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THESIS

A DESCRIPTIVE ANALYSIS OF THE  
1992 ACTIVE-DUTY PHYSICIAN ASSET:  
WITH COMPARISONS TO THE KAISER-PERMANENTE  
PHYSICIAN STAFF MODEL DATA

by

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September, 1993

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A Descriptive Analysis of the 1992 Active-Duty Physician Asset:  
With Comparisons to the Kaiser-Permanente Physician Staff Model Data

by

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Submitted in partial fulfillment  
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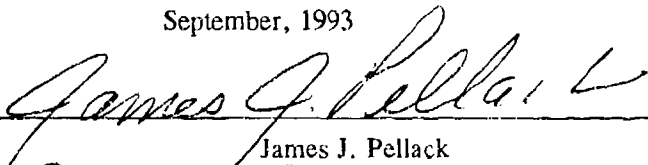
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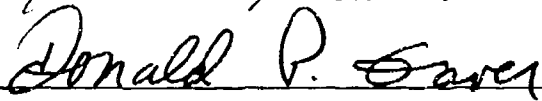
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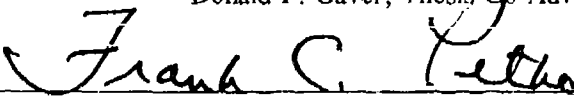
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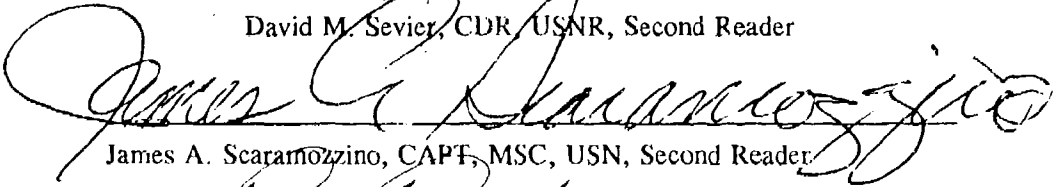
  
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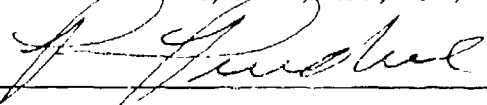
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**ABSTRACT**

In a time of declining military budgets, DoD is reducing health care costs while insuring available, accessible, and quality health care. One area which impacts these factors is physician staffing levels. The problem for DoD is one of maintaining a cadre of active-duty physicians, which is generally based on wartime requirements, while providing peacetime medical care to over eight million beneficiaries. This thesis examines this problem by using data from the Defense Manpower Data Center and the Kaiser-Permanente HMO, northern CA region, in Oakland, CA (K-P). A baseline assessment of the 1992 active-duty physician asset is done by first analyzing each Service's number of active-duty physician specialists and then by comparing DoD active-duty physician staffing levels to the corresponding physician staffing levels of K-P. Additionally, beneficiary demographics are analyzed and compared between each Service, as well as, DoD and K-P. Similarities and differences in physician staffing levels between the Services and between DoD and K-P are discussed.

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## EXECUTIVE SUMMARY

In a time of declining military budgets, DoD is developing innovative policies that reduce health care costs while insuring available, accessible, and quality health care. One area which impacts these factors is physician staffing levels. Specifically, the problem for DoD health-care planners is one of using a cadre of active-duty physicians, the size of which is principally based on wartime requirements, while providing peacetime medical care to over eight million beneficiaries.

The present study used very large health-care related data sets (over 8 million people were included) from the Defense Manpower Data Center and the Kaiser-Permanente HMO, northern CA region, in Oakland, CA (K-P) to address this staffing issue. The overarching objective was to provide a baseline assessment of 1992 active-duty physician manpower levels by conducting two broad exercises:

- Analyzing the structure of each Service's medical department; specifically, the numbers of active-duty physician specialists, as well as beneficiary demographics, and
- Comparing DoD active-duty physician staffing levels to the corresponding physician staffing levels of K-P.

The findings from the analysis into different Service's physician manning levels were straight-forward. The proportion of active-duty medical personnel differs as a function of each Service. Moreover, the ratio of active-duty medical department personnel to the total number of active-

duty personnel were essentially the same for the Air Force and Army, but markedly different for the Navy which was far lower.

Comparisons between each Service's number of active-duty physicians and beneficiary demographics were examined to extend the analysis. The ratio of the number-of-physicians-per-100,000-beneficiaries was used to compare inter-service differences of the number of physicians by specialty.

The comparative analysis revealed that the Army had the largest physician-to-beneficiary ratio. The Navy had the smallest. Of 23 specific physician specialties examined, the Army had the largest ratios in 16 categories while conversely, the Navy had the smallest ratios in 15 categories. Two additional findings emerged. First, a large proportion of each Service's active-duty physicians were in training programs. Second, the beneficiary demographic analysis showed that the Navy and Marine Corps had the youngest median age and the Air Force had the oldest. Three conclusions were drawn.

- The number of physicians in both the Army and Air force may not have decreased proportionately to the decreases in its respective beneficiary population.
- Each medical department allocates significant levels of physician assets to training programs.
- Differences in operational requirements and beneficiary demographics may explain some of the differences between each Services physician to beneficiary ratios.

Another analysis compared physician-to-beneficiary ratios in DoD with the corresponding ratios of a large civilian HMO, Kaiser-Permanente in Oakland, CA (K-P). Also, similarities and differences between beneficiary populations were examined.

The results of this analysis showed that, of total physicians, DoD had a greater physician-to-beneficiary ratio than K-P. If those physicians in training programs were excluded from the total, however, then DoD had a smaller ratio than K-P. Also, of 20 physician specialties, DoD had a greater ratio in only two categories, Pathology and Adult Medicine, while four specialties - OB/GYN, Anesthesiology, Emergency Medicine, and Pediatrics - showed a significant difference between the larger K-P ratios and smaller DoD ratios. This analysis revealed two other findings. Based on certain assumptions, there may be enough active-duty physicians to meet the health-care demand of all DoD beneficiaries, and the median age of the DoD beneficiary population is about five years younger than that of K-P.

Three conclusions were drawn from the DoD and K-P comparative analysis.

- Demand for medical care by DoD beneficiaries in the Pediatric, Emergency Medicine, Anesthesiology, and OB/GYN specialties may substantially exceed the supply of active-duty physicians in those specialties.
- DoD operational requirements and differences in beneficiary demographics would explain some of the variation between the DoD and K-P ratios.
- The capacity of the DoD direct health care system is reduced because of the large proportion of active-duty physicians in training programs.

In summary, this study compiled baseline information from over 8 million people and addressed the DoD active-duty physician asset issue. Its initial findings provide health-care planners a foundation on which to base future decisions.

## I. INTRODUCTION

### A. BACKGROUND

The escalating and prohibitive cost of health care for both the military and civilian sectors presents a difficult problem to Department of Defense (DoD) and civilian health-care planners. This situation is stimulating health-care organizations to develop innovative policies that reduce health-care delivery costs while ensuring available, accessible, quality health care. In addition, DoD must address the problem of meeting the health-care requirements of a down-sizing military force and any relocations of that force.

#### 1. Civilian Sector

A major concern to civilian health-care planners is the uncertain aspects of the many potentialities involving health-care reform. The most notable group which has studied this issue, the President's Task Force on National Health Care Reform, is exploring the concept of a national health-care delivery system.<sup>1</sup> An important stimulus for reforming the national health-care system is the dramatic rise in national health-care costs as illustrated in Figures 1 and 2.<sup>2</sup>

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<sup>1</sup>Initial figures estimate the cost to taxpayers of a national health-care system between \$110-\$180 billion [Ref.1].

<sup>2</sup>Projected costs assume no changes to current national health-care policy.

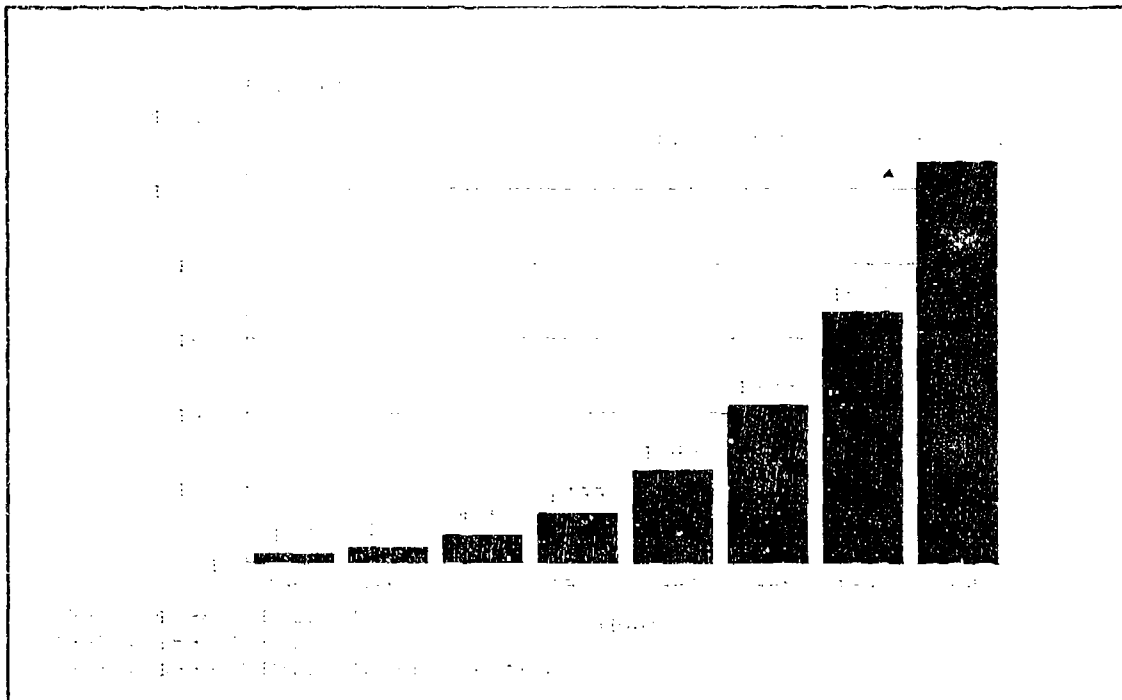


Figure 1. National Health Care Costs [Ref. 2]

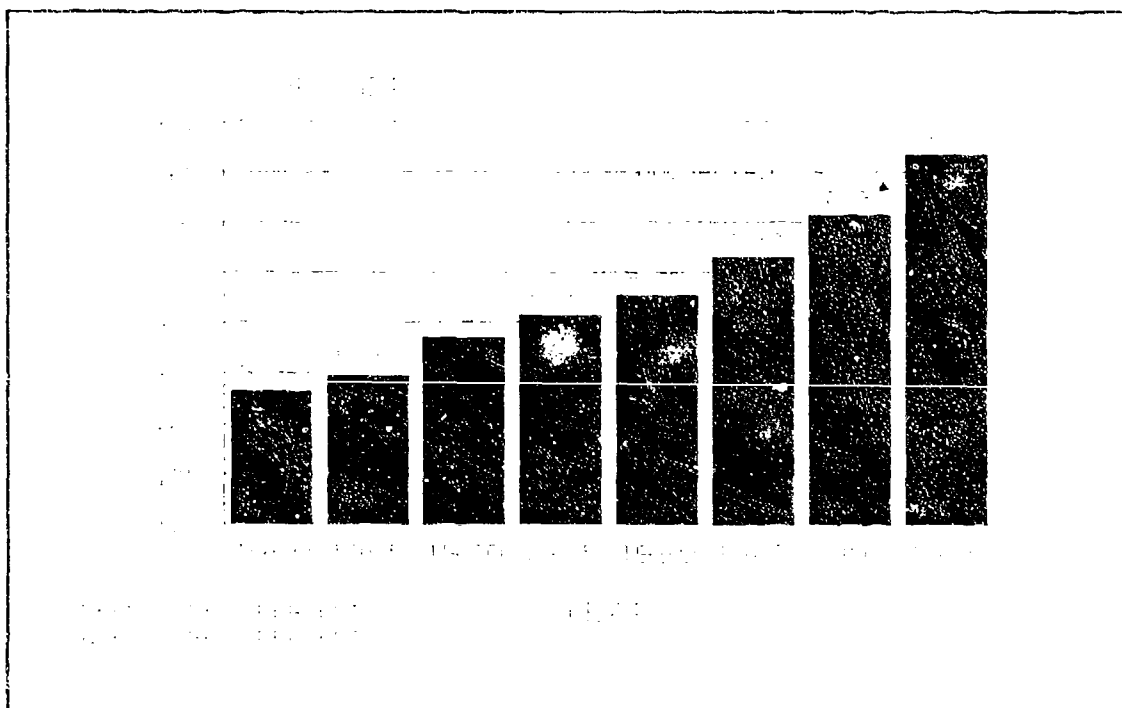


Figure 2. National Health Care Cost As A Percent of Gross Domestic Product [Ref. 2]

These costs have been rising almost twice as fast as the general inflation rate for decades, despite efforts to control them [Ref. 3]. In 1993, the national health-care cost is projected to be \$940 billion, or over 14 percent of the Gross Domestic Product (GDP). Figure 3 plots these costs on a logarithmic scale to highlight the continuous annual percent increase in national health care costs.<sup>3</sup>

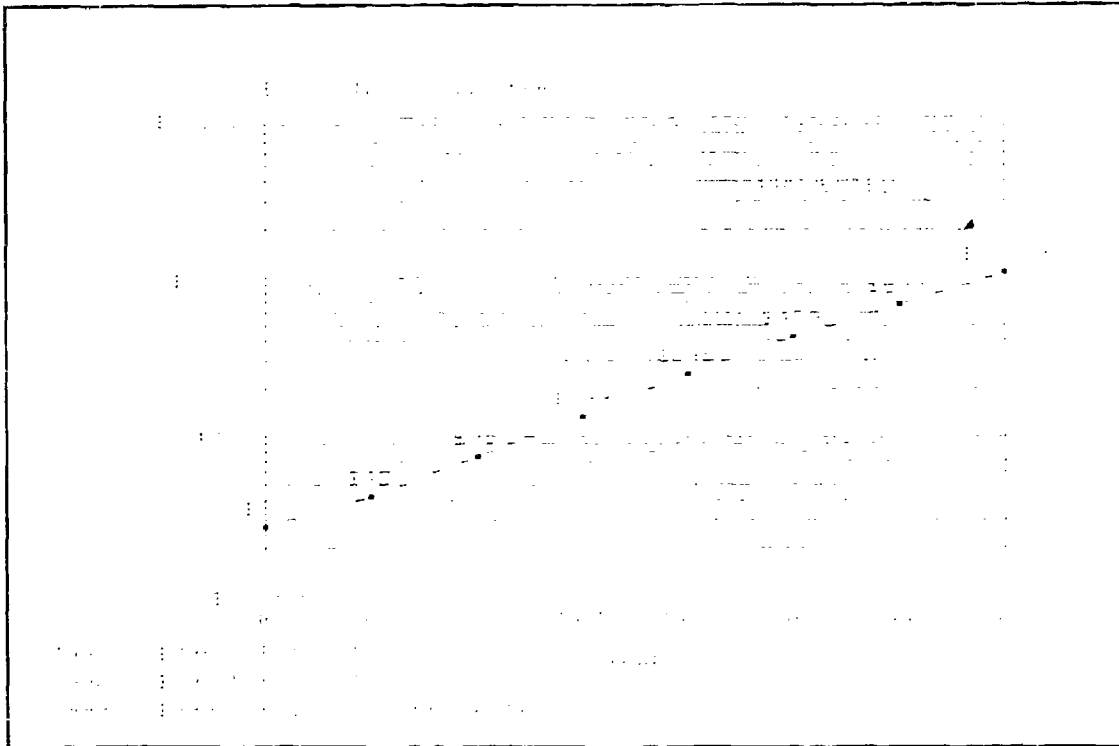


Figure 3. Logarithms of National Health Care Costs

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<sup>3</sup>Fitting a least squares best fit regression line to the logarithms of national health care costs, the statistics for the regression calculate an R-square of 0.9989 and a F-value of 2949.785. Additionally, the statistics for the slope calculate a coefficient of 0.108202, a very small standard error of 0.001992, and t-value of 54.31192.

The data show that over time there has been a constant annual percent increase of 10.82 percent in national health care costs. To further demonstrate rising health-care costs, average per-capita health-care expenditures, as illustrated in Figure 4, increased from \$1,054 to \$2,585 or 150 percent during the ten-year period 1980-1990 [Ref. 4]. Putting this figure in perspective, in 1990 the median four-person family income was \$30,000. Given the average per-capita health-care expenditure was \$2,500, approximately \$10,000 or one-third of a (median) family's income was spent on health care [Ref. 3]. The variability of such expenditures is not known, but is probably quite high.

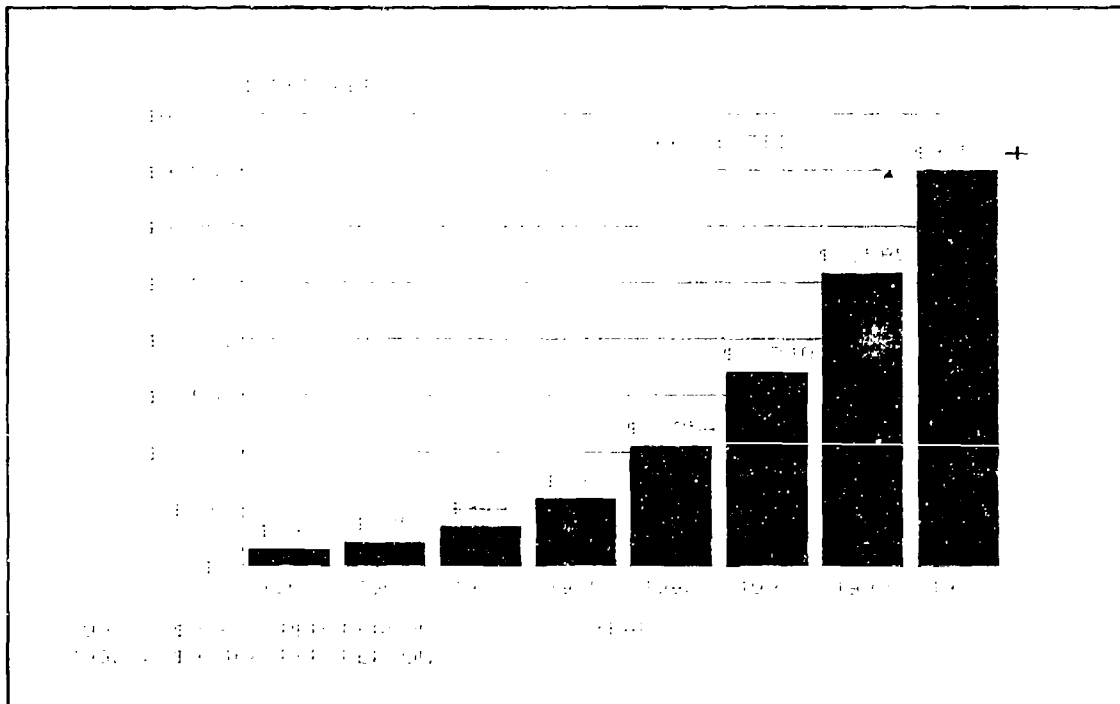


Figure 4. Per Capita Health Expenditures

The high cost associated with providing health care is forcing private providers to examine all facets of their industry in order to reduce price by reducing costs. One area, health-care labor, which is obviously considered a vital element in the delivery of health care, represents a large portion of that cost.

## **2. Military Sector**

Military health-care planners have concerns that are somewhat different from those of their civilian counterparts. Specifically, they must deal with managing service provision in the environment of a declining DoD budget. The current administration's proposed fiscal year (FY) 1994 Budget Plan reduces DoD's FY-1993 \$290.6 billion budget to \$276.9 billion in FY-1994 and to \$252 billion in FY-1998 [Ref. 5], a decrease of some 14 percent notwithstanding inflation. To plan for significant DoD budget cuts and fundamental changes in health-care delivery, DoD has enacted several policy modifications effecting a shift from a service-segregated to a more DoD-integrated health-care system. For example, in the past and continuing today, the three Services (Army, Navy, and Air Force) have managed their respective medical department independently of one another. In effect, DoD consists of three separate and distinct health-care delivery systems. To create a more efficient management, DoD has initiated the Lead Agent Facility Program, which states the following policy [Ref. 6]:

In order to enhance the efficiency and effectiveness of the Military Health Services System, medical programming guidance has identified a goal of establishing a DoD health care organizational structure for overlapping catchment areas which supports the goals of the coordinated care program. Such an organization has been envisioned through the concept of the lead agency.

This program would establish one lead agent (the commanding officer of a hospital) for 12 geographic Health Services Areas (HSA) throughout the continental United States. Through a collaborative effort with the other Services' medical facilities, the lead agent would be responsible for the delivery of health care to all DoD beneficiaries in the HSA. In the central California health service area, for example, the commanding officer of Travis Air Force Medical Center is the lead agent. The Army's Letterman and Silas B. Hays hospitals, and the Navy's Oak Knoll hospital, and other smaller DoD medical facilities, are to receive immediate direction and fiscal guidance from the lead agent facility.

As managerial barriers between the Services' medical departments merge, DoD must preserve cost-efficient, readily available, and quality health care. To maintain this level of health care for eligible beneficiaries, a requirement exists for detailed analyses of health-care resources and the demands imposed on these resources at the DoD corporate level. One topic needing such an analysis is that of determining appropriate physician manpower levels for a large, comprehensive health-care delivery system. Analyzing the DoD active-duty physician asset levels, can provide insight into

appropriate levels of care across the health-care continuum, as well as identify potential weaknesses in the overall health-care delivery system.

#### **B. OBJECTIVE OF THE RESEARCH**

The objective of this thesis is to provide a broad baseline assessment of the active-duty physician asset in a peacetime environment. A descriptive data analysis is performed, based on compilation of the most current beneficiary demographic data, to identify and report the 1992 level of DoD's active-duty physician manpower assets and to relate those assets to a similar civilian health-care delivery system. In meeting the objective this thesis will focus on three areas.

- Determine the current (FY-92) proportion of active-duty physicians in each medical duty specialty area across the three Services.
- Compare and contrast the proportions of DoD active-duty physicians in each medical duty specialty to those of a large civilian comprehensive health-care delivery systems.
- Estimate the required physician manning levels for a prototype DoD health-care delivery system and discuss the results.

#### **C. SCOPE AND LIMITATION OF THIS STUDY**

This thesis analyzes various aspects of the peacetime DoD active-duty physician force. The focus of the study is at the DoD level, although some intra-service and inter-service analysis is done. Information used in this study is DoD active-duty physician manpower data, DoD beneficiary

demographic data, civilian-sector physician staffing data and civilian sector beneficiary demographic data.<sup>4</sup> The results from this analysis should be viewed as a static interpretation of the DoD health-care system from information gathered up to end of FY 1992. When more current information becomes available, the methodology developed in this analysis can be used to continually evaluate the DoD active-duty physician asset. The dynamics of the changing DoD force structure mitigate against making projections in the area of active-duty physician staffing levels.

#### **D. ORGANIZATION OF THE THESIS**

Chapter II describes the problem focus in this study. A more detailed discussion of DoD and civilian health-care issues are presented. Active-duty physician staffing levels are specifically addressed. The final section of Chapter II presents the raw data and the assumptions regarding the data. Chapter III is the analytical portion of this thesis; it performs a series of statistical treatments of the raw data and reports the results. Chapter IV summarizes and offers conclusions based on the statistical evidence of Chapter III. Finally, Chapter V provides recommendations and topics for future expansion regarding the DoD active-duty physician asset area.

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<sup>4</sup>DoD data was obtained from the Defense Manpower Data Center, Monterey, CA. Civilian data was obtained from the Kaiser-Permanente Health Maintenance Organization (northern CA. region), Oakland, CA.

## II. PROBLEM FOCUS

The goal of this chapter is to focus on the subject of active-duty physician staffing levels. To accomplish this task the following four topics will be addressed.

- The organizational structure of, and physician manpower models used in, civilian health-care delivery systems.
- The organizational structure of, and types of health-care information used in, the military health-care system.
- The problem of this study, which addresses the effects that active-duty physician manpower levels have on the delivery of health care to DoD beneficiaries.
- The sources of the health-care data used for this study and the assumptions regarding that data.

Included in the discussion of the military health-care system is a presentation of the various raw data to be examined and analyzed in Chapter III.

### A. MANAGED CARE SYSTEMS

As discussed in Chapter I the rising price of national health care is forcing private health-care delivery systems to make major reductions in cost. One way such health-care delivery is becoming more cost-efficient is through organizational changes. For example, over the last 30 years, health-care delivery has evolved from individual providers each serving a small population to large corporate networks serving millions of beneficiaries through Managed Care Systems

(MCS's).<sup>3</sup> To illustrate this change using two types of MCS's: Health Maintenance Organization<sup>4</sup> (HMO) enrollment grew sixfold, from six million in 1976 to 36.5 million in 1990 [Ref. 7], and enrollment in Preferred Provider Organizations<sup>5</sup> (PPO) increased at an average annual rate of 46 percent since their inception in the early 1980's [Ref. 4].

With the growth in MCS's, these organizations depend on numerous factors to meet basic objectives of providing adequate health-care to enrolled members. Two of these factors, demand for health care and differing physician staffing models, are described in the following sections.

#### **1. Demand for Health Care**

Although large MCS's require complex and detailed planning, analysis, and implementation, two elements; supply and demand, drive system performance. From a consumer's viewpoint, supply includes the quantity, types, and availability of medical services within his or her area, as well as the affordability of such care. Demand from the

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<sup>3</sup>The legislative catalyst for this change was the "Health Maintenance Organization Act of 1973" (P.L. 93-222) which authorized the expenditure of federal funds for establishing health maintenance organizations (HMO's) [Ref. 8].

<sup>4</sup>A HMO is defined as a medical organization which provides comprehensive health services to an enrolled population for fixed, prepaid premiums [Ref. 4].

<sup>5</sup>A PPO is an arrangement which provides financial incentives rather than controls, to enrolled members, to persuade them to 'prefer' to receive health care services from a member of a designated select panel of health-care providers [Ref. 4].

health-care provider's standpoint can be explained by two theories. The first proposes that physicians create their own demand [Ref. 9]. The second theory, most commonly used by MCS's, suggests that utilization rates based upon the demographics of a population decide demand. The following statement by J.R. Jeffers best explains this philosophy:

Health needs of the population are determined independently by expert medical professionals and reflect the quantity of health care services which these medical experts believe the population should consume, given the existing medical knowledge, in order for the population to experience the maximum level of well being. [Ref. 10]

Simply put, for a health-care system to meet a "standard of care" (decided by expert medical professionals), for a population of given size and type, health-care planners estimate demand using historical utilization data.

## **2. Physician Manpower Models**

Since health-care delivery is primarily physician driven, the number and specialty mix of physicians is a vital element in meeting demand. To provide the proper level of physician manpower to meet this demand, MCS's use three basic physician staffing models:

- Independent Practice Association (IPA's),
- Group, and
- Staff.

Most IPA's are contracts between a MCS and a single physician.<sup>6</sup> The physician is responsible for providing

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<sup>6</sup>Some IPA's contract with a small group of physicians.

service to the contracted number of beneficiaries in the MCS. Physicians under IPA's are not employees of the MCS, thus only part of their practice generally serves the contracting MCS.

The Group model is similar to the IPA model. As opposed to contracting with individual providers, the MCS will contract with multi-specialty group practices. These groups are usually larger and more diverse than IPA's.

The Staff model is a centrally controlled system in which the physician is an employee of that MCS and serves only its beneficiaries. The MCS determines physician staffing levels based on a population's demographics and related historical utilization rates. For example, in one system, for every 1,000 females between the ages of 18-50 one obstetrician is required. This model most closely resembles the DoD health-care system and is utilized in Chapter III to compare DoD and civilian health-care systems.

These types of staffing models are not the sole mechanisms for establishing a MCS. In addition to health-care manpower levels, a population requires facilities, equipment and health care delivery mechanisms in order to receive quality health care [Ref. 11]. However, this thesis focuses on the physician manpower aspect of a health-care system.

The following section describes the structure of the current DoD health-care system and the decision mechanisms used by health-care planners. Additionally, quantitative data

regarding DoD beneficiary population, medical and dental facilities and health-care manpower are presented.

## **B. MILITARY HEALTH SERVICES SYSTEM**

The architecture on which the DoD health-care delivery system is built is the Military Health Services System (MHSS). Controlled by the Office of the Assistant Secretary of Defense for Health Affairs (OASD(HA)), the mission of the MHSS is to ensure adequate health-care to active-duty personnel and other eligible beneficiaries. In meeting this mission, health-care delivered under the MHSS, during wartime and peacetime can be divided into three programs:

- Direct care,
- CHAMPUS (Civilian Health and Medical Program of the Uniformed Services) care,
- Supplementally funded care.

Direct care includes health care provided by DoD medical treatment facilities (MTF's) at virtually no cost to the beneficiary. The goal of the MHSS is to maximize the use of direct care by expanding in-house medical specialty services and by improving patient accessibility to the MTF [Ref. 12]. Medical care not available because of excessive demand within a medical facility or lack of medical specialty services is obtained from the civilian sector.

CHAMPUS is a federally funded health-care insurance program offered to DoD beneficiaries, except active-duty personnel and MEDICARE eligible beneficiaries, when direct

care in MHSS is unavailable. Under CHAMPUS, the beneficiary incurs some deductible and co-payment costs.

When direct care in the MHSS is not available for active-duty personnel, health-care is obtained through the civilian sector. The price of this care is paid by supplemental funds, part of the Operations and Management (O&M) budget. These supplemental funds are distributed as part of a MTF's budget and are based on the size of the active-duty population for which it is responsible.

To administer these three programs and maximize direct care, the MHSS has developed into a complex health management system. One integral part of this system, the Defense Medical Information System (DMIS),<sup>7</sup> is a repository for many DoD health-care data sets. Information obtained from DMIS is utilized by DoD health-care planners to manage the MHSS. The following four categories are examples of data which influence the decisions DoD makes regarding health-care delivery:

- Beneficiary population,
- Number, type, and location of medical facilities,
- Facility workload and expense data,
- Number and type of DoD health-care providers.

Therefore, given its number of beneficiaries, health-care facilities, health-care providers, and utilization data, DoD

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<sup>7</sup>The mission of DMIS is to provide health-care management information services to the OASD(HA) [Ref. 13].

can analyze the demand for medical services and the level of care the MHSS provides to its beneficiaries.

The next section discusses the specific sources from which DoD obtains beneficiary, facility, utilization, and manpower information. Additionally, some of the most current DoD beneficiary, medical facility, and medical manpower data are presented.

#### **1. Defense Enrollment Eligibility Reporting System**

The source for beneficiary population and demographic data, indexed by sex, age, service, category, and catchment area is the Defense Enrollment Eligibility Reporting System (DEERS). One use of this data is determining demand for health care in specific geographic areas.<sup>8</sup> For example, at the end of 1992 there were 8,228,213 eligible DoD beneficiaries in the MHSS [Ref. 14]. The relationship between this DoD demographic data and physician manpower levels will be analyzed in Chapter III.<sup>9</sup> Table I details the 1992 total DoD beneficiary population, partitioned by Service and beneficiary category.

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<sup>8</sup>MHSS is divided into 12 geographic Regions worldwide; nine (Region 1-9) in the continental United States (CONUS), one (AK/HW) for Alaska and Hawaii, and one each for the Atlantic and Pacific areas (not part of the U.S.).

<sup>9</sup>It is worth noting that there are various proposals in DoD and Congress addressing the downsizing of the military. Therefore the exact size and structure of the future active-duty force is unknown at this time. This situation makes projecting future DoD beneficiary population difficult.

TABLE I. DoD ELIGIBLE BENEFICIARIES AS OF OCTOBER 1992

BENEFICIARY TYPE	ARMY	NAVY AND MARINE CORPS	AIR FORCE	TOTAL
ACTIVE DUTY	601,770	711,267	446,618	1,759,655
ACTIVE-DUTY DEPENDENT	874,835	885,728	714,228	2,474,791
RETIRED	579,891	519,002	602,211	1,701,104
RETIRED DEPENDENT	664,180	588,021	715,571	1,967,772
SURVIVOR	134,317	92,130	98,444	324,891
<b>TOTAL</b>	<b>2,854,993</b>	<b>2,796,148</b>	<b>2,577,072</b>	<b>8,228,213</b>

2. Defense Medical Facilities Office

The Defense Medical Facilities Office (DMFO) maintains facility descriptive data for over 1400 DoD medical and dental treatment facilities [Ref. 13]. This information is utilized to determine the availability of care, due to facility location, size and capacity, for a beneficiary population in a specific geographic area. Table II displays a detailed breakdown of the number and type of DoD military health-care facilities.

TABLE II. DoD MILITARY HEALTH-CARE FACILITIES AS OF 1991

FACILITY TYPE	ARMY	NAVY	AIR FORCE	TOTAL
HOSPITALS/ BRANCH HOSPITALS <sup>10</sup>	48	35	82	165
MEDICAL CLINICS	494	233	80	807
DENTAL CLINICS	242	173	86	501
<b>TOTAL</b>	<b>784</b>	<b>441</b>	<b>248</b>	<b>1,473</b>

### 3. Medical Expense and Performance Reporting System

The best source of a medical treatment facility's (MTF) workload information is the Medical Expense and Performance Reporting System (MEPRES). MEPRES offers a detailed report of the number of inpatient bed days and outpatient visits for each MTF. This system is developed to provide comparative analysis of the total workload within a MTF and between MTF's [Ref. 13].

### 4. Defense Manpower Data Center

Health-care manpower data are obtained from the Defense Manpower Data Center (DMDC) through its Health Manpower and Personnel Data System (HMPDS) . As of October 1992, DoD employed 198,250 health-care related personnel. It

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<sup>10</sup>The Air Force has a greater number of hospitals, as compared to that of the Navy and Army for two reasons. First, many of the Air Force hospitals are smaller in capacity than those of the Navy or Army. Second, the Air Force has many bases which are smaller in size and more spread-out geographically than the Navy or Army.

is this supply of health-care professionals which affects the MHSS's level of direct-care. The numbers and types of DoD health-care personnel, at the end of FY-92, is categorized in Table III. Active-duty physician (Medical Corps) manpower data, the main area of concern in this thesis, is discussed in detail at the end of this chapter and analyzed in Chapter III.

**TABLE III. DOD ACTIVE-DUTY AND CIVILIAN HEALTH-CARE MANPOWER LEVEL AS OF OCTOBER 1992**

TYPE	ARMY	NAVY	AIR FORCE	TOTAL
MEDICAL CORPS	5,512	4,385	4,379	14,276
DENTAL CORPS	1,573	1,590	1,380	4,543
NURSE CORPS	4,555	3,336	4,958	12,849
MEDICAL SERVICE CORPS <sup>11</sup>	6,051	2,832	3,889	12,772
WARRANT OFFICERS	350	144	0	494
ENLISTED MEDICAL	40,929	27,354	23,874	92,157
ENLISTED DENTAL	2,458	3,330	3,226	9,014
TOTAL ACTIVE-DUTY	61,428	42,971	41,706	146,105
CIVILIAN <sup>12</sup>	31,162	12,842	8,141	52,145
GRAND TOTAL	92,590	55,813	49,847	198,250

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<sup>11</sup>Medical Service Corps includes Air Force Biomedical Sciences Corps and Army Medical Specialist and Veterinary Corps.

<sup>12</sup>Does not include civilian contract personnel.

### C. SCOPE OF THE PROBLEM

The sheer number and specialty mix of physicians, is perhaps the most influential factor in managing any health-care system, including MHSS. As illustrated in Figure 5, many decisions in DoD regarding the delivery and cost of health care can be directly attributed to physician staffing levels.

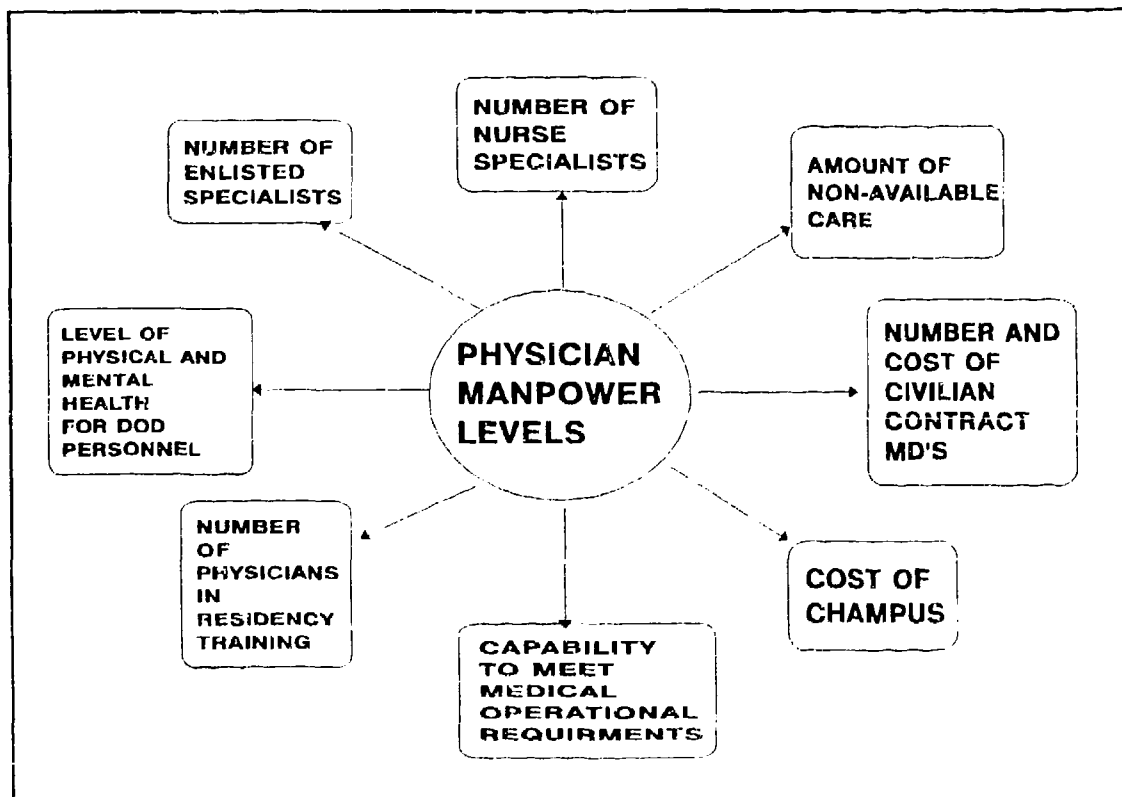


Figure 5. Factors Influenced by Physician Manpower Levels

As detailed in Table IV, DoD had 14,276 active-duty physicians in over 35 different specialties as of October 1992 [Ref. 14]. This number and specialty mix of active-duty physicians has generally been determined by wartime requirements, although peacetime health-care requirements have had a growing impact in recent years.

TABLE IV. 1992 DoD ACTIVE-DUTY PHYSICIANS END-STRENGTHS AS OF OCTOBER 1992

SPECIALTY	ARMY	NAVY	AIR FORCE	TOTAL
ALLERGY/IMMUNOLOGY	37	15	22	74
ANESTHESIOLOGY	141	177	113	431
AVIATION MED	142	358	475	975
CARDIAC/THORACIC SURGERY	24	8	15	47
CARDIOLOGY	59	29	38	126
COLON/RECTAL SURGERY	0	6	6	12
DERMATOLOGY	64	48	39	151
EMERGENCY MED	101	57	133	291
ENDOCRINOLOGY	36	8	13	57
EXECUTIVE MED	163	82	34	279
FAMILY PRACTICE	351	249	485	1,085
GASTROENTEROLOGY	42	28	31	101
GENERAL SURGERY	227	170	196	593
GENERAL MED	320	520	119	959
GENERAL INTERNIST	314	117	252	683
HEMATOLOGY/ONCOLOGY	41	18	22	81
INFECTIOUS DISEASE	46	25	13	84
NEPHROLOGY	29	9	15	53
NEUROLOGICAL SURGERY	25	16	11	52
NEUROLOGY	62	24	38	124
NUCLEAR MED	30	9	9	48
OBSTETRICS/GYNECOLOGY	184	91	170	445
ONCOLOGY SURGERY	0	1	2	3
OPHTHALMOLOGY	71	57	63	191
ORTHOPEDIC SURGERY	137	112	103	352
OTORHINOLARYNGOLOGY	48	52	54	154
PATHOLOGY	183	89	89	361

TABLE IV. 1992 DoD ACTIVE-DUTY PHYSICIANS END-STRENGTHS AS OF OCTOBER 1992 (CONT.)

SPECIALTY	ARMY	NAVY	AIR FORCE	TOTAL
PEDIATRIC SURGERY	0	2	3	5
PEDIATRICS	258	165	290	713
PERIPHERAL VAS. SURGERY	9	6	16	31
PHYSICAL MED	29	2	2	33
PLASTIC SURGERY	24	10	12	46
PREVENTIVE MED	97	104	124	325
PSYCHIATRY	191	124	138	453
PULMONARY	39	21	25	85
RADIOLOGY	134	109	142	385
RHEUMATOLOGY	21	8	14	43
UNDERSEA MED	0	121	0	121
UROLOGY	63	44	38	145
GME-1 (INTERNSHIP) <sup>13</sup>	346	348	354	1,048
OTHER GME <sup>14</sup>	1,424	946	661	3,031
GRAND TOTAL	5,512	4,385	4,379	14,276

Therefore, the relationship between a wartime-based active-duty physician force and the provision of health care in a non-wartime environment may be questioned. Specifically, how does the composition and number of active-duty physician specialists impact each Service's role in providing peacetime

<sup>13</sup>GME-1 (internship) are physicians in Graduate Medical Education (GME) who have completed medical school and are performing the internship portion of their medical training.

<sup>14</sup> Other GME include those physicians who have completed medical school and internship, and are enrolled in a Graduate Medical Education (GME) medical residency program.

health care? Since the three Services independently manage their physician resources, a considerable likelihood exists that the priority of distributing active-duty physician specialties within each service is different. For example, if 10 percent of the Navy's active-duty physicians are radiologists, one cannot assume a similar percentage for the Army or the Air Force. Additionally, one cannot assume that the current proportion of radiologists, in any Service, is efficient for either the Navy's health-care system or the other Services.

This issue is vital because the health care needs of each Service's beneficiary population should be met regardless of the number of active-duty physicians. As previously discussed, to meet demand the MHSS relies upon the Supplemental Fund and CHAMPUS programs as well as DOD civilian and contract physicians to augment active-duty physicians in direct care.

Therefore, the analytic requirement to evaluate this issue is significant. One such requirement is a baseline assessment of the active-duty physician asset within and between the three Services. Based on the results of such a comprehensive quantitative analysis, differences between certain active-duty physician specialties can be identified and evaluated. Furthermore, a comparison of DoD active-duty physician staffing levels to the staffing levels of a comparable civilian Managed Care System Staff model may suggest improvements in the Military Health Services System.

## D. DISCUSSION OF DATA

### 1. Sources of Data

Data collected for this study came from civilian and DoD sources. The primary types of data include, beneficiary demographics and number of physician specialists. The main source of DoD data is the Defense Manpower Data Center (DMDC) in Monterey, CA. The following data were extracted from DMDC records:

- Number of active-duty physicians, by duty specialty and by Service (listed in Table IV),
- Number of active-duty Nurse, Dental, and Medical Service Corps officers and enlisted medical personnel by Service,
- Number of DoD beneficiaries by age, sex, Service, and status (active-duty, active-duty dependent, retired, retired dependent, and survivor).

Civilian data were obtained from a large civilian MCS, the Kaiser-Permanente HMO, northern CA region, in Oakland, CA (K-P). K-P uses a Managed Care System Staff model in determining the number of physician specialists it needs to meet the health-care demand of its enrolled beneficiary population. As of March 1993, K-P provided comprehensive medical care for 2,437,117 enrolled beneficiaries and employed over 4,000 full-time equivalent physicians. The K-P data includes the following information:

- Number of physicians by specialty,
- Number of beneficiaries by age and sex.

This information is used in Chapter III and compared with DoD active-duty physician and beneficiary demographic data.

## 2. Assumptions Concerning the Data

This thesis research is dependent on sufficiently accurate data so that proper conclusions are drawn based on analytical results. Most of the data are discrete, categorical and descriptive of a population. However, the following three assumptions are made:

- All DoD Services employ the same standards when reporting active-duty manpower and beneficiary numbers.
- A physician listed as a specialist has received formal training in that specialty and is delivering adequate and competent medical care in that specialty.
- For comparison purposes, specialties unique to DoD physicians will be logically grouped with an equivalent civilian specialty.

In addition to these assumptions, two delimitations were made in this thesis addressing the topics of operational requirements and Graduate Medical Education (GME). First, it is important to recognize that the MHSS not only serves the health needs of the DoD beneficiary population, but also plays a vital role in support of military operations. For the present study, the arena of wartime requirements and Reserve force augmentation during wartime is not considered. The reason for this assumption stems from the objective of this thesis, which is to provide a broad baseline assessment of the active-duty physician asset in a peacetime environment.

Second, physicians-in-training programs are assumed to provide negligible patient care to the DoD beneficiary population. There are two reasons for this assumption. The first reason, and perhaps most easily understood, concerns

those active-duty physicians assigned to civilian training programs. It is reasonable to assume that while a physician is being trained in a civilian health-care facility, he or she is not providing health care to DoD beneficiaries. The second reason addresses those active-duty physicians assigned to in-service programs. The amount of patient care that interns or residents perform is assumed to be offset by the equivalent amount of care the staff physicians can not perform because they are training the interns or residents. This philosophy is employed by Kaiser-Permanente (K-P) in its training program. That is, management at K-P believes the net amount of patient care provided by residents, interns, and the training staff is the same as the full-time equivalent of the training staff [Ref. 15].

### **3. Department of the Navy**

Throughout this study certain data are partitioned among three of the four Services: Army, Navy, and Air Force. Although the Marine Corps is part of the Department of the Navy, it's considered the fourth Service. When applicable it will be referenced in combination with Navy data, as Navy/Marine Corps. For example, the Navy is primarily responsible for delivering the Marine Corps' health care, therefore the Navy's beneficiary population includes Navy/Marine Corps beneficiaries.

### III. ANALYSIS

The goal of this chapter is to provide a descriptive summary of numbers and types of active-duty physicians in DoD.

The following three topics are addressed.

- Examine the active-duty manpower structure of each Service's medical department,
- Compare the number of active-duty physicians, by specialty, between the three Services,
- Compare the number of DoD active-duty physicians, by specialty, to those of the Kaiser-Permanente HMO, northern CA region, (K-P).

Throughout this chapter, tabular data will be listed initially, followed by graphical representation and analysis. The first section provides a general overview of how each Service staffs its medical department with active-duty health-care personnel. It also discusses the relative manpower strength of each Service's medical department as a function of its total number of active-duty personnel and the size of its beneficiary population. In the second section, a detailed analysis, using mainly graphical techniques, is carried out, examining every physician specialty among the three Services. The third section compares the DoD active-duty physician asset to that of K-P, again mainly using graphical techniques. In the final section, two physician staffing scenarios are presented for DoD using the K-P Staff model data. For the second and third sections a brief analysis comparing the beneficiary populations of each Service is presented.

**A. ACTIVE-DUTY MANPOWER ANALYSIS**

This section employs descriptive analyses to determine the similarities and differences of active-duty health-care personnel manpower levels within and between each Service's medical department. These manpower levels are determined from end-strength numbers calculated as of October 1992 and are listed in Table III of Chapter II.

With 61,428 active-duty personnel, the Army Medical Department (AMEDD) has the largest number of active-duty medical personnel in DoD. The Navy's Bureau of Medicine and Surgery (BUMED) has the second largest number of active-duty medical personnel, with 42,971, followed by the Air Force Medical Department's (AFMEDD) strength of 41,706. To determine staffing characteristics of AMEDD, BUMED, and AFMEDD, the proportions of each type of active-duty medical department personnel to all active-duty medical personnel, for each Service, were calculated and are displayed in Table V.

**TABLE V. PROPORTION OF EACH TYPE OF ACTIVE-DUTY MEDICAL PERSONNEL TO ALL ACTIVE-DUTY MEDICAL PERSONNEL BY SERVICE AS OF OCTOBER 1992**

TYPE	ARMY	NAVY	AIR FORCE
MEDICAL CORPS	0.090	0.102	0.105
DENTAL CORPS	0.026	0.037	0.033
NURSE CORPS	0.074	0.078	0.119
MEDICAL SERVICE CORPS	0.099	0.066	0.093
WARRANT OFFICERS	0.006	0.003	0.000
ENLISTED MEDICAL	0.666	0.637	0.572
ENLISTED DENTAL	0.040	0.077	0.077
TOTAL ACTIVE DUTY	1.000	1.000	1.000

From the data in Table V, it is obvious that "enlisted medical" is the largest type of active-duty health-care personnel, accounting for over 55 percent of each Service's medical department personnel. But it is difficult to make additional observations from Table V alone since many of the other proportions are quite similar. In order to make further comparisons, this data is displayed in Figure 6.

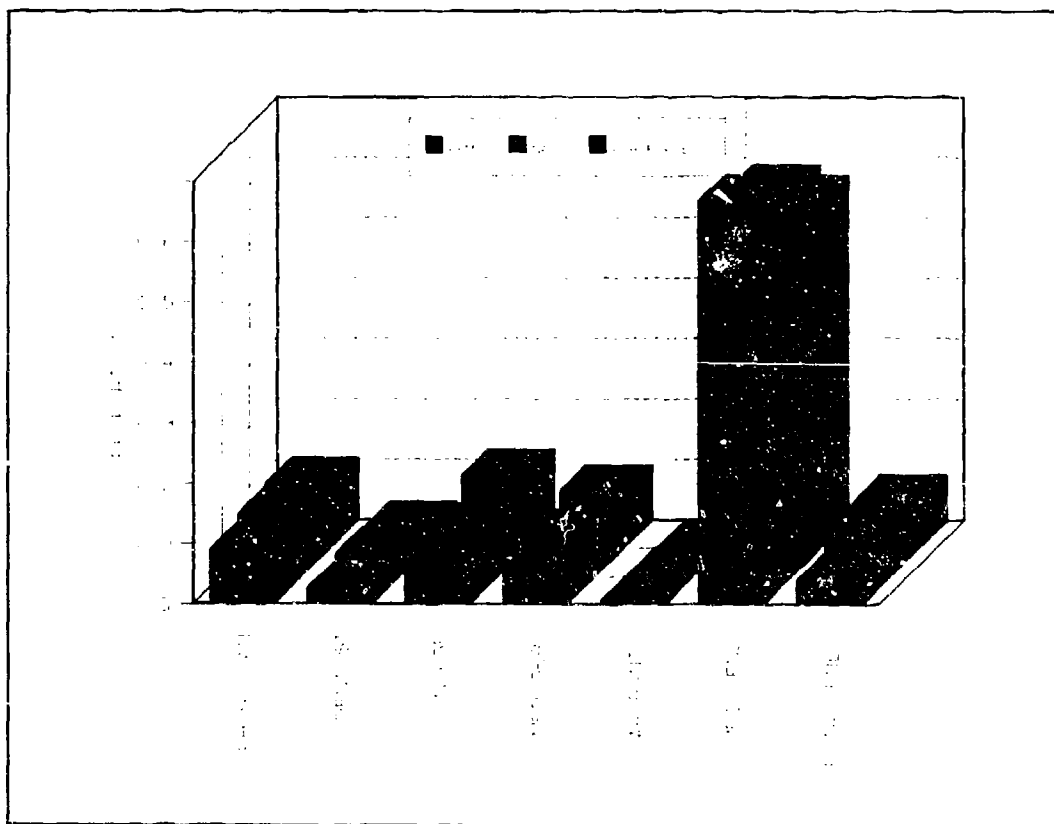
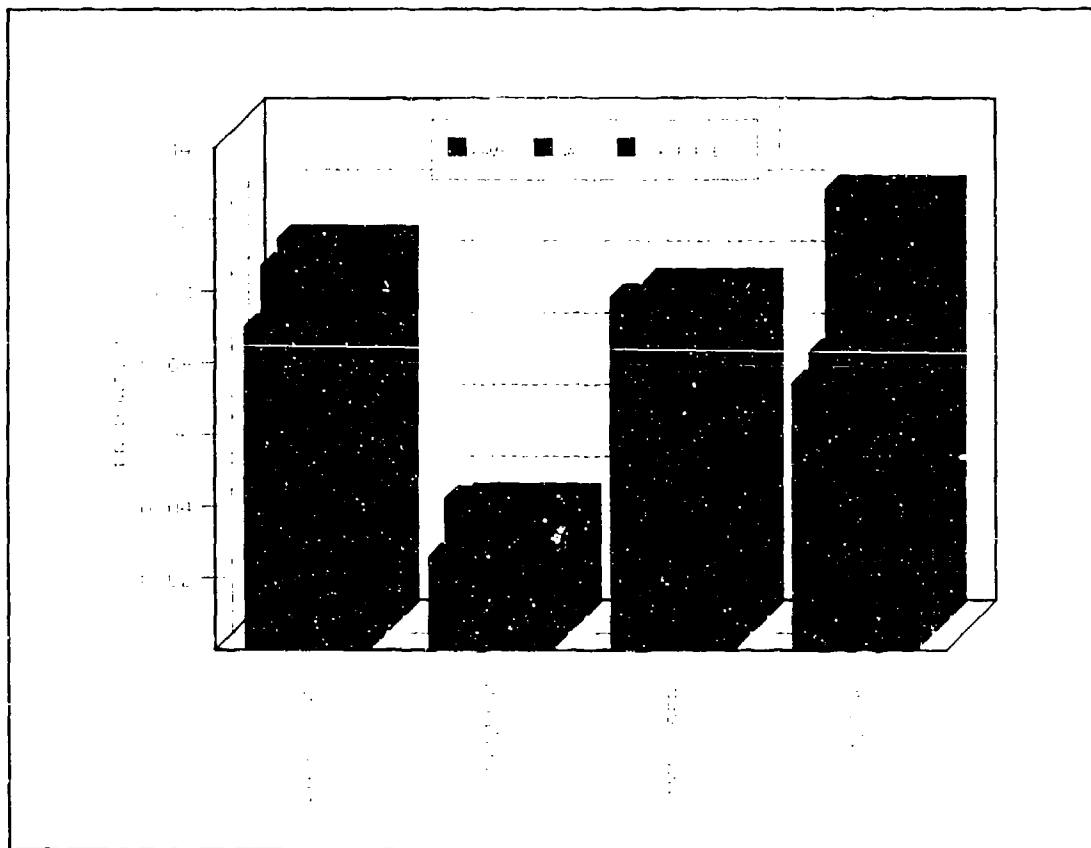


Figure 6. Proportion of Active-Duty Medical Personnel By Service as of October 1992

Figure 6 graphically depicts the large proportion of medical enlisted personnel, with the Army having the largest proportion of this group. It also shows that the Army has a

smaller proportion of Dental personnel, both officer and enlisted, than do either the Navy or the Air Force. Because of the large proportion of medical enlisted, the scale effect obscures the distinction between the smaller proportion categories. To eliminate this scale effect, thus allowing a more detailed display of the proportions of selected active-duty medical officers, Figure 7 graphs only Physician, Dental, Nurse and Medical Service Corps officer groups.



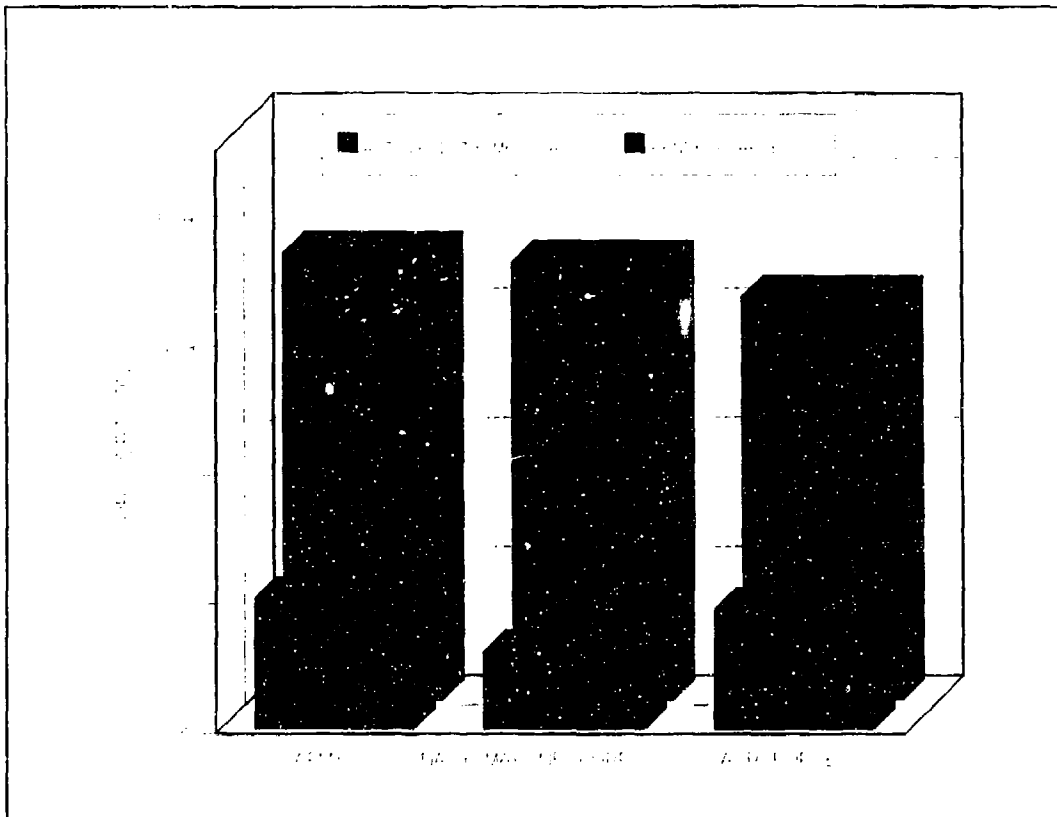
**Figure 7. Proportion of Selected Active-Duty Medical Officers by Service as of October 1992**

Figure 7 shows that the proportions of these active-duty officer types differ between the three Services. There does not appear to be any single type of relationship between the

proportions of Physicians, Nurses, Dentists, or Medical Service Corps Officers among each Service. Therefore, each Service appears to have a different staffing policy regarding its active-duty medical personnel. In particular, three observations are:

- The Air Force has a comparatively high proportion of nurses as compared to that of the Army and Navy, which are similar.
- The Air Force and Army have similar proportions of Medical Service Corps while the Navy has noticeably the smallest.
- The Army has the smallest proportion of physicians, while the Navy's and Air Force's proportions tend to be similar.

This descriptive analysis does not offer insight as to the relative size of any one Service's medical department, to its active-duty force, or to its beneficiary population. Such comparisons may generally assess the quantity of health care a Service's medical department can produce based solely on its number of active-duty medical personnel. To make these comparisons, Figure 8 displays the proportion of each Service's active-duty medical personnel to all its active-duty personnel, and the proportion of DoD beneficiaries related to that Service.



**Figure 8. Proportion of Active-Duty Medical Personnel to all Active-Duty Personnel, and Beneficiaries in each Service as of October 1992**

Figure 8 suggests the following two observations:

- While the proportions of active-duty medical department personnel within the Army and Air Force are similar (about 10 percent of the total active-duty force) the Navy's proportion (6 percent of the total active-duty force, including Marine Corps) is nearly 40 percent smaller than those of the Air Force and Army.
- The proportions of Navy/Marine Corps beneficiaries and Army beneficiaries are very close (about 34 percent) while the Air Force's is only slightly less (32 percent).

Therefore it appears, from an active-duty medical manpower perspective, that the Navy's medical department is smaller than those of the Army and the Air Force. That is, the Navy has approximately the same number of beneficiaries as either

the Army and the Air Force, but has fewer active-duty medical personnel than either the Army or Air Force. This could suggest that the Navy has a relatively efficient medical department, or that the Army and Air Force medical departments can be reduced, or that the Navy needs additional active-duty medical personnel, or that operational requirements affect all these differences in manpower levels between the Services medical departments.<sup>15</sup> Given these previous alternatives, there appears to be reason to further examine the manpower structure of each Service's medical department. The following section analyzes the active-duty physician component by comparing the number of active-duty physicians by specialty among the three Services.

## **B. INTER-SERVICE ANALYSIS**

### **1. Active-Duty Physicians**

To facilitate comparing and contrasting the number of active-duty physicians across each Service two methods were employed to make the analysis consistent and easier to understand.

- Reduce the number of physician specialty categories and,
- Develop a standardized measure to assess the number of physicians in these specialty categories.

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<sup>15</sup>The differences between the manpower levels of the three medical departments reflect a specific point in time. Over time, fluctuations in these manpower levels could demonstrate a more similar staffing characteristic between the medical departments.

The number of physician specialties, listed in Table IV on pages 20-21, was reduced from 39 to 25 specialties by allocating selected similar specialties into four broadly based specialty categories. These four categories are: Imaging (diagnostic imaging specialties), Medicine Specialty (Internal Medicine specialties), Primary Care, and Specialty Surgery. Table VI lists these four categories, below which each of the specialties from which they are formed are specified. In addition, the number of active-duty physicians within these newly defined four specialty categories and the 21 unchanged specialty categories are listed in Table VII.

**TABLE VI. PHYSICIAN BROAD BASED SPECIALTIES CATEGORIES**

<b>IMAGING</b>	<b>MEDICINE SPECIALTY</b>	<b>PRIMARY CARE</b>	<b>SPECIALTY SURGERY</b>
RADIOLOGY  NUCLEAR MEDICINE	ENDOCRINOLOGY	GENERAL MEDICINE	CARDIAC/ THORACIC SURGERY
	GASTROENTEROLOGY	FAMILY PRACTICE	COLON/RECTAL SURGERY
	HEMATOLOGY/ONCOLOGY	AVIATION MEDICINE	NEUROLOGICAL SURGERY
	INFECTIOUS DISEASE	UNDERSEA MEDICINE	ONCOLOGY SURGERY
	NEPHROLOGY		PERIPHERAL VASCULAR SURGERY
	PULMONARY		PLASTIC SURGERY
	RHEUMATOLOGY		PEDIATRIC SURGERY

TABLE VII. NUMBER OF DoD ACTIVE-DUTY PHYSICIANS BY SERVICE AS OF OCTOBER 1992

PHYSICIAN SPECIALTY	AMEDD	BUMED	AFMEDD
ALLERGY/IMMUNOLOGY	37	15	22
ANESTHESIOLOGY	141	177	113
CARDIOLOGY	59	29	38
DERMATOLOGY	64	48	39
EMERGENCY MED	101	57	133
EXECUTIVE MED	163	82	34
GENERAL SURGERY	227	170	196
GENERAL INTERNIST	314	117	252
IMAGING	164	118	151
MEDICINE SPECIALTY	254	117	133
NEUROLOGY	62	24	38
OBSTETRICS/GYNECOLOGY	184	91	170
OPHTHALMOLOGY	71	57	63
ORTHOPEDIC SURGERY	137	112	103
OTORHINOLARYNGOLOGY	48	52	54
PATHOLOGY	183	89	89
PEDIATRICS	258	165	290
PHYSICAL MED	29	2	2
PREVENTIVE MED	97	104	124
PRIMARY CARE	813	1,248	1,079
PSYCHIATRY	191	124	138
SPECIALTY SURGERY	82	49	65
UROLOGY	63	44	38
<b>SUBTOTAL</b>	<b>3,742</b>	<b>3,091</b>	<b>3,364</b>
GME-1 (INTERNSHIP)	346	348	354
OTHER GME	1,424	946	661
<b>GRAND TOTAL</b>	<b>5,512</b>	<b>4,385</b>	<b>4,379</b>

Using the additional four specialty categories, and keeping 21 previous specialties unchanged, the measurement used to standardize the number of active-duty specialty physicians is a ratio of the number of physicians-per-100,000-beneficiaries. Since the entire DoD beneficiary population can be related to a specific Service (listed in Table I of Chapter II) and the number of physicians in a given specialty is known, the formula to calculate the ratio, Number-of-Physicians-per-100,000 Beneficiaries is:<sup>16</sup>

$$\frac{\text{Number of Physicians per 100,000 Beneficiaries}}{\text{Beneficiaries}} = \frac{\text{Number of Physicians}}{\text{Beneficiary Population / 100,000}} \quad (3.1)$$

These ratios were then calculated for the 25 physician specialty categories, by Service, and are listed in alphabetical order (by specialty) in Table VIII. The Subtotal category includes all physicians not in training, therefore it does not include GME-1 (internship) and Other GME. The Grand Total category includes all active-duty physicians, both in-training and not in-training. Since the ratios for Pediatric and Obstetric/Gynecology specialties were calculated using a specific subset of the beneficiary population, the Subtotal categories **are not** the sum of the ratios of those non-training physician specialty categories.

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<sup>16</sup> Beneficiary population for Obstetric/Gynecology includes only females over 15 years old. Beneficiary population for Pediatrics only includes those under 15 years old.

TABLE VIII. DoD ACTIVE-DUTY PHYSICIANS PER 100,000 BENEFICIARIES BY SERVICE AS OF OCTOBER 1992

PHYSICIAN SPECIALTY	AMEDD	BUMED	AFMEDD
ALLERGY/IMMUNOLOGY	1.30	0.54	0.85
ANESTHESIOLOGY	4.94	6.33	4.38
CARDIOLOGY	2.07	1.04	1.47
DERMATOLOGY	2.24	1.72	1.51
EMERGENCY MED	3.54	2.04	5.16
EXECUTIVE MED	5.71	2.93	1.32
GENERAL INTERNIST	11.00	4.18	9.78
GENERAL SURGERY	7.95	6.08	7.61
IMAGING	5.74	4.22	5.86
MEDICINE SPECIALTY	8.90	4.18	5.16
NEUROLOGY	2.17	0.86	1.47
OBS./GYNECOLOGY	17.56	9.46	16.98
OPHTHALMOLOGY	2.49	2.04	2.44
ORTHOPEDIC SURGERY	4.80	4.01	4.00
OTORHINOLARYNGOLOGY	1.68	1.86	2.10
PATHOLOGY	6.41	3.18	3.45
PEDIATRICS	44.12	29.17	60.86
PHYSICAL MED	1.02	0.07	0.08
PREVENTIVE MED	3.40	3.72	4.81
PRIMARY CARE	28.48	44.63	41.87
PSYCHIATRY	6.69	4.43	5.35
SPECIALTY SURGERY	2.87	1.75	2.52
UROLOGY	2.21	1.57	1.47
<b>SUBTOTAL</b>	<b>131.07</b>	<b>110.54</b>	<b>130.54</b>
GME-1 (INTERNSHIP)	12.12	12.45	13.74
OTHER GME	49.88	33.83	25.65
<b>GRAND TOTAL</b>	<b>193.07</b>	<b>156.82</b>	<b>169.92</b>

Several initial observations can be made from the data in Table VIII.

- The Army has the largest number of physicians-per-100,000-beneficiaries (193.07), then the Navy (156.82), then the Air Force (169.92),
- The Navy has the fewest physicians-per-100,000-beneficiaries (110.54) in non-training positions, then the Army (131.07), then the Air Force (130.54),
- The Army has a larger number of physicians-per-100,000-beneficiaries, in training programs, (62.00) then the Navy (46.28), then the Air Force (39.38).

To further quantify the above statements in terms of percentages:

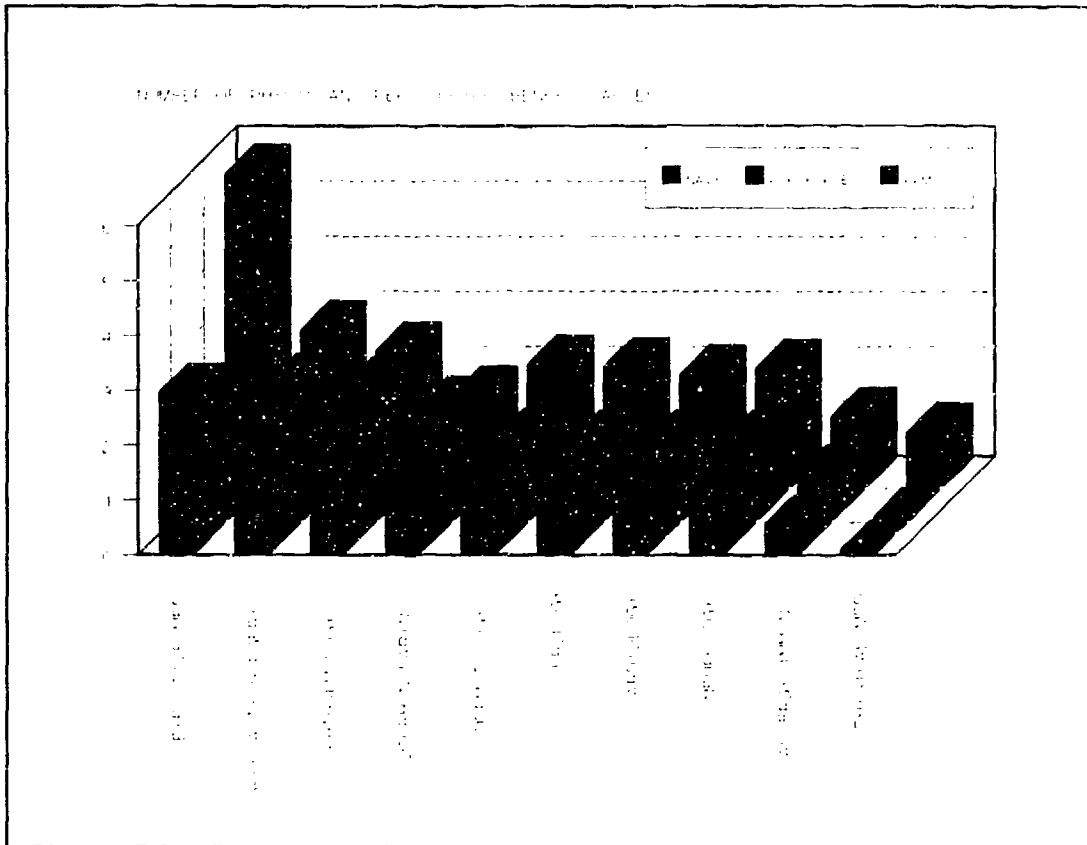
- The Navy has approximately 18 percent fewer physicians-per-100,000-beneficiaries in non-training positions, than the Army or Air Force,
- The Army has approximately 12.9 and 12.5 percent more physicians-per-100,000-beneficiaries, than the Navy or Air Force, respectively, and,
- Approximately 32 percent of all Army active-duty physicians are in training programs (GME-1 internship and Other GME ), as compared to 29 percent for the Navy and 23 percent Air Force.

From this analysis it appears that the Army and Air Force possess higher active-duty physician-to-beneficiary ratios, for total physicians, than does the Navy. But to make further observations regarding specific specialties, based solely on the data in Table VIII, would be exhausting! Therefore, to perform comparative analyzes, 3-D histograms were created for each physician specialty category, using the number of physicians-per-100,000-beneficiaries ratio.

Each graph of histograms incorporates several physician specialty categories, not necessarily in the same

order as the data in Table VIII. The grouping of physician specialties in each graph was determined from the relative sizes of the physicians-per-100,000-beneficiaries ratios. This was done to reduce any scale effect attributable to one set of ratios being significantly larger than the others. For example, it would be difficult to examine Physical Medicine's histograms, whose ratios are all less than 1.02, in the same graph as Pediatric's histograms, whose ratios are all greater than 29.17. Using this structure, graphs of 3-D histograms were created.

The first, Figure 9, graphs only those physician specialties with ratios less than 6.00 physicians-per-100,000-beneficiaries. These specialties include: Executive Medicine, Specialty Surgery, Ophthalmology, Otorhinolaryngology, Dermatology, Urology, Cardiology, Neurology, Allergy/Immunology and Physical Med.



**Figure 9. Number of Physicians per 100,000 Beneficiaries by Service as of October 1992.**

In general, it appears that in nine of ten specialties, except for Otorhinolaryngology, the Army has more physicians-per-100,000-beneficiaries than the Air Force or Navy. Also, the Navy has the lowest ratios among the three Services in six of the ten specialties; Specialty Surgery, Ophthalmology, Cardiology, Allergy/Immunology, Neurology, and Physical Medicine. In most specialties the Air Force ratios appear to be between the smaller Navy ratios and the larger Army ratios.

Only two specialties, Executive Medicine and Physical Medicine, show significant differences between the three

Services. The most reasonable explanation for the differences in Physical Medicine is the lack of physicians in this specialty for either the Navy or Air Force: both have two, while the Army has 24 physicians. With respect to the differences in Executive Medicine, one explanation may be the lack of accuracy in the data. Executive Medicine is the only specialty which is not related to a specific medical practice. It is an administrative label that includes those physicians in upper management positions.<sup>17</sup> This "administrative" categorization may create an interpretive difference among the Services, causing inconsistency in reporting a physician to be in Executive Medicine.

One final observation of Figure 9 suggests the sensitivity of the ratios to the small number of physicians in each of these categories. Any increase or decrease in the actual number of physicians in these categories will affect the ratio by a larger percentage than it will for categories with a large number of physicians. For example, if the Navy were to add six Physical Medicine specialists, its ratio would increase from 0.07 to 0.29 or 300 percent. If these six physicians were added to Primary Care, that ratio would increase from 44.63 to 44.84, less than one percent. Consequently, it would not take a draconian effort for any Service to significantly change the ratios that are related to

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<sup>17</sup>Examples of Executive Medicine are physicians usually in Flag/General, Commanding, or Executive Officers positions.

those physician specialties which have few physicians. Therefore, to make strong statements regarding the differences of the ratios in these specialties may be misleading.

The second graph of histograms, Figure 10, plots those physician specialties, not included in Figure 9, with ratios between 2.04 and 10.00. The nine specialties compared in this graph are: General Surgery, Medicine Specialty, Psychiatry, Imaging, Anesthesiology, Pathology, Orthopedic Surgery, Preventive Medicine, and Emergency Medicine.

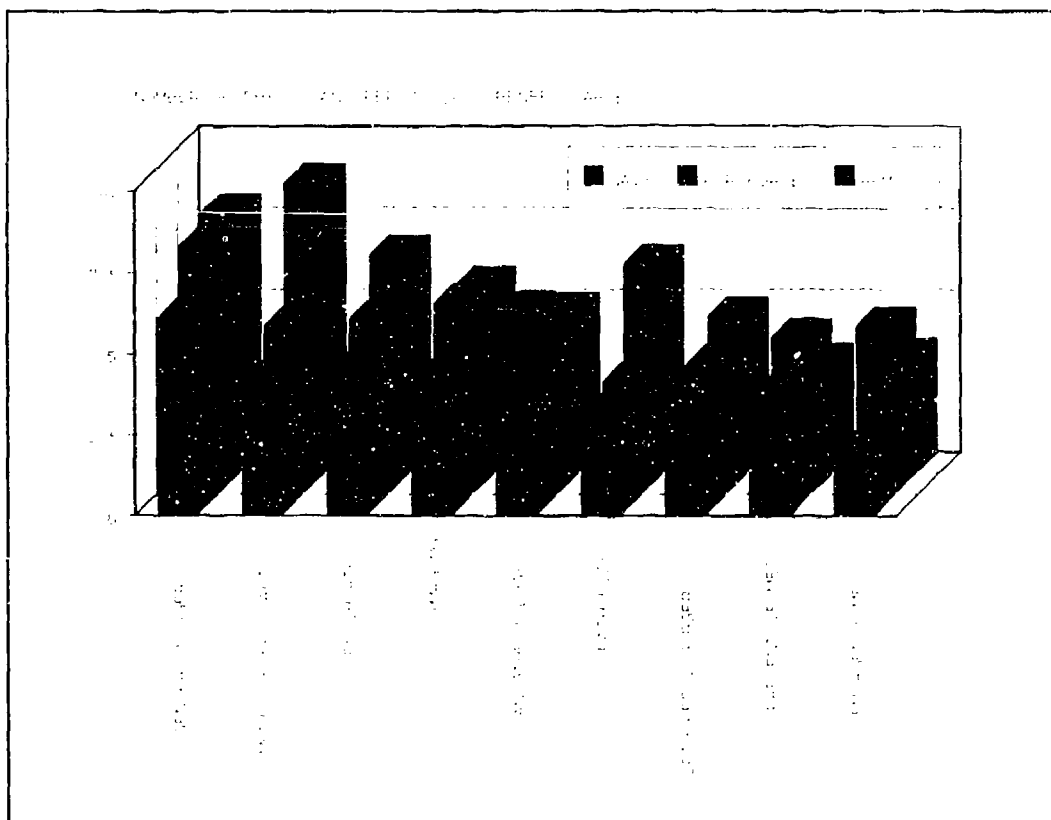


Figure 10. Number of Physicians per 100,000 Beneficiaries by Service as of October 1992.

Many of the observations in Figure 10 are consistent with those in Figure 9 where; 1) the Navy has the smallest

ratios among all Services in six of the nine physician specialties; General Surgery, Medicine Specialty, Psychiatry, Pathology, and Emergency Medicine, 2) the Army has the largest ratios among all Services in five of the nine physician specialties; General Surgery, Medicine Specialty, Psychiatry, Pathology, and Orthopedic Surgery and 3) most ratios for the Air Force are higher than the Navy's but lower than the Army's.

Anesthesiology, the first specialty in which the Navy has the highest ratio among the Services, is in this group of nine specialties. This high ratio of Navy Anesthesiologists appears contradictory to previous observations, which showed the Navy having the lowest ratios of General and Specialty Surgery among each Service, since Anesthesiology is a complementing specialty to surgical procedures.

Two specialties showing significant differences among each Service are Medicine Specialty and Pathology. Both of these specialties have very high ratios for the Army, compared to either the Navy or the Air Force ratios. A possible explanation for the Army's high ratio in Medicine Specialty has to do with those specialties listed under the broader Medicine Specialty category. That is, the specialties within the Medicine Specialty requires additional training in specific residency programs. Therefore, the Army's high ratio in the Medicine Specialty is consistent with the previous finding which showed the Army having the most physicians in

training programs. The Army's large ratio of Pathologists may be attributed to their role through the Armed Forces Institute of Pathology (AFIP), which is predominantly staffed by Army pathologists. Additionally, DoD's pathology services during wartime have been mainly carried out by the Army.

The next graph, Figure 11, displays the histograms of the remaining six specialties: Pediatrics, Primary Care, Other GME (Graduate Medical Education), Obstetrics/ Gynecology, GME-1 Internship, and General Internist. The ratios of these specialties are between 4.18 and 60.86 physicians-per-100,000-beneficiaries.

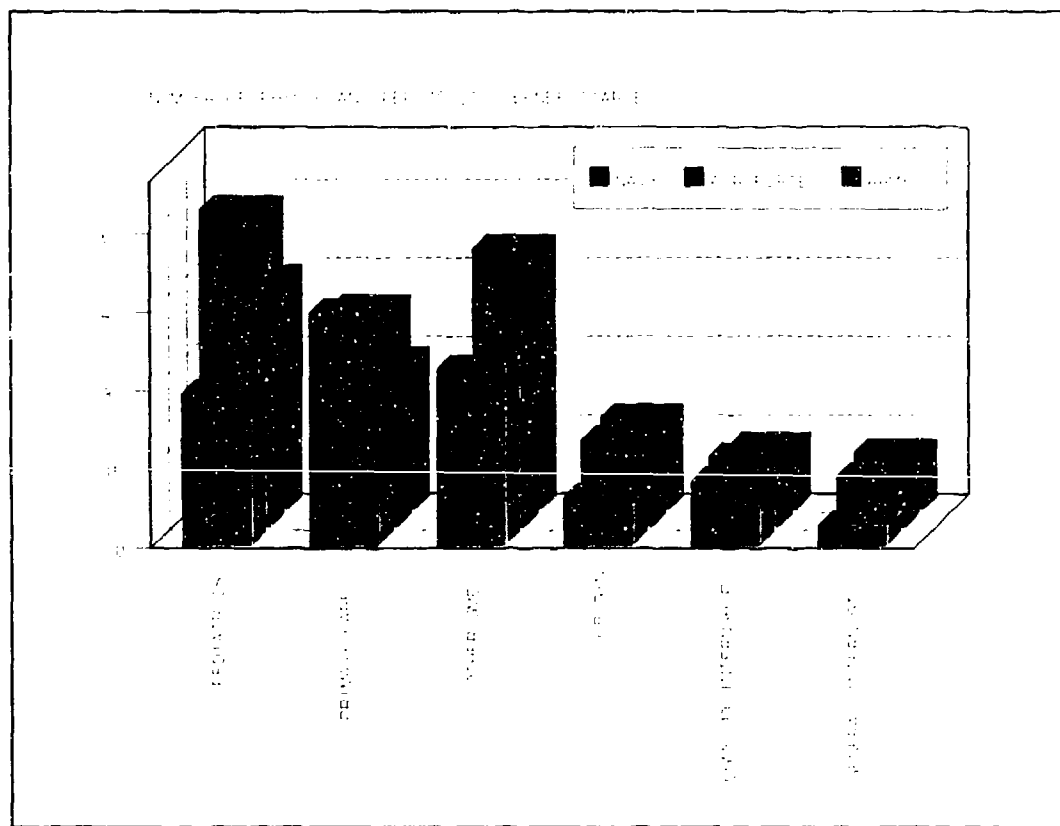
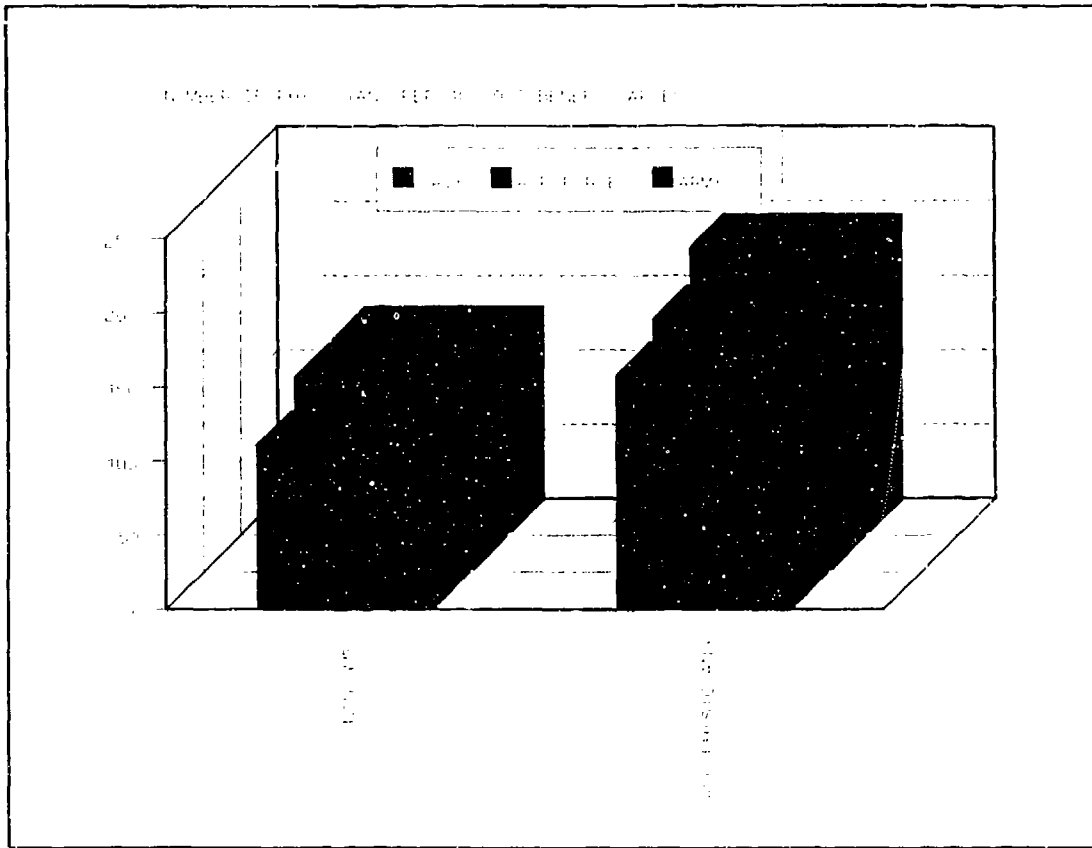


Figure 11. Number of Physicians per 100,000 Beneficiaries by Service as of October 1992.

The large number of active-duty physicians in these six specialties are reflected by the largest physicians-per-100,000-beneficiaries ratios. Consequently, unlike the specialties with a smaller number of physicians, it would take a major effort for a Service to change its ratio in any of these specialties. Therefore, the following stronger statements can be made from the observations of Figure 11.

- The Army does not appear to have the largest ratios between the three Service's, in most of these specialties, as it did in the two previous figures.
- In three specialties, Obstetrics/Gynecology, General Internist, and Pediatrics the Navy ratios are significantly lower than the Army or Air Force ratios. This may be important since two of these specialties, OB/GYN and Pediatrics, relate most directly with the availability of medical care for dependents, as well as being a type of medical care with high demand.
- The large number of Army physicians in-training programs is easily displayed with its large ratio in the Other GME category. This is consistent with the previous analysis which demonstrated a high percentage of Army active-duty physicians in-training programs.
- The Navy has the largest ratio in the Primary Care specialty among all Services. This may be explained by the differences in operational requirements between the three Services. That is, the Navy may have more operational units; for example, ships, Marine companies, or aviation squadrons, requiring a primary care physician than either the Army or Air Force.

The final graph, Figure 12, displays the Subtotal Group (includes all active-duty physicians not in-training programs) and the Grand Total group, all active-duty physicians.



**Figure 12. Number of Physicians per 100,000 Beneficiaries by Service as of October 1992.**

Observations of Figure 12 support the findings from the original table of ratios, Table VII. That is, the Army has the most physicians-per-100,000 beneficiaries, both in-training and total, while the Air Force has the second most and the Navy the fewest. Most of the analyses from previous histograms are consistent with this result, showing in most instances, that the Army had the highest ratio of specialists and the Navy had the fewest. Conclusions regarding this finding and others will be discussed in Chapter IV.

## 2. Beneficiary Demographics

The active-duty physician analysis discusses similarities and differences among physician specialties using a ratio measurement. It did not, nor is it the objective of this thesis, to analyze all possible explanations for the variation in these ratios. Since the ratio was developed from the total number of beneficiaries attributed to a particular Service, it is important to recognize demographic differences as possibly explanatory of different physician staffing levels and specialty mixes.<sup>18</sup> For example, if the Navy had a much younger beneficiary population than the Army, possibly implying a healthier population, it is logical to assume that the Navy would require fewer physicians-per-100,000-beneficiaries than the Army.

The following analysis presents a more detailed display of the demographic data than that in Table I of Chapter II. It discusses the major similarities and differences between the beneficiary demographics of each Service and provides descriptive information regarding a Service's beneficiary population. The analysis does not make inferences, comparisons, or conclusions regarding each Service's demand for health care because DoD specific utilization rates can not be quantified at this time.

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<sup>18</sup> This is reflective of the discussion in Chapter II regarding the demand for health care. Recalling, utilization rates applied to beneficiary demographics forecast demand, which then may impact physician staffing levels.

Tables IX, X, and XI display the demographic data for each Service and partitions the data by: Age (five year increments) and Sex (Female or Male). This data is part of the data base obtained from DMDC. As previously discussed, the beneficiary population for the Navy's medical department includes Marine Corps beneficiaries.

**TABLE IX. ARMY BENEFICIARY DEMOGRAPHICS AS OF OCTOBER 1992**

AGE	FEMALE	MALE	TOTAL
0-4	102,142	104,778	206,920
5-9	98,041	100,814	198,855
10-14	87,971	90,912	178,883
15-19	103,977	128,327	232,304
20-24	120,866	197,913	318,779
25-29	100,148	122,553	222,701
30-34	90,213	94,877	185,090
35-39	81,659	83,223	164,882
40-44	75,847	83,913	159,760
45-49	68,337	75,767	144,104
50-54	66,946	64,248	131,194
55-59	76,535	63,565	140,100
60-64	83,566	110,225	193,791
65-69	74,180	93,900	168,080
70-74	58,137	62,707	120,844
75+	47,356	41,350	88,706
<b>TOTAL</b>	<b>1,335,921</b>	<b>1,519,072</b>	<b>2,854,993</b>

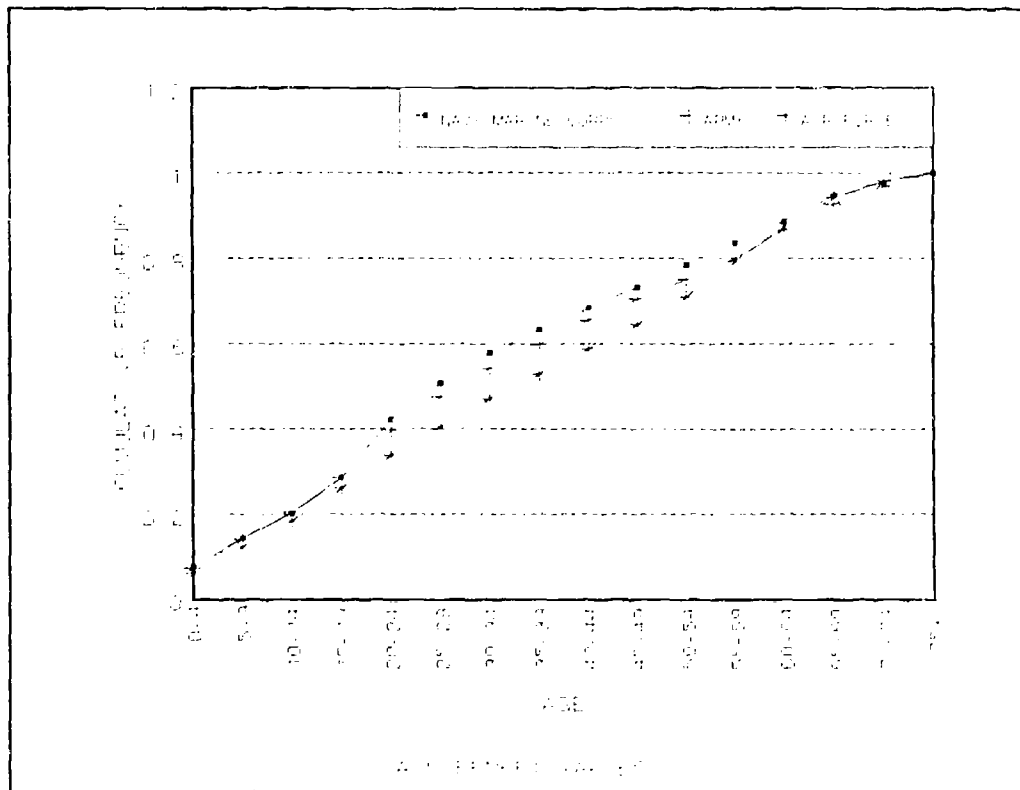
**TABLE X. NAVY/MARINE CORPS BENEFICIARY DEMOGRAPHICS AS OF OCTOBER 1992**

<b>AGE</b>	<b>FEMALE</b>	<b>MALE</b>	<b>TOTAL</b>
0-4	105,374	108,899	214,273
5-9	93,694	97,191	190,885
10-14	78,249	81,250	159,499
15-19	93,979	142,328	236,307
20-24	122,133	261,545	383,678
25-29	100,728	136,034	236,762
30-34	89,133	103,749	192,882
35-39	75,332	78,863	154,195
40-44	69,548	71,082	140,630
45-49	68,182	73,028	141,210
50-54	68,341	77,682	146,023
55-59	65,670	76,960	142,630
60-64	67,342	75,797	143,139
65-69	61,660	105,037	166,697
70-74	44,269	40,297	84,566
75+	35,867	26,905	62,772
<b>TOTAL</b>	<b>1,239,501</b>	<b>1,556,647</b>	<b>2,796,148</b>

TABLE XI. AIR FORCE BENEFICIARY DEMOGRAPHICS AS OF OCTOBER 1992

AGE	FEMALE	MALE	TOTAL
0-4	78,066	81,289	159,355
5-9	78,612	81,169	159,781
10-14	76,980	80,364	157,344
15-19	93,051	102,740	195,791
20-24	87,773	112,593	200,366
25-29	80,536	93,832	174,368
30-34	78,444	86,498	164,942
35-39	75,556	72,737	148,293
40-44	74,888	76,402	151,290
45-49	76,601	75,484	152,085
50-54	87,980	76,453	164,433
55-59	106,300	109,109	215,409
60-64	88,918	122,119	211,037
65-69	72,367	100,568	172,935
70-74	52,169	50,243	102,412
75+	26,755	20,476	47,231
<b>TOTAL</b>	<b>1,234,996</b>	<b>1,342,076</b>	<b>2,577,072</b>

In order to analyze the above data two graphical methods were used; 1) a cumulative frequency plot and 2) 3-D histogram plot. Each of these plots were created for the Female, Male, and Total categories. The first category to be discussed is the total beneficiary category. Figure 13 displays the cumulative frequencies for all beneficiaries, in five year increments, for each Service.

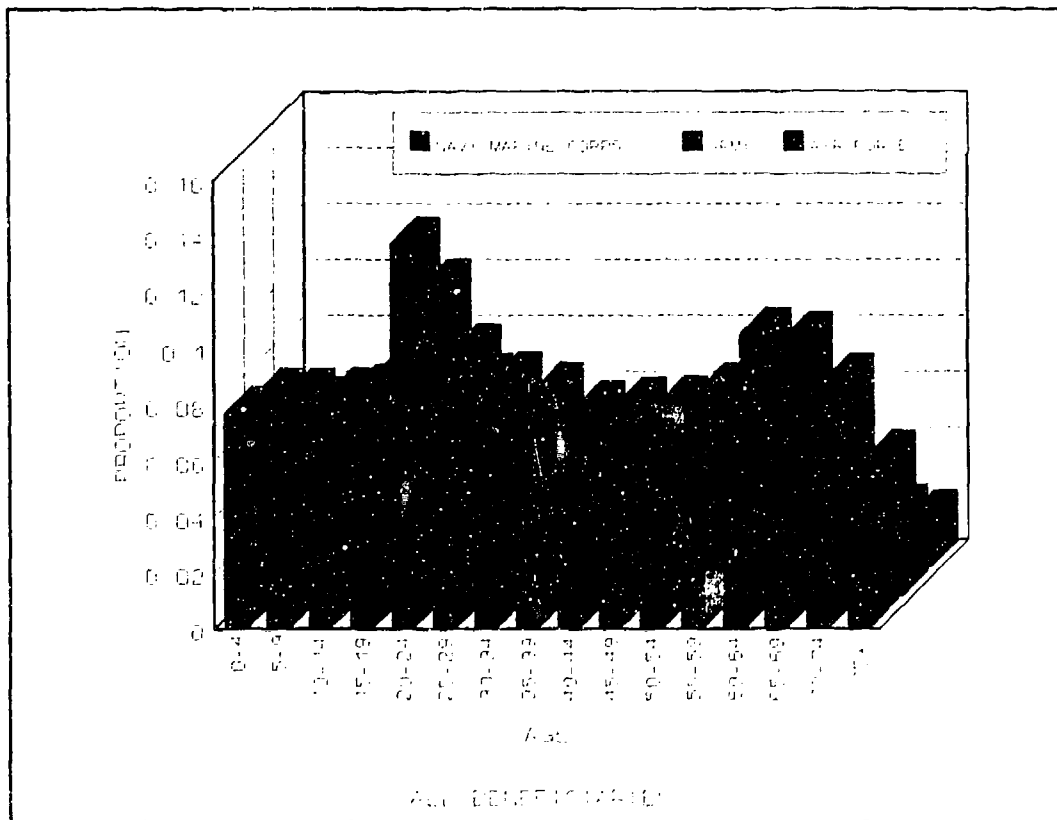


**Figure 13. Age Demographics for All DOD Beneficiaries as of October 1992**

The cumulative frequency plot displays a similar distribution of ages, for all three Services, in the 0-19 and over 60 year old ranges. Differences show up in the 20-59 year old range, specifically the 20-24 year old group, whereas the Navy/Marine Corps have a somewhat more youthful beneficiary population than Army and also the Air Force. The median ages for all the Navy/Marine Corps, Army, and Air Force beneficiaries are approximately 25, 27, and 34 years old respectively. Additionally, it appears that the Air Force's beneficiary population is almost uniformly distributed

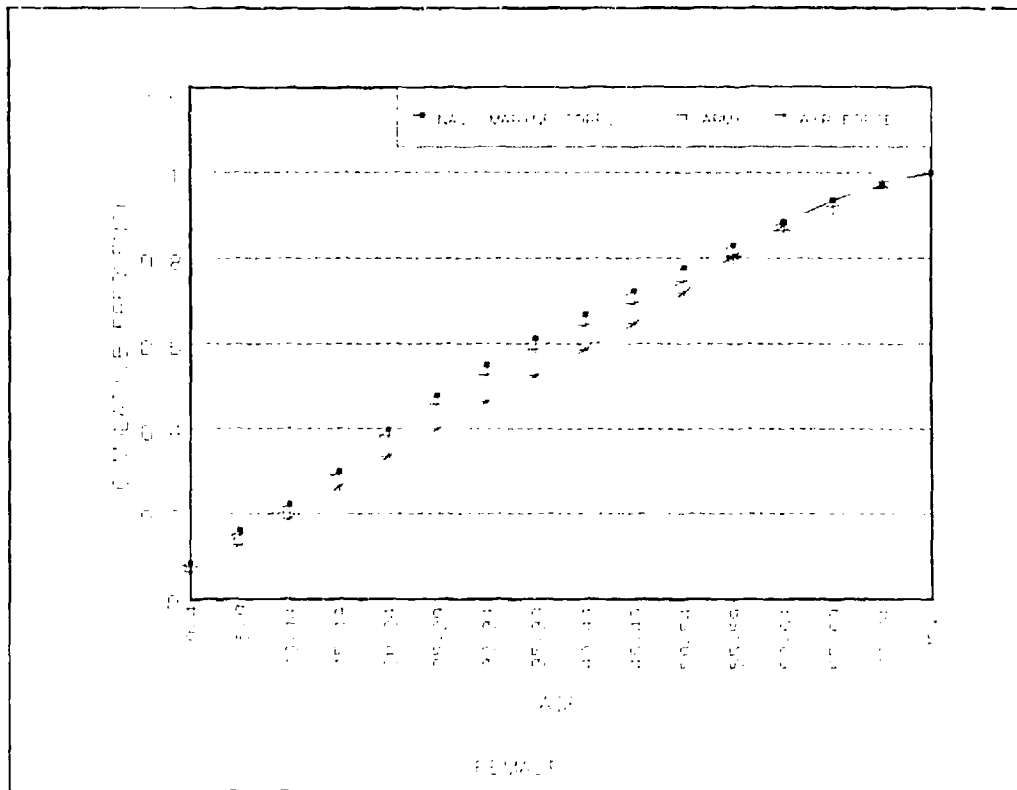
throughout all age ranges, while the Navy/Marine Corps and Army beneficiaries have a large mode around 20-24 years old.

The greater median age for the Air Force's beneficiary population, for this point in time, may be explained by the Air Force's higher proportion of active-duty officer personnel, as compared to that of the Navy/Marine Corps and Army. That is, the average age of officer personnel is typically greater than enlisted personnel. Consequently, the data show, approximately 67 percent of the Air Force's active-duty personnel are between the ages of 25-44 years old. In comparison, about 55 percent of the Army's and 51 percent of the Navy/Marine Corps', active-duty personnel, are between the ages of 25-44 years old. Also, only 30 percent of the Air Force's active-duty personnel are younger than 25 years old while 47 percent of the Navy/Marine Corps' and 41 percent of the Army's active-duty personnel are younger than 25 years old. Further analysis is reported in Figure 14, which provides 3-D histograms of this data.



**Figure 14. Age Demographics for All DOD Beneficiaries as of October 1992**

Most evident from the histograms of Figure 14 is the large mode for the Navy/Marine Corps and Army beneficiary populations at the 20-24 year old age group. Also, the Air Force appears to have a higher proportion of the over 55 years old beneficiary population than either the Navy/Marine Corps or Army beneficiary populations. To provide an additional examination of this total beneficiary population data, the male and female beneficiary populations are examined. Figure 15 displays the cumulative frequency plot for each Service's female beneficiary population.



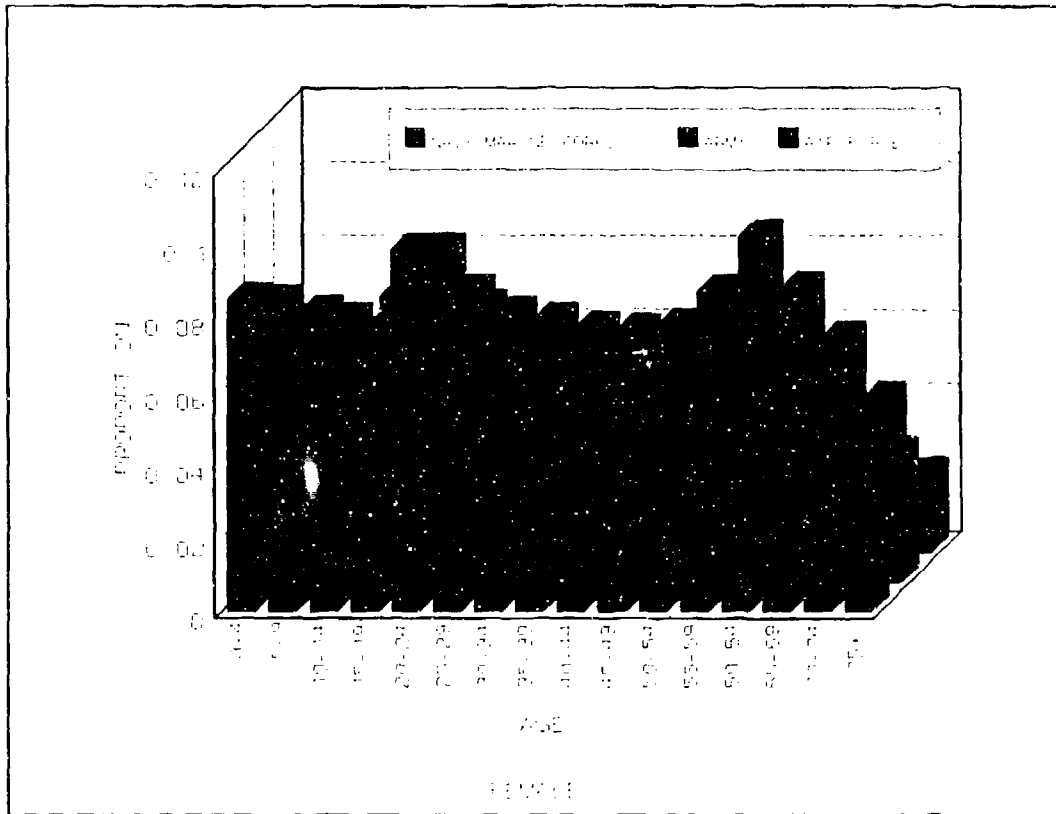
**Figure 15. Age Demographics for Female DOD Beneficiaries as of October 1992**

The findings in Figure 15, of each Service's female beneficiary populations, are quite consistent with that displayed in Figure 13 of the total beneficiary population. That is, the female beneficiaries of the Navy/Marine Corps tend to be slightly younger than Army and much younger than the Air Force female beneficiaries.

The older Air Force female beneficiary population can again be explained by the differences in age distribution of female active-duty personnel. The data show that 62 percent of the Air Force's female active-duty personnel are older than 25 years old, as compared to 54 percent for the Navy/Marine

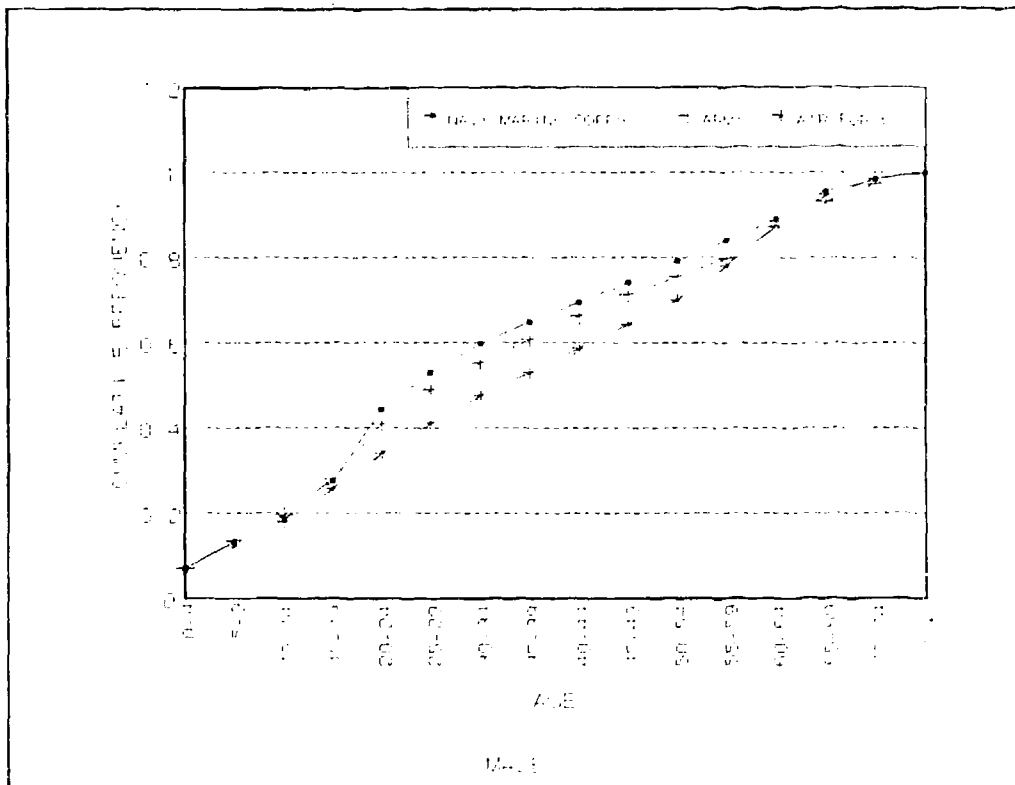
Corps' and 56 percent for the Army's female active-duty personnel. That is, 38 percent of the Air Force's active-duty females are younger than 25 years old while 46 percent of the Navy/Marine Corps' and 44 percent the Army's active-duty females are younger than 25 years old.

In addition, approximate median ages for female beneficiary populations are: 26 for the Navy/Marine Corps, 29 for the Army, and 34 for the Air Force. These median ages for each Service's female beneficiary population are slightly older than that of their total beneficiary population. A significant difference from the total population frequencies is the smaller deviation between each Service's female beneficiary population in the 20-59 year old range. Figure 16 displays the 3-D histograms of this data.



**Figure 16. Age Demographics for Female DOD Beneficiaries as of October 1992**

The above graph shows a relatively similar distribution of female beneficiaries between the Navy/Marine Corps and the Army. The modes for Navy/Marine Corps and Army female beneficiaries, in the 20-24 year old group, is younger than the Air Force's whose is in the 55-59 year old range. It appears that the distributions between each Service's female beneficiary populations are more closely related than that of their total beneficiary populations. This finding would suggest that the male beneficiary populations should have the least similar distributions. Figure 17 graphs the cumulative frequency plot for each Service's male beneficiary population.



**Figure 17. Age Demographics for Male DOD Beneficiaries as of October 1992**

Figure 17 shows the greatest deviation of age distribution between each Service in the male beneficiary populations. As discussed for total and female beneficiaries, the differences among each Service's male beneficiary age distribution can be explained by the differences between each Service's male active-duty age distribution. The data show that 28 percent of the Air Force's male active-duty personnel are younger than 25 years old, as compared to 47 percent for the Navy/Marine Corps' and 41 percent for the Army's male active-duty personnel. In addition, 27 percent of the Air Force's male active-duty personnel are older than 35 years

old, while only 17 percent of the Navy/Marine Corps' and 21 percent of the Army's male active-duty personnel are older than 35 years old.

Subsequently, the Navy/Marine Corps and Army male beneficiary populations are concentrated more towards the 20-year-old range than is the Air Force's male beneficiary population. The median ages for the male beneficiary populations are quite similar to those of each Service's total beneficiary populations, with 25, 27, and 35 years old for the Navy/Marine Corps, Army, and Air Force respectively. The histograms for the male populations is displayed in Figure 18.

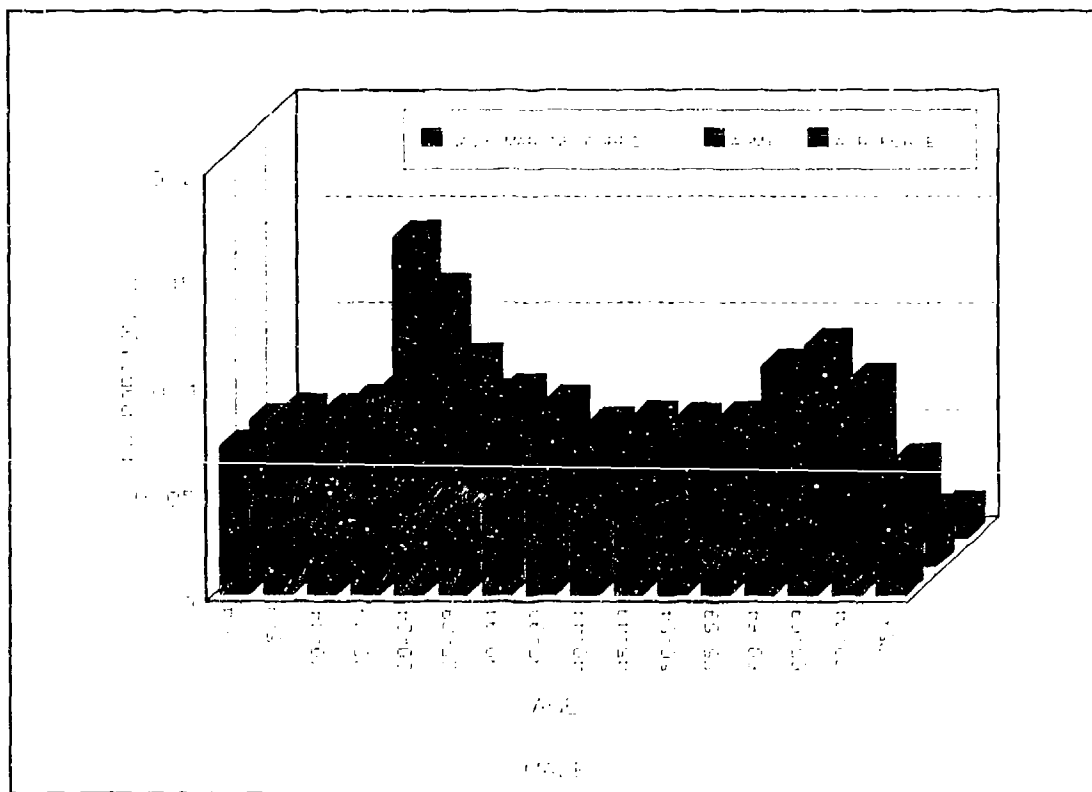


Figure 18. Age Demographics for Male DOD Beneficiaries as of October 1992

Once again, these histograms of each Service's male beneficiary population show that the Navy/Marine Corps and Army having concentrated modes at the 20-24 years old group while the Air Force's is at 60-64 years old. Also, there appears to be a smaller proportion of over 60 year old male beneficiaries in the Navy/Marine Corps than either the Army or Air Force.

From this analysis of beneficiary demographics, all three beneficiary categories (Total, Male, and Female) exhibit some consistent characteristics among the three Services. For example, the Navy/Marine Corps beneficiaries appear to be proportionally younger than the Army or Air Force beneficiary populations. Specific conclusions concerning inter-service beneficiary demographics will be discussed in Chapter IV.

### **C. DoD VS. KAISER PERMANENTE ANALYSIS**

#### **1. Physician Specialists**

This section performs an analysis similar to that of the inter-service active-duty physician section. But instead of comparing the ratios for physician specialties among the three DoD Services, this section compares those ratios of the Kaiser-Permanente HMO, Northern CA region, (K-P) to the corresponding ratios of active-duty physicians in DoD. The DoD ratios were computed from an aggregate of the three Services and their beneficiary populations. The ratios for K-P were derived from data supplied by that organization for

the sole purpose of this thesis. Both beneficiary and number of physicians data for K-P were calculated as of March 1993.

There are two areas which differ from the previous analysis and require further explanation. First, there is one physician specialty, Adult Medicine, used by Kaiser-Permanente that has not yet been defined as a DoD physician specialty. Adult Medicine is defined as a specialty which consists of the following DoD physician specialties: General Internist, Medicine Specialty, Preventive Medicine, and Primary Care. The remaining physician specialties are identical for both DoD and K-P. Second, K-P has very few physicians in training programs, unlike DoD which has a large number. Consequently, K-P does not have a GME-1 or Other GME category, and does not include physicians in training programs when calculating its physician-per-100,000-beneficiary ratios.

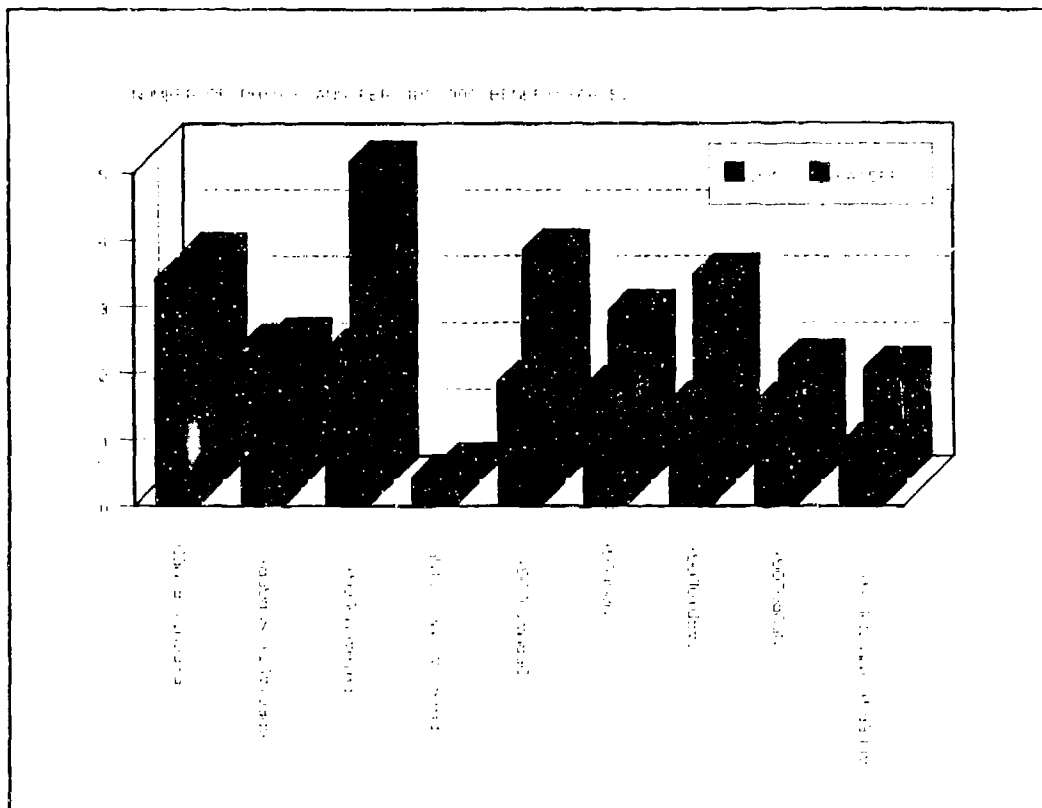
From the above information and using equation 3.1, the physicians-per-100,000-beneficiaries ratios were calculated for both DoD and K-P, and are displayed in Table XII. Recalling the adjustment in calculating the OB/GYN and Pediatric ratios: the beneficiary population for Obstetrics includes only female beneficiaries over 15 years old and the beneficiary population for Pediatrics includes only beneficiaries under 15 years old.

TABLE XII. DoD ACTIVE-DUTY PHYSICIANS AND KAISER-PERMANENTE PHYSICIANS PER 100,000 BENEFICIARIES BY SPECIALTY

SPECIALTY	DOD	KAISER
ADULT MEDICINE	56.54	47.28
ALLERGY/IMMUNOLOGY	0.90	1.67
ANESTHESIOLOGY	5.24	10.78
CARDIOLOGY	1.53	3.08
DERMATOLOGY	1.84	3.45
EMERGENCY MED	3.54	10.80
EXECUTIVE MED	3.39	3.39
GENERAL SURGERY	7.21	8.82
IMAGING	5.26	7.78
NEUROLOGY	1.51	1.78
OBSTETRICS/GYNECOLOGY	14.78	38.00
OPHTHALMOLOGY	2.32	4.78
ORTHOPEDIC SURGERY	4.28	5.57
OTORHINOLARYNGOLOGY	1.87	3.15
PATHOLOGY	4.39	2.43
PEDIATRICS	43.85	89.91
PHYSICAL MED	0.40	0.23
PSYCHIATRY	5.51	10.94
SPECIALTY SURGERY	2.38	2.11
UROLOGY	1.76	2.54
SUBTOTAL	123.93	165.29
GME-1 (INTERNSHIP)	12.74	0.00
OTHER GME	36.84	0.00
GRAND TOTAL	173.50	165.29

A most significant observation from of the Table XII ratios concerns the Subtotal and Grand Total categories. The DoD ratio (123.93) is much less than the Kaiser-Permanente ratio (165.29) for physicians not in training programs but the DOD ratio for all physicians (173.50) is greater than the K-P ratio (165.29). This difference between the DoD and corresponding K-P ratios in the Subtotal and Grand Total categories reflects the large number of active-duty physicians in training programs. Also, it appears that in almost every specialty the DoD ratio is less than the K-P ratio. To provide more detailed analysis, each of these specialties will be graphed using 3-D histograms.

Similar to the inter-service active-duty physician analysis, the grouping of physician specialties is determined by the magnitude of the physicians-to-beneficiary ratios. The first set of histograms, displayed in Figure 19, examines the nine physician specialties with ratios less than 5.00. These specialties are Executive Medicine, Specialty Surgery, Ophthalmology, Physical Medicine, Dermatology, Urology, Cardiology, Neurology, and Allergy/Immunology.



**Figure 19. Number of Physicians per 100,000 Beneficiaries for Kaiser-Permanente and DOD.**

The DoD ratios are smaller than the corresponding Kaiser-Permanente ratios, except for the Executive Medicine, Specialty Surgery and Physical Medicine. The greatest difference in ratios appears to be in the specialties labelled Ophthalmology and Dermatology where the DoD ratios are about 50 percent of K-P. As previously mentioned, any increase or decrease in the relatively low numbers of physicians in these categories allows for major fluctuations in the ratios. Therefore, it is difficult to make strong statements regarding the differences among these physician ratios.

The next plot, Figure 20, displays those specialties with ratios up to 12.00. It includes seven physician specialties: General Surgery, Emergency Medicine, Psychiatry, Imaging, Otorhinolaryngology, Pathology, and Orthopedic Surgery.

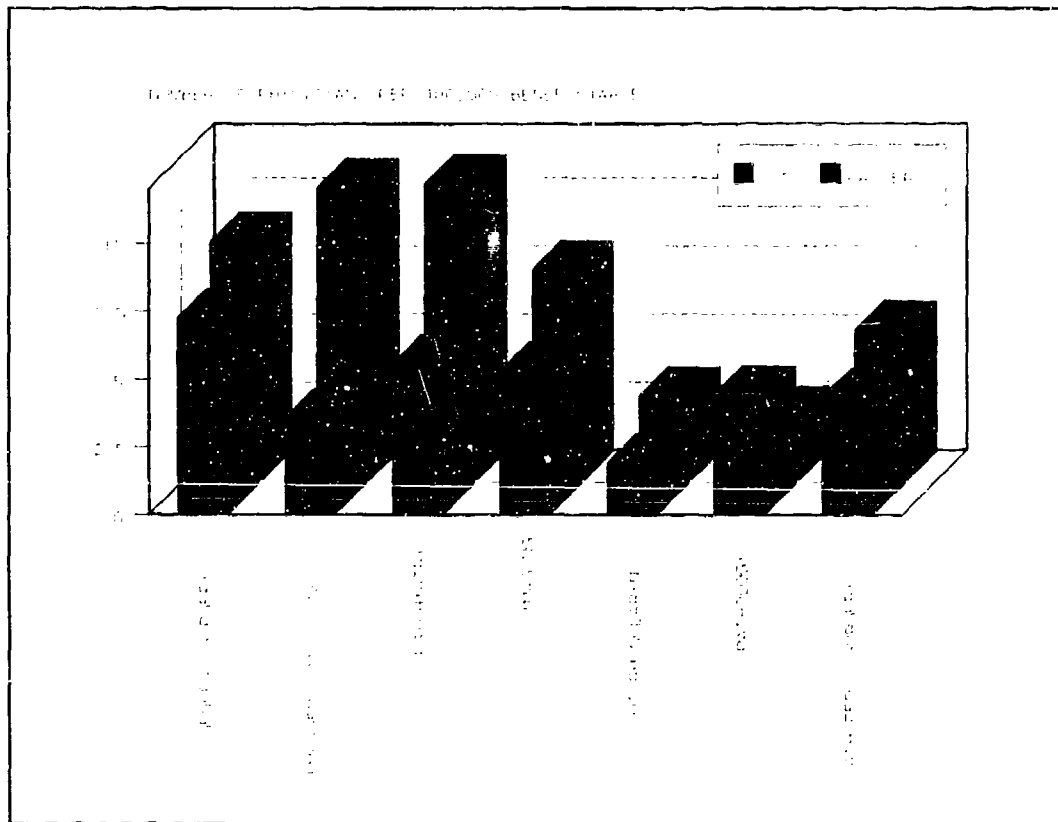


Figure 20. Number of Physicians per 100,000 Beneficiaries for Kaiser-Permanente and DOD.

As was true of Figure 19, with the exception of Pathology, all the DoD ratios are less than those of K-P. Two specialties, Psychiatry and Emergency Medicine, display the greatest differences. The Emergency Medicine ratio for DoD is about a third of K-P while the Psychiatry ratio is half that of K-P.

Figure 21 displays the remaining specialties: Pediatrics, Adult Medicine, Anesthesiology, and Obstetrics/Gynecology. All these ratios range from 5.24 to 89.91.

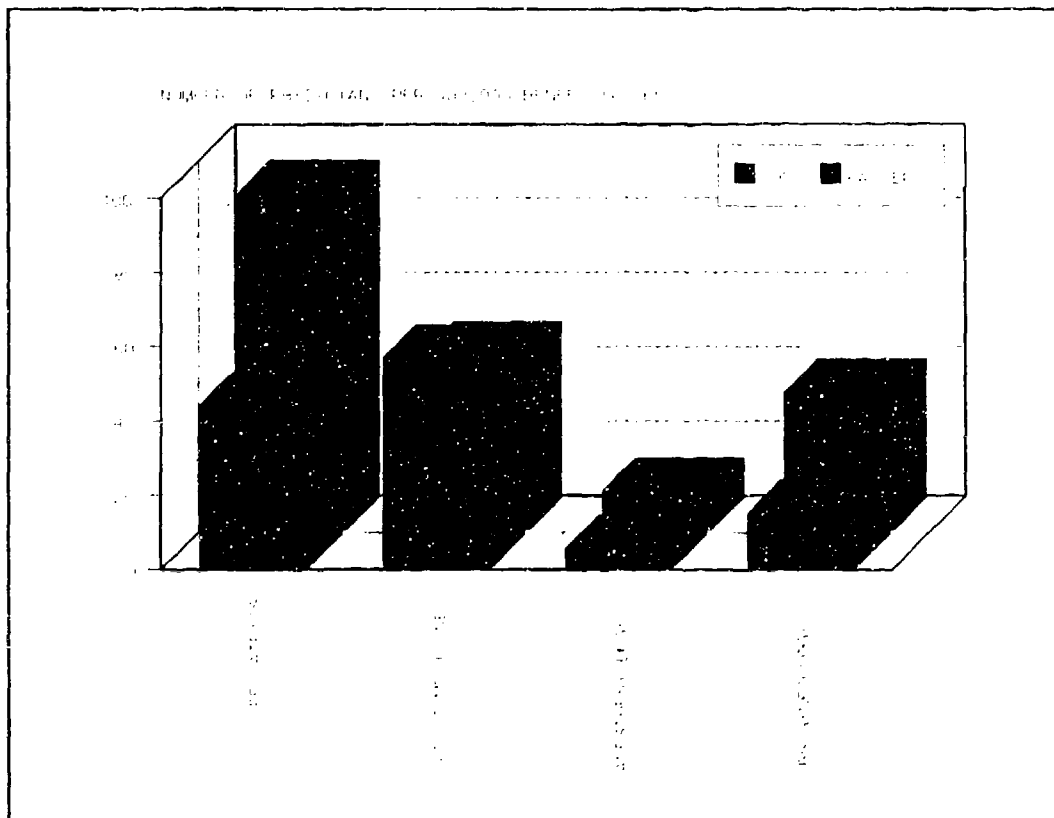
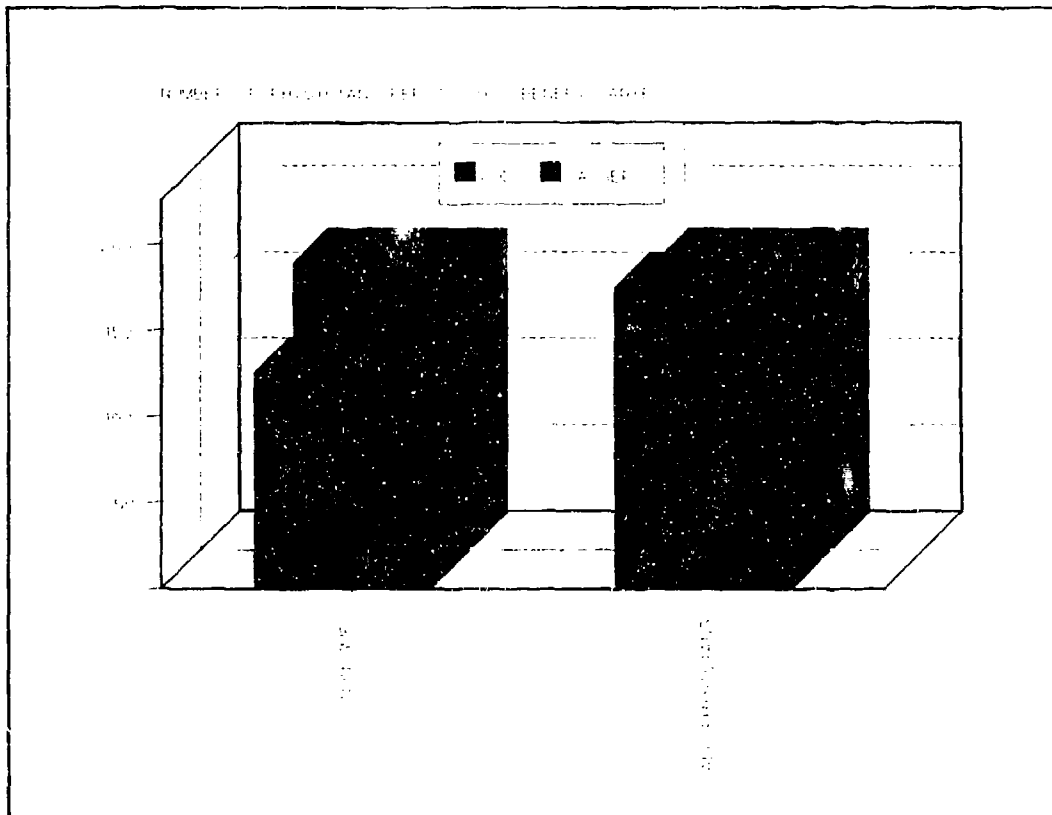


Figure 21. Number of Physicians per 100,000 Beneficiaries for Kaiser-Permanente and DoD.

These histograms provide a very strong graphical display of some major differences between DoD and K-P physician staffing. First, DoD has a slightly higher ratio of Adult Medicine physicians than does K-P. Second, the K-P ratio for Anesthesiology is nearly twice that of DoD. Finally and most striking is the low ratio of DoD Pediatric and OB/GYN specialties as compared to K-P. The DoD ratio for Pediatrics is less than half that of K-P and for OB/GYN the DoD ratio is

40 percent of K-P. These differences are significant for two reasons; 1) with a large percentage of DoD's physicians in these specialties it would take a major effort on the part of DoD to increase these ratios, and 2) these are high demand specialties. Therefore, this lack of active-duty physicians in OB/GYN and Pediatrics may quantify the need for DoD to "buy" these services either through DoD civilian or contract physicians, or CHAMPUS. This statement regarding "buying" services may be applicable to all those specialties where DoD physicians-per-100,000-beneficiaries ratios are less than the corresponding K-P ratios. The observations for Figure 20 warrants further discussion in Chapter IV.

The final graph, Figure 22, displays the Subtotal and Grand Total categories. As discussed from the data in Table XII, these categories represent the total number of physicians in training and the total number of all physicians.



**Figure 22. Number of Physicians per 100,000 Beneficiaries for Kaiser-Permanente and DoD.**

Graphically displayed is the lower DoD ratio for physicians not in training (Non-GME) and the similar ratios for the total number physicians for both organizations. Again, this supports the previous discussion, from Table XII, regarding the high number of DoD active-duty physicians in training programs. Other conclusions regarding these findings will be examined in Chapter IV.

**2. DoD and Kaiser-Permanente Beneficiary Demographics**

This section performs the same type of descriptive analysis on the DoD and K-P beneficiary populations as did the inter-service section. As previously discussed this analysis

is done to demonstrate demographic similarities and differences between different beneficiary populations and to recognize demographics as an area which would significantly effect physician specialty mix and staffing. Utilization rates are not analyzed, therefore there is no discussion comparing DoD and K-P demand for health care. Tables XIII and XIV display the demographic data for DoD and K-P partitioned by; Age (five year increments) and Sex (Female or Male).

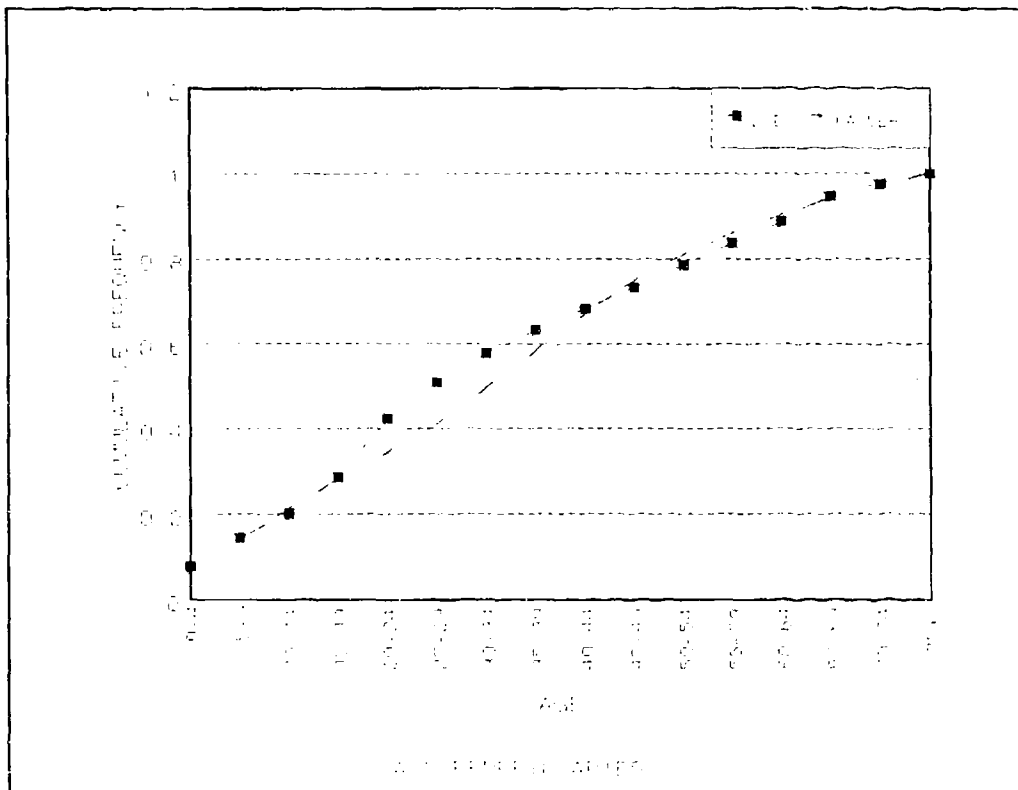
**TABLE XIII. DoD BENEFICIARY DEMOGRAPHICS AS OF OCTOBER 1992**

<b>ALL DoD BENEFICIARIES</b>			
<b>AGE</b>	<b>FEMALE</b>	<b>MALE</b>	<b>TOTAL</b>
0-4	285,582	294,966	580,548
5-9	270,347	279,174	549,521
10-14	243,200	252,526	495,726
15-19	291,007	373,395	664,402
20-24	330,772	572,051	902,823
25-29	281,412	352,419	633,831
30-34	257,790	285,124	542,914
35-39	232,547	234,823	467,370
40-44	220,283	231,397	451,680
45-49	213,120	224,279	437,399
50-54	223,267	218,383	441,650
55-59	248,505	249,634	498,139
60-64	239,826	308,141	547,967
65-69	208,207	299,505	507,712
70-74	154,575	153,247	307,822
75+	109,978	88,731	198,709
<b>TOTAL</b>	<b>3,810,418</b>	<b>4,417,795</b>	<b>8,228,213</b>

**TABLE XIV. KAISER-PERMANENTE (NORTHERN CA. REGION)  
BENEFICIARY DEMOGRAPHICS AS OF MARCH 1993**

<b>KAISER-PERMANENTE</b>			
<b>AGE</b>	<b>FEMALE</b>	<b>MALE</b>	<b>TOTAL</b>
0-4	79,446	82,997	162,443
5-9	85,577	89,472	175,049
10-14	90,494	94,963	185,457
15-19	82,623	85,451	168,074
20-24	79,277	71,447	150,724
25-29	86,426	76,158	162,584
30-34	106,278	99,240	205,518
35-39	111,527	103,247	214,774
40-44	111,953	100,977	212,930
45-49	99,764	91,550	191,314
50-54	76,032	71,086	147,118
55-59	61,729	58,856	120,585
60-64	55,226	51,886	107,112
65-69	47,837	42,818	90,655
70-74	36,247	32,171	68,418
75+	41,985	32,377	74,362
<b>TOTAL</b>	<b>1,252,421</b>	<b>1,184,696</b>	<b>2,437,117</b>

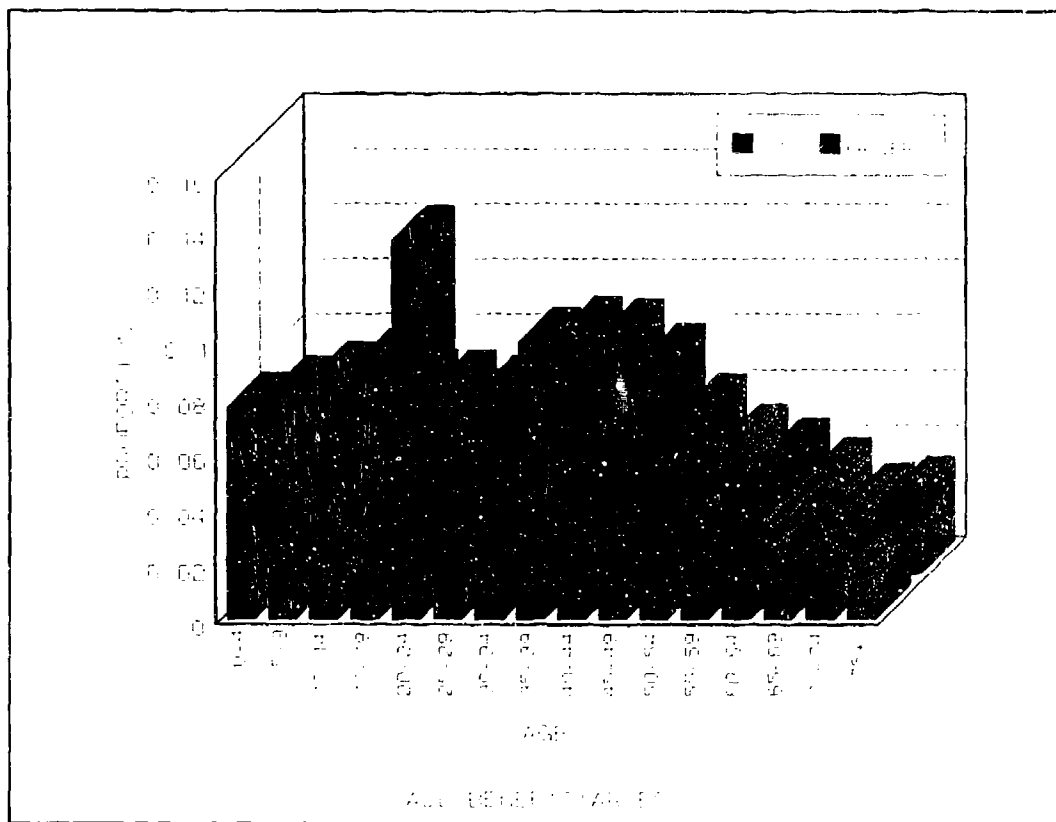
To analyze the above data the same two graphical methods were used as the Inter-Service analysis; 1) the cumulative frequency plot and 2) 3-D histogram plot. The first category to be discussed is total beneficiaries. Figure 23 displays the cumulative frequencies for total beneficiaries, in five year increments, for both DoD and K-P.



**Figure 23. Age Demographics for Total Beneficiaries**

The cumulative frequency plot for all beneficiaries shows similar distributions of ages, for both DoD and K-P, below 19 and above 60 years old. However, there is a significant difference at the 20-24 year old category, where the DoD beneficiary population appears to be highly concentrated. Additionally, the median age for all beneficiaries in DoD is around 27 years old as opposed to the K-P median age of 32 years old; about 5 years different. This suggests that the age distribution for all DoD beneficiaries has a higher density towards the youngest age groups. Figure

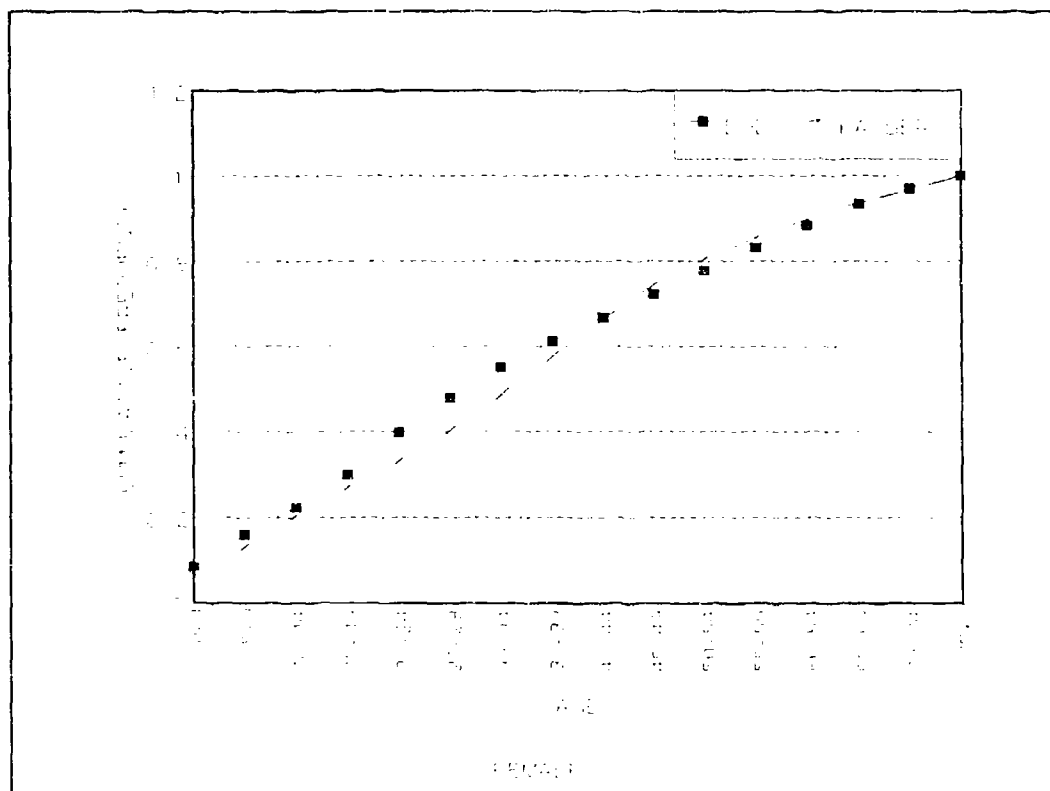
24, provides another view of this data displaying the 3-D histograms.



**Figure 24. Age Demographics for Total Beneficiaries**

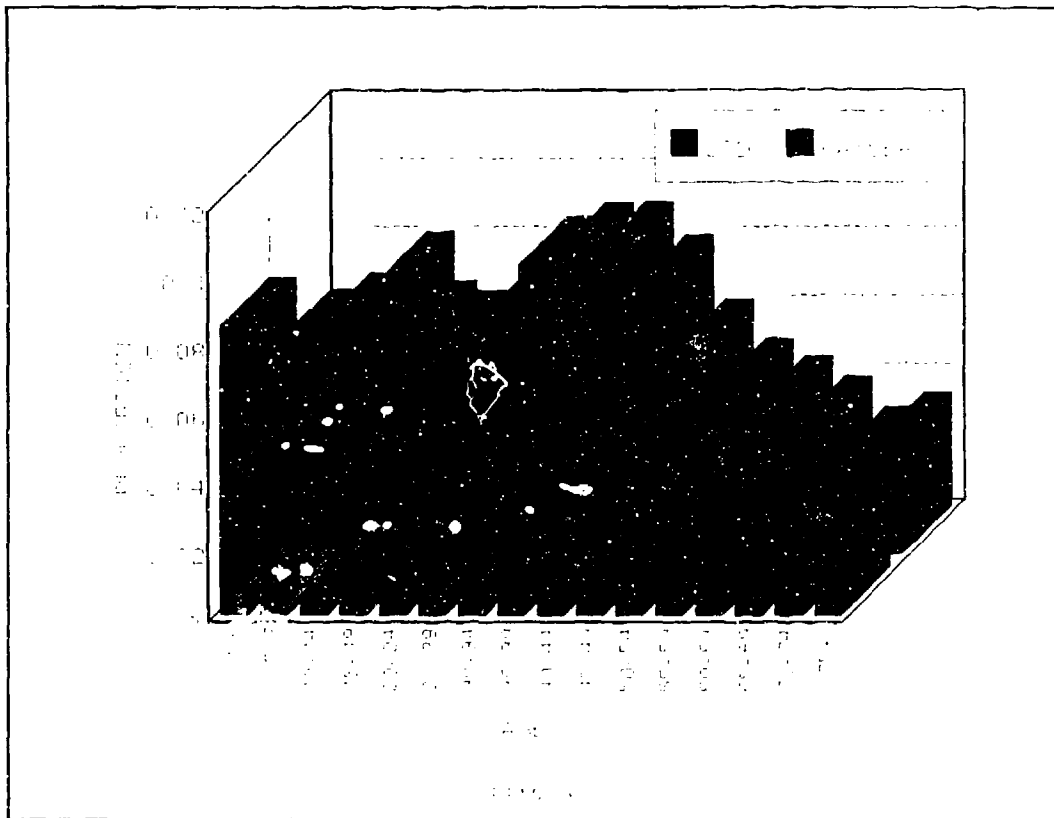
Two observations are evident from the histograms of DoD's and K-P's total beneficiary populations; 1) a rather large mode exists at the 20-24 year old range for DoD and 2) a larger proportion of K-P beneficiaries between 30-60 years old. This graph suggests that K-P has more middle-aged beneficiaries than DoD, which has a high concentration of 20-24 year-old beneficiaries. To provide further analysis of the DoD and K-P total beneficiary populations the male and female

beneficiary populations are examined. Figure 25 displays the cumulative frequencies for the female beneficiary populations.



**Figure 25. Age Demographics for Female Beneficiaries**

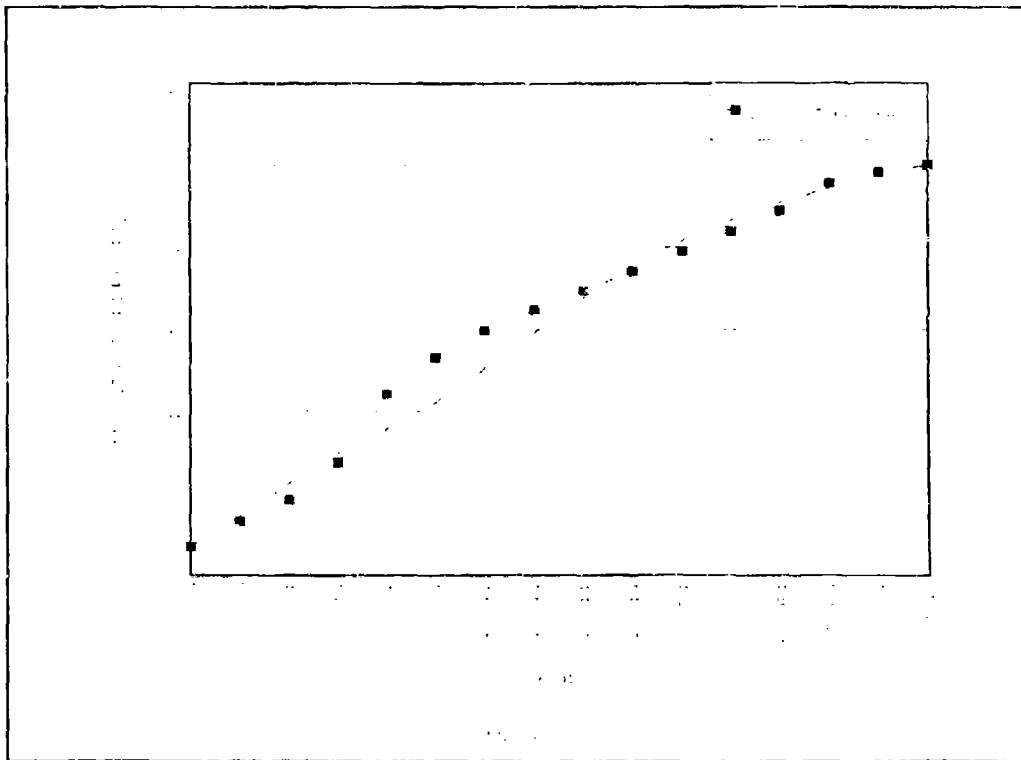
The cumulative frequency plots of DoD and K-P female beneficiary populations are quite similar to that of their total populations. Specifically, DoD displays a high concentration of female beneficiaries at the 20-24 year old group. The approximate median age for DoD female beneficiaries is 30 years old, five years less than the K-P median age of 35 years old. Additionally, DoD female beneficiaries start with a slightly higher concentration of 0-4 year old than do K-P female beneficiaries. The 3-D histograms for this data are displayed in Figure 26.



**Figure 26. Age Demographics for Female Beneficiaries**

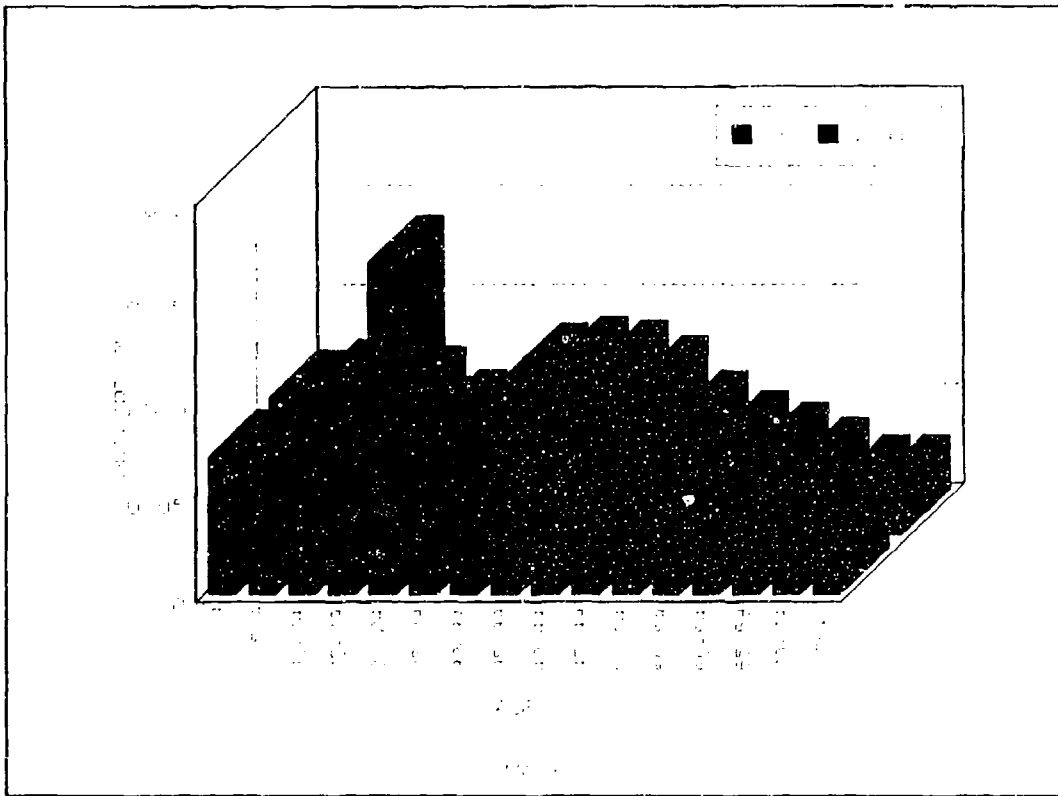
The histogram in Figure 26 shows the female beneficiary population for DoD more heavily distributed under 30 years old than the K-P female beneficiaries. Additionally, there is a higher proportion of the K-P female beneficiary population between 30-50 years old than the DoD female population. Over 55 years old, both DoD and K-P female beneficiary populations exhibit similar proportions.

The final demographic analysis examines the male beneficiary populations. Figure 27 displays the cumulative frequency plot for these DOD and K-P populations.



**Figure 27. Age Demographics for Male Beneficiaries**

The cumulative distribution plots of the male beneficiary populations display DoD's high concentration of 20-24 year old as did its total and female populations. Also, K-P appears to have a higher concentration of males beneficiaries under 15 years old than the DoD male beneficiary population. The median age for the male DoD beneficiaries, approximately 25 years old, is less than the K-P median of 32 years old. This difference between DoD and K-P male beneficiaries median ages, seven years, is the greatest among each beneficiary population category. Figure 28 displays the 3-D histogram plots of the DoD and K-P male beneficiary populations.



**Figure 28. Age Demographics for Male Beneficiaries**

DoD's large proportion of 20-24 year old male beneficiaries is most evident from Figure 28. Also, DoD appears to have a closely uniformed distribution of 35-64 year old male beneficiaries, although smaller in proportion than K-P male beneficiaries. The distribution for K-P male beneficiaries exhibits high proportions under 14 years old and between 30-49 years old.

As introduced at the beginning of this analysis, the similarities and differences of these DoD and K-P beneficiary demographics may impact the physician staffing patterns of either organization. Chapter IV discusses the conclusions derived from this analysis.

#### D. DoD/KAISER-PERMANENTE STAFF MODEL

This study has acknowledged that demand for health care is dependent upon utilization rates applied to the demographics of a beneficiary population. Additionally, this study has demonstrated some differences between the DoD and K-P beneficiary demographics. For the purposes of this final section, since neither DoD nor K-P utilization rates are available; it is assumed that DoD beneficiary population has a similar demand for health care as the K-P beneficiary population. With this assumption, two physician staffing scenarios for DoD can be constructed based on the Kaiser-Permanente Staff model data. The objective of these DoD staffing scenarios is to examine which physician specialties demonstrate major staffing level differences from the 1992 DoD active-duty staffing levels.

The first scenario determines the physician staffing requirements which would give DoD the capability of providing health care to all of its 8,228,213 beneficiaries. These staffing requirements are based upon using each K-P physician-per-100,000-beneficiaries ratio for each specialty, applying these ratios to the DoD population to determine the number of required physicians, and examining the increases or decreases of required physicians from the 1992 number of active-duty physicians.

The second scenario estimates the percent of DoD beneficiaries, DoD could provide health care to, using the

1992 number of active-duty physicians **not in-training**. This scenario is again based upon using each K-P ratio, for each specialty, to determine the required physician staffing requirements for this estimated percentage of beneficiaries.

The first analysis, determining the number of physicians needed to provide care to all DoD beneficiaries, is defined as the 100 PERCENT SCENARIO. Table XV displays the 1992 number of active-duty physicians, number of physicians required under a 100 percent scenario, that difference, and the percent increase or decrease from the 1992 active-duty physicians levels. The formula used to determine this percent change, having the 1992 number of active-duty physicians by specialty as the base is:

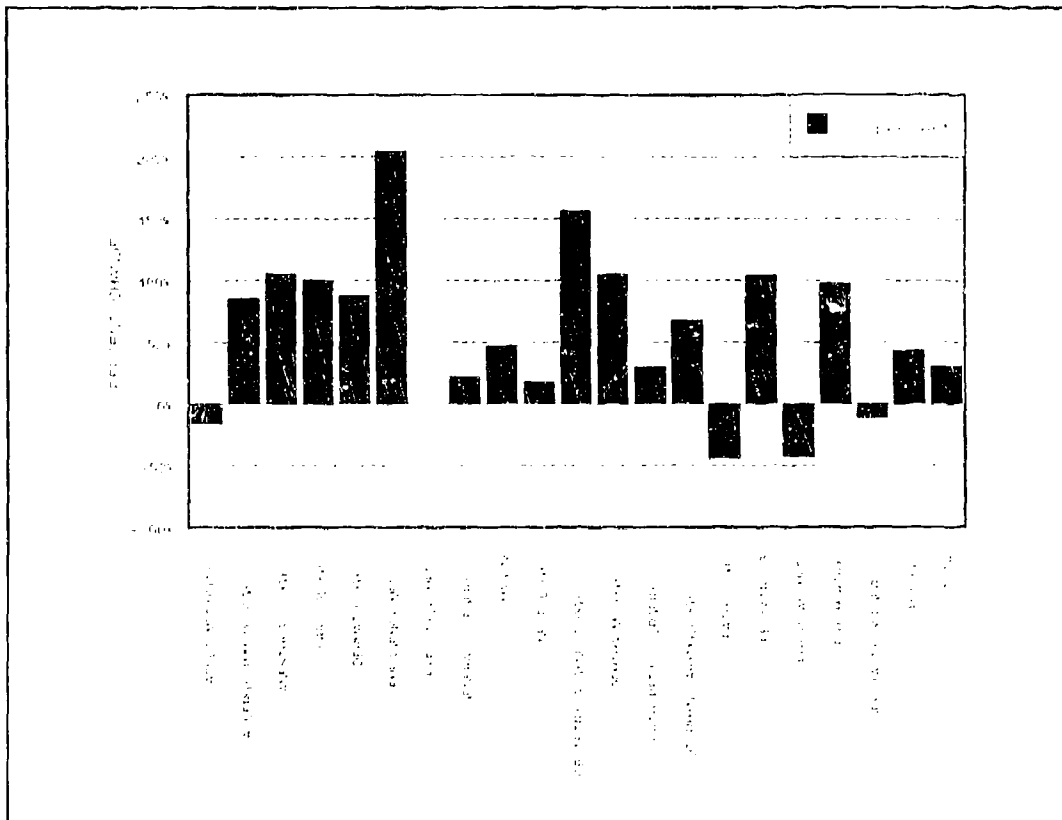
$$\text{Percent Change} = \left[ \frac{\text{Number of Physician Specialists Required by K-P Model} - \text{1992 Number of Physician Specialists on Active-Duty}}{\text{1992 Number of Physician Specialists on Active-Duty}} \right] \times 100 \quad (3.2)$$

TABLE XV. PROPOSED NUMBER OF ACTIVE-DUTY PHYSICIANS: 100 PERCENT SCENARIO

SPECIALTY	NUMBER 1992	NEEDED	DIFFERENCE	PERCENT CHANGE
ADULT MEDICINE	4,652	3,891	-761	-16
ALLERGY/IMMUNOLOGY	74	137	63	86
ANESTHESIOLOGY	431	887	456	106
CARDIOLOGY	126	253	127	101
DERMATOLOGY	151	284	133	88
EMERGENCY MED	291	889	598	205
EXECUTIVE MED	279	279	0	0
GENERAL SURGERY	593	725	132	22
IMAGING	433	640	207	48
NEUROLOGY	124	147	23	18
OBS./GYNECOLOGY	445	1,144	699	157
OPHTHALMOLOGY	191	393	202	106
ORTHOPEDIC SURGERY	352	458	106	30
OTORHINOLARYNG.	154	259	105	68
PATHOLOGY	361	200	-161	-45
PEDIATRICS	713	1,462	749	105
PHYSICAL MED	33	19	-14	-43
PSYCHIATRY	453	900	447	99
SPECIALTY SURGERY	196	174	-22	-11
UROLOGY	145	209	64	44
<b>TOTAL</b>	<b>10,197</b>	<b>13,350</b>	<b>3,153</b>	<b>31</b>

Most noticeable about the data in Table XV is the net increase in the total number physicians, 3,153, needed for the 100 percent scenario. Recalling that there are 4,079 active-duty physicians in-training, it is conceivable that DoD may have the resources to meet the requirements of this scenario.

The four specialties showing large differences are Pediatrics, Obstetrics/Gynecology, Anesthesiology, and Emergency Medicine. The Pediatric specialty would require 749 additional physicians, nearly double the number of active-duty physicians that are currently in DoD. OB/GYN would need an additional 699 physicians or an increase of 150 percent from active-duty levels. Emergency Medicine would require the largest percentage increase of all specialties, 205 percent, or 598 physicians and Anesthesiology would require 456 more physicians or a 100 percent increase from active-duty levels. Of the 15 specialties needing increases, these four specialties account for 80 percent of the net increase of all physicians under the 100 percent scenario. Only five of the 20 specialties, Adult Medicine, Executive Medicine, Pathology, Physical Medicine, and Specialty Surgery show either no change or decreases in 1992 DoD levels. The percent change data of Table XV is graphed in Figure 29, showing the relative increases or decreases for each specialty.



**Figure 29. DOD Physician Staffing Requirements using Kaiser-Permanente Staffing Data**

Figure 29 shows that DoD would require a significant increase in the number of physicians in most specialties, under the 100 Percent Scenario. Of the 20 specialties half need an increase of more than 80 percent from active-duty levels, while four could be decreased. The significance of this analysis is to demonstrate to DoD health-care planners which specialty services may be understaffed with active-duty physicians. As discussed previously, to increase services in these specialties DoD may need to purchase medical care

through civil service physicians, contract physicians, or CHAMPUS.

The next scenario approximates the percent of beneficiaries which could be provided health care based on the 10,197 active-duty physicians not in-training, using the K-P total physician ratio of 165.29 physicians-per-100,000-beneficiaries. This percent increase or decrease assumes a linear addition or reduction across all demographic categories. Given this percentage of beneficiaries, the number of specialty physicians is then determined. The reasoning for using physicians not in-training is based on the assumption that physicians in-training provide negligible net patient care. Therefore, given the 10,197 active-duty physicians not in-training, a physician-per-100,000-beneficiary ratio of 165.29, 8,228,213 DoD beneficiaries, and using equation 3.1, approximately 75 percent or 6,171,160 beneficiaries could receive total care. The proposed number of active-duty physicians required for 6,171,160 beneficiaries under this 75 PERCENT SCENARIO, and related data are listed in Table XVI.

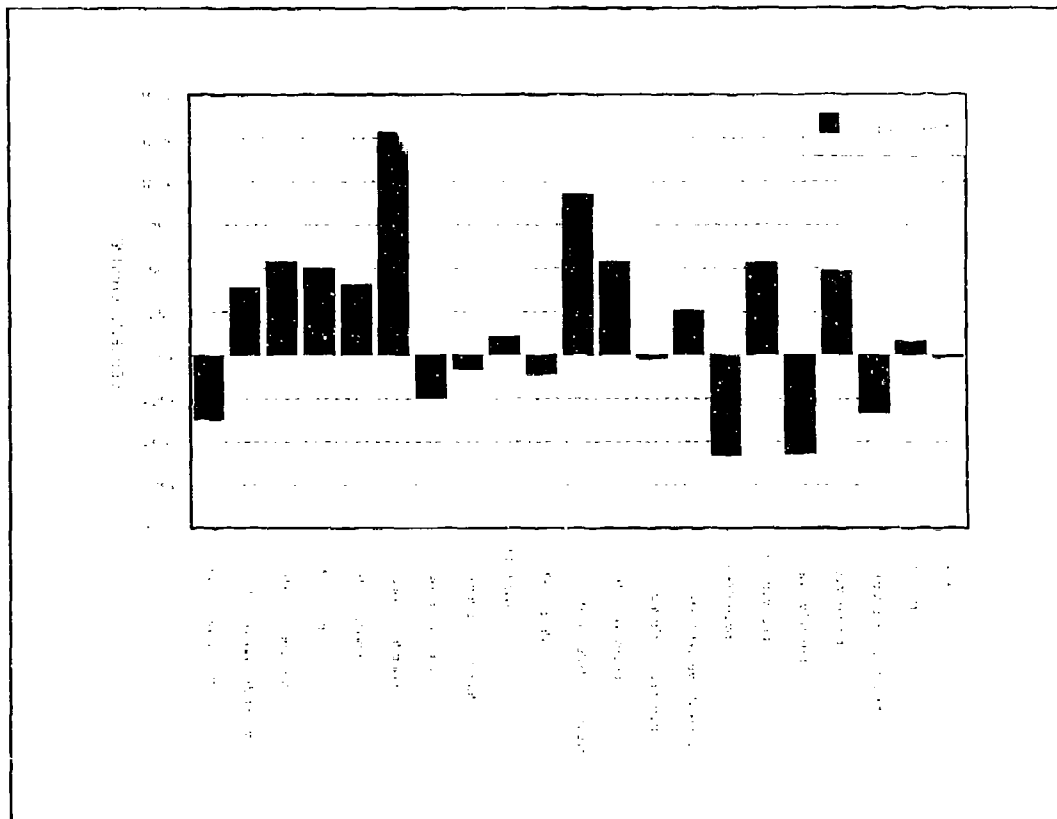
TABLE XVI. PROPOSED NUMBER OF ACTIVE-DUTY PHYSICIANS: 75 PERCENT SCENARIO

SPECIALTY	CURRENT	NEEDED	DIFFERENCE	PERCENT CHANGE
ADULT MEDICINE	4652	2918	-1734	-37
ALLERGY/IMMUNOLOGY	74	103	29	39
ANESTHESIOLOGY	431	665	234	54
CARDIOLOGY	126	190	64	51
DERMATOLOGY	151	213	62	41
EMERGENCY MED	291	666	375	129
EXECUTIVE MED	279	209	-70	-25
GENERAL SURGERY	593	544	-49	-8
IMAGING	433	480	47	11
NEUROLOGY	124	110	-14	-11
OBS./GYNECOLOGY	445	858	413	93
OPHTHALMOLOGY	191	295	104	54
ORTHOPEDIC SURGERY	352	344	-8	-2
OTORHINOLARYNG.	154	195	41	26
PATHOLOGY	361	150	-211	-59
PEDIATRICS	713	1,096	383	54
PHYSICAL MED	33	14	-19	-57
PSYCHIATRY	453	675	222	49
SPECIALTY SURGERY	196	130	-66	-34
UROLOGY	145	157	12	8
TOTAL	10,197	10,012	-185	-1.81

The data in Table XVI shows the staffing requirements needed to meet the demand for health care for 75 percent of the DoD beneficiary population. Under this scenario, the required total number of active-duty physicians (10,012) are approximately the same as the DoD number on active-duty

(10,197) physicians not in-training as of October 1992. The difference of 185 active-duty physicians, in this scenario, is attributed to the general estimate of 75 percent. A more accurate number reflecting 76.5 percent of the DoD beneficiary population would display no net difference between the actual and proposed number of active-duty physicians. But the 75 percent serves the purpose of this analysis.

From Table XVI, remaining significant are the large increases in physicians for OB/GYN, Pediatrics, Emergency Medicine and Anesthesiology specialties, a total of 1393 physicians. The largest decrease of physicians (1734), is in the Adult Medicine category followed by a decrease of 222 Pathologists. Similar to Figure 28, the percent changes for the 75 percent scenario are displayed in Figure 30.



**Figure 30. DOD Physician Staffing Requirements using Kaiser-Permanente Staffing Data**

Figure 30 shows eight specialties having percent decreases in the 75 percent scenario as opposed to four specialties under the 100 percent scenario. As expected, most of the specialties with high percent increases, Emergency Medicine, Pediatrics, and OB/GYN remain consistent with the 100 percent scenario. Conclusions addressing certain observations of the 100 and 75 PERCENT SCENARIOS will be presented in the next chapter.

#### IV. SUMMARY AND CONCLUSIONS

The escalating cost of military health care, in the environment of reduced budgets, is stimulating DoD to develop innovative policies that reduce these costs while insuring available, accessible, and quality health care. One area which significantly impacts these factors is physician staffing levels and specialty mix. Specifically, for military health-care planners the problem is one of maintaining a cadre of active-duty physicians, which is generally based on wartime requirements, while providing peacetime medical care to over eight million beneficiaries.

This study examined the problem by obtaining health-care related data from the Defense Manpower Data Center and the Kaiser-Permanente HMO, northern CA region, (K-P) in Oakland, CA. The objective of this study, providing a baseline assessment of 1992 active-duty physician manpower levels, was accomplished by analyzing the following components:

- The structure of each Service's medical department. Specifically, the numbers of active-duty physician specialists in each Service, as well as, the demographics of each Service's beneficiary population.
- Comparing DoD active-duty physician staffing levels to the corresponding physician staffing levels of the Kaiser-Permanente HMO.

The analysis which addressed the structure of each Service's medical department structure showed that, in general, each Service staffs its medical department with

different proportions of active-duty personnel. Additionally, the size of the Air Force and Army medical departments are similar (ten percent of the active-duty force) while the Navy's medical department is about six percent of the Navy and Marine Corps active-duty force. Finally, the proportion of each Service's beneficiary population are quite similar. That is, of all DoD beneficiaries, about 34 percent are each Army and Navy/Marine Corps beneficiaries, and the remaining 32 percent are Air Force beneficiaries. From these summary statements the following two conclusions are drawn:

- There is no DoD policy which requires similar active-duty staffing policies for each Service's medical department.
- From an active-duty manpower perspective, the Navy's medical department is smaller than that of the Army and the Air Force. This may, or may not, be the consequence of an articulated policy.

Explanatory of these conclusions may be the different wartime requirements of each Service's medical department. However, this does not quantify, nor imply, substandard or non-available medical care for a Service's beneficiary population. Therefore, to provide additional insight, similarities and differences between each Service's number of active-duty physicians, and its beneficiary demographics were examined. A ratio of the Number-of-Physicians-per-100,000-Beneficiaries was developed to standardize the number of physicians by specialty.

The results of this inter-service analysis demonstrated that for the total number of physicians in each Service, the

Army had the largest physician-to-beneficiary ratio while the Navy had the smallest ratio. Subsequently, of the 23 physician specialties, the Army had the largest ratios in 16 specialties, the Navy had the smallest ratios in 15 specialties, and in 12 specialties the ratios for the Air Force were greater than the Navy but smaller than the Army. Also, approximately 32 percent of all Army physicians are in training programs, as compared to 29 percent for the Navy and 23 percent for the Air Force. Finally, the beneficiary demographic analysis showed that the median ages in the total beneficiary population and male and female sub-population categories, are youngest for the Navy/Marine Corps and oldest for the Air Force. From this inter-service analysis the following conclusions are drawn:

- The number of physicians, in both the Army and Air force, has not decreased proportionately to the decreases in its respective beneficiary population.
- Each medical department allocates a significant asset to physician training programs.
- Differences in operational requirement and beneficiary demographics may explain some of the variation between the Services' number-of-physicians-per-100,000-beneficiaries ratios.

These results do not suggest that if a Service has a greater physician-to-beneficiary ratio it is more capable of delivering health care than the Services with smaller ratios. However, it does quantify the differences of physician staffing between each Service, and provides a baseline assessment of each Service's beneficiary demographics.

The final analysis provided quantitative results of how physician-to-beneficiary ratios in DoD compare to the corresponding ratios of a large civilian Health Maintenance Organization (HMO), the Kaiser-Permanente HMO, northern CA region, in Oakland, CA (K-P). Additionally, similarities and differences between beneficiary populations were analyzed.

The results of this analysis showed that of the total number of physicians in DoD and K-P, DoD had more physicians-per-100,000-beneficiaries than K-P. But if those physicians in training programs were excluded from this total, DoD had a smaller ratio than K-P. Subsequently, of the 20 physician specialties, DoD had a greater ratio in only two categories, Adult Medicine and Pathology, while four specialties, OB/GYN, Anesthesiology, Emergency Medicine, and Pediatrics, demonstrated a significant difference between the larger K-P ratios and smaller DoD ratios. Also, based on the assumption that the MHSS can operate similarly to a large civilian HMO, there are enough active-duty physicians in DoD to meet the health-care demand of all DoD beneficiaries. But if those physicians in training programs were excluded from the DoD total, there would be enough remaining active-duty physicians to meet the demand of approximately 75 percent of DoD beneficiaries.

Finally, the demographic analysis of beneficiary populations showed that the median ages, in the total beneficiary population and male and female sub-population

categories, are all about five years younger for DoD beneficiaries as compared to the K-P population.

The following four conclusions are drawn as a result of the DoD-Kaiser-Permanente analysis:

- Demand for medical care by DoD beneficiaries in the Pediatric, Emergency Medicine, Anesthesiology, and OB/GYN specialties may substantially exceed the supply of active-duty physicians in those specialties. This may imply frequent use of civilian physicians by DoD beneficiaries in these medical services.
- DoD operational requirements and differences in beneficiary demographics would explain some of the variation between the DoD and K-P ratios. For example, the smaller ratios of OB/GYN and Pediatric active-duty physicians may be explained by a lack of wartime requirements for those specialties. Also, the younger DoD beneficiary population may not require the same amount of specialty care as the older K-P beneficiary population.
- The capacity of the DoD health care system is significantly reduced, but not necessarily substandard, because of the large proportion of DoD active-duty physicians in training programs.
- If DoD were to adopt an HMO physician staffing mechanism the distribution of specialists in DoD may be improved.

In summary, this analysis provided a vast amount of information that addressed DoD's active-duty physician asset and beneficiary demographics. This information should afford health-care planners a foundation on which to base future decisions.

## V. RECOMMENDATIONS

Based on the results of this study the following recommendations are provided:

- The unavailability of specific utilization rates for DoD beneficiaries implies that this study could not quantify the demand for health care in the MHSS. Therefore, it is recommended that these data be tracked and obtained so that the DoD demand for health care can be estimated, as well as compared to that in the civilian sector.
- The policy of basing active-duty physician staffing requirements generally on wartime requirements has an impact on the availability of direct care during peacetime. This subject should be further analyzed to determine if there are certain wartime requirements which may be altered to provide more direct care in a peacetime environment. For example, the demand for Emergency Medicine services appears to be greater than the number of active-duty Emergency Medicine specialists. Therefore, it may be cost effective to increase the number of active-duty Emergency Medicine physicians. Additionally, Emergency Medicine may provide ideal training for wartime contingencies.
- A significant proportion of DoD active-duty physicians are assigned to training programs. Since these physicians can not provide the same quantity of medical care as a physician who has previously received training, it is recommended that a cost analysis be made to determine the impact of accessing more specialty trained physicians into DoD.
- The comparison to the Kaiser-Permanente HMO demonstrated some large differences between DoD active-duty staffing levels and corresponding K-P levels. A study which maximizes the availability of specialty care while minimizing the cost of that care should be done to determine the optimal mix of CHAMPUS, contract, DoD civil service and active-duty physicians.
- Given some of the inter-service quantitative analyses in this study, DoD should continue to pursue "joint" policies which combines the assets of all Services' medical departments. Such policies could result in "economies of scale" which increase productivity and reduce the overall cost of military medical care.

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