

A RAND NOTE

ADA142390

PROCUREMENT OF AIR FORCE PHYSICIANS:
SCHOLARSHIP OR DIRECT RECRUITING?

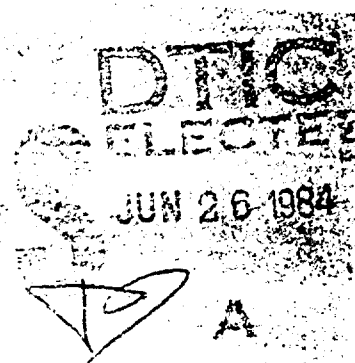
Susan D. Hosek

N-1968-AF

July 1983

Prepared for

The United States Air Force



Reproduced From
Best Available Copy

5th
ear



REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER N-1968-AF	2. GOVT ACCESSION NO. DA A142 390	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Procurement of Air Force Physicians: Scholarship or Direct Recruiting		5. TYPE OF REPORT & PERIOD COVERED Interim
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Susan D. Hosek		8. CONTRACT OR GRANT NUMBER(s) F49620-82-C-0018
9. PERFORMING ORGANIZATION NAME AND ADDRESS The Rand Corporation 1700 Main Street Santa Monica, CA. 90406		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS Requirements, Programs & Studies Group (AF/RDQM) Ofc, DCS/R&D and Acquisition Hq USAF, Washington, D.C. 20330		12. REPORT DATE July 1983
		13. NUMBER OF PAGES 34
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for Public Release; Distribution Unlimited		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report) No Restrictions		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Air Force Physicians Recruiting Military Medicine		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) See Reverse Side		

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

This study evaluates direct physician recruitment in light of recent trends in civilian physician incomes and other market indicators, compares the cost savings to the All Force of direct recruiting over the Armed Forces Health Professions Scholarship Program (AFHPSP), and reviews general supply trends in the U.S. physician market. Despite military physician pay increases and an increasingly competitive civilian market, the volunteers continue to be a heterogeneous group. The AFHPSP program represents a more stable procurement source than direct recruiting in both numbers and composition, but it is also more expensive. The comparison made in this Note of the cost-effectiveness of the AFHPSP and volunteer programs must remain tentative without further information.

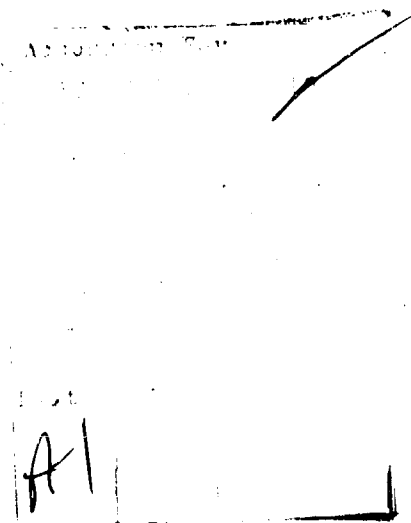
UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

PREFACE

Assuring an adequate supply of physicians has posed special problems for the military services since conscription ended in 1973. Recently, the shortages have begun to disappear, largely because of increasing accessions from the Armed Forces Health Professions Scholarship Program. This Note evaluates the continuing need for this expensive program in light of the rapidly increasing stock of civilian physicians. The study was requested by the Director of Medical Plans and Resources, Office of the Surgeon General, Headquarters, U.S. Air Force. It identifies trends in the Air Force's direct recruiting program, estimates the costs of AFHPSP and volunteer physicians, and explores the effects of future changes in the civilian physician market.

This study was conducted under the Project AIR FORCE Resource Management Program project "Air Force Medical Resources Planning".



SUMMARY

↓ This study evaluates direct physician recruiting in light of recent trends in civilian physician incomes and other market indicators, compares the cost savings to the Air Force of direct recruiting over the Armed Forces Health Professions Scholarship Program (AFHPSP), and reviews general supply trends in the U.S. physician market. The physician shortages that have plagued the military medical services since the mid-1970s are disappearing, although the Air Force still needs more surgeons. In large part, the improvement is due to the AFHPSP, which offers medical students scholarship support if they agree to serve subsequently in the active duty physician force.

The profile of Air Force physician volunteer accessions from 1975 to 1982 changed somewhat:

- More of the volunteers are now U.S. or Canadian trained and their average age has declined.
- The trends are more pronounced in the lower-paid medical specialties than in the higher-paid surgical specialties.
- Among surgeons, military practice continues to attract primarily those in mid-career.

However, despite military physician pay increases and an increasingly competitive civilian market, the volunteers continue to be a heterogeneous group.

The AFHPSP program represents a more stable procurement source than direct recruiting in both numbers and composition, but it is also more expensive. This study estimates the costs of both recruiting programs with a billet cost model that calculates the cost of filling a position indefinitely with either an AFHPSP or volunteer physician. The relative costs of these two types of physicians are sensitive to the discount rate because the costs are timed differently.

- Based on FY1981 data and a 5 percent discount rate, AFHPSP physicians are 25-30 percent more expensive; the gap is 40 percent at an 8 percent discount rate.
- The cost difference would probably decrease at higher volunteer recruiting levels because of increasing supply prices.
- If a procurement policy shift in favor of volunteers over AFHPSP physicians required \$15,000-20,000 additional annual pay, the cost difference would vanish.

As the stock of U.S. physicians continues to increase, the direct recruitment program may become more successful and eventually decrease or even end the need for a scholarship program. In 1980, the Graduate Medical Education National Advisory Committee (GMENAC) projected that an expected 3 percent annual rate of increase in the U.S. physician stock would result in 15 percent more physicians than GMENAC expert panels projected would be required to meet the population's health care needs by 1990. Physician manpower projections have traditionally been inaccurate and demand in 1990 might not equal the GMENAC need estimates, but there is little doubt that the number of physicians per capita will increase greatly for some years.

Already there is some evidence that the civilian market is responding to the added physicians. Most noticeable is the declining number of visits the typical office-based physician receives each week. Up through 1981, physician incomes had not shown a comparable drop, although they fell somewhat in constant dollars. To find a market for their services, more physicians are locating their practices in previously underserved small towns where they earn incomes that are comparable to those of their urban colleagues.

The comparison made here of the cost-effectiveness of the AFHPSP and volunteer programs must remain tentative without more information on:

- Civilian physicians' supply prices to the military, and

- Physician retention under varying conditions.

Whether the Air Force must continue to bear the high costs of training new physicians through the AFHPSP will also depend on how the civilian physician services market responds to the increasing number of physicians and to government measures to control U.S. health care costs. Without more information, changes in physician procurement policy should be approached cautiously.

ACKNOWLEDGMENTS

The author would like to thank Lt. Col. Frank Moran and Dr. John Bircher of the Air Force Surgeon General's Office for supplying information and comments on an earlier version of this Note, and Jane Peterson for performing the computations. David Grissmer reviewed the earlier version and provided valuable suggestions.

CONTENTS

PREFACE	iii
SUMMARY	v
ACKNOWLEDGMENTS	ix
FIGURES AND TABLES	xiii

Section

I. INTRODUCTION	1
II. PHYSICIAN REQUIREMENTS AND VOLUNTEER RECRUITING	4
Physician Requirements, FY1984-FY1988	4
Profile of Physician Volunteer Accessions, FY1976-FY1982 ..	6
III. THE COSTS OF AFHPSP AND VOLUNTEER PHYSICIANS	12
The Cost Model	12
Data	13
Results	15
IV. TRENDS IN THE U.S. PHYSICIAN MARKET	19
The GMENAC Forecasting Methods	19
Trends in the Physician Services Market	22
V. IMPLICATIONS FOR PHYSICIAN PROCUREMENT STRATEGY	29
Concluding Observations	29
Need for More Data	30
BIBLIOGRAPHY	33

FIGURES

1.	Characteristics of Air Force Physician Volunteers, 1976-1982	8
2.	Age Profile of Civilian Physicians' Incomes by Specialty, 1979	10
3.	Average Nominal and Real Net Income: 1970-1981	23
4.	Increases in Civilian Physicians' Fees and Visits	24

TABLES

1.	Air Force Physicians, FY1982 (Actual) and FY1984 (Planned) .	5
2.	Nonobligated Volunteer Recruiting, FY 1976-1981	7
3.	Present Value of the Costs of Staffing One Position with Volunteer Physicians (Thousands of dollars)	16
4.	Present Value of the Costs of Staffing One Position AFHPSP versus New Graduate Volunteer Physicians (Thousands of dollars)	17
5.	Growth in U.S. Physician Stock	20
6.	Average Net Income by Civilian Physicians by Specialty, 1981	26
7.	Military Pay for Physicians: Basic Military Compensation (BMC) Plus Special Pay	27
8.	Distribution of Civilian Physician Earnings by Specialty, 1981	28

I. INTRODUCTION

In 1973 the United States ended military conscription in favor of an all-volunteer force. Anticipating that few physicians would volunteer for military service at commissioned officers' pay rates, Congress established the Armed Forces Health Professions Scholarship Program (AFHPSP) in 1972. The new program established scholarships for medical students willing to serve a year of military service for each year of AFHPSP support. Because the scholarships provide tuition in addition to a monthly stipend, the AFHPSP appears to be an expensive military personnel procurement program. Congress has all but ended a similar National Health Service Corps (NHSC) scholarship program, designed to provide physicians to medically underserved areas. The continuing rapid increases in the stock of U.S. physicians have now called into question the need for such an expensive program. A natural question is: Does the military still need the AFHPSP, or could they recruit enough trained physicians directly? More generally, could either program by itself supply the required number of physicians and specialty mix, or is a combined strategy best? Unfortunately, there is not sufficient evidence to support a clear choice between the AFHPSP and direct recruiting.

This Note gathers the evidence on the supply of physician volunteers to the military, assesses the strength of this evidence, evaluates the prospects for early termination of the AFHPSP, and suggests where further research is needed.

The transition from procuring physicians through the draft to relying on the AFHPSP was hindered by the long AFHPSP lead-time. A board-certified physician spends seven or more years in training. The first scholarship students were enrolled at the same time the draft ended, so it has taken a decade for the program to reach its potential. In the early 1970s, the military relied on drafted physicians who contracted to delay military service until they completed residency training, and, since 1976, they have relied on direct recruiting of physician volunteers. To make military service more attractive to volunteers,

unobligated physicians have received substantial special pay supplements. The current special pay schedule, enacted in 1980, ranges from \$14,000 per year to almost \$30,000, depending on specialty, professional and military experience, and board certification.

Regardless of the procurement program, volunteer-era physicians are expensive. However, AFHSP physicians entail enormous scholarship costs (\$14,000 for each Air Force participant in FY80) as well as substantial costs during their active duty service, when they receive \$14,000-30,000 special pay. At first glance, the volunteers look like a bargain even at higher special pay levels. But without the AFHSP, would physician special pay have to increase to attract the desired number, specialty mix, and quality of physicians? As this Note will show, a \$15,000-20,000 increase in special pay (or approximately 40 percent increase in total pay) would wipe out the cost advantage of the volunteer program. Current levels of civilian physician earnings and stagnant military pay levels suggest this may be a conservative estimate of the pay action needed to attract enough acceptable physicians. If so, ending the AFHSP at this time would be inadvisable.

Throughout the past decade, public discussion of military physician procurement has suffered from lack of information on basic supply parameters. No one knows how many physicians in each specialty would seek to volunteer at differing pay levels, or what the characteristics of these physicians would be. Equally important and unknown is retention behavior, both of volunteers and AFHSP physicians. These factors are even less certain in the future, when increasing stocks of U.S. physicians will change the physician marketplace in ways difficult to predict.

Section II examines the Air Force's volunteer recruiting program from 1976 to 1981, following trends in the characteristics of the volunteers. Section III estimates the costs of filling physician slots with AFHSP physicians or volunteers at differing pay levels. Section IV summarizes the projections of physician supply and demand in 1990 made by the Graduate Medical Education National Advisory Committee (GMENAC), describes how civilian physicians have responded so far to their increasing numbers, and draws implications for military recruiting

of physicians. The final section identifies and assesses the advantages and disadvantages of pursuing different strategies for procuring military physicians.

II. PHYSICIAN REQUIREMENTS AND VOLUNTEER RECRUITING

The Air Force began recruiting civilian physicians in the mid-1970s to fill in the gaps left by the slow start of the AFHPSP program. The first sizable recruiting year was FY1976; in that year and the three-month transition period to FY1977, 551 volunteers were recruited. By FY1982, however, with more AFHPSP physicians becoming available, only 73 volunteers were recruited. Currently, the AFHPSP and USUHS programs are the primary physician procurement sources; direct recruits will make up about 22 percent of the average 574 physician accessions required between FY1983 and FY1988.

Although direct recruiting supplies only a small fraction of current accessions, it plays an important role in reaching the desired specialty mix. AFHPSP physicians are recruited while still in medical school, before they have selected a specialty. Although the Air Force must approve specialty training for these physicians, its decisions must reflect the physicians' preferences for the program to remain viable. Volunteers are recruited to adjust the specialty mix as well as augment the total numbers.

PHYSICIAN REQUIREMENTS, FY1984-FY1988

The Five-Year Defense Plan for the fiscal years 1984-1988 calls for considerable increases in the number of Air Force physicians. In FY1982, the physician end strength, including residents in training, was 3,671. By FY1984, the required number will rise by 5 percent, to 3,854. As Table 1 shows, the biggest gaps between the actual 1982 force and the targetted 1984 force occur in the surgical specialties, which have been plagued by shortages in the past several years.¹ Between FY1984 and

¹Since the draft ended, the patterns of shortages have shifted from the surgical specialties in the early years to the medical specialties more recently. Immediate shortages were forestalled by the continuing entry through the Berry Plan of physicians who had contracted to delay conscription until the completion of their training. The Berry Plan pipeline ran out first in the shorter-residency medical specialties. Similarly, fully trained AFHPSP physicians first became available in the medical specialties, thus relieving the shortages in these areas.

Table 1

AIR FORCE PHYSICIANS, FY1982 (ACTUAL) AND FY1984 (PLANNED)

Specialty	No. Physicians on Active Duty End, FY82	No. Physicians in FYDP FY84	No. Physicians in FYDP FY88+
Family/general practice	544	542	598
Internal medicine	351	328	518
Pediatrics	263	244	351
Obstetrics/ gynecology	176	193	204
Surgery	214	302	311
Orthopedics	71	157	158
Other surgical specialties	120	161	163
Aerospace medicine	456	494	529
Other	661	600	755
Total active duty	2,856	2,847	3,587

FY1988, the total number of Air Force physicians is again planned to increase by almost 20 percent. In contrast to the near-term increases, most of these later increases occur in medical specialties, particularly internal medicine and pediatrics, where both the projected total patient population (including dependents and retirees) and Air Force medical facilities can support more physicians.

PROFILE OF PHYSICIAN VOLUNTEER ACCESSIONS, FY1976-FY1982

The Air Force's experience to date in recruiting volunteer physicians does not encourage the belief that volunteers will fill these additional physician requirements, especially in surgical specialties. To build a profile of volunteer physicians, I used the Air Force's Uniformed Officer Records data file. In each fiscal year, records were extracted for physicians whose entry date (EAD date) equalled the same year and whose procurement source was listed as "nonobligated volunteer".² Table 2 shows the total number of volunteers recruited in the fiscal years 1976 to 1981, the number of nonobligated volunteers, and the specialty mix of the latter group. Nonobligated volunteers account for three-quarters or more of the total in all years.

The specialty mix of Air Force volunteers has shifted over time as the Air Force's recruiting goals and its ability to achieve those goals has changed; attempting to improve both recruitment and retention, in 1974 and again in 1980, Congress increased military physicians' pay. Early recruiting emphasized general practice and family practice physicians. Then, as the most severe overall shortages began to fade in the late 1970s and AFHPSP family practitioners became available, the recruiting program increasingly emphasized surgeons.

The attributes of the typical medical and surgical specialists volunteering in each fiscal year from 1976 through 1982 are shown in Fig. 1.³ The number of medical specialists recruited by the Air Force rose to a peak of 68 in 1977, but since then it has fallen steadily. Between 1977 and 1980, the recruiters achieved 63 percent of their goals for medical specialists. Except for 1978, when an unusually large number of obstetrician-gynecologists volunteered, the number of entering surgeons remained fairly constant until 1981. Only 36 percent of the

²UOR records for volunteers are coded either 13="obligated volunteers" or 14="nonobligated volunteers". "Obligated volunteers" were excluded because the records provided no information about the indicated obligation.

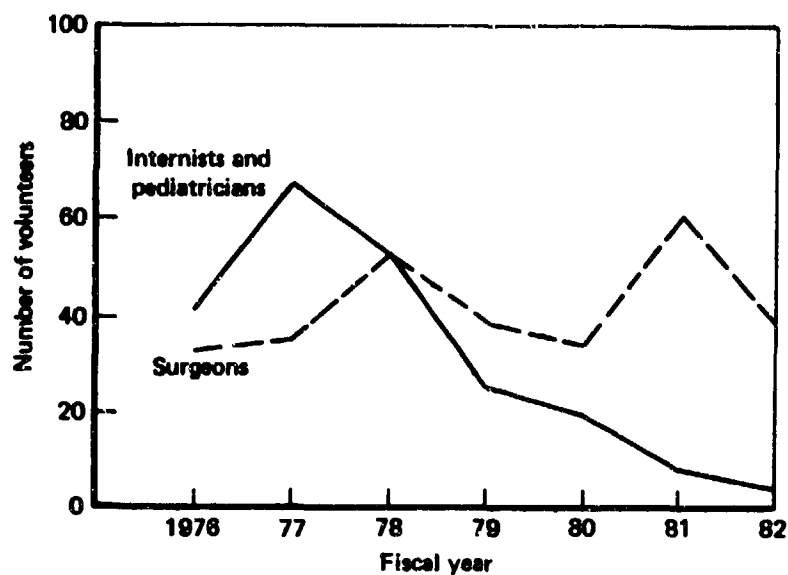
³Medical specialties include internal medicine and pediatrics and their subspecialties. Surgical specialties include general surgery, urology, ophthalmology, otolaryngology, orthopedic surgery, obstetrics-gynecology, and the surgical subspecialties.

Table 2

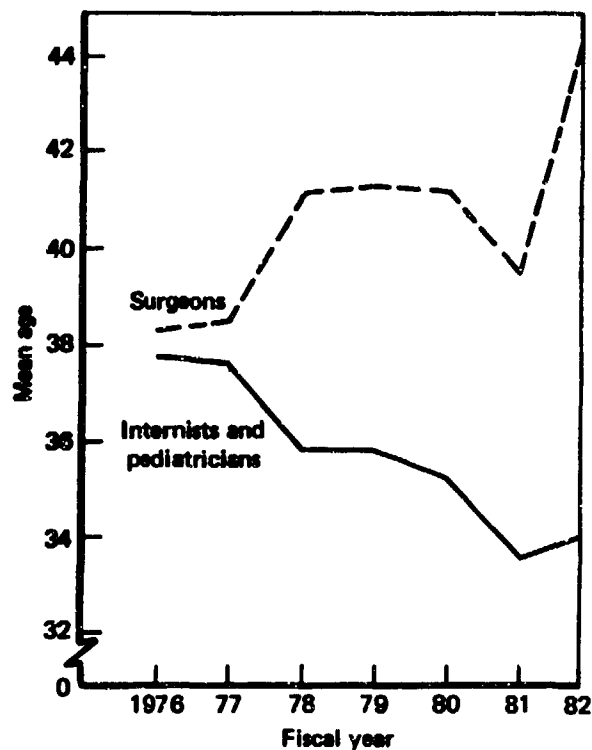
NONOBLIGATED VOLUNTEER RECRUITING
FY 1976-1981

Year	Number Recruited	Number Non obligated	Specialty (percent)						Percent Foreign Medical Graduate	Percent Osteopathic
			General/ Family Practice	Flight Medicine	Pediatrics/ Internal Medicine	Surgery	Other			
1976 ^a	n. a.	291	44	18	14	11	13	46	16	
1977	345	290	31	13	23	12	21	52	14	
1978	270	221	24	8	24	24	20	63	4	
1979	204	157	24	19	17	25	15	41	13	
1980	176	135	23	19	15	25	18	44	12	
1981	125	112	13	5	7	53	22	44	5	
1982	73	56	4	2	7	70	18	38	5	

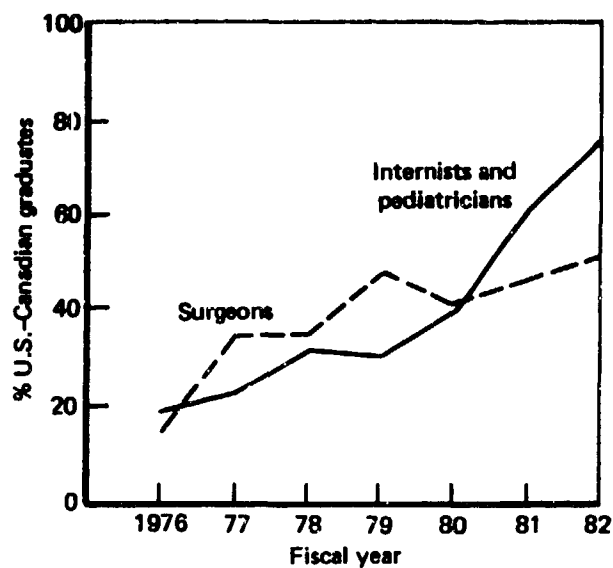
^a July 1, 1975 through June 30, 1976. Subsequent years ran from October 1 to September 30.
The transition period from FY1976 to FY1977 (July 1, 1976 to September 30, 1976) is omitted because it is subject to seasonal effects.



(a) Number recruited



(b) Age



(c) Medical school training

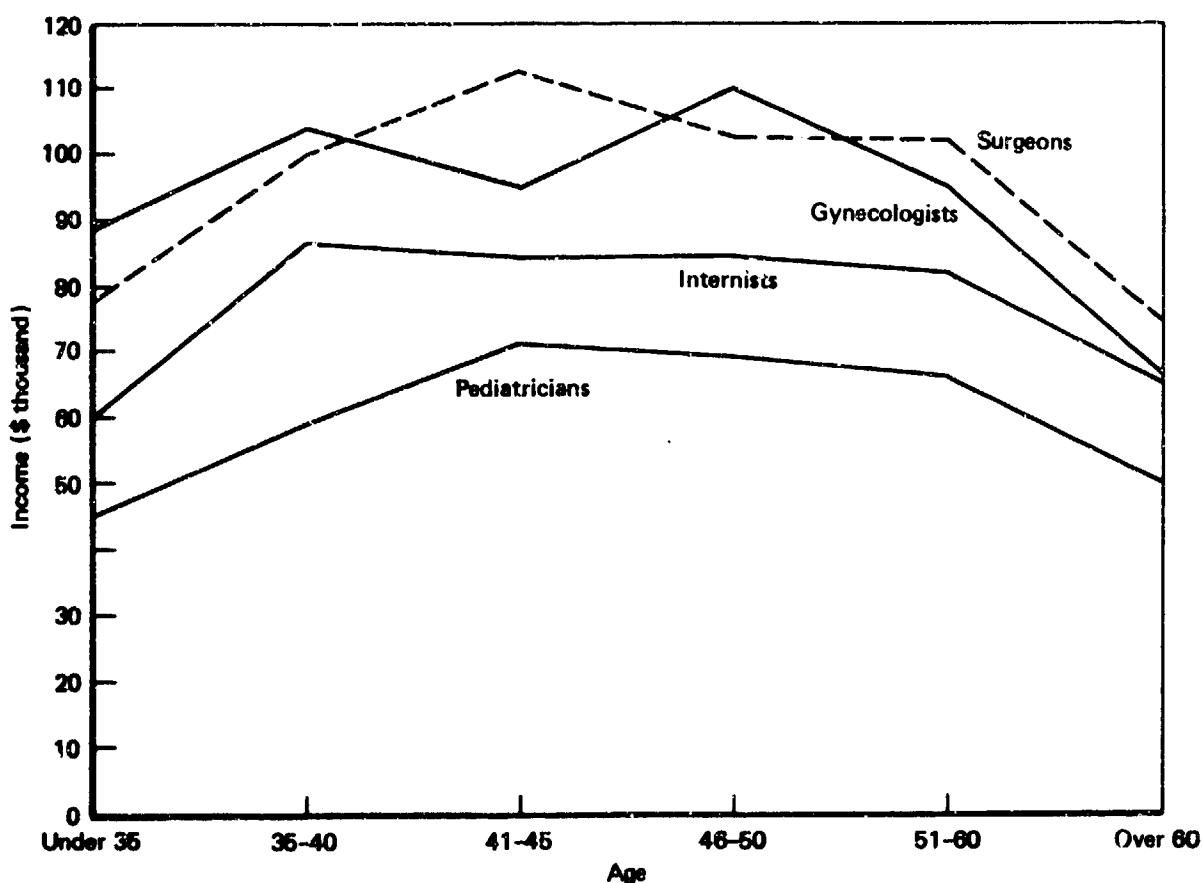
Fig. 1 - Characteristics of Air Force physician volunteers, 1976-1981

1977-1980 surgical goals were met. In FY1982, with surgeons being the primary recruiting target, 60 percent of the goal was met. Thus, during most of the period surveyed, the Air Force volunteer program did not meet its goals in either medicine or surgery, but the shortfalls were most pronounced in surgery. By 1981, the influx of AFHPSP physicians had eliminated the shortages in medicine, but most surgical specialties retained their critical shortage designation.

As the Air Force's ability to achieve its recruiting goals improved (as supply relative to demand improved) the typical recruited physician changed. Internists and pediatricians in particular became younger (Fig. 1b) and considerably more likely to be a U.S. or Canadian medical school graduate (Fig. 1c).⁴ Volunteer surgeons are increasingly U.S. graduates, but the change has been slower than for medical specialists. In contrast to internists and pediatricians, the surgeons are becoming older. It appears that, where the supply constraints are more severe, the volunteers are older and more often foreign trained. In fact, 40 percent of all surgeons recruited up through 1981 were over 40 the year they entered the Air Force and could not attain retirement without exceeding the maximum active duty age of 60.

Figure 2 displays average net physician incomes by age in four specialties in 1979, the most recent information available from the American Medical Association. All the specialties show patterns fairly similar to those of workers in other occupations: Earnings first increase, then become flat, then decline for older workers. The obstetrics and gynecology profile is double-peaked, with the dip in mid-career probably reflecting the shift from obstetrics to gynecology. Surgeons' and gynecologists' earnings decline more steeply in later life than internists' and pediatricians' earnings. Although the AMA statistics do not report hours worked by age, decreasing hours have been found to explain the falloff in earnings in other occupations. Surgeons perhaps cut back more sharply on their demanding practices after age

⁴The personnel records supposedly record whether the physician is board-certified in several places, but this information was not regularly entered until recently, when it began to affect the amount of special pay. Therefore, it has not been possible to investigate trends in the proportion of board-certified volunteers.



SOURCE: D.L. Goldfarb, ed., *Profile of Medical Practice*, 1981, Center for Health Services Research and Development, American Medical Association, Table 49.

Fig. 2 — Age profile of civilian physicians' incomes by specialty, 1979

45-50. Surgeons looking for a practice change in mid-career thus become promising targets for military recruiting.

Is there any evidence that the 1980 special pay bill shifted the supply of physicians upward? The very limited evidence provided by the Air Force's small volunteer recruiting program is mixed. The number of surgeons recruited increased over 40 percent in 1981 and then fell in 1982. However, more of the incoming surgeons, internists, and radiologists were U.S. graduates in these two years.

If increasing physician pay did improve supply conditions, the effect will fade over time unless physician special pay increases along with regular military compensation or unless civilian physician earnings begin to decline more sharply in real terms. Furthermore, improvement

in a limited volunteer program provides little information about the necessary conditions for recruiting up to 600 physicians annually in all specialties.

III. THE COSTS OF AFHPSP AND VOLUNTEER PHYSICIANS

In this section, the costs to the Air Force of obtaining their physicians from the AFHPSP program are compared with the costs of volunteer procurement. The comparisons do not recognize any of the differences in the characteristics of the physicians procured by the two programs. Costs were calculated for entry-level, board-certified physicians in two representative specialties--general internal medicine and general surgery. The methodology used determines the costs to the Air Force of staffing a position with a particular personnel category, in this case AFHPSP or volunteer physicians. Costs for each category are calculated separately and then compared. This billet cost model was originally developed to estimate the relative costs of employing physician assistants and physicians. It is described more fully in Buchanan and Hosek (1983).

THE COST MODEL

For each year, the billet cost model calculates the costs of employing each individual necessary to keep the position filled. At the beginning of the planning horizon, the Air Force obtains the first person from the procurement category under consideration. The model assumes the procurement costs are incurred one year before the person begins his active duty service. The costs for each year thereafter depend on whether the person remains in the Air Force through that year. In each year of service, the probability that the individual provider stays equals his procurement group's average continuation rate in the same year. If he remains, the cost is just his salary plus bonus pay. If he leaves, another person must be procured to take his place, and the cost cycle begins again. In addition, if the person remains 20 years or more, the Air Force pays a retirement annuity.

The model uses an infinite planning horizon to facilitate the calculations and eliminate inequities introduced with an arbitrary, finite horizon. The cost profiles and continuation probabilities for each provider type are assumed to remain stationary over time. In other

words, costs are expected to inflate in proportion to other goods and services. Thus, the proper discount rate is net of inflation. These assumptions imply that the expected discounted costs from the point of each new procurement equal those from the initial procurement. The model is recursive.

The billet cost model could be used to estimate either marginal or average costs. To select an optimal physician recruiting strategy, the Air Force should use estimates of the marginal cost schedules for each potential procurement source. However, data on marginal costs are typically not available, particularly for volunteer physicians. Daubert, Relles, and Roll (1982) have estimated a supply function for medical student applications to the AFHPSP program, which could be used to derive the shape of the AFHPSP marginal cost curve. However, the meager information about the supply of volunteers, described in the previous two sections, tells us nothing about marginal costs. Therefore, the cost estimates reported below represent average costs at current procurement levels. Since the policy question is whether to consider increasing volunteer recruiting and cutting back or eliminating the AFHPSP program, I estimated the costs of volunteers both at current special pay levels and at higher levels that might be needed to support substantially increased recruiting.

DATA

The billet cost calculation requires data for an individual AFHPSP or volunteer physician on recruiting costs, scholarship support for AFHPSP students, a two-week active duty orientation program, active duty compensation, time in each grade, the probability of continuing beyond each year of service, and the expected length of retirement. Retirement pay is a function of the number of years served more than 20 and base pay in the final year of service. The data used here reflect costs in FY1981.

Procurement costs--including recruiting, scholarship support, and active duty orientation--were provided by the Air Force for FY1980. I inflated these by 14.3 percent, the FY1981 pay raise, because most of these costs are for personnel. Base pay and allowances reflect the rates effective during FY1981.¹ The physicians also receive special pay

¹Compensation costs equal the sum of pay and allowances rather than

equal to \$14,000 to \$26,500, depending on years of training and national service, specialty, and board-certification. To facilitate comparisons, I assumed all physicians are board-certified.

Upon graduation from medical school, AFHPSP physicians complete their residency training in the Air Force or defer their active duty service until they complete a civilian residency program; 50 percent of the graduates are deferred. Because the net costs of military residency training are difficult to estimate, I estimated only the costs of employing AFHPSP physicians who receive civilian residency training.² The fully trained AFHPSP physician begins practicing medicine in the Air Force as a captain (O-3). I assumed that, if he stayed, he would be promoted to major after six years in grade (with credit for each year of residency training), lieutenant colonel after five more years, and colonel after six more years. He could then remain in the Air Force for 15 more years or until he reaches the age of 60.

Volunteer physicians may enter the Air Force as captains, majors, or lieutenant colonels. Entering rank depends on the individual's years of residency training (or specialty) and years of practice (age). Once on active duty status, the volunteers' careers progress in the same manner as AFHPSP physicians.

The probability that an AFHPSP or volunteer physician in each year of service stays at least one additional year equals his cohort's continuation rate for that service year. The Air Force Surgeon General's Office publishes updated estimates of continuation rates each year (Bircher, 1981). All calculations use Bircher's estimated continuation rates for all FY1980 physician accessions.³ The few

Basic Military Compensation (BMC) because BMC includes the tax advantage associated with the nontaxable allowances, which is not a cost to the Air Force. For calculating quarters allowances, all providers are assumed to be married.

²The cost comparisons focus on civilian-trained AFHPSP physicians for several other reasons. To the extent that residents substitute for more expensive physicians in providing patient care, the cost of residency training is decreased. The additional benefits the Air Force receives from its training programs decreases the net cost further. At the same time, without the AFHPSP, the Air Force would need to procure residents from other procurement sources, including direct recruiting.

³While Bircher has estimated separate rates for each procurement program, these rates are unreliable due to small or unrepresentative samples.

physicians who stay 20 years or more can retire with from one-half to three-quarters of their base pay. Military actuarial tables show that the life expectancy of 35 year-old officers is 76.8 years. The cost calculations assumed retirement benefits are paid until age 80, because surviving spouses, who are often younger and live longer, also receive benefits.

The cost estimates were prepared for different values of several important parameters to test for possible sensitivity in the results. These factors included discount rate, age at entry, retention rate at completion of first three-year contract, and pay level.

The relative costs of volunteer and AFHPSP physicians depend on the discount rate used in the calculations. Higher discount rates inflate initial AFHPSP scholarship costs and discount higher future compensation and retirement payments to volunteers. Shishko (1976) discusses the theory behind discounting public expenditures, surveys the numerous estimates of the nominal discount rate in the literature, and adjusts these estimates for inflation. The discount rate is thought by some to equal the social opportunity cost of the resources devoted to public expenditure; social opportunity cost is defined as the return society would get from the best private investment. Others believe the discount rate should reflect society's rate of time preference, which measures society's preference for resources available today instead of tomorrow. Shishko found that, after adjusting for inflation, those adhering to the social opportunity cost approach estimated discount rates between 7.65 percent and 10.67 percent, with all but one near 8 percent. To represent the rate of time preference approach, which leads to lower estimates, I have also used a 5 percent real rate; of the estimates surveyed by Shishko, three were in the 4.5 to 6.0 percent range. All of these estimates include a risk factor.

RESULTS

Tables 3 and 4 show the costs of volunteer and AFHPSP physicians in two specialties, general surgery and internal medicine. General surgeons have completed five years of residency training, internists have completed three years. The extra two years of training places the

surgeons higher in the special pay schedule; in addition, surgeons currently receive the incentive pay component of special pay (up to \$8000, but now set at \$5000). More experienced volunteer surgeons may enter the Air Force as lieutenant colonels (0-5), while internists rarely qualify for more than the grade of major (0-4).

Table 3 shows the costs estimated for volunteer physicians entering the Air Force at different ages and in different specialties. At an 8 percent discount rate, the differences are small. The lowers rate volunteers are those who, like the AFHPSP physicians, are new practitioners. These volunteers enter at a lower grade. The second row of estimates assumed that the retention rate after the initial three years of service was halved; these physicians are less expensive because lower pay and retirement costs outweigh increased procurement costs of obtaining more frequent replacements. Experienced physicians are up to

Table 3

PRESENT VALUE OF THE COSTS OF STAFFING ONE POSITION
WITH VOLUNTEER PHYSICIANS
(Thousands of dollars)

Description	Internist	Surgeon
	<i>r = .08, current incentive pay</i>	
New graduate (0 - 3)		
retention rate = 65%	\$581	\$675
retention rate = 36%	624	665
Some experience (0 - 4)	587	685
(age = 35)		
Experienced (0 - 4 or 0 - 5)	591	728
(age = 40)		
Experienced (0 - 4 or 0 - 5)	598	718
(age = 45)		

12 percent more expensive than new practitioners and, with the current special pay schedule, surgeons are 7-25 percent more expensive than internists.

Table 4 compares the costs of AFHPSP physicians and comparable volunteers who enter the Air Force upon completing their training. Cost estimates are shown for the 5 percent and 8 percent discount rates. For volunteer physicians, costs were calculated at current special pay rates and at higher rates.

Cost comparisons between these two procurement programs depend on the discount rate because the timing of costs differs. The AFHPSP program carries high procurement costs early, but the volunteer program carries higher compensation costs later on. At higher discount rates, the AFHPSP program becomes relatively more expensive. At 5 percent, AFHPSP physicians are 25-30 percent more expensive; the gap is 40

Table 4

PRESENT VALUE OF THE COSTS OF STAFFING ONE POSITION
AFHPSP VERSUS NEW GRADUATE VOLUNTEER PHYSICIANS
(Thousands of dollars)

Rate	Internist		Surgeon	
	AFHPSP	Volunteer	AFHPSP	Volunteer
Discount rate = 5%				
Current Incentive Pay (IP)	\$1,264	\$ 971	\$1,407	\$1,120
IP + \$15,000	--	1,264	--	1,413
Discount rate = 8%				
Current IP	813	581	937	675
IP + \$20,000	--	822	--	915

percent at the 8 percent discount rate.

These cost comparisons are misleading, however, because they represent different points in the supply schedules for the two programs. The Air Force is currently acquiring about 400 physicians each year from the AFHPSP program. With the demise of its major competitors for medical school financing, the National Health Service Corps and subsidized loans, the AFHPSP program has been having little trouble attracting over 1,000 new participants in recent years. In contrast, the Army, Navy, and Air Force are currently recruiting about 500 volunteers. In past years, the Air Force has recruited up to 550 volunteers, but this number included 270 physicians not specialty trained, large numbers of foreign medical graduates and older physicians, and far too few surgeons. Replacement of AFHPSP accessions with comparable volunteer accessions would require increases in the current special pay rates, particularly for the higher-paid specialists.

At what pay levels would the volunteer program lose its cost advantage over the AFHPSP program? The answer depends on which discount rate one adopts, but, as Table 4 shows, volunteers are less expensive so long as their supply price does not increase by more than \$15,000 to \$20,000. Increases of this magnitude might well be required for the Air Force to obtain the majority of its physicians by directly competing in the civilian marketplace.

IV. TRENDS IN THE U.S. PHYSICIAN MARKET

In 1980, the Graduate Medical Education National Advisory Committee submitted an extensive report to the Department of Health and Human Services forecasting physician manpower supply and needs to the year 1990 and beyond (McNutt, 1981). Table 5 indicates that the committee predicted physician supply will increase between 1978 and 1990 at an average annual rate similar to that from 1970 to 1980. In most cases, the growth rates by specialty were not expected to change noticeably; one exception is general/family practice, where the new family practice residency programs are now beginning to more than replace retiring general practitioners.

GMENAC also estimated the need for each specialty in 1990 and compared it with the projected supply. As the third column in Table 5 shows, the study forecast a 15 percent surplus across all specialties by 1990. This surplus is not expected to spread itself evenly over the specialties: the largest "gluts" fall in the surgical specialties. Indeed, the predicted requirement for general surgeons in 1990 is only 77 percent of the 1978 stock of surgeons.

These predictions are playing an important role in discussions about future supplies of military physicians. The proposition is that a crowded civilian marketplace for physician services will encourage more physicians to consider military medicine. If this proposition is true, the AFHPSP could soon be superfluous. Can we place very much confidence in the GMENAC predictions? And how is the civilian physician market responding to the changing supply conditions?

THE GMENAC FORECASTING METHODS

Supply Forecasts

Reinhardt (1981) provides a good summary and critique of the methods the GMENAC used to forecast the supply and demand of physicians in 1990. Forecasting the physician stock was fairly straightforward because most physicians who will be practicing in 1990 were already practicing or in training in 1978. The committee had to predict medical

Table 5
GROWTH IN U.S. PHYSICIAN STOCK, 1970-1990
(Percent)

Specialty	Average Annual Rate of Increase 1970-1980	Predicted Annual Rate of Increase 1978-1990	Predicted Excess 1990
All physicians	3.4 ^a	3.0	+15
General/family practice	0.4	1.4	+ 5
Pediatrics	4.6	4.0	+ 9
Internal medicine	5.2	5.0	+19
Surgery	2.3	2.5	+38
Obstetrics/gynecology	3.4	3.4	+44
Radiology ^b	4.3	3.4	+54
Psychiatry	2.8	1.7	-27
Anesthesiology ^b	3.9	2.3	- 7

SOURCES: *Physician Characteristics and Distribution in the U.S.*
(1981 edition), American Medical Association, McNutt (1981).

^a2.9% without Foreign Medical Graduates

^bNot modeled by GMENAC.

school entrants through 1983, foreign medical school entrants, retirements (and deaths), and specialty choices of new medical school graduates. In past forecasts, despite the long training pipeline, the latter factors have been so poorly predicted that the forecasts were well off the mark. Because of recent declines in the growth rate of foreign medical school graduates, the GMENAC aggregate supply forecasts may prove more accurate than their predecessors. However, the specialty-level forecasts should not be taken too seriously; to my knowledge, no one has yet estimated a satisfactory model of specialty choice.

The GMENAC's forecasts actually rely on predictions of numerous contributing factors, each of which could take on several values by the target year (1990). Rather than predict a single point estimate, as GMENAC did, a more useful forecast would suggest the range of estimates produced by several plausible predictions for the contributing factors; the forecast would indicate not only the several estimates but also the estimated probability that physician supply in 1990 would equal each number.

Another comment Reinhardt makes regarding the supply forecasts concerns not the number of physicians but the number of physician manhours. Many more women are entering medicine; currently, women physicians work fewer hours and see even fewer patients than their male colleagues. This is consistent with labor force patterns for women versus men in all occupations. Many women physicians are still fairly young; they may or may not continue to see fewer patients in the future. Indeed, there is no reason why male physicians should not alter their work habits in the future. If, in 1990, the average physician cuts back his patient workload by 15 percent, GMENAC's projected surplus disappears.

Requirements Forecasts

The military services procure volunteer physicians by competing in the civilian physicians' services market. Given the conditions of military employment, the number of physicians willing to volunteer depends on the civilian supply and demand for physicians' services. If civilian demand keeps pace with the GMENAC supply forecasts for 1990,

the military will not find its competitive position any better than it is today.

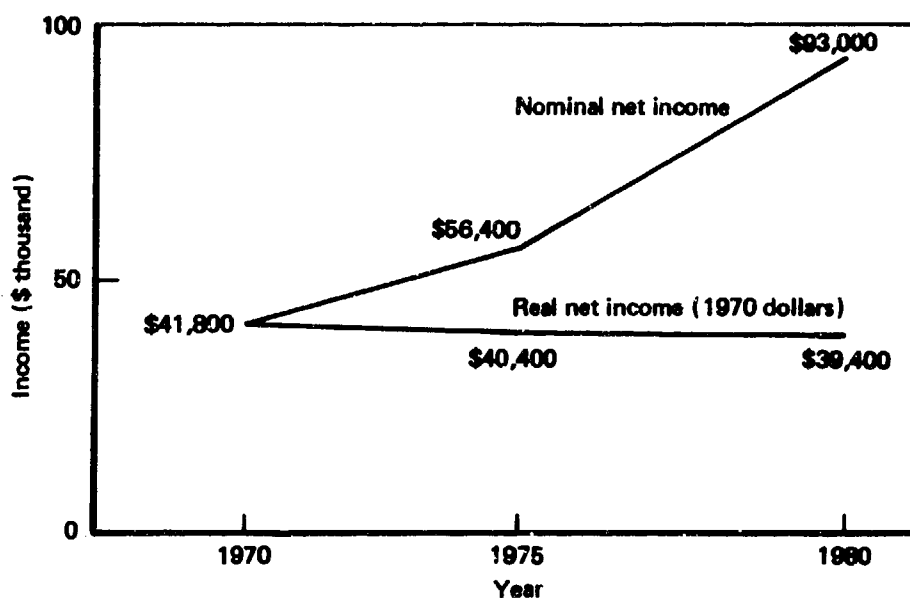
GMENAC estimated a surplus of physicians in 1990, not to meet projected demand, but to meet projected need. Need was estimated by panels of experts, given estimates of the population to be served in 1990. But in many circumstances, demand and need will not be equivalent. The current conditions in general surgery demonstrate why a needs-based forecast can mislead. GMENAC forecasts the United States will need fewer than 24,500 general surgeons in 1990. In 1978, there were already an estimated 30,700 in practice. From these numbers, we can surmise the existence of a substantial glut of general surgeons. However, the *Medical Economics* estimates show that general surgeons' median earnings have increased at a rate (10.5 percent) above the rate for physicians as a whole (8.2 percent). The proportion earning under \$60,000 dropped from 27 percent to only 17 percent.

A final source of error in GMENAC's predictions is the physician substitute population. The past 15 years have seen the rapid growth of non-physician health care providers, such as nurse practitioners and physician assistants. Various studies have shown that these providers can substitute for physicians for numerous simple medical services. How the demand and supply of non-physician providers will develop over the next decade is open to question, especially because these providers must work under physician supervision. Therefore, when we consider all these unknown factors--the rising importance of women physicians, uncertain work patterns, physician substitutes, and specialty choice--we should be wary of basing decisions about procuring military physicians on the GMENAC supply predictions unless we can observe resulting changes in the civilian market for physician services.

TRENDS IN THE PHYSICIAN SERVICES MARKET

To see how the physician services market has responded to increasing supply, consider recent changes in physician incomes, fees, visit rates, and geographic distribution. These indicators are apparently responding to the supply changes, although this conclusion must be tentative until the trends establish themselves over a longer period of time. Right now, one could easily mistake demand effects caused by the economic recession for supply effects.

Income and other financial market indicators show physicians just holding even with inflation, although, on average, they see fewer patients. Figure 3 shows that average physician net incomes grew at an annual rate of just over 6 percent between 1970 and 1975, and near 9 percent between 1975 and 1981.¹ Adjusted for inflation, net incomes have remained essentially constant, dropping only about .5 percent per year in both periods.² In the early 1970s physicians raised their fees around 4 percent in real dollars, but fee increases exceeded inflation by over 9 percent in the 1975-1981 period (Fig. 4a). Without these fee increases and--according to data from both the AMA and *Medical Economics*--successful attempts to keep expenses from outpacing fees,

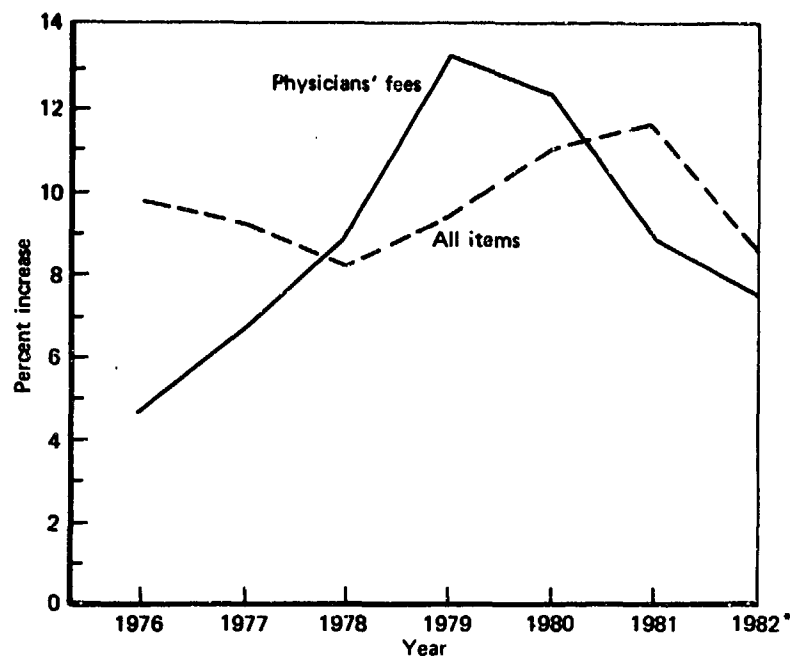


SOURCE: SMS Report, American Medical Association, June 1982.

Fig. 3 - Average nominal and real net income: 1970-1981

¹The 1981 estimate comes from the American Medical Association's new Socioeconomic Monitoring System whereas the earlier estimates come from their previous system, the Periodic Survey of Physicians. They do not indicate whether the data are compatible.

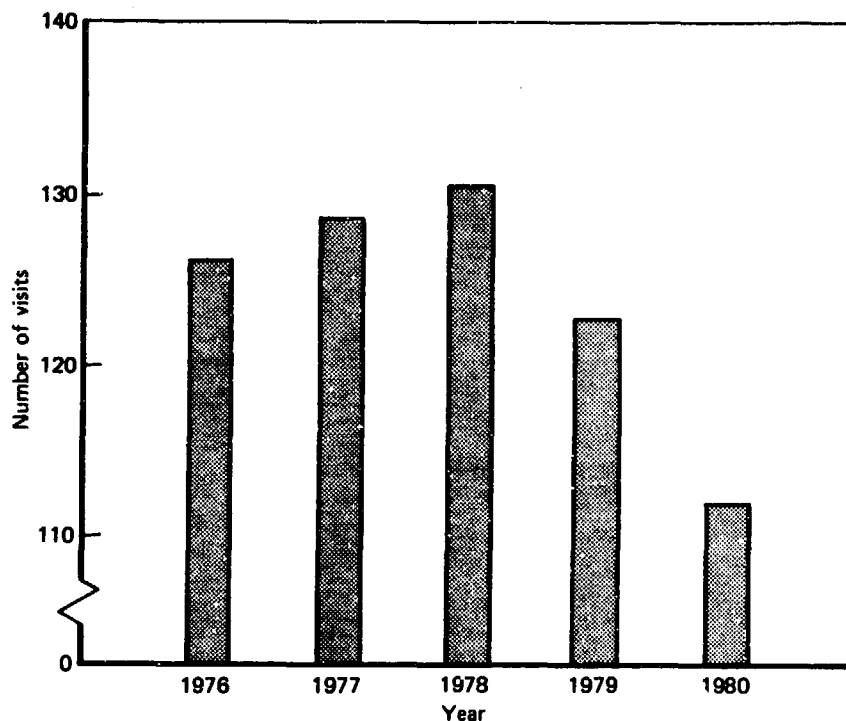
²Estimates published regularly by *Medical Economics* show a larger decrease in median net income of office-based physicians (1.1 percent per year). On the other hand, Sloan and Schwartz (1983) estimate an overall real increase between 1970 and 1979 of 1.7 percent.



SOURCE: U.S. Bureau of Labor Statistics.

(a) Increases in physicians' fees, compared with the cost of living for all items 1976-1982

*Estimated from January-July, 1982 figures.



SOURCE: D. L. Goldfarb, ed., *Profile of Medical Practice*, 1981, Center for Health Services Research and Development, American Medical Association, Table 14.

(b) Average number of total patient visits per week by specialty, 1976-1980

Fig. 4 — Increases in civilian physicians' fees and visits

decreasing visit rates would probably have caused more noticeable income declines (Fig. 4b).

Surgical specialties are considerably more lucrative than medical specialties; surgeons' earnings growth has kept pace with that of other specialties in recent years (Table 6).

In the civilian market, Health Maintenance Organizations (HMOs) offer physicians a practice setting most similar to military practice. Using 1979 data on a representative sample of U.S. physicians, merged with a special over-sample of HMO physicians, Wolinsky and Marder (1983) find considerable differences between HMO physicians and group fee-for-service physicians only for staff-model HMOs. After controlling for medical specialty, experience, sex, and workload, their results show that observed differences in the mean incomes earned by fee-for-service and group-model HMO physicians disappear. Staff-model HMO physicians did earn an estimated 16 percent less than physicians in fee-for-service groups. Solo fee-for-service physicians also earned less than their group counterparts (9 percent).

Based on estimates of the contributing factors to increasing expenditures on physicians' services in the 1970s, Sloan and Schwartz (1983) predict that the demand for services will approximately keep pace with the expected supply increases in the 1980s. Consequently, physicians' real net incomes should remain fairly constant during this decade. Important factors increasing demand include population changes, real growth in per capita income, and development of new medical technologies.

Recently, several health researchers have tried to determine whether the increased physician supply has caused more physicians to seek new practice opportunities by moving to traditionally less well-served rural areas. The researchers disagree about what has occurred. For example, after comparing the physician/population ratios in counties of differing populations, Fruen and Cantwell (1982) conclude that dispersion has not occurred. In particular, they find that, although physicians are becoming more plentiful relative to population in areas of all sizes, the rate of increase is smallest in the least populated

Table 6

AVERAGE NET INCOME BY CIVILIAN PHYSICIANS BY SPECIALTY, 1981

Specialty	Average Net Income in 1981	Annual % Change 1975-1981
General/family practice	\$ 72,000	11.6
Internal medicine	76,000	12.3
Pediatrics	63,900	10.6
Surgery	92,100	11.6
All physicians	74,000	11.8

SOURCE: *SMS Report*, American Medical Association, June 1982.

counties. However, Newhouse et al. (1982b), controlling for differing growth rates within specialties, find that physicians are dispersing. The altered locational patterns of individual physicians are being masked by changes in the specialty distribution, in particular the demise of the general practitioner.

Newhouse et al. (1982b) show that as a specialty grows its members move into smaller towns. Similarly, the larger specialties are more diffuse. Competition from board-certified and more specialized physicians in the larger towns causes relatively more of the non-board-certified and less specialized physicians to locate in smaller towns at each point.³ Civilian physicians who choose rural practices typically do not suffer financially. Newhouse et al. (1982a) estimate that, after

³Occasionally, as in the cases of internists and general surgeons, competition across specialties will negate the expected relationships between specialty size and diffusion. Thus, internists, who have a competitive edge over general and family practitioners, are infrequently found in small towns. However, the less numerous general surgeons, who compete primarily with surgical specialists instead of general or family practitioners, practice in twice as many towns under 5,000 as internists do.

adjusting for cost of living differences, physicians in towns and cities up to 1,000,000 earn 7 percent more than their big-city colleagues.

To summarize the civilian market trends, despite the noticeable decrease in the number of visits he handles, the typical physician has suffered very little real loss in earnings. However, he is beginning to locate in smaller cities and towns as the more desirable urban markets become more crowded. At each point, less populous areas are most likely to attract non-board-certified, less specialized physicians.

Implications of Civilian Market Trends for Military Supply

If civilian physicians are increasingly looking for new practice opportunities, we would expect more of them to consider a military practice. However, the parallel between the military and underserved areas is weakened to an unknown degree by the military's inability, in many specialties, to pay competitive salaries. Table 7 shows the total

Table 7
MILITARY PAY FOR PHYSICIANS:
BASIC MILITARY COMPENSATION (BMC) PLUS SPECIAL PAY
(Effective October 1981)

		Without Incentive Pay	With \$5,000 Incentive Pay	
		3-Years of Residency	5-Years of Residency	7-Years of Residency
Entering Volunteers				
0-3		\$ 40,300	\$ 45,300	\$ 50,300
0-4		42,400	47,400	52,400
0-5		47,000	52,000	57,000
Career Volunteers				
0-5	10 YOS	59,100	64,100	64,100
0-6	20 YOS	73,700	78,700	78,700

SOURCE: BMC from 1982 *Uniform Services Almanac*

compensation paid to military physicians in fiscal year 1981. Entering volunteers who had just completed their residency training earned from \$40,000 to \$50,000 in base pay, allowances, and special pay, depending on the amount of specialty training.¹ The rare experienced civilian physician who could qualify for the rank of lieutenant colonel (O-5) upon entry earned an additional \$7,000. After ten years of service, pay rose to a maximum of \$64,000. In 1981, only the most senior military physicians earned over \$70,000. In contrast, three-quarters or more civilian physicians in all specialties but pediatrics--including physicians still practicing past retirement age--earned over \$70,000 (Table 8).

In October 1982, all military personnel received a 4 percent pay raise; because their special pay is unchanged, physicians actually received only a 2-3 percent raise. To control the ballooning federal deficit, the Reagan administration is considering freezing federal pay in FY1984. That would mean that entry wages for physician volunteers will have grown only 3-4 percent a year between FY1980 and FY1984, despite large military pay increases in the first two years. The gap between military and civilian physician earnings is sure to remain.

Table 8

DISTRIBUTION OF CIVILIAN PHYSICIAN EARNINGS BY SPECIALTY, 1981
(Percent)

Earnings	Pediatrics	Internal Medicine	General Surgery	Orthopedic Surgery
Under \$50,000	30	13	11	5
\$50,000 - 70,000	27	15	13	6
Over \$70,000	43	72	76	89

¹ Medicine, pediatrics, and family practice require three years of residency training; general surgery requires five years. Because some physicians have extensive training and bonus pay increases after six years, pay is also calculated for seven years of training.

V. IMPLICATIONS FOR PHYSICIAN PROCUREMENT STRATEGY

CONCLUDING OBSERVATIONS

The AFHPSP scholarships provide the Air Force with a more stable supply source than direct recruiting. The long AFHPSP pipeline guarantees time to adjust to changing market conditions. At any point, the Air Force knows how many physicians will enter the active duty force for more than five years. The AFHPSP program provides stability in physician attributes as well as numbers. In particular, it yields a steady stream of young physicians, some of whom will become careerists. In contrast, many volunteers are already at mid-career, especially in the crucial surgical specialties. The benefits of the AFHPSP program are not free, although we can not tell how expensive they are without better estimates of the supply price of volunteers. Given the dearth of other medical school financial aid, if AFHPSP scholarship benefits could be cut without threatening participation, AFHPSP costs could be brought closer to current volunteer costs.

Direct recruiting offers some unique advantages, the most important of which is flexibility. Volunteer accessions can be increased or decreased quickly. Increases, however, are possible only if Congress approves any pay rates necessary to attract more physicians.

To what extent could the Direct Recruiting Program replace the Health Professions Scholarship Program in the long run? The answer to this question depends on how the physicians' services market responds to the increasing physician stock in the future. This market is changing, but the supply conditions the Air Force will face in even a few years are uncertain.

Physician training is expensive. People will not invest in medical education unless they expect an adequate return in income and the other rewards of medical practice. The past two years have seen a precipitous drop in government subsidization of medical education. The National Health Service Corps scholarships, which competed with the AFHPSP scholarships, are essentially gone. If medical students continue to pay a substantial share of the costs of their education, and physician

incomes drop relative to other professions, fewer college graduates will enter medicine. Medicine might join other highly skilled professions--engineering is one example--in experiencing cycles of excess supply and shortage. Over the long run, however, physician incomes will remain high enough to repay the individual's investment in educational costs and forgone earnings.

If, however, the subsidy cut-backs prove to be temporary and students need invest less in their education, lower incomes will not necessarily discourage applicants to medical school. In this case, how far incomes fall as the physician stock expands will depend on changes made in the financing and regulation of health care consumption.

One new option that may become increasingly attractive is to redirect some of the AFHPSP scholarship funds to subsidize residency training. The number of residencies has not grown with the number of medical students (Kindig and Dunham, 1982). A residency scholarship might augment or replace the income now paid by the teaching hospital for existing positions, or it might subsidize new positions. Unlike the current program, the subsidies can be targeted to specialties difficult to recruit directly. In addition, the lead time for altering the number or mix of physician accessions would be shorter. However, this and other new options should be undertaken cautiously lest the stable AFHPSP pipeline be disrupted.

NEED FOR MORE DATA

Before considerable changes are made in physician procurement policy, more information should be acquired. A study similar to the Daubert, Relles, and Roll study of AFHPSP participation could estimate the supply of volunteers as a function of the military-civilian pay ratio. These estimates, together with plausible assumptions about future civilian earnings, could then be used to estimate volunteer costs at higher recruiting levels. A second piece of information, now lacking, is the retention of physicians from each major procurement source. On) recently have enough volunteers completed their initial obligation to permit analysis of retention; however, reliable predictions of AFHPSP retention cannot be made for another several

years. Finally, given the differing profiles of entering AFHPSP and volunteer physicians, an evaluation of the performance of the physicians procured through the two programs appears warranted.

BIBLIOGRAPHY

- Bircher, J., "Physicians Retention and Outlook with Analysis by Specialty," *Health Policy and Programs Report 110-80*, Office of the Surgeon General, USAF, June 1981.
- Buchanan, J. L. and S. D. Hosek, *Costs, Productivity, and Utilization of Physician's Assistants in Air Force Primary Medicine Clinics*, The Rand Corporation, R-2896-AF, June 1983.
- Daubert, V. L. J., D. A. Relles, and C. R. Roll, Jr., *Medical Student Financing and the Armed Forces Health Professions Scholarship Program*, The Rand Corporation, R-2414-HA, January 1982.
- Fruen, M. A., and J. R. Cantwell, "Geographic Distribution of Physicians: Past Trends and Future Influences," *Inquiry*, Vol. 19, Spring 1982, pp. 44-50.
- Kindig, D. A., and N. C. Dunham, "A Future Shortage of Residency Training Positions: Dilemma or Opportunity?" *The New England Journal of Medicine*, Vol. 306, No. 24, June 17, 1982, pp. 1484-1485.
- McNutt, D. R., "GMENAC: Its Manpower Forecasting Framework," *American Journal of Public Health*, Vol. 71, No. 10, October 1981, pp. 1116-1124.
- Newhouse, J. P., A. P. Williams, B. W. Bennett, and W. B. Schwartz, "Where Have All the Doctors Gone?" *Journal of the American Medical Association*, Vol. 247, No. 17, May 7, 1982a, pp. 2392-2406.
- , "Does the Geographical Distribution of Physicians Reflect Market Failure?" *The Bell Journal of Economics*, Vol. 13, No. 2, Autumn 1982b, pp. 493-505.
- Reinhardt, U. E., "The GMENAC Forecast: An Alternate View," *American Journal of Public Health*, Vol. 71, No. 10, October 1981, pp. 1149-1157.
- Saywell, R. M., J. Studnicki, J. A. Bean, and R. L. Ludke, "A Performance Comparison: USMG-FMG Attending Physicians," *American Journal of Public Health*, Vol. 69, No. 1, January 1979, pp. 57-62.
- Shishko, R., *Choosing the Discount Rate for Defense Decision Making*, The Rand Corporation, R-1953-RC, July 1976.
- Sloan, F. A., and W. B. Schwartz, "More Doctors: What Will They Cost?" *Journal of the American Medical Association*, Vol. 249, No. 6, February 11, 1983, pp. 766-769.

Wolinsky, F. D. and W. D. Marder, "The Organization of Medical Practice and Primary Care Physician Income," *American Journal of Public Health*, Vol. 73, No. 4, April 1983, pp. 379-383.