switch: an investigation of change

during medical school"; Ohio State Med. J. 80:646-649.
=> MCAT preference stability through medical school of graduates of a midwestern US medical school

Thomae-Forgues, M, et. al.; "Curriculum evaluation, education financing, and career plans of 1983 medical school graduates"; J. Med. Educ. 59: 691-698.

Weisman, CS; "Gender composition of medical schools and specialty choice of graduates"; J. Med. Educ. 59: 347-349.

1985

Adler, R, et. al.; "Timing and Motivation in Pediatric Career Choices"; J. Med. Educ. 60: 174-180.

Bazzoli, G.; "Medical Education Indebtedness: Does it Affect Specialty Choice?"; Health Affairs 4(2): 98-104.
=> Tendency to choose primary care residencies increased with increased indebtedness in the form of subsidized loans (GSL, NDSL, HPSL) that had to be paid back during residency
=> Increased indebtedness in the form of HEAL significantly less tendency to enter primary care.
=> Overall, however, indebtedness less significant than marital status, spouse earnings, and parental education/SEC/ethnic group.

Bazzoli, GJ; "Does Educational Indebtedness Influence Physician Specialty Choice?"; J. Health Economics 4: 1-19.

Rosevear, GC, et. al.; "Relationship between specialty choice and acadmic performance"; J. Med. Educ. 60: 640-641.

Wilson, JL and Hallett, J; "Students' Attitudes Toward Career Choice: A Family Practice Perspective"; J. Med. Educ. 60: 56-58.

1986

Adams, EK and Bazzoli, G; "Career Plans of Women and Minority Physicians: Implications for Health Manpower Policy"; J. Am. Med. Wom. Assoc. 41: 17-20.
=> Race does not affect specialty choice overall

Bazzoli, G, et. al.; "Race and Socioeconomic Status in Medical School Choice and Indebtedness"; J. Med. Educ. 61: 285-292.
=> In the past, minority students from low-income families tend towards primary care

Bender, L., et. al.; "Medical School Effect on Student Selection of Physical Medicine and Rehabilitation as a

Specialty"; Arch. Phys. Med. Rehabilitation 67: 783-789.
=> In general, summarized previous studies that indicated that additional courses, clerkships, etc., as an intervention, failed to increase the number of students that elected to go into PM&R.
=> Exposure in the fourth year is generally considered far too late to be a factor.
=> Foreign medical graduates used to be super significant (50%--1983-1984) factors in filling PMR residencies, but this is declining (40%).
=> Small advantages if the medical school has a PMR residency associated, or if have a major PMR department.
=> Small disadvantage if the medical school has a small PMR section rather than nothing at all.

Bowman, MA; "Specialty choice of black physicians" J. of the National Medical Association 78: 13-15.

Greco, RS, et. al.; "Career development of residents in university and independent training programs: the influence of special training fellowships, type of practice, specialization, and research"; Surgery 100: 312-320.

Hadac, RR, et. al.; "Sex differences in student preferences for family medicine"; Family Medicine 18: 42-43.

Iglehart, JK; "The future supply of physicians"; NEJM 314: 860-864.

Meir, EI and Engel, K; "Interests and specialty choice in medicine"; Social Science and Medicine 23: 527-530.

Rabinowitz, HK; "Estimating the percentage of primary care rural physicians produced by regular and special admissions policies"; J. Med. Educ. 61: 598-600.
=> Although distribution problem seems to be improving, these small gains may be reversed by changes in policy designed to address the national oversupply of physicians.

Savickas, ML, et. al.; "Difficulties experienced by medical students in choosing a specialty"; J. Med. Educ. 61: 467-469.

Schmittling, G, et. al.; "Entry of US medical school graduates into family practice residencies: 1983-1984"; Fam. Med. 18: 296-300.

Shelley, RK and Webb, MG; "Does clinical clerkship alter students' attitudes to a career choice of psychiatry?"; Med. Educ. 20: 330-334.

Tardiff, K, et. al.; "Selection and Change of Specialties by

Medical School Graduates"; J. Med. Educ. 61: 790-796.

Zimny, GH and Sata, LS; "Influence of factors before and during medical school on choice of psychiatry as a specialty"; American J. of Psychiatry 143: 77-80.

1987

Allen, SS, et. al.; "Effect of Early Exposure to Family Medicine on Students' Attitudes Toward the Specialty"; J. Med. Educ. 62: 911-917.
=> Little effect.

Calkins, EV, et. al.; "Gender and psychosocial factors associated with specialty choice"; JAMWA 42: 170-172.

Dial, TH and Eliot, PR; "Relationship of Scholarships and Indebtedness to Medical Students' Career Plans"; J. Med. Educ. 62: 316-324.
=> Indebtedness insignificant factor.

2-Dial, TH and Lindley, DW; "Predictive Validity of Specialty Choice Data from AAMC Graduation Questionnaire"; J. Med. Educ. 62: 955-958.

Duthrie, EH, et. al.; "Fourth-year students preference for geriatrics as a career"; J. Med. Educ. 62: 511-514.

Jewett, LS; "Another look at career choice and learning preferences"; Medical Education 21: 244-249.

Markert, RJ; "Gender differences in the choice of a primary care medical specialty"; J. Med. Educ. 62: 601-603.

McCarty, DJ; "Why are Today's Medical Student's Choosing High Technology Specialties over Internal Medicine?"; NEJM 317: 567-569.
=> Interest in primary care declining.

Medder, J., et. al.; "Content of a preceptorship experience: effects of location, gender, and specialty choice"; Family Practice Research Journal 6: 215-224.

Sledge, WH, et. al.; "Applicants' Choice of Residency Training Programs"; Am. J. Psychiatry 144: 501-503.

Smith, RD and Prichard, RW; "A survey of first-year pathology residents: factors in career choice"; Human Pathology 18: 1089-1096.

Taggart, MP and Workman, SA; "An analysis of medical students residency and specialty choices"; Soc. Sci. Med. 25: 1063-

1068.

1988

Babbott, D., et. al.; "The Stability of Early Specialty Preferences Among US Medical School Graduates in 1983"; JAMA 259: 1970-1975.
=> Comparison between PSQ and GQ for medical school class of '83. Detailed breakdown of specialties and non-specialties, with general trend away from primary care, and toward specialties and support services.

3-Bowman, M.; "Family Practice Resident Attrition: Reasons and Rates by Sex"; Family Medicine 20(4): 257-261.
=> Rates of family practice attrition approximately 12.4% overall, due primarily to switching specialties, private practice,, incoluntary.
=> Higher female attrition rate, but not significant.

1-Colwill, J.; "Primary Care Education: Shortage of Position and Applicants"; Family Medicine 20(4): 250-254.
=> An inadequate proportion of medical school graduates is currently preparing for primary care careers.
=> Interest in primary care is waning.
=> Related to changing values of students as well as curricula of medical schools (specialists oriented).
=> Changes to reverse: curriculum, admissions, financial.

Ebbesson, SO; "The Alaska WAMI Program: a preliminary study of factors affecting specialty choice and practice location"; Alaska Med. 30: 55-60.

Edwards, JC, et. al.; "Changes in student attitudes towards family medicine: A four-year study"; Fam. Med. 20: 211-214.

Friedman, CP and Slatt, LM; "New results relating the Myers-Briggs Type Indicator and medical specialty choice"; J. Med. Educ. 63: 325-327.

Graettinger, JS; "Internal Medicine in the NRMP 1987: The Ides of March"; Ann. Intern. Med. 108: 101-115.
=> Unfilled residency positions in IM cause concern.

Hafferty, FW and Boulger, JG; "Medical students view family practice"; Fam. Med. 20: 277-281.

Klug, J; "AIDS Fears Affect Medical Students' Career Moves"; Clin. Psychiatric News 2: 2-21.

Montano, DE, et. al.; "A survey of fourth-year medical students' decisions regarding family practice as a career"; J. Med. Educ. 63: 830-838.

Onady, AA, et. al.; "Effects of stress and social phobias on medical students' specialty choice"; J. Med. Educ. 63: 162-170.

Rabinowitz, HK; "The Relationship between Medical Student Career Choice and a required Third Year Family Practice Clerkship"; Fam. Med. 20: 118-121.
=> Some evidence present that this increases yield.

Rabinowitz, H.; "Evaluation of a Selective Medical School Admissions Policy to Increase The Number of Family Physicians in Rural and Underserved Areas"; NEJM 319: 480-486.
=> Special program with preferred admissions and special financial aid programs to students exhibiting interest in family/general practice and serving in underserved areas showed exceptional capacity to increase proportion of students doing just that.

Tudor, C; "Career Plans and Debt Levels of Graduating US Medical Students 1981-1986"; J. Med. Educ. 63: 271-275.
=> Decrease in primary care primarily due to decrease in general internal medicine.

2-Tudor, C; "G. DataWatch: Medical Students' Specialty Choices: The Case of Internal Medicine"; Health Affairs 7: 37-41.
=> Decline in total number of applicants for residencies in IM.

1989

Anders, DL, et. al.; "Lack of recognition of internal medicine as a specialty: a factor in medical student career choice?"; Southern Medical Journal 82: 411-413.

3-Babbott, D., et. al., "Trends in Evolution of Specialty Choice Comparison of US Medical School Graduates in 1983 and 1987"; JAMA 261: 2367-2373.
=> Followed class of'87 cohort through medical school, then compared them as seniors to class of '83. Noted increasing interest in general internal medicine, and then subsequently in an internal medicine subspecialty, psychiatry, OB/GYN, anesthesiology, rehabilitation, and radiology. Became less interested in family practice, general surgery, pathology, and public health.
=> Compared with 1983, less likely to choose general internal medicine and more like to choose internal medicine and pediatric subspecialties.
=> Differences between male and female were noted.

Babbott, D., et. al.; "Racial-Ethnic Background and Specialty Choice: A Study of U.S. Medical School Graduates in 1987";

Academic Medicine 64: 595-599.
=> AAMC, PSQ, GQ data used to determine that while racial-ethnic background was a factor in pre-med choices for residency, the medical school experience/passage of time resulted in a conformity that obliterated any significant difference at the time of graduation.

Babbott, D., et. al.; "Personal characteristics, career plans, and specialty choices of medical students elected to Alpha Omega Alpha"; Archives of Internal Medicine 149: 576-580.

Campos-Outcalt, D. and Senf, J.; "Characteristics of Medical Schools Related to the Choice of Family Medicine as a Specialty"; Academic Medicine 64: 610-615.
=> Summarized previous studies stating that there has been a general decline in interest in family practice, and this decline in interest occurs between the first and last years of medical school. Also that programs that emphasize family practice produce an increased percentage of students interested in family practice. But singular, early exposure have not been consistently shown to make a difference. Third year clerkships were the most significant. Other factors: geographic location, type of ownership, indebtedness.
=> Study examined 1) training time, 2) timing, 3) type of school ownership, 4) geographic location, and 5) the administrative structure of the family practice section. Found that only 1) and 3) were significant.

Coffin, S. and Babbott, D.; "Early and Final Preferences for Pediatrics as a Specialty: A Study of US Medical School Graduates in 1983"; Academic Medicine 64: 600-605.
=> From PSQ to GQ, proportion of women indicating a preference for pediatrics increased 11.5% to 13.5%), while proportion of men decreased (5.9% to 4.8%), with women higher in both cases.
=> 31.3% female and 14.6% male did not change from one to the next. Of those that changed, 51% female and 42% male switched to another specialty within primary care.
=> More of both genders switched from family practice to pediatrics than kept their preference for pediatrics.

Eschenbach, K. and Woodward, RS; "Medicine as a career: choices and consequences"; Theoretical Medicine 10: 217-229.

Ezersky, S, et. al.; "Specialty choice in occupational therapy"; American J. of Occupational Therapy 43: 227-233.

3-Golden, W.; "Initial Career Choices of Medical School Honors Graduates in the Early 1970s and 1980s"; Academic Medicine 64: 616-621.
=> '72,'73 and '82,'83 honors graduates were combined to

represent 70s and 80s respectively. Results showed significant declines in internal medicine, and increases in radiology. Men gravitated towards surgery, while women gravitated towards pediatrics and OB-GYN.
=> Of primary care, only internal medicine attracted fewer.
=> Neurology, urology, radiology, otolaryngology, opthalmology increased.
=> Internal medicine, neurosurgery, plastic surgery, pathology declined,
=> Increasing females showed to have significant affect on distribution.

Greer, T and Carline, JD; "Specialty choice by medical students: recent graduate follow-up survey at the University of Washington"; Family Medicine 21: 127-131.

Lieu, T., et. al.; "Specialty Choices at One Medical School: Recent Trends and Analysis of Predictive Factors"; Academic Medicine 64: 622-629.
=> UCSF classes 1982 through 1988 saw no significant trends away from family practice, internal medicine, psychiatry, and pediatrics (personal care specialties). NOTE: Different classifications than most studies.
=> Those entering personal care specialties were significantly older, female, and less minority students.
=> Students surveyed indicated that income and lifestyle factors were less significant influence factors than are medical school experiences and intrinsic qualities of the chosen specialties. But students who chose technology-oriented specialties rated higher such factors as the ability to do procedures, level of income, and lesser degree of uncertainty, and rated lower such factors as less time. AIDS exposure and indebtedness were the least significant factors.
=> Selected pre-admission characteristics (age, sex, minority status) correlate strongly with specialty choice.
=> Noted that UCSF was somewhat unusual relative to the average medical school.

Mowbry, RM; "Research in choice of medical specialty: a review of the literature 1977-1987"; Australian and New Zealand J. Of Medicine 19: 389-399.

Ness, R., et. al.; "Likelihood of Contact with AIDS Patients as a Factor in Medical Students' Residency Selections"; Academic Medicine 64: 588-594.
=> NRMP data in 1980, 1983, and 1987 were used to examine changes over time in residency composition in cities with high concentrations of AIDS patients. Surgery residents less likely to choose high-risk cities in 1987 compared

with 1980/1983. Proportion more significant for medical students from schools located in high-risk cities,
=> Decline in internal medicine regardless of location.

Nieman, LZ, et. al.; "Specialty career decision making of third-year medical students"; Family Medicine 21: 359-363.

Potts, MJ and Brazeau, NK; "The effect of first clinical clerkship on medical student specialty choices"; Medical Education 23: 413-415.

Rezler, AG. and Kalishman, SG.; "Who Goes Into Family Medicine?"; The J. of Fam. Pract. 29: 652-656.

Schwartz, R., et. al.; "Controllable Lifestyle: A New Factor in Career Choice by Medical Students"; Academic Medicine 64: 606-609.
=> Top 15% of medical students studied, in which all controllable lifestyle residencies received significant increases in entering students, while non-CL residencies experienced a decline.

Schwartz, RW, et. al.; "Career change: in quest of a controllable lifestyle"; J. of Surgical Research 47: 189-192.

Wittman, PP, et. al.; "Variables affecting specialty choice in occuptational therapy"; American J. of Occupational Therapy 43: 602-606.

1990

Arnold, RM., et. al.; "The Role of Partners in Selecting a Residency"; Academic Medicine 65: 211-215.

Psykoty, CE, et. al.; "Malpractice litigation as a factor in choosing a medical specialty"; Western J. of Medicine 152: 309-312.

Rabinowitz, HK; "The change in specialty preference by medical students over time: an analysis of students who prefer family medicine"; Family Medicine 22: 62-63.

Schubiner, H. and Mullan, P.; "Medical student interest in combined internal medicine-pediatrics"; J. of General Internal Medicine 5: 225-228.

Schwartz, RW, et. al.; "The Controllable Lifestyle Factor and Students' Attitudes about Specialty Selection"; Academic Medicine 65: 207-210.

1-Senf, JH; "Specialty selection: trends over time in one medical school"; J. Family Practice 30: 217-218.

Senst, BL and Scott, BE; "Factors that influence residency applicants in the selection of a specific program"; American J. of Hospital Pharmacy 47: 1094-1096.

Simmonds, AC., et. al.; "Factors Important to Students in Selecting a Residency Program"; Academic Medicine 65: 640-643.

Taylor, A., et. al.; "Personality Types of Family Practice Residents in the 1980s"; Academic Medicine 65: 216-218.

Appendix II

Literature Search Time Line-- Starting Batch Studies

Key
*: Studies from the Starting Batch that qualified for the Final Batch.
**: Studies from the Starting Batch that qualified for the Singles Batch.

1963

1. Schumaker, CF; Interest and Personality Factors as Related to Choice of Medical Career"; J. Med. Educ. 38: 932-942.

1964

2. Bruhn, JG and Parsons, OA; "Medical Student Attitudes Toward Four Medical Specialties"; J. Med. Educ. 39: 40-49.

3. Schumaker, CF; "Personal characteristics of students choosing different types of medical careers"; J. Med. Educ. 39: 278-288.

1965

4. Boverman, H.; "Senior Student Career Choices in Retrospect"; J. Med. Educ. 40: 161-165.

5. Bruhn, JG and Parsons, OA; "Attitudes Toward Medical Specialties: Two Follow-Up Studies"; J. Med. Educ. 40: 273-280.

6. Livingston, PB and Zimet, CN; "Death Anxiety, Authoritarianism, and Choice of Specialty in Medical Students"; J. Nerv. Ment. Dis. 140: 222-230.

1967

*7. Kritzer, H and Zimet, CN; "A Retrospective View of Medical Specialty Choice"; J. Med. Educ. 42: 47-53.

1968

8. Yufit, RI, et. al.; "Medical specialty choice and personality"; Arch. Gen. Psychiatry 20: 89-99.

1969

9. Wasserman, E, et. al.; "Medical specialty choice and

personality. II. Outcome and post-graduate follow-up results"; Arch. Gen. Psychiatry 21: 529-535.

1970

10. Breed, JE; "The Plans of Our Doctors in Training"; Ill. Med. J. 138: 536-537.

11. Monk, MA and Thomas, CB; "Characteristics of Male Medical Students Related to their Subsequent Careers"; Johns Hopkins Med. J. 127: 254-272.

12. Slater, SB, Chyatte, SB; "Evaluation of effects on medical students of introductory course in rehabilitation medicine"; Arch. Phys. Med. Rehab. 51: 558-564.

1971

13. Paiva, REA and Haley, HB; "Intellectual, personality, and environmental factors in career specialty preferences"; J. Med. Educ. 46: 281-289.

1972

14. Donovan, JC, et. al.; "Studies in Medical Education: Career Choice Consistency in Medical Students"; Am. J. Obstet. Gynecol. 112: 519-526.

*15. Fishman, DB and Zimet, CN; "Specialty Choice and Beliefs About Specialties Among Freshman Medical Students"; J. Med. Educ. 47: 524-533.

*16. Geertsma, RH and Grinols, DR; "Specialty Choice in Medicine"; J. Med. Educ. 47: 509-517.

*17. Herrman, TJ; "Influence of 'all elective' fourth year on career goal selection"; J. Med. Educ. 47: 518-523.

1973

18. Mattson, DE, et. al.; "Evaluation of a program designed to produce rural physicians"; J. Med. Educ. 48: 323-331.

*19. Otis, GD and Weiss, JR; "Patterns of Medical Career Preference"; J. Med. Educ. 48: 116-1123.

20. Schroeder, SA and Schliftman, A; "The influence of medical school on selection of career specialties"; Med. Ann. DC 42: 339-343.

1974

20. Oates, RP and Feldman, HA; "Patterns of Chnage in Medical Student Career Choices"; J. Med. Educ. 49: 562-569.

21. Paiva, RE, et. al.; "Factors in Internship Choice"; J. Med. Educ. 49: 343-350.

1975

22. Anderson, RBW; "Choosing Medical Specialty: Critique of Literature in Light of 'Curious Findings'; J. Health Soc. Behavior 16: 156-162.

23. Collins, F and Roessler R; " Intellectual and Attidudinal Characteristics of Medical Students Selecting Family Practice"; J. Fam. Practice 2: 431-432.

24. Held, ML and Zimet, CN; "A longitudinal study of medical specialty choice and certainty level"; J. Med. Educ. 50: 1044-1051

25. Mitchell, WD; "Medical Student Career Choice: A Conceptualization"; Soc. Sci. Med. 9: 641-653.

26. Weinstein, P and Gipple, C; "Some Determinants of Career Choice in the Second Year of Medical School"; J. Med. Educ. 50: 194-198.

*27. Zimet, CN and Held, ML; "The development of views of specialties during four years of medical school"; J. Med. Educ. 50: 157-166.

1976

28. Beering, SC; "Should the Medical Curriculum Be Modified to Influence Career Choice and If So, How?"; Bull. NY Acad. Med. 52: 1091-1108.

29. Cullison, S, et. al.; "Medical school admissions, specialty selection, and distribution of physicians"; JAMA 235: 502-505.

1977

30. Beck, JD, et. al.; "The Effect of the Organization and Status of Family Practice Undergraduate Programs on Residency Selection"; J. Fam. Pract. 4: 663-669.

31. Gough, HG and Ducker, DG; "Social Class in Relation to Medical School Performance and Choice of Specialty"; J. Psychol. 96: 31-43.

*32. Herman, MW and Veloski, J; "Family medicine and primary

care: trends and student characteristics"; J. Med. Educ 52: 99-106.

*33. Matteson, MT and Smith, SV; "Selection of medical specialties: preference versus choices"; J. Med. Educ. 52: 548-554.

*34. McGrath, E and Zimet CN; "Female and male medical students: Differences in specialty choice selection and personality"; J. Med. Educ. 52: 293-300.

83. Nieman, LZ, et. al.; "Career preferences and decision-making habits of first-year medical students"; J. Med. Educ. 52: 78-81.

35. Skipper, JK and Gliebe, WA; "Forgotten Persons: Physicians' Wives and their Influence on Medical Career Decisions"; J. Med. Educ. 52: 764-765.

*36. Yancik, R; "Time of decision to study medicine: It's relation to specialty choice"; J. Med. Educ 52:78-81.

37. Zuckerman, HS; "Evaluation of the Literature on Career Choice Within Medicine"; Med. Care Rev. 34: 1079-1100.

1978

38. Asken, MJ and Strock, BK; "Expressed Reasons for the Choice of Residency in Family Practice"; J. Fam. Pract. 6: 809-813.

39. Eagleson, BK and Tobolic, T; "A Survey of Students Who Chose Family Practice Residencies"; J. Fam. Pract. 6: 111-118.

*40. Gough, HG; "Some predictive implications of premedical scientific competence and preferences"; J. Med. Educ. 53: 291-300.

41. Phillips, TJ, et. al.; "Family Physician Pathway and Medical Student Career Choice."; JAMA 240: 1736-1741.

42. Zuckerman, HS; "Structural Factors as Determinants of Career Patterns in Medicine"; J. Med. Educ. 53: 453-463.

1979

43. Dobmeyer, TW; "Rehabilitation medicine educational experiences: retrospective study of exposure to RM"; Evaluation Health Professions 2: 309-330.

*44. Rosenblatt, RA and Alpert, JJ; "The Effect of a Course

in Family Medicine on Future Career Choice: A Long-Range Follow-Up of a Controlled Experiment in Medical Education"; J. Fam. Pract. 8: 87-91.

1980

45. Beil, et. al.; "A comparison of specialty choices among senior medical students using Bem Sex-Role Inventory Scale": JAMWA 35: 178-181.

75. Black, R, et. al.; "Characteristics and Practice Patterns of Family Practice Residency Graduates in the United States"; J. Fam. Pract. 11: 767-778.

46. Carline, JD, et. al.; "Career Preferences of First- and Second-Year Medical Students: The WAMI Experience"; J. Med. Educ. 55: 682-691.

47. Cuca, JM; "1978 US Medical School Graduates: Practice Setting Preferences, Hometowns, and Spouses' Hometowns"; J. Med. Educ. 55: 220-222.

48. Weisman, CS, et. al.; "Male and Female Physician Career Patterns: Specialty Choices and Graduate Training"; J. Med. Educ. 55: 813-825.

1981

49. Burkett, GL and Kurz, DE; "A comparison of the professional values and career orientations of male and female medical students: Some unintended consequences of US public policy"; Health Policy Educ. 2: 33-45.

50. Crowder, MK and Hollender, M; "The Medical Student's Choice of Psychiatry as a Career: A Survey of One Graduating Class"; Am. J. of Psychiatry, 135: 505-508.

51. Harris, MB and Conley-Muth, MA; "Sex role stereotypes and medical specialty choice"; JAMWA 36: 245-252.

*52. Weil, PA and Schleiter, MK; "Mational Study of Internal Medicine Manpower: VI/ Factors Predicting Preferences of Residents for Careers in Primary Care or Subspecialty Care amd Clinical Practice of Academic Medicine"; Ann. Intern. Med. 94: 691-703.

1982

**53. Brearley, WD; "Family Practice as a Specialty Choice: Effect of Premedical and Medical Education"; J. Med. Educ. 57: 449-454.

54. Burkett, GL and Gelula, MH; "Characteristics of Students Preferring Family Practice/Primary Care Careers"; J. Fam. Pract.

55. Glasser, M., et. al.; "Career choice from medical school to practice: Findings from a regional clinical education site"; J. Med. Educ. 57: 442-448.

56. Goldsmith, G; "Factors Influencing Family Practice Residency Selection: A National Survey"; J. Fam. Pract. 15: 121-124.

57. Harris, DL, et. al.; "Impact of Participation in a Family Practice Track Program in Student Career Decisions"; J. Med. Educ. 57: 609-614.

*58. Paiva, RE, et. al.; "The Effect of Clinical Experiences in Medical School on Specialty Choice Decisions"; J. Med. Educ. 57: 666-674.

59. Stephens, GG; "Choosing Family Practice? Report of a Medical Student Survey Class of '81"; Ala. J. Med. Sci. 19: 76-80.

*60. Zimny, GH and Shelton, BR; "Sex differences in medical specialty preferences"; J. Med. Educ. 57: 403-405.

1983

61. Czinkota, MR and Johnston, WJ; "Choosing a career and specialty: When do students decide?"; Health Care Manage. Rev. 1983: 43-51.

62. Markert, RJ; "Change in Specialty Choice during Medical School"; J. Fam. Practice 2: 295-300.

63. Ramsdell, JW; "The timing of career decisions in internal medicine"; J. Med. Educ. 58: 547-554.

64. Samra, SK, et. al.; "The Effect of Clinical Clerkship on Attitudes of Medical Students Towards Anesthesiology"; J. Med. Educ. 58: 641-647.

65. Scher, ME, et. al.; "Specialization in Psychiatry: What Determines the Medical Student's Choice Pro or Con?"; Compr. Psychiatry 24: 459-468.

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66. Chandra, P and Hughes, M; "Factors Affecting the Choice of Anesthesiology by Medical Students for Specialty Training"; J. Med. Educ. 59: 323-330.

67. DeLeo, D, et. al.; "Eysenck Personality Inventory and choice of psychiatry as a career"; Psychological Reports 54: 18.

*68. Fadem, BH, et. al.; "Predicting medical specialty choice: A model based on students' records"; J. Med. Educ. 59: 407-415.

69. Katz, LA, et. al.; "The Role of Negative Factors in Changes in Career Selection by Medical Students"; J. Med. Educ. 59: 285-290.

70. Thomae-Forgues, M, et. al.; "Curriculum evaluation, education financing, and career plans of 1983 medical school graduates"; J. Med. Educ. 59: 691-698.

71. Weisman, CS; "Gender composition of medical schools and specialty choice of graduates"; J. Med. Educ. 59: 347-349.

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72. Adler, R, et. al.; "Timing and Motivation in Pediatric Career Choices"; J. Med. Educ. 60: 174-180.

73. Bazzoli, G.; "Medical Education Indebtedness: Does it Affect Specialty Choice?"; Health Affairs 4(2): 98-104.

*74. Bazzoli, GJ; "Does Educational Indebtedness Influence Physician Specialty Choice?"; J. Health Economics 4: 1-19.

75. See 1980.

76. Rosevear, GC, et. al.; "Relationship between specialty choice and acadmic performance"; J. Med. Educ. 60: 640-641.

77. Wilson, JL and Hallett, J; "Students' Attitudes Toward Career Choice: A Family Practice Perspective"; J. Med. Educ. 60: 56-58.

1986

78. Adams, EK and Bazzoli, G; "Career Plans of Women and Minority Physicians: Implications for Health Manpower Policy"; J. Am. Med. Wom. Assoc. 41: 17-20.

79. Bazzoli, G, et. al.; "Race and Socioeconomic Status in Medical School Choice and Indebtedness"; J. Med. Educ. 61: 285-292.

80. Bender, L., et. al.; "Medical School Effect on Student Selection of Physical Medicine and Rehabilitation as a Specialty"; Arch. Phys. Med. Rehabilitation 67: 783-789.

**81. Hadac, RR, et. al.; "Sex differences in student preferences for family medicine"; Family Medicine 18: 42-43.

82. Meir, EI and Engel, K; "Interests and specialty choice in medicine"; Social Science and Medicine 23: 527-530.

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88. Zimny, GH and Sata, LS; "Influence of factors before and during medical school on choice of psychiatry as a specialty"; American J. of Psychiatry 143: 77-80.

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**89. Allen, SS, et. al.; "Effect of Early Exposure to Family Medicine on Students' Attitudes Toward the Specialty"; J. Med. Educ. 62: 911-917.

90. Calkins, EV, et. al.; "Gender and psychosocial factors associated with specialty choice"; JAMWA 42: 170-172.

*91. Dial, TH and Eliot, PR; "Relationship of Scholarships and Indebtedness to Medical Students' Career Plans"; J. Med. Educ. 62: 316-324.

92. Duthrie, EH, et. al.; "Fourth-year students preference for geriatrics as a career"; J. Med. Educ. 62: 511-514.

93. Jewett, LS; "Another look at career choice and learning preferences"; Medical Education 21: 244-249.

94. Markert, RJ; "Gender differences in the choice of a primary care medical specialty"; J. Med. Educ. 62: 601-603.

95. McCarty, DJ; "Why are Today's Medical Student's Choosing High Technology Specialties over Internal Medicine?"; NEJM

317: 567-569.

96. Medder, J., et. al.; "Content of a preceptorship experience: effects of location, gender, and specialty choice"; Family Practice Research Journal 6: 215-224.

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98. Smith, RD and Prichard, RW; "A survey of first-year pathology residents: factors in career choice"; Human Pathology 18: 1089-1096.

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*99. Babbott, D., et. al.; "The Stability of Early Specialty Preferences Among US Medical School Graduates in 1983"; JAMA 259: 1970-1975.

100. Ebbesson, SO; "The Alaska WAMI Program: a preliminary study of factors affecting specialty choice and practice location"; Alaska Med. 30: 55-60.

101. Edwards, JC, et. al.; "Changes in student attitudes towards family medicine: A four-year study"; Fam. Med. 20: 211-214.

102. Friedman, CP and Slatt, LM; "New results relating the Myers-Briggs Type Indicator and medical specialty choice"; J. Med. Educ. 63: 325-327.

103. Hafferty, FW and Boulger, JG; "Medical students view family practice"; Fam. Med. 20: 277-281.

104. Klug, J; "AIDS Fears Affect Medical Students' Career Moves"; Clin. Psychiatric News 2: 2-21.

**105. Montano, DE, et. al.; "A survey of fourth-year medical students' decisions regarding family practice as a career"; J. Med. Educ. 63: 830-838.

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Appendix III:

Tables A1-A13, B1-B13, C1-C13

Starting Batch Factor Assessments

Symbols Key
+: represents a factor that the indicated study found to have an influence on or have a relationship to the medical student specialty choice decision process.
0: represents a factor that the indicated study found to have relatively little to no influence on or have little to no relationship to the medical student specialty choice decision process.
X: represents a factor that the indicated study's results could not be interpreted for a specific factor's affects on medical student choice of specialty.

Note: All factors were assessed in this study relative to their importance to or their relationship to medical student choice of a primary care specialty. 'X' factors often are those factors with mixed results (e.g. important for internal medicine but not family practice, or important for both family practice and surgery).

TABLE A1: Starting Batch First Group of Factors, Studies 1-10										
	1	2	3	4	5	6	7	8	9	10
GEOGRAPHIC LOCATION										
Hometown										
Hometown SES										+
Hometown Rural/Urban			+							
MEDICAL SCHOOL										
Academic Performance										
Classroom										
Clinical Rotations										
Experience with Residents										
Experience with Faculty										
Faculty Attitudes Towards Specialty										
Peer Group Attitudes										
Location										
Public vs. Private										
Research Experience										
Year I/II Curriculum										
Year III/IV Curriculum										
+/- Course										
+/- Rotation										
+/- Department										
PATIENT POPULATION										

TABLE A2: Starting Batch										
First Group of Factors, Studies 11-20										
	11	12	13	14	15	16	17	18	19	20
GEOGRAPHIC LOCATION										
Hometown		+								
Hometown SES										
Hometown Rural/Urban		+		+						
MEDICAL SCHOOL										
Academic Performance	+									
Classroom										
Clinical Rotations										
Experience with Residents										
Experience with Faculty										
Faculty Attitudes Towards Specialty										
Peer Group Attitudes										
Location										
Public vs. Private										
Research Experience										
Year I/II Curriculum										
Year III/IV Curriculum							+			
+/- Course										
+/- Rotation										
+/- Department										
PATIENT POPULATION										

TABLE A3: Starting Batch First Group of Factors, Studies 21-30	21	22	23	24	25	26	27	28	29	30
GEOGRAPHIC LOCATION										
Hometown										
Hometown SES										
Hometown Rural/Urban									+	
MEDICAL SCHOOL					+					
Academic Performance										
Classroom										
Clinical Rotations										
Experience with Residents										
Experience with Faculty										
Faculty Attitudes Towards Specialty										
Peer Group Attitudes							+			
Location										
Public vs. Private										
Research Experience										
Year I/II Curriculum								+		
Year III/IV Curriculum								+		
+/- Course								+		+
+/- Rotation								+		+
+/- Department										+
PATIENT POPULATION				+						

TABLE A4: Starting Batch										
First Group of Factors, Studies 31-40										
	31	32	33	34	35	36	37	38	39	40
GEOGRAPHIC LOCATION										
Hometown									+	
Hometown SES										
Hometown Rural/Urban										
MEDICAL SCHOOL										
Academic Performance	+	+								
Classroom	+	+								+
Clinical Rotations	+	+								+
Experience with Residents										
Experience with Faculty										
Faculty Attitudes Towards Specialty									+	
Peer Group Attitudes									+	
Location										
Public vs. Private										
Research Experience										
Year I/II Curriculum									+	
Year III/IV Curriculum									+	
+/- Course										
+/- Rotation										
+/- Department										
PATIENT POPULATION			+							

TABLE A5: Starting Batch										
First Group of Factors, Studies 41-50										
	41	42	43	44	45	46	47	48	49	50
GEOGRAPHIC LOCATION										
Hometown										
Hometown SES										
Hometown Rural/Urban	+					+	+			
MEDICAL SCHOOL										
Academic Performance										
Classroom										
Clinical Rotations										
Experience with Residents										
Experience with Faculty	+									
Faculty Attitudes Towards Specialty										+
Peer Group Attitudes										
Location										
Public vs. Private										
Research Experience										
Year I/II Curriculum										
Year III/IV Curriculum			+							
+/- Course			+							
+/- Rotation	+		+							+
+/- Department	+									+
PATIENT POPULATION										

TABLE A6: Starting Batch										
First Group of Factors, Studies 51-60										
	51	52	53	54	55	56	57	58	59	60
GEOGRAPHIC LOCATION										
Hometown			+							
Hometown SES										
Hometown Rural/Urban										
MEDICAL SCHOOL		+								
Academic Performance		+								
Classroom										
Clinical Rotations										
Experience with Residents			+			+		+		
Experience with Faculty								+		
Faculty Attitudes Towards Specialty		+	+			+				
Peer Group Attitudes								+		
Location										
Public vs. Private										
Research Experience										
Year I/II Curriculum			+							
Year III/IV Curriculum			+							
+/- Course			+							
+/- Rotation										
+/- Department						+				
PATIENT POPULATION										

TABLE A7: Starting Batch										
First Group of Factors, Studies 61-70										
	61	62	63	64	65	66	67	68	69	70
GEOGRAPHIC LOCATION										
Hometown										
Hometown SES										
Hometown Rural/Urban										
MEDICAL SCHOOL										
Academic Performance								+		
Classroom										
Clinical Rotations								+		
Experience with Residents					+	+				
Experience with Faculty				+	+	+				
Faculty Attitudes Towards Specialty					+					
Peer Group Attitudes			+							
Location										
Public vs. Private										
Research Experience										
Year I/II Curriculum					+				+	
Year III/IV Curriculum					+				+	
+/- Course										
+/- Rotation				+						
+/- Department						+				
PATIENT POPULATION					+					

TABLE A8: Starting Batch										
First Group of Factors, Studies 71-80										
	71	72	73	74	75	76	77	78	79	80
GEOGRAPHIC LOCATION										
Hometown										
Hometown SES										
Hometown Rural/Urban										
MEDICAL SCHOOL		+								
Academic Performance						+				
Classroom										
Clinical Rotations										
Experience with Residents										
Experience with Faculty										
Faculty Attitudes Towards Specialty										
Peer Group Attitudes										
Location										+
Public vs. Private										
Research Experience										
Year I/II Curriculum										
Year III/IV Curriculum										
+/- Course										
+/- Rotation										
+/- Department										+
PATIENT POPULATION		+					+		+	

TABLE A9: Starting Batch First Group of Factors, Studies 81-90	81	82	83	84	85	86	87	88	89	90
GEOGRAPHIC LOCATION										
Hometown										
Hometown SES										
Hometown Rural/Urban				+						
MEDICAL SCHOOL										
Academic Performance										
Classroom										
Clinical Rotations										
Experience with Residents								+		
Experience with Faculty								+		
Faculty Attitudes Towards Specialty								+		
Peer Group Attitudes						+	+			+
Location										
Public vs. Private										
Research Experience										
Year I/II Curriculum							+	+		
Year III/IV Curriculum							+	+	+	
+/- Course						+				+
+/- Rotation									+	
+/- Department										
PATIENT POPULATION										

TABLE A10: Starting Batch										
First Group of Factors, Studies 91-100										
Final column is 100 (1XX).	91	92	93	94	95	96	97	98	99	00
GEOGRAPHIC LOCATION										
Hometown				+						
Hometown SES										
Hometown Rural/Urban				+						
MEDICAL SCHOOL										
Academic Performance				+						
Classroom				+						
Clinical Rotations										
Experience with Residents							+			
Experience with Faculty										
Faculty Attitudes Towards Specialty							+	+		
Peer Group Attitudes										
Location										
Public vs. Private	+									
Research Experience							+			
Year I/II Curriculum										+
Year III/IV Curriculum						+				+
+/- Course										+
+/- Rotation										+
+/- Department										
PATIENT POPULATION							+			

TABLE A11: Starting Batch											
First Group of Factors, Studies 101-111											
Column headings 1XX	01	02	03	04	05	06	07	08	09	10	11
GEOGRAPHIC LOCATION											
Hometown											
Hometown SES							+				
Hometown Rural/Urban											
MEDICAL SCHOOL							+				
Academic Performance											
Classroom											
Clinical Rotations											
Experience with Residents											
Experience with Faculty											
Faculty Attitudes Towards Specialty											
Peer Group Attitudes											
Location											
Public vs. Private								+			
Research Experience											
Year I/II Curriculum											
Year III/IV Curriculum								+			
+/- Course											
+/- Rotation								+			
+/- Department											
PATIENT POPULATION		+		+	+						

TABLE A12: Starting Batch											
First Group of Factors, Studies 112-122											
Column headings are 1XX.	12	13	14	15	16	17	18	19	20	21	22
GEOGRAPHIC LOCATION											
Hometown											
Hometown SES											+
Hometown Rural/Urban											
MEDICAL SCHOOL											
Academic Performance								+			
Classroom											
Clinical Rotations								+			
Experience with Residents							+				
Experience with Faculty							+	+			
Faculty Attitudes Towards Specialty						+		+	+		
Peer Group Attitudes									+		
Location		+									
Public vs. Private		+									
Research Experience							+				
Year I/II Curriculum										+	
Year III/IV Curriculum		+								+	+
+/- Course						+					
+/- Rotation		+									
+/- Department		+									
PATIENT POPULATION						+	+		+		

TABLE A13: Starting Batch											
First Group of Factors, Studies 123-133											
Column headings numbers are 1xx.	23	24	25	26	27	28	29	30	31	32	33
GEOGRAPHIC LOCATION											
Hometown											
Hometown SES											
Hometown Rural/Urban											
MEDICAL SCHOOL											
Academic Performance	+			+							
Classroom	+										
Clinical Rotations	+										
Experience with Residents					+						
Experience with Faculty				+	+						
Faculty Attitudes Towards Specialty					+						
Peer Group Attitudes						+					
Location										+	
Public vs. Private											
Research Experience				+							
Year I/II Curriculum				+							
Year III/IV Curriculum				+							
+/- Course											
+/- Rotation											
+/- Department											
PATIENT POPULATION						+				+	

TABLE B1: Starting Batch										
Second Group of Factors, Studies 1-10										
	1	2	3	4	5	6	7	8	9	10
PERSONAL CHARACTERISTICS										
Age							+			
Children										
Ethnic Background										
Gender										
Indebtedness										
Marital Status		+					+			
Self-Perception Correlation										
Personality	+	+	+					+	+	
Physician in Family						+				
Religious Affiliation							+			
SES										
Parent Occupation							+			
PRE-MED FACTORS										
Academic Performance										
GPA			+							
MCAT			+							
Public vs. Private										
Clinical Experience										
Student Preconception							+			
Pre-Med Selection										
Science Correlation										

TABLE B2: Starting Batch										
Second Group of Factors, Studies 11-20										
	11	12	13	14	15	16	17	18	19	20
PERSONAL CHARACTERISTICS	+									
Age		+								
Children										
Ethnic Background	+									
Gender	+									
Indebtedness										
Marital Status	+	+								
Self-Perception Correlation							+			
Personality				+			+		+	
Physician in Family				+						
Religious Affiliation				+						
SES	+									
Parent Occupation	+	+								
PRE-MED FACTORS										
Academic Performance										
GPA								+		
MCAT				+						
Public vs. Private	+									
Clinical Experience		+		+						
Student Preconception										
Pre-Med Selection										
Science Correlation		+				+				

TABLE B3: Starting Batch										
Second Group of Factors, Studies 21-30										
	21	22	23	24	25	26	27	28	29	30
PERSONAL CHARACTERISTICS		+			+					
Age		+								
Children										
Ethnic Background		+								
Gender		+								
Indebtedness							+			
Marital Status						+				
Self-Perception Correlation		+								
Personality		+	+							
Physician in Family										
Religious Affiliation										
SES										
Parent Occupation										
PRE-MED FACTORS					+					
Academic Performance										
GPA										
MCAT			+							
Public vs. Private										
Clinical Experience						+				
Student Preconception						+				
Pre-Med Selection						+				
Science Correlation										

TABLE B4: Starting Batch										
Second Group of Factors, Studies 31-40										
	31	32	33	34	35	36	37	38	39	40
PERSONAL CHARACTERISTICS										
Age										
Children									+	
Ethnic Background										
Gender				+						
Indebtedness										
Marital Status					+				+	
Self-Perception Correlation			+							
Personality				+						
Physician in Family										
Religious Affiliation										
SES	+									
Parent Occupation										
PRE-MED FACTORS									+	
Academic Performance	+									+
GPA	+									+
MCAT	+									
Public vs. Private										
Clinical Experience										
Student Preconception										
Pre-Med Selection										
Science Correlation										

TABLE B5: Starting Batch										
Second Group of Factors, Studies 41-50										
	41	42	43	44	45	46	47	48	49	50
PERSONAL CHARACTERISTICS										
Age							+			
Children										
Ethnic Background					+		+			
Gender					+			+	+	
Indebtedness							+			
Marital Status					+		+			
Self-Perception Correlation					+					
Personality					+					
Physician in Family					+					
Religious Affiliation										
SES										
Parent Occupation					+					
PRE-MED FACTORS										
Academic Performance										
GPA										
MCAT										
Public vs. Private										
Clinical Experience				+						
Student Preconception										
Pre-Med Selection										
Science Correlation										

TABLE B6: Starting Batch										
Second Group of Factors, Studies 51-60										
	51	52	53	54	55	56	57	58	59	60
PERSONAL CHARACTERISTICS										
Age										
Children			+							
Ethnic Background										
Gender	+									+
Indebtedness			+					+		
Marital Status										
Self-Perception Correlation										
Personality										
Physician in Family			+							
Religious Affiliation		+								
SES		+								
Parent Occupation										
PRE-MED FACTORS			+							
Academic Performance										
GPA				+						
MCAT				+						
Public vs. Private										
Clinical Experience										
Student Preconception										
Pre-Med Selection			+							
Science Correlation										

TABLE B7: Starting Batch										
Second Group of Factors, Studies 61-70										
	61	62	63	64	65	66	67	68	69	70
PERSONAL CHARACTERISTICS			+							
Age										
Children										
Ethnic Background								+		
Gender								+		
Indebtedness										
Marital Status										
Self-Perception Correlation										
Personality							+			
Physician in Family										
Religious Affiliation										
SES										
Parent Occupation										
PRE-MED FACTORS										
Academic Performance										
GPA										
MCAT										
Public vs. Private										
Clinical Experience										
Student Preconception										
Pre-Med Selection										
Science Correlation										

TABLE B8: Starting Batch										
Second Group of Factors, Studies 71-80										
	71	72	73	74	75	76	77	78	79	80
PERSONAL CHARACTERISTICS										
Age										
Children									+	
Ethnic Background				+				+		
Gender	+	+						+		
Indebtedness		+	+	+						
Marital Status		+	+	+						
Self-Perception Correlation										
Personality										
Physician in Family										
Religious Affiliation										
SES				+					+	
Parent Occupation			+	+						
PRE-MED FACTORS										
Academic Performance										
GPA										
MCAT										
Public vs. Private										
Clinical Experience										
Student Preconception										
Pre-Med Selection										
Science Correlation										

TABLE B9: Starting Batch										
Second Group of Factors, Studies 81-90										
	81	82	83	84	85	86	87	88	89	90
PERSONAL CHARACTERISTICS										
Age										
Children										
Ethnic Background										
Gender	+					+				
Indebtedness										
Marital Status							+	+		
Self-Perception Correlation		+				+				
Personality		+				+	+			+
Physician in Family								+		
Religious Affiliation										
SES										
Parent Occupation								+		
PRE-MED FACTORS										
Academic Performance										
GPA										
MCAT										
Public vs. Private										
Clinical Experience										
Student Preconception							+			
Pre-Med Selection				+						
Science Correlation										

TABLE B10: Starting Batch										
Second Group of Factors, Studies 91-100										
	91	92	93	94	95	96	97	98	99	100
PERSONAL CHARACTERISTICS										
Age							+			
Children	+									
Ethnic Background	+									
Gender	+			+		+	+		+	
Indebtedness	+									
Marital Status	+						+			
Self-Perception Correlation										
Personality			+							
Physician in Family										
Religious Affiliation										
SES										
Parent Occupation										
PRE-MED FACTORS										
Academic Performance										
GPA				+						
MCAT				+						
Public vs. Private										
Clinical Experience										
Student Preconception										
Pre-Med Selection				+						
Science Correlation										

TABLE B11: Starting Batch											
Second Group of Factors, Studies 101-111											
	101	102	103	104	105	106	107	108	109	110	111
PERSONAL CHARACTERISTICS											
Age											
Children											
Ethnic Background											+
Gender											+
Indebtedness			+						+		
Marital Status											
Self-Perception Correlation						+					
Personality		+				+					
Physician in Family											
Religious Affiliation											
SES											
Parent Occupation											
PRE-MED FACTORS											
Academic Performance											
GPA											
MCAT											
Public vs. Private											
Clinical Experience											
Student Preconception											
Pre-Med Selection											
Science Correlation											

TABLE B12: Starting Batch											
Second Group of Factors, Studies 112-122											
	112	113	114	115	116	117	118	119	120	121	122
PERSONAL CHARACTERISTICS											
Age											
Children											
Ethnic Background	+										
Gender	+		+					+			
Indebtedness				+							
Marital Status										+	
Self-Perception Correlation											
Personality					+			+			
Physician in Family											
Religious Affiliation	+										
SES											
Parent Occupation											
PRE-MED FACTORS											
Academic Performance								+			
GPA											
MCAT											
Public vs. Private											
Clinical Experience											
Student Preconception								+			
Pre-Med Selection											
Science Correlation											

TABLE B13: Starting Batch											
Second Group of Factors, Studies 123-133											
	123	124	125	126	127	128	129	130	131	132	133
PERSONAL CHARACTERISTICS											
Age	+										
Children											
Ethnic Background											
Gender	+										
Indebtedness						+					
Marital Status	+				+						
Self-Perception Correlation											
Personality											+
Physician in Family											
Religious Affiliation											
SES											
Parent Occupation	+										
PRE-MED FACTORS											
Academic Performance											
GPA											
MCAT	+										
Public vs. Private	+										
Clinical Experience	+			+							
Student Preconception											
Pre-Med Selection				+							
Science Correlation											

TABLE C1: Starting Batch										
First Group of Factors, Studies 1-10										
	1	2	3	4	5	6	7	8	9	10
SPECIALTY CHARACTERISTICS										
Residency Call Schedule										
Continuity of Care										
Dx Uncertainty										
Peer Group										
Job Opportunity										
Residency Length										
Malpractice										
Dx vs. Procedural										
Status/Prestige					+					
Tx People										
Tx Variety										
Controllable Lifestyle										
Salary and Benefits										
Specialty Personality		+			+					
ROLE MODELS										
Faculty										
OTHER										
Time of Specialty Selection				+			+			
Stability of Selection		+		+	+		+			
Desire to Meet Manpower Needs										

TABLE C2: Starting Batch										
First Group of Factors, Studies 11-20										
	11	12	13	14	15	16	17	18	19	20
SPECIALTY CHARACTERISTICS										
Residency Call Schedule										
Continuity of Care										
Dx Uncertainty										
Peer Group										
Job Opportunity										
Residency Length										
Malpractice										
Dx vs. Procedural				+		+				
Status/Prestige					+			+		
Tx People						+				
Tx Variety										
Controllable Lifestyle										
Salary and Benefits										
Specialty Personality					+					
ROLE MODELS										
Faculty										
OTHER										
Time of Specialty Selection		+				+				+
Stability of Selection						+	+		+	+
Desire to Meet Manpower Needs										

TABLE C3: Starting Batch										
First Group of Factors, Studies 21-30										
	21	22	23	24	25	26	27	28	29	30
SPECIALTY CHARACTERISTICS					+					
Residency Call Schedule										
Continuity of Care										
Dx Uncertainty										
Peer Group										
Job Opportunity										
Residency Length										
Malpractice										
Dx vs. Procedural										
Status/Prestige		+					+			
Tx People										
Tx Variety										
Controllable Lifestyle										
Salary and Benefits										
Specialty Personality										
ROLE MODELS					+					
Faculty										
OTHER										
Time of Specialty Selection	+			+						
Stability of Selection	+			+			+			
Desire to Meet Manpower Needs										

TABLE C4: Starting Batch										
First Group of Factors, Studies 31-40										
	31	32	33	34	35	36	37	38	39	40
SPECIALTY CHARACTERISTICS			+							
Residency Call Schedule										
Continuity of Care										
Dx Uncertainty										
Peer Group			+							
Job Opportunity										
Residency Length										
Malpractice										
Dx vs. Procedural								+		
Status/Prestige			+							
Tx People								+		
Tx Variety								+		
Controllable Lifestyle			+					+		
Salary and Benefits										
Specialty Personality										
ROLE MODELS								+	+	
Faculty								+	+	
OTHER										
Time of Specialty Selection					+					
Stability of Selection										
Desire to Meet Manpower Needs			+							

TABLE C5: Starting Batch										
First Group of Factors, Studies 41-50										
	41	42	43	44	45	46	47	48	49	50
SPECIALTY CHARACTERISTICS										
Residency Call Schedule										
Continuity of Care										
Dx Uncertainty										
Peer Group										
Job Opportunity										
Residency Length										
Malpractice										
Dx vs. Procedural										
Status/Prestige										
Tx People										
Tx Variety										
Controllable Lifestyle										
Salary and Benefits										
Specialty Personality										
ROLE MODELS										
Faculty										
OTHER										
Time of Specialty Selection										
Stability of Selection								+		
Desire to Meet Manpower Needs										

TABLE C6: Starting Batch										
First Group of Factors, Studies 51-60										
	51	52	53	54	55	56	57	58	59	60
SPECIALTY CHARACTERISTICS										
Residency Call Schedule										
Continuity of Care									+	
Dx Uncertainty									+	+
Peer Group										
Job Opportunity									+	
Residency Length								+		
Malpractice										
Dx vs. Procedural		+								+
Status/Prestige									+	
Tx People									+	+
Tx Variety									+	+
Controllable Lifestyle		+							+	+
Salary and Benefits								+		
Specialty Personality										
ROLE MODELS			+							
Faculty										
OTHER										
Time of Specialty Selection			+		+		+	+		
Stability of Selection		+			+		+	+		
Desire to Meet Manpower Needs									+	

TABLE C7: Starting Batch										
First Group of Factors, Studies 61-70										
	61	62	63	64	65	66	67	68	69	70
SPECIALTY CHARACTERISTICS				+						
Residency Call Schedule										
Continuity of Care										
Dx Uncertainty										
Peer Group										
Job Opportunity										
Residency Length										
Malpractice										
Dx vs. Procedural					+					
Status/Prestige										
Tx People			+	+						
Tx Variety										
Controllable Lifestyle			+		+					
Salary and Benefits			+							
Specialty Personality				+						
ROLE MODELS									+	
Faculty			+						+	
OTHER										
Time of Specialty Selection	+	+	+							
Stability of Selection	+	+	+						+	
Desire to Meet Manpower Needs										

TABLE C8: Starting Batch										
First Group of Factors, Studies 71-80										
	71	72	73	74	75	76	77	78	79	80
SPECIALTY CHARACTERISTICS		+								
Residency Call Schedule		+								
Continuity of Care							+			
Dx Uncertainty										
Peer Group										
Job Opportunity		+								
Residency Length		+								
Malpractice										
Dx vs. Procedural							+			
Status/Prestige										
Tx People		+					+			
Tx Variety		+					+			
Controllable Lifestyle		+					+			
Salary and Benefits		+								
Specialty Personality										
ROLE MODELS										
Faculty		+								
OTHER										
Time of Specialty Selection		+			+					
Stability of Selection		+								
Desire to Meet Manpower Needs										

TABLE C9: Starting Batch										
First Group of Factors, Studies 81-90										
	81	82	83	84	85	86	87	88	89	90
SPECIALTY CHARACTERISTICS										
Residency Call Schedule										
Continuity of Care										
Dx Uncertainty						+	+			+
Peer Group										
Job Opportunity						+		+		
Residency Length							+	+		
Malpractice								+		
Dx vs. Procedural		+					+			+
Status/Prestige							+			
Tx People							+	+		
Tx Variety							+	+		
Controllable Lifestyle						+	+	+		
Salary and Benefits							+	+		
Specialty Personality										
ROLE MODELS								+		
Faculty							+	+		
OTHER										
Time of Specialty Selection					+			+		
Stability of Selection							+			
Desire to Meet Manpower Needs							+	+		

TABLE C10: Starting Batch										
First Group of Factors, Studies 91-100										
	91	92	93	94	95	96	97	98	99	100
SPECIALTY CHARACTERISTICS										
Residency Call Schedule					+					
Continuity of Care		+								
Dx Uncertainty								+		
Peer Group					+					
Job Opportunity		+			+		+	+		
Residency Length								+		
Malpractice					+					
Dx vs. Procedural		+			+			+		
Status/Prestige					+					
Tx People		+			+					
Tx Variety										
Controllable Lifestyle					+			+		
Salary and Benefits		+			+			+		
Specialty Personality										
ROLE MODELS										
Faculty							+	+		
OTHER										
Time of Specialty Selection									+	
Stability of Selection				+					+	
Desire to Meet Manpower Needs		+								

TABLE C11: Starting Batch											
First Group of Factors, Studies 101-111											
	101	102	103	104	105	106	107	108	109	110	111
SPECIALTY CHARACTERISTICS										+	
Residency Call Schedule											
Continuity of Care					+						
Dx Uncertainty											
Peer Group											
Job Opportunity											
Residency Length					+						
Malpractice											
Dx vs. Procedural			+								
Status/Prestige					+						
Tx People					+						
Tx Variety			+		+						
Controllable Lifestyle			+		+						
Salary and Benefits			+		+						
Specialty Personality											
ROLE MODELS											
Faculty											
OTHER											
Time of Specialty Selection			+								
Stability of Selection	+		+								
Desire to Meet Manpower Needs											

TABLE C12: Starting Batch											
First Group of Factors, Studies 112-122											
	112	113	114	115	116	117	118	119	120	121	122
SPECIALTY CHARACTERISTICS					+	+					
Residency Call Schedule							+				
Continuity of Care						+	+	+			
Dx Uncertainty						+		+			
Peer Group							+				
Job Opportunity					+		+				
Residency Length											
Malpractice							+				
Dx vs. Procedural						+	+	+			
Status/Prestige						+	+	+		+	
Tx People							+	+			
Tx Variety								+			
Controllable Lifestyle							+	+			
Salary and Benefits						+	+	+		+	
Specialty Personality											
ROLE MODELS						+					
Faculty								+			
OTHER											
Time of Specialty Selection			+					+			
Stability of Selection			+					+			
Desire to Meet Manpower Needs										+	

TABLE C13: Starting Batch											
First Group of Factors, Studies 123-133											
	123	124	125	126	127	128	129	130	131	132	133
SPECIALTY CHARACTERISTICS											
Residency Call Schedule										+	
Continuity of Care											
Dx Uncertainty											
Peer Group								+			
Job Opportunity				+							
Residency Length						+			+		
Malpractice						+					
Dx vs. Procedural						+					
Status/Prestige				+				+	+	+	
Tx People								+			
Tx Variety											
Controllable Lifestyle		+	+			+			+		
Salary and Benefits				+				+	+	+	
Specialty Personality											
ROLE MODELS						+					
Faculty					+	+					
OTHER											
Time of Specialty Selection				+			+				
Stability of Selection			+	+			+				
Desire to Meet Manpower Needs						+					

Appendix IV:

Singles and Final Batch Studies Abstracts

The Final Batch

Article #7, Kritzer and Zimet, 1967: Kritzer and Zimet surveyed 120 residents from the University of Colorado Medical Center for a retrospective analysis that compared personal characteristics such as marital status, father's occupation, and religion with specialty choice. The authors also analyzed the timing of the students' career choice with their final choice. Rank order correlation tests were used to analyze correlation. A Chi-square analysis was used to assess statistical significance of any relations. Comparisons were made for medicine, ob/gyn, pediatrics, psychiatry, and surgery. Some interesting findings were that fewer psychiatrists were married and/or religious, that more obstetrician/gynecologists were married and religious, and that a negative correlation was found between the perceived prestige of the surgical specialties and the prestige of the father's occupational level. No generalizations to primary care (PC) vs. non-primary care (NPC) were made explicit, except to infer that, because so many of the students that chose their fields early ended up changing their minds, medical school experiences must be an important factor in medical student specialty choice, except for early choice of psychiatry, which showed remarkable continuity.

Article #15, Fishman and Zimet, 1972: Fishman and Zimet surveyed 166 freshman, male medical students at the University of Colorado Medical School to ascertain certain personal characteristics, specialty choice, perceived status and social attractiveness of specialty, perceived future income of specialty, and perceptions regarding similarity-to-self of specialties. They compared psychiatry, pediatrics, general practice, internal medicine, and surgery. They found that those students choosing a specific field perceived that field to have the highest status, social attractiveness, and believed similarity-to-self ratings. Statistical significance for the differences was assessed by t-test, and found ($P < 0.05$, two-tailed) for 12 of 15 of the comparative combinations. Those non-significant perceptions were the positive social attractiveness of surgery, and the similarity-to-self rating of pediatrics and psychiatry. Older age and high Verbal MCAT Scores were found to be associated with primary care specialty choice.

Article #16, Geertsma and Grinols, 1972: Geertsma and Grinols surveyed three classes at the University of Rochester School of Medicine, with a sample size varying from 140 to

204, depending on the factor studied. They categorized specialty choice between Medicine, Surgery, Psychiatry, Pediatrics, Ob/Gyn, and Other. Chi-square tests for significance between factor and choice of specialty relationships were used. Only statistically significant relationships were reported. A science concentration major was found to be important in influencing specialty choice (particularly positive for pediatrics and negative for psychiatry). Specialty preference stability over time was positively associated with primary care choice, but the study also revealed that grouping specialties into person-oriented (medicine, psychiatry, pediatrics), technique-oriented (surgery, pathology, radiology, anesthesiology), and mixed (ob-gyn) revealed a much greater stability across all specialties. In addition, the existence of a physician father was found to contribute positively to stability of specialty choice.

Article #17, Herrmann, TJ, 1972: Herrmann investigated the influence of an all-elective fourth-year on specialty choice at the University of Michigan Medical School. Sample size was 180, with data collection via a questionnaire. No statistical test was performed to determine significance, but inspection of data was interpreted to conclude that an all-elective fourth year had an important influence on medical student choice of specialty. No conclusions as to direction relative to primary care were drawn.

Article #19, Otis and Weiss, 1973: Otis and Weiss surveyed 152 students representing all four years at the University of New Mexico School of Medicine on their specialty preference for 15 specialties. Personality and attitudinal characteristics were also assessed. The variable cluster analysis using the BC-TRY method of independent dimensional analysis was used. They showed that primary care specialty choice was related to perceived similarity between specialty "personality" and medical student personality self-assessment. They also indicated that specific career preference clusters exhibited certain specific personality and attitudinal patterns.

Article #27, Zimet and Held, 1975: Zimet and Held described a longitudinal study of 141 male medical students from two successive classes at the University of Colorado. They analyzed specialty choices in psychiatry, pediatrics, family practice, internal medicine, and surgery, and correlated these choices with student perception of specialty status, social attractiveness determined via adjectives used by the students to describe that specialty, and similarity-to-self rankings of specialty to student characterizations. They also analyzed how these perceptions changed over the four years of the students' medical school careers. A two-way

Friedman analysis of variance was used to test statistical significance. Status of specialty, social attractiveness, and similarity to self correlations changed favorably towards the primary care specialties as students progressed through medical school. The study speculated that students more influenced by social attractiveness tended to enter the primary care specialties.

Article #32, Herman and Veloski, 1977: Herman and Veloski reported on a longitudinal study at Jefferson Medical College evaluating 891 senior medical students over four years via a survey questionnaire. They compared personal characteristics and academic performance and specialty choice preferences. The Chi-square test, analysis of variance, Fmax test of homogeneity of variance, and Fisher's Least Significant Difference method were used to test for statistical significance. They determined that older age was probably an important factor associated with primary care specialty choice (family practice), while female gender, parenthood, and social sciences or humanities college major were probably not. The results analyzing academic performance were ambiguous, with no difference between the academic performance of students choosing family medicine compared with other specialties, but significantly higher performance for those that chose internal medicine.

Article #33, Matteson and Smith, 1977: Matteson and Smith used a questionnaire to study 350 medical students attending a southwestern medical school. They analyzed the student's specialty choice preference and compared them with their actual choice. They found a discrepancy of approximately 25% between students preferring a specific specialty and actually choosing them. Matteson and Smith concluded that a difference between student personality and specialty characteristics accounted for the discrepancy, and this relation was backed-up by a significant student's t-test for the psychiatry and a combined surgery and obstetrics/gynecology group only. The most frequent reasons given by the students for their not choosing their first preference, however, were low demand, nature of the training, and would demand too much time. Inconsistent with personality was at the bottom of their list. The study also found that female gender was positively associated with the selection of a primary care specialty.

Article #34, McGrath and Zimet, 1977: McGrath and Zimet used questionnaires to survey 261 students at the University of California at San Diego and the University of Colorado medical schools. They asked about specialty choice preference, perceived status of the specialties, similarity-to-self, social attractiveness of the specialties, and personality characteristics of self. They stratified these analyses by gender and by specialty (family practice, internal

medicine, pediatrics, psychiatry, and surgery). McGrath and Zimet used a Chi-square statistical analysis test to determine statistical significance of any associations. They found that female gender had a very strong association with primary care specialty choice. They concluded that some of the reasons contributing to this gender discrepancy were a difference in perception of the status and social attractiveness of internal medicine and surgery, as well as personality differences.

Article #36, Yancik, R, 1977: Yancik utilized data from the AAMC and the AMA to study 624 medical students, their subsequent fields of specialization, and the time prior to medical school that the students chose to enter the medical field. The author concluded that the timing of the medical profession as a career was a significant factor in subsequent specialty choice. Overall, primary care specialties (in particular to this study, general practice and psychiatry) were chosen by students making a later career decision (after entering college). Internists posed ambiguous results, while obstetricians/gynecologists tended to be early decision-makers. No statistical analysis was performed.

Article #40, Gough, HG, 1978: Gough looked at the predictive value of various indicators of academic performance in medical student specialty choice. Sample size varied from 933 to 1,026 because the data was incomplete for some of the study subjects. Gough employed the Chi-square test to determine statistical significance of any associations of these factors regarding specialty choice. Gough found that a preference for science was a negatively correlated with primary care specialty choice, while pre-medical science academic performance provided only ambiguous results regarding its affect on medical student specialty choice.

Article #44, Rosenblatt and Alpert, 1979: Rosenblatt and Alpert mailed questionnaires to three cohorts of Harvard Medical students, for a total sample size of 894. A simple comparison was made, with no statistical tests of significance. The study concluded that a single course in family medicine had no discernible effect on medical student specialty choice.

Article #46, Carline, et. al., 1980: Carline and associates used a questionnaire to survey students from three classes at the University of Washington School of Medicine. They used a matched-pair analysis between WAMI and regular medical students to assess significant differences in location of practice and in specialty choice. They used both Chi-square and one-way analyses of variance to test their relationships. They concluded that differences in home community had the largest impact on medical student specialty choice, with a metropolitan upbringing favoring non-surgical

specialties, and vice-versa. The different academic environments (WAMI and regular) were not found to have any relationship to subsequent medical student specialty choice.

Article #52, Weil and Schleiter, 1981: Weil and Schleiter studied 340 residents in internal medicine sampled at random with an extensive questionnaire. They used a multi-variate regression analysis to test associations. They found that while religion and "investigative interest" were important factors in medical student specialty choice, socio-economic status was not. The type of medical school (public vs. private) attended was determined to be an important factor, but the authors attributed this to be "person/environment interactions" throughout the students' medical school career, where the goals of the school match those of the admitted students. Along a similar vein, predetermined intent to practice primary care and a primary care role model were determined to be important factors in choice of primary care. Type of residency program, however, was not an important influence on medical student choice of specialty. Weil and friends determined that qualities of the specialty itself (e.g. autonomy, control over working conditions) were very important factors in the specialty choice process, but that other personal variables (MCAT scores) were not.

Article #58, Paiva, RE, 1982: Paiva studied 144 medical students at the Southern Illinois University School of Medicine via questionnaire at the end of their basic sciences period, the end of the clinical sciences period, and at the end of the clerkship period. The hypothesis of no difference was tested via a paired t-test. Paiva concluded that persons and events had far more influence on student specialty choice than did financial considerations, educational debt, or length of residency. Paiva also determined that the most significant influences were exerted during the students' clinical clerkships. The influential persons were found to be mostly faculty members. Paiva also determined that order of clerkships played an important role in medical student specialty choice. Paiva noted, however, that most students chose their specialty prior to their clinical clerkships, and that the influencing factors above influenced only those undecided students or those that changed their minds. The study attributed this early decision process onto the relatively greater magnitude of personal characteristics in influencing medical student specialty choice.

Article #60, Zimny and Shelton, 1982: Zimny and Shelton surveyed 380 medical students via a questionnaire to examine the differences between males and females in the perception of factors that might or might not influence specialty choice. They concluded that being female was an important factor in choosing a primary care specialty. Analysis of variance was

used to determine statistical significance.

Article #68, Fadem, BH, et. al., 1984: Fadem and associates surveyed 628 students at the New Jersey Medical School in an attempt to generate a predictive model of medical student specialty choice. They determined that female gender, high National Board of Medical Education test scores in primary care sections, and minority ethnicity were strongly related to choice of primary care. The relationship of clinical performance in medical schools and primary care specialty choice could not be ascertained. Analysis of variance was performed to determine significant statistical differences.

Article #73, Bazzoli, 1985: Excluded to avoid duplication, and therefore, misrepresentation, of the results in Article #74, Bazzoli, GJ, 1985. Although not identical articles, they appear to be similar, if not identical studies, with identical results, by the same author, published in the same year.

Article #74, Bazzoli, GJ, 1985: Bazzoli used a survey of 3,855 U.S. residents to determine the relative effect of indebtedness on medical student specialty choice. T-tests were used to analyze the statistical significance of any relationships found. Bazzoli found that unsubsidized debt had a small, negative influence on the choice of primary care, but that subsidized debt had a small, positive influence on the choice of primary care. Potential income was a small negative influence on primary care specialty choice. In comparison, higher levels of parental education, and single marital status were cited as being much more of an influence on specialty choice than any measure of indebtedness. This study found no significant relationship between female gender and specialty choice.

Article #91, Dial and Elliott, 1987: Dial and Elliott studied 8,667 medical students through AAMC survey data. They used a series of discriminant function analyses to test for statistical significance, comparing factors which influenced medical student specialty choice of PC vs. NPC specialties. Female gender and financial scholarship were found to be important positive factors regarding primary care specialty choice. They also found that single marital status, private medical school, and increased indebtedness were associated with not choosing a primary care field. Ethnicity and number of dependents were found to be unimportant.

Article #99, Babbott, D, et. al., 1988: Babbott and company studied 10,321 U.S. medical school graduates through information stored in the Association of American Medical Colleges' Student and Applicant Information Management System

(SAIMS). They concluded that "Interest in the primary specialties declined among both men and women; interest in specialty care and supporting services increased" during the period extending from just prior to entering medical school to just prior to graduation. Babbott and friends then concluded from these results that experiences during the general medical school experience had a negative influence on medical student primary care specialty choice.

Article #106, Onady, AA, et. al., 1988: Onady and associates surveyed 173 senior medical students from Wright State University School of Medicine. These investigators studied the perceived levels of stress of different medical specialties, as well as the self-correlation rating between the student's perception of his or her own ability to handle stress, as factors influencing medical student choice of specialty. Neither of these factors were found to be important. Although correlation methods were used, no statistical significance methodology was employed.

Article #111, Babbott, D, et. al., 1989: Babbott and associates used data from two AAMC questionnaires to study the relationship between racial-ethnic background and medical student specialty choice. They concluded that ethnicity was not an important determinant of specialty choice. Their study, with a sample size of 11,136, also determined that female gender was positively associated with the choice of a PC specialty. No statistical analysis was performed.

Article #117, Greer and Carline, 1989: Greer and Carline conducted a study at the University of Washington School of Medicine, surveying 439 students to analyze a number of factors. They determined that increased patient contact opportunities, job opportunities, and patient population were all positive factors in PC choice, while late choice of specialty (i.e. after the end of the third year) was a negative factor. Specific courses in medical school and the technological aspects of medicine were also cited as important factors influencing medical specialty choice, although no "direction" of influence could be inferred. Parental influence, faculty influence, potential income, prestige, and potential lifestyle were all determined to be unimportant. Chi-square and t-tests were used to determine statistical significance of relationships.

Article #118, Lieu, TA, et. al., 1989: Lieu and colleagues used a questionnaire to study 113 students at the University of California at San Francisco School of Medicine. They used Chi-square and two non-parametric tests of association (Mann-Whitney U test and Kruskal-Wallis test), where appropriate, to determine statistical significance of differences of factor ratings on their degree of influence on

medical student specialty choice. They determined that the most important factors influencing medical student specialty choice were medical school experiences, patient population, opportunity to work with acute problems, opportunity to provide community care, time allowed for family, overview by clinical clerkship, peer group, and social responsibility of choice. Some of the less important factors were income, job opportunity, residency length, call schedule of residency, prestige, diagnostic and therapeutic uncertainty, research experiences, and proportion of AIDS patients. They also determined that female gender and older age were positive factors, while late choice of specialty was a negative factor in the choice of a primary care specialty. Undergraduate major, private vs. public undergraduate school, undergraduate academic performance, and SES were not important.

Article #120, Ness, R, et. al., 1989: Ness and associates utilized data from the AAMC, Student and Applicant Information Management System (SAIMS), and the National Residency Matching Program (NRMP) to study specialty choice and geographic location of the chosen residency of 39,301 U.S. medical school graduates from the 1980, 1983, and 1987 graduating classes. Then, the authors examined differences between the class of 1980 and the classes of 1983 and 1987 regarding specialty choice and geographic location of residency in an attempt to correlate the influence of the prevalence of AIDS in the local patient population. They utilized Chi-square analyses to determine significance, and concluded that, even after controlling for geographic location of residency programs (re: high-AIDS vs. low-AIDS), the number of students choosing internal medicine was significantly lower for students from high-AIDS medical school locations than for students from medical schools located in low-AIDS areas. No relationship was found between the prevalence of AIDS and choice of other specialties (family practice, surgery, pediatrics, OB/GYN, psychiatry, pathology, anesthesiology, or surgical subspecialties).

Article #121, Nieman, LZ, et. al., 1989: Nieman and friends used a questionnaire to survey 251 students at four North Carolina medical schools. They determined that medical school experiences, patient population, and comprehensive knowledge and time demand factors as important factors in medical student specialty choice. On the other hand, supply and demand factors, faculty and peer attitudes towards the specialty, and various monetary issues such as income and indebtedness were not found to be influential factors.

Article #122, Potts and Brazeau, 1989: Potts and Brazeau studied the transcripts of 569 graduates of Michigan State University College of Human Medicine to study the effect of the first clinical clerkship on medical students' specialty choice. Chi-square analyses was used to test the statistical

probability of the relationships of these factors to specialty choice decisions. They determined that clerkship order does not influence medical student specialty choice.

Article #128, Psykoty, CE, et. al., 1990: Psykoty and colleagues studied 102 students at a medical college in a major city. Their primary interest was the impact of malpractice as a factor influencing medical student specialty choice. Method of study involved a questionnaire, and test for significance was performed via Chi-square analysis. They found that, relative to a number of other factors studied, malpractice issues were among the least important. Among the most important factors were aptitude for material in the specialty, wide variety of diseases, types of diseases seen, opportunity to know patients well, patients appreciate physicians' efforts, ability or technical competence, effectiveness of treatments, procedural medicine, scientific knowledge or precision, presence of many difficult problems, opportunity to add to the field, and faculty or house staff as role models. Factors of lesser importance included site of residency training, potential job location, controllable lifestyle, manpower needs, length of residency, status, financial rewards, indebtedness, influence of friends or family, experience as a patient, and peer attitudes.

Article #131, Schwartz, RW, et. al., 1990: Schwartz and associates studied by survey 346 students at the University of Arizona and University of Louisville medical schools to assess the importance of the controllable lifestyle variable on medical student specialty choice. They identified fourteen factors that they felt had a profound influence on medical student specialty choice, and grouped them into three categories. The factors grouped under the "Perceived lifestyle criteria" were potentially high renumeration, number of work hours, adequate time for pursuit of avocational activities, perceived number of call nights, perceived prestige, and residency length. Those important factors grouped under the "Cerebral and practice activities factor" were clerkship experience, clinical faculty role models, desire to enter academic medicine, and desire to practice in large urban area. Those under the third and final category "Altruism factors" were non-faculty physician role models, patient population, desire to practice in a rural area, and the desire to provide community services. Schwartz also found that those students choosing primary care specialties (defined as family practice, internal medicine, pediatrics, and obstetrics/gynecology), differed significantly from the non-primary care groups in all three categories. The PC group stated that the Cerebral and practice activities group and the Altruism group were far more important to them than was stated by the NPC group. The Perceived lifestyle group was rated as far more important by those in the PC group.

The Singles Batch

Article #53, Brearley, WD, et. al., 1982: Brearley and colleagues used a questionnaire to survey 194 first-year family practice residents from 19 Southeastern residency programs to determine what factors had the greatest influence both for and against the choice of family practice as a specialty. The most important positive factors were: preceptorship with a family physician during years 3 and 4, clerkship in family medicine, influence of their hometown family doctor, contact with family practice residents, preceptorships with a FP during years 1 and 2, the year 4 curriculum, contact with the family practice faculty, hometown of student, and year 3 curriculum. The most negative influences were peer group attitudes, and first and second year curriculum. None of these negative factors showed as clear a relationship to specialty choice as the important positive factors did. Other factors that were examined and found to have a far less probable relationship to medical student specialty choice were American Academy of Family Physicians membership, religion, parents, spouse and children, premedical education, and family practice club meetings.

Article #81, Hadac, RR, et. al., 1986: Hadac studied 1,273 medical students that had attended the University of Washington School of Medicine from 1968-1977 to analyze the significance of female gender in the choice of family medicine. A Chi-square analysis was used to determine statistical significance. Results showed that female gender was not an important factor in the choice of family medicine as a specialty.

Article #89, Allen, SS, et. al., 1987: Allen and associates outlined an interventional study of a total of 346 students at the University of Minnesota at Minneapolis Medical School. The Minnesota program experimented with earlier exposure of students to family practice physicians, and also with the order of clinical rotations. Attitudes were assessed via survey, and Chi-square and t-tests were used where appropriate to determine statistical significance. They concluded that early exposure to family medicine physicians during the course of the students' medical school training has no affect. They also determined that order of clerkships, also, had no significant affect on the attitudes of students towards family medicine.

Article #105, Montano, DE, et. al., 1988: Montano and friends surveyed 136 fourth year medical students at the University of Washington School of Medicine to determine the most important factors influencing their choice of family practice as a specialty. They used a paired t-test to determine levels of statistical significance. They found that the most positive factors influencing choice of family

practice over all other career opportunities in medicine were: having close personal relationships with patients, patient population characteristics (healthy, children, families), continuity of care, practicing preventive medicine, the power to refer patients to specialists, tolerance of long and irregular hours, variety of diseases and conditions faced, doing obstetrics, opportunity to practice in a rural environment, and having time for personal interests. Factors found to lack such influence were: the emphasis of pathophysiology, prestige, less income, options to practice in HMOs, and short residency length.

Article #108, Rabinowitz, HK, 1988: Rabinowitz studied the specialty choice of the graduates of 123 U.S. medical schools and correlated that with the presence or absence of a required clerkship in family practice at each of the schools. Rabinowitz used multiple regression techniques to establish statistical significance of any relationships found. The author concluded that medical schools with either a third-year or a fourth-year clerkship in family practice had a significantly higher percentage of students entering family practice than medical schools without a required clerkship. Also, schools with a required third-year clerkship had significantly higher numbers of students choosing family practice residencies than those with required fourth-year clerkships. Multiple regression techniques determined that other factors such as age in medical school, graduating class size were not a factor. Whether or not the medical school was public or private, however, was determined to be independently important.

Article #113, Campos-Outcalt and Senf, 1989: Campos-Outcalt and Senf studied national data from the AAMC to assess the correlation between medical student choice of family practice residencies and the following school characteristics: total annual tuition and fees, weeks of family practice clinical training, timing of required family practice training, geographic location, public or private medical school, and type of administrative structure of family practice within the school. Sample size total was 15,169. They used univariate and multivariate analyses to determine significance. The findings showed that the following were important positive factors influencing the choice of family practice: decreasing tuition and fees, increasing weeks of required family medicine, required family medicine clerkship before the fourth year, public school, larger administrative structure in family practice in medical school (correlated with increased required time in family medicine clerkships), and, in general, increasing Western location of the medical school.