CNS 1023

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# NAVY PHYSICIAN STAFFING LEVELS



CENTER FOR NAVAL ANALYSES
1401 Wilson Boulevard
Arlington, Virginia 22209
Institute of Naval Studies

November 1973



Prepared for:

OFFICE OF NAVAL RESEARCH
Department of the Navy
Washington, D.C. 20350

OFFICE OF THE CHIEF OF NAVAL OPERATIONS (Op96)
Department of the Navy
Washington, D.C. 20380

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

| REPORT DOCUMENTATION PAGE | | READ INSTRUCTIONS BEFORE COMPLETING FORM |
|---|---|---|
| 1. REPORT NUMBER<br>CNS 1023 | 2. GOVT ACCESSION NO. | 3. RECIPIENT'S CATALOG NUMBER |
| 4. TITLE *(and Subtitle)*<br>Navy Physician Staffing Levels | | 5. TYPE OF REPORT & PERIOD COVERED<br><br>6. PERFORMING ORG. REPORT NUMBER |
| 7. AUTHOR*(s)*<br>Eugene J. Devine, Brian E. Forst | | 8. CONTRACT OR GRANT NUMBER*(s)*<br>N00014-68-A-0091 |
| 9. PERFORMING ORGANIZATION NAME AND ADDRESS<br>Center for Naval Analyses<br>1401 Wilson Boulevard<br>Arlington, Virginia 22209 | | 10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS |
| 11. CONTROLLING OFFICE NAME AND ADDRESS<br>Office of Naval Research<br>Department of the Navy<br>Washington, D.C. 20350 | | 12. REPORT DATE<br>November 1973<br>13. NUMBER OF PAGES<br>102 |
| 14. MONITORING AGENCY NAME & ADDRESS*(if different from Controlling Office)*<br>Office of the Chief of Naval Operations (Op96)<br>Department of the Navy<br>Washington, D.C. 20380 | | 15. SECURITY CLASS. *(of this report)*<br>For Official Use Only<br>15a. DECLASSIFICATION/DOWNGRADING SCHEDULE |

16. DISTRIBUTION STATEMENT *(of this Report)*
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17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*

18. SUPPLEMENTARY NOTES
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19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*
CHAMPUS, health, Kaiser Plan, management, medical examination, medical services, medicine, Navy, personnel, requirements, physicians, planning, procurement, volunteers

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*
For the past 30 years the Navy has been able to procure physicians at greatly depressed salaries because of conscription, and this has been reflected in staffing levels. Efficient adjustment to the new all-volunteer environment will entail the provision of medical care with fewer physicians (and more of various other inputs). However, there exists no widely accepted method of determining physician staffing in either the military or civilian sectors. The method we have chosen is to compare Navy physician staffing with that of the Kaiser Plan. One important difference between the two systems which makes the comparison especially relevant is that the

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE
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20 Kaiser Plan has had to pay market prices for all its resources, as will the Navy in the future, and staffing patterns reflect this. There are also other important differences between the two systems. Our analysis consists of making adjustments for these differences.

DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
WASHINGTON, D.C. 20350

IN REPLY REFER TO
Ser 96/958

7 JUN 1974

From: Chief of Naval Operations
To: Distribution List

Subj: Navy Physician Staffing Levels (CNA/INS #1023 of 26 Nov 73); promulgation of

Encl: (1) Navy Physician Staffing Levels Study Report (CNA/INS #1023 of 26 Nov 73)

1. The subject study was conducted to help develop realistic plans for meeting health care requirements in the All-Volunteer Force and is one of a number of studies in this area. The specific objective was to determine the minimum number of Navy Physicians required in FY73-74.

2. The methodology employed was to compare Navy's physician staffing with that of a demographically similar civilian group. Estimates of the beneficiary populations to be served in FY73-74 were developed for Navy and for Kaiser--Permanente's Northern and Southern California regions (Kaiser is a civilian Health Maintenance Organization). Adjustments were made for selected differences between the two systems and adjusted physician staffing levels were developed. The study concludes that about 2,900 physicians would be adequate to provide services, in a manner comparable to Kaiser's, for the number of beneficiaries who were estimated to receive care in Navy facilities in FY73-74. The study recognizes, however, that such a substantial reduction in physicians would necessitate increased use of other resources and that this adjustment would take time, beyond the FY-74 time frame.

3. The following should be noted when reviewing the analysis:

a. More recent reports have indicated lower active duty and significantly higher non-active duty populations than were used in the study.

b. The proportion of the population which was estimated to be provided care in Navy facilities during FY73-74 may be significantly understated.

c. Other studies indicate different numbers of physicians required and the question is receiving continuing study.

d. The basic analysis contained in this report was included in the "Reduction in Strength of Health Professionals" study report (Bureau of Medicine and Surgery memorandum of 20 September 1972), as were major criticisms of the methodology.

4. Enclosure (1) is forwarded.

T. B. HAYWARD
DIRECTOR
NAVY PROGRAM PLANNING

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## SYNOPSIS

Medical care may be delivered using various combinations of resources, both human and physical, and the efficient combination of these resources will depend upon their prices and will change as relative prices change. It is important to realize that the Navy medical care system has evolved over a period of 30 years in response to a pricing system under which much of its manpower has been obtained at artificially low prices through conscription-related sources. Over the same period, the Navy has not been able to conscript physical resources, such as buildings and equipment, at low prices; nor has it been able to conscript all its human resources, notably female nurses. The earnings of physicians have been particularly depressed under conscription because they have the highest civilian earnings opportunities of any group in the Navy, and these will exhibit the greatest relative increase after removal of conscription.

It has been rational for the Navy, from the point of view of its budget, to respond to the set of prices confronting it by making relatively heavy use of those resources whose prices are depressed, especially physicians. There is abundant evidence that the Navy has responded in this way. It is also clear that efficient adaptation to the increase in physicians' salaries is to deliver medical care with a combination of resources which includes fewer physicians than in the past. Indeed, some reduction from current levels would appear to be appropriate even without an increase in physicians' salaries. The workload in Navy medical facilities has declined continuously from the peak year of fiscal 1969 through 1972, and to a far greater extent than the decrease in physicians.

But while the direction of the adjustment is clearly to utilize fewer physicians, the magnitude of the reduction is less clear. There are no widely accepted criteria in the civilian sector concerning the number of physicians to serve a given population, and members of the staffs of the three military surgeons general were unable to agree on staffing criteria after five years of study. Therefore, the method we have chosen is to compare Navy physician staffing with that of the Kaiser Plan.

The Kaiser Plan is a prepaid, hospital-based, group practice, providing comprehensive medical care to a population comparable in size to the Navy's population. One important difference between the two systems which makes our comparison particularly apt is that the Kaiser Plan has had to pay market prices for all its resources as the Navy will in the future, and its evolution over the years reflects these prices. In particular, Kaiser has had an incentive to conserve upon physicians which would not have been present had they also been able to conscript them.

There are other important differences in the structural characteristics of the two systems. Therefore a simple comparison of physician staffing and population in the two systems will be inadequate, and our analysis consists of adjusting for those differences which we believe will affect physician staffing. These include: (1) an adjustment for the

differing age-sex distributions of the populations; (2) estimates of the proportions of the eligible populations of each system receiving care outside these systems; (3) an adjustment for physicians providing support for military missions which have no counterpart in civilian life; (4) an adjustment to take account of the geographical dispersion of the Navy population; (5) an estimate of additional Navy physicians to provide a rotation base to minimize tour length in unpopular assignments; (6) an adjustment to take account of the lower productivity of interns and residents, who constitute a heavy proportion of total Navy physicians; (7) an adjustment to take account of time spent by Navy physicians in transit from one duty station to another.

The total population eligible for care in Navy facilities in fiscal years 1973 and 1974 is about 2.5 million. The equivalent of about 1.8 million, or about 70 percent of this total population, does receive care in Navy facilities. This total population has been relatively stable in recent years, but its composition has been changing, with retired personnel and their dependents constituting an increasing proportion of the total. These beneficiaries use Navy medical facilities less than proportionately to their representation in the population; moreover, they have been receiving an increasing proportion of their medical care under CHAMPUS every year since that program became available to them.

We estimate that a population of this magnitude and composition could be served with about 2,900 physicians, after enough time has elapsed to adjust the combination of resources used in the delivery of medical care. These 2,900 physicians would consist of about 100 interns, 400 residents and 2,400 post-residents, if the same proportions are retained in the future as at present; they would be the equivalent of approximately 2,500 post-residents. The resulting ratio of Navy physicians to population served would be 160 physicians per 100,000, compared with a Kaiser Plan ratio of 98 per 100,000. The adjusted Navy ratio of post-resident equivalents would be 137 physicians per 100,000, which is about 50 percent higher than the adjusted (for differences in age and sex distribution) Kaiser Plan ratio of 91 per 100,000. We believe that our method is valid, and that the higher physician/population ratio for the Navy results in enough additional physicians adequately to take account of differences between the two systems and to serve the Navy population. The numbers can readily be revised as the magnitude and composition of this population change.

Limitations

1. A substantial reduction in the number of physicians will necessitate increased use of other resources used in the delivery of medical care. This adjustment will take time, and we have not specified the time path for adjustment. This would require a detailed examination of physician staffing and resource substitution possibilities at each facility. Such an estimate of the timing of the reduction in the number of physicians has been completed by the Medical and Dental Officer Billet Requirements Study Group.

2. We have taken as given the categories of beneficiaries to be served. That is, we have not investigated the advisability of adopting policies to shift more of the patient load to CHAMPUS. We have taken into account autonomous shifts in the use of CHAMPUS by beneficiaries.

3. We have taken as given the existing method of rationing medical care in Navy facilities, viz., by queueing. We have not investigated the effect of other rationing methods, such as the introduction of a copayment mechanism for non-active duty beneficiaries, upon utilization.

Recommendations

1. We recommend a decrease in the number of physicians serving the Navy from the present authorized level of 4, 200 to about 2, 900. This decrease should take place as soon as the necessary substitution of other resources can be made. The timing of reductions in the number of Navy physicians proposed by the Medical and Dental Officer Billet Requirements Study Group does not appear to be unduly rapid.

2. Analysis of the advisability of shifting more (or less) of the care of Navy beneficiaries to CHAMPUS have been hampered by lack of valid cost data for Navy care. Studies estimating these costs are now being conducted. The Navy should ascertain that such studies take into account the markedly higher rates of hospital utilization and surgical procedures observed for populations served under the fee-for-service payment system compared with prepayment systems before adopting policies designed to increase CHAMPUS usage.

3. The implications of alternative methods of rationing medical care and their effects on utilization should be investigated. In particular, the effects of instituting or increasing copayment by non-active duty beneficiaries should be compared with the present method of rationing by queue.

# I. INTRODUCTION: PURPOSE AND BACKGROUND

The purpose of this Study is to estimate the appropriate level of physician staffing for the Navy in the all-volunteer environment. For over 30 years, the Navy has been able to procure physicians and many other types of manpower at artificially depressed salaries because of the existence of conscription. Salaries have been particularly depressed for physicians, whose alternative earnings opportunities in the civilian sector exceed those of any other Navy occupational group. However, during the same period the Navy has had to pay market prices for many of the other resources used in the provision of health services. The Navy has not been able to "draft" medical equipment or buildings at artifically depressed prices; nor has it been able to draft all of the human resources used, such as female members of the Navy Nurse Corps and civilian employees. The end of conscription is the occasion for a reexamination of the resource mix utilized to produce health services in the Navy, and especially for a reexamination of physician staffing. The greatest relative price increase is expected to occur in physician salaries because these were depressed most in the past.[1]

It would indeed be remarkable if the combination of resources used in the Navy health care system as it has evolved over the past 30 years did not reflect the relative prices paid by the Navy. We would expect to find overutilization of those resources obtainable at below-market prices and underutilization of those resources for which market prices have had to be paid. There is abundant evidence that this has been the case, as discussed in appendix A. Although such resource utilization has always been inefficient from the point of view of society, from the Navy's point of view, it has been rational to utilize resources according to the impact on its budget, that is, in accordance with the relative prices it has had to pay.

In the future, the Navy will have to pay market prices for all resources. The economics of efficient production indicate that the appropriate response to changes in the relative prices of inputs is to recombine them in such a way as to use less of those which have become relatively more expensive and more of those which have become relatively less expensive. This recombination, or substitution of less for more expensive inputs, takes time; that is to say, it would be more expensive to adjust to the new set of prices

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[1] The cost of physicians to the Navy will rise whatever procurement method is used, viz., civilianization, variable incentive pay, the scholarship program, or any combination thereof. In Study 1030 we examine alternative procurement methods in order to identify least-cost methods. (E. J. Devine, Procurement and Retention of Navy Physicians, Nov. 1973.) Our staffing estimates in this study are for total physicians, with no division into military and civilian categories.

immediately than more gradually. The longer the time period available for adjustment, the greater the degree of substitution we should expect to occur.

Throughout our analysis we have assumed that the level and quality of Navy health care is to be maintained, that the categories of beneficiaries eligible for care in Navy medical facilities will remain unchanged, and that there will be no major policy changes designed to alter the relative use of Navy and civilian medical facilities by beneficiaries.[1] All of these assumptions have been undergoing scrutiny recently, and properly so, but we have regarded this as beyond the scope of our analysis.

Our analysis, therefore, is addressed toward the narrower question of the appropriate physician staffing level to provide a given level and quality of medical care. The above discussion of adaptation to relative price changes is relevant only to the extent that efficient resource use is desired, that is, only to the extent that it is desired to provide a given level and quality of health care at lower rather than greater cost. Removal of conscription has created strong pressures for more efficient utilization of manpower and no one in the Defense community would advocate wasteful use of manpower. However, two approaches to manpower (and other resource) utilization are frequently advocated which have the same effect. These are the "requirements" approach, under which resource levels are determined essentially without reference to cost, and the historical approach, under which patterns of future resource utilization are determined by past patterns.[2] Because these approaches are as resilient as they are pernicious, appendix A includes a critique of them and an exposition of the elementary economics of efficient production.

Although the principles of efficient production set forth in appendix A identify the direction of the appropriate response to a change in relative prices, they do not identify the magnitude of that response. Several other study groups have simultaneously or subsequently addressed the question of military physician staffing. Most of them recognize that there is no universally or even widely accepted method of determining physician staffing in either the military or civilian sectors. This is emphasized by the inability of a study group consisting of members of the staffs of the three military surgeons general

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[1] As appendix B shows, however, an autonomous shift toward greater relative use of civilian facilities by retired personnel and their dependents has been taking place over the past several years.

[2] There are circumstances under which the latter approach may be valid, but these circumstances do not prevail in the present situation.

to agree on staffing criteria for comparable fixed facilities after a five year study.[1] The task is further complicated by lack of adequate measures of either the quantity or the quality of the output of the medical care "industry." In spite of these obstacles, we believe that a reasonable estimate of physician staffing levels can be made. The method we have used has been called the "comparative systems approach;" a description of this approach and the reasons for its use are presented in the following section.

Our original instructions concerning physician staffing, issued in March 1972, were to assist in developing a Navy position on the minimum acceptable number of physicians for projected Navy strength in fiscal years 1973 and 1974.[2] This part of the study was completed three months later, in July 1972. Our staffing estimates were for 2800-2900 physicians, as compared with the then current level of 4500. However, as noted above, changes in input combinations which have been built up over many years require time, and during this short period we were unable to acquire the detailed information about substitution possibilities necessary to specify the time path of reductions in physician staffing. We recognized, therefore, that the staffing levels we recommended could not be achieved in fiscal years 1973 and 1974, but were in the nature of long-run equilibrium estimates. We continue to maintain that these estimates are reasonable after sufficient time has elapsed to make the necessary adjustments. BUMED, on the other hand, maintained that virtually no reduction in physician staffing was possible during fiscal years 1973 and 1974 if acceptable health care standards were to be maintained, and that our method was invalid not only for these years but also for the forseeable future.[3]

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[1] Cited in "Reducing the Need for Military Medical Personnel in the Armed Forces," A Report to the President and the Congress by the Secretary of Defense and the Secretary of Health, Education, and Welfare, October 1972, p. 11.

[2] Memorandum from the Vice Chief of Naval Operations for the Chief, Bureau of Medicine and Surgery and Chief, OP-090, Subject: "Reduction in Strength of Health Professions," 24 March 1972.

[3] Memorandum from the Surgeon General to the Chief of Naval Operations, Subject: "Reduction in Strength of Health Professionals," 20 September 1972, pp. 2-3.

Physician end strength for fiscal year 1973 was 3955, and target figures are 4016 physicians for the end of fiscal year 1974 and 3763 for the end of fiscal year 1975. Meanwhile, the Medical and Dental Officer Billet Requirements Study Group has completed a detailed examination of physician billets to ascertain where physician billets could be eliminated and/or substitutions made, and have estimated a time path for reducing the number of physicians.[1] They recommended decreases in end strengths such that 3760 physicians would remain on board at the end of fiscal year 1975, decreasing to an end strength of 3220 by the end of fiscal year 1980. This result does not differ greatly from our estimates of 2800-2900, especially in view of the fact that the population estimates they used were higher than ours. (The source of their population estimates, presented on p. 21 of the report, was not given. Our estimates are presented in table B-5 of appendix B.) In view of all this, we have not updated our staffing study, but have instead prepared the analysis of procurement which is presented in CNA Study 1030, and which we believe is valid for the range of staffing levels likely to exist in the future.

[1] "Medical and Dental Officer Billet Requirements: Study Report," Office of the Chief of Naval Operations, 1973.

## II. METHOD OF ANALYSIS AND RATIONALE

The method of analysis chosen was to compare physician staffing in the Navy with that in the Kaiser Plan.[1] Both the Navy and the Kaiser Plan are hospital-based, prepaid group practice systems of medical care, providing comprehensive care to large populations. The Kaiser Plan and its membership is the most similiar group in the civilian populations which we have been able to identify. In this section, we discuss several similarities and one important difference between the two systems which we think makes the comparison of the two systems particularly relevant. There are other differences between the systems, however, which complicate the task of making a comparison. The analysis of the following section consists of adjusting for as many of these differences as possible in order that a valid comparison may be made.

### A. Scale of Operation

An important similarity is that both systems are sufficiently large to realize whatever economies of scale may be present in the provision of medical care. Both can operate in such a way as to avoid the duplication of expensive capital assets, such as cobalt equipment, that is characteristic of most civilian settings. Both are sufficiently large to allow economies that result from the division of labor; for example, physicians are freed from certain administrative chores common to smaller settings.

The Navy has approximately 2.5 million beneficiaries eligible for medical care and we have estimated that the equivalent of 1.8 million of these beneficiaries receive their care in Navy facilities.[2] The Kaiser Plan had 2.1 million members at the end of 1970

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[1] In March 1972, we presented a briefing to the CNO which compared physician/population ratios for the United States and the Navy. After some appropriate adjustments were made, it was found that the Navy had a much higher ratio, and that if it were to maintain the same ratio as the civilian sector, it would use 3500 physicians rather than the 4500 then on board. The CNO, among others, raised the objection that some segments of the civilian population were not being adequately served because of financial barriers, which do not exist for the Navy population. The CNO then asked that some comparable group within the civilian sector be identified and compared with the Navy, if possible. Of course, there is no civilian group directly comparable to the Navy population; therefore, what we have done is to select a group as similar as possible and make the comparison by "standardizing" the population for age and sex, and making other adjustments to take account of as many of the differences as possible. (Briefing for the Chief of Naval Operations by E. J. Devine, Center for Naval Analyses, Subject: "Briefing on Medical Staffing," 22 March 1972.)

[2] Appendix B, tables B-5 and B-8.

located in six geographical regions, the largest two regions being Northern California (972,000 members) and Southern California (911,000 members).[1] We estimated that the equivalent of 1.9 million of these members receive their care in Kaiser facilities.[2]

The systems are not identical in scale, however. The Kaiser population is more highly concentrated geographically, and in the following section we have made adjustments in the physician staffing estimates to take account of this. Geographic dispersion also implies a larger number of facilities to care for a population of a given size, and the Navy does operate a larger number of hospitals and dispensaries than Kaiser, as one would expect.[3] While allowances must be made for the effect of differences in concentration of the population on resource use, the scale of operations of the Kaiser Plan is sufficiently large to constitute an important similarity between the systems in our view.

B. Absence of Financial Barriers

Another important similarity is that there are no serious financial barriers to receiving medical care for either the Kaiser Plan or Navy populations. This meets the objective raised by the CNO to the comparison of the Navy with the general civilian population. In neither system is care rendered on a fee-for-service basis, as is typical in the United States. Thus, while both systems face the problem of having to ration services, they do so on bases other than ability to pay.

C. Physicians' Incentives

The absence of fee-for-service financing in both the Navy and the Kaiser Plan has another important consequence, namely, that it removes the perverse incentive for "overdoctoring" that exists in much of the civilian sector, particularly with respect to certain surgical procedures such as appendectomies, tonsillectomies and/or adenoidectomies, and hysterectomies. In most of the civilian sector, physicians' incomes increase as their workload increases, creating an incentive for heavy utilization which is

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[1] Anne R. Somers, ed., The Kaiser-Permanente Medical Care Program: A Symposium, New York: The Commonwealth Fund, 1971, p. 197.

[2] See Section III, below, for a discussion of out-of-plan usage.

[3] See James D. Bentley and Robert L. White, "An Evaluation of Physician Staffing Requirements Recommended by the Center for Naval Analyses," Naval School of Health Care Administration, National Naval Medical Center, Bethesda, Md., June 1972, p. 11. Bentley and White also point out that per capita utilization of health services is much higher in the Navy, a point which we also discuss in Section III.

exacerbated by the extensive use of third-party payment arrangements. This is not to say that physicians' incentives are identical in the Navy and the Kaiser Plan, but both are free from a perverse incentive common in the civilian sector. As we discuss in Section III, there are aspects of military life which, even in peacetime, generate a large workload for both outpatient and inpatient services among active duty personnel.

## D. Demographic Similarities

Another similarity results from the fact that both the Navy and Kaiser sift their eligible populations out of the general population. Eighty-seven percent of Kaiser subscribers in Northern California are eligible for care at Kaiser only by virtue of belonging to a particular employment group.[1] These groups are similar to the Navy active duty population, at least insofar as they are generally healthier than the remainder of the civilian population, which includes many unemployed and unemployable persons. Related to the fact that they are healthier is the fact that both populations are younger, on the average, than the rest of the U. S. population. However, there remain differences between the age and sex distributions of the two populations, and in Section III we make adjustments for these differences.

## E. Subjection to Market Forces

An important dissimilarity between the two systems, and one that is highly useful for our purposes, is that Kaiser has always been subject to market forces, whereas the Navy has not. On the output side, Kaiser competes with alternative health plans. Each employer offering the Kaiser Plan must also offer at least one alternative plan, and employees have the opportunity to change plans periodically. Moreover, most employers pay part or all of the premiums for whatever plan the employee selects.

More important for our purposes is that on the input side, Kaiser has always had to compete in the market for all of its resources. The Navy, on the other hand, has had to pay market prices for its non-human resources, but not for many of its human resources, including physicians. As we have discussed elsewhere,[2] the structure of the medical care system under the Kaiser Plan reflects the market prices of these inputs, whereas the Navy's structure has been built up under the artificial set of prices for some resources established by conscription. However, now the Navy will have to pay market prices for all its resources, and this will necessitate a recombination of resources in a direction which will be closer to the Kaiser pattern than the past Navy pattern.

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[1] Somers, op. cit., p. 35. (The Northern California Region comprises almost half of the total Kaiser membership. The remainder of the Kaiser Plan membership also consists predominantly of group rather than individual enrollments.)

[2] Section I and appendix A.

## III. NAVY-KAISER PLAN COMPARISON

### A. Adjustments

In this section we compare physician staffing in the Navy and the Kaiser Plan, and make several adjustments to take account of differences between the two systems and the populations they serve. The adjustments are summarized in table 1, which shows two sets of calculations, one each for fiscal years 1973 and 1974. The final figures are our estimates of the number of physicians the Navy would have used to serve its population during these years if its staffing pattern more closely resembled that of Kaiser.

#### 1. Age and Sex Differences

The first line in table 1 shows the physician/population ratio for the Kaiser Plan, which is about 97.5 physicians per 100,000 subscribers.[1] Age and sex are important determinants of the utilization of medical care, and while the age-sex distribution of the Kaiser population more closely resembles that of Navy beneficiaries than does the distribution of the national population, there are important differences. Specifically, the Kaiser population includes a greater proportion of females and of the oldest and youngest age groups than the Navy population, and a smaller proportion of males in the 17-44 age group (see table 2). The very young and the very old have higher medical care utilization rates than other age brackets, and females have higher utilization rates than males. Therefore, our first adjustment is for the purpose of taking account of these differences in order to estimate the physician/population ratio Kaiser would need if the age and sex distribution of its population were the same as the Navy's.

This adjustment was made by using two different utilization statistics: (1) the number of physician visits per person per year; and (2) hospital days per person per year. These adjustments are shown in tables 2 and 3.

Table 2 shows that the age-sex distribution of the population served by the Navy,[2] if applied to the national experience of number of physician visits per year, would have produced 3.69 visits per year, whereas the Kaiser age-sex distribution would have produced

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[1] Average for Northern and Southern California regions. (Somers, op. cit., pp. 66, 101.)

[2] Eligible population less estimated numbers using civilian facilities (CHAMPUS).

4.13 visits per year.[1] From this we can say, ignoring all other considerations, that Kaiser would have used only 89.4 percent (i.e., 3.69 divided by 4.13) as many physicians per 100,000 persons as it does if the age-sex composition of its population were the same as the Navy's.

Table 3 contains similar calculations based upon hospital utilization rather than physician visits, using 1969 data for the Northern California region of the Kaiser Plan. Whereas Kaiser (Northern California) employed 95 physicians per 100,000 subscribers, they would have used only 71 per 100,000, or 74.7 percent as many physicians if the age-sex composition of its population were the same as the Navy's.

The adjustment factor based on physician visits is 89 percent, and based on hospital days it is 75 percent. On the one hand, in-patient care is likely to be a more physician-intensive activity than out-patient care, and on the other hand, there are surely more out-patient visits than in-patient episodes. We do not know how these two effects balance out; therefore, we have arbitrarily assigned a weight of .3 to the in-patient statistic and .7 to the out-patient statistic. This results in an adjustment factor of 85 percent, which we have used in line 2 of table 1. If the Kaiser population had the same age-sex distribution as the Navy population, it could be served with a ratio which is 85 percent of the actual ratio, that is, with 83 physicians per 100,000 subscribers instead of 97.5 per 100,000.

2. Out-of-Plan Usage

For various reasons, the Kaiser Plan does not provide all of the medical care received by its subscribers and the Navy does not provide all of the medical care received by its eligible beneficiaries. There is a paucity of reliable information about the extent of out-of-plan usage under either system. Therefore, we have had to adjust both populations in order to estimate the numbers actually being cared for by the physicians serving each system.

Some of the out-of-plan usage by Kaiser subscribers is paid for by the Plan and some is purchased by the subscriber. We were unable to obtain data on either category. This usage occurs for a variety of reasons, such as travel outside the service area, emergencies, convenience, and dissatisfaction with service. We have noted that most subscribers

[1] The national experience was used because physician visits by age and sex are not available for either Kaiser or the Navy. That the aggregate number of visits per year for either Kaiser or the Navy is, in fact, different from 4.13 or 3.69 does not, by itself, weaken the validity of this adjustment. As long as the relative utilization rates of each age-sex class to every class are nearly constant across the three groups (Kaiser, Navy and nationwide), the use of national rates permits a valid age-sex adjustment. The causes of differences in utilization rates between Kaiser and the Navy are discussed elsewhere in this section.

## TABLE 1

## ADJUSTMENTS MADE IN NAVY-KAISER PLAN COMPARISION

| | | FY 1973 | FY 1974 |
|---|---|---|---|
| 1. Kaiser physicians per 100,000 subscribers[a] | 97.5 | | |
| 2. Age-sex adjustment, 85 percent | 83 | | |
| 3. Out-of-plan usage, Kaiser, 10 percent | 91 | | |
| 4. Navy eligible population | | 2,482,330 | 2,538,070 |
| Less number using CHAMPUS | | 736,950 | 751,316 |
| Number using Navy medical facilities[b] | | 1,745,380 | 1,786,754 |
| 5. Less small populations and special missions | | 105,000 | 105,000 |
| 6. Adjusted number of Navy users | | 1,640,380 | 1,681,754 |
| 7. Number of Navy physicians to serve line 6 population at ratio of 91:100,000[c] | | 1,495 | 1,533 |
| 8. Plus physicians serving small populations and and special missions and research physicians[d] | | 521 | 521 |
| 9. Plus rotation billets | | 400 | 400 |
| 10. Estimated Navy post-graduate physician equivalents, exclusive of transients | | 2,416 | 2,454 |
| 11. Adjustment for Navy interns and residents, excluding transients: | | | |
| A. Interns | | 94 | 95 |
| B. Residents | | 375 | 381 |
| C. Post-graduates | | 2,273 | 2,309 |
| Total | | 2,742 | 2,785 |
| 12. Navy physician estimates after adjustment for transients (3 percent): | | | |
| A. Interns | | 97 | 98 |
| B. Residents | | 386 | 392 |
| C. Post-graduates | | 2,341 | 2,378 |
| Total | | 2,824 | 2,868 |

[a]Northern and Southern California regions. (Source: Somers, *op. cit.*, pp. 66, 101.)

[b]Appendix B, table B-8.

[c]Row 6 divided by 100,000, times row 3.

[d]Fifty-one serving small populations, 400 assigned to special missions, 70 research physicians.

## TABLE 2

## ADJUSTMENT FOR AGE AND SEX DIFFERENCES BETWEEN THE NAVY AND KAISER ELIGIBLE POPULATIONS BASED UPON AGE-SEX SPECIFIC NUMBER OF PHYSICIAN VISITS PER PERSON PER YEAR

| | Males | | | | | | Females | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0-16 | 17-24 | 25-44 | 45-64 | 65-74 | 75+ | 0-16 | 17-24 | 25-44 | 45-64 | 65-74 | 75+ | |
| Physician visits per person per year[a] | 3.7 | 3.0 | 3.2 | 4.1 | 5.5 | 5.5 | 3.4 | 4.8 | 5.3 | 5.2 | 6.6 | 6.7 | |
| Navy eligible population, FY 1974[b] | 197,600 | 552,500 | 362,200 | 94,400 | 8,400 | 2,700 | 189,600 | 160,800 | 119,500 | 72,600 | 17,400 | 7,500 | 1,785,300 |
| Physician visits per year, Navy[c] | 731,100 | 1,657,500 | 1,159,000 | 387,000 | 46,200 | 14,900 | 644,600 | 771,800 | 633,400 | 377,500 | 114,800 | 50,300 | 6,588,100 |
| Kaiser eligible population, FY 1971[d] | 328,032 | 113,270 | 249,633 | 183,635 | 29,409 | 8,021 | 314,210 | 130,099 | 258,462 | 183,784 | 30,139 | 7,306 | 1,836,000 |
| Physician visits per year, Kaiser[e] | 1,213,717 | 339,811 | 798,826 | 752,904 | 161,751 | 44,114 | 1,068,312 | 624,476 | 1,369,849 | 955,677 | 198,915 | 48,955 | 7,577,306 |
| | | | | | | | | | | | Aggregate physician visits per person per year, Navy age-sex mix | | 3.69 |
| | | | | | | | | | | | Aggregate physician visits per person per year, Kaiser age-sex mix | | 4.13 |

[a]Source: *Current Estimates from the Health Interview Survey: United States—1969,* Public Health Service Publication No. 1000, Series 10, No. 63, Washington, D.C.: U.S. Government Printing Office, June 1971.

[b]Exclusive of CHAMPUS participants. Sources: Appendix B, table B-8 and B. L. Perlman, "Distribution of Persons Eligible for Navy Health Care by Age, Sex, and Category," Working Paper, Center for Naval Analyses, 1972.

[c]Row 1 times row 2.

[d]Total of Northern and Southern California regions. Source: Somers, *op. cit.,* p. 202.

[e]Row 1 times row 4.

## TABLE 3

## ADJUSTMENT FOR AGE AND SEX DIFFERENCES BETWEEN NAVY AND KAISER ELIGIBLE POPULATIONS BASED UPON AGE-SEX SPECIFIC NUMBER OF HOSPITAL DAYS PER 1,000 PERSONS PER YEAR

| | Males | | | | Females | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | 0-19 | 20-44 | 45-64 | 65+ | 0-19 | 20-44 | 45-64 | 65+ | |
| 1. Eligible population, Northern California Kaiser[a] | 197,125 | 163,875 | 94,050 | 19,950 | 190,605 | 178,965 | 95,545 | 19,885 | 960,000 |
| 2. Above, relative frequency distribution | 20.53% | 17.07% | 9.80% | 2.08% | 19.85% | 18.64% | 9.95% | 2.07% | 100.0% |
| 3. Hospital days per 1,000 persons per year[b] | 192.774 | 255.102 | 816.866 | 2510.309 | 170.109 | 664.043 | 811.899 | 1863.249 | 488.055 |
| 4. Kaiser hospital days per year in millions[c] | 38.001 | 41.805 | 76.826 | 50.081 | 32.424 | 118.840 | 77.573 | 37.051 | 472.600 |
| 5. Proportion of Kaiser inpatient days | 8.041% | 8.846% | 16.256% | 10.597% | 6.861% | 25.146% | 16.414% | 7.840% | 100.0% |
| 6. Estimated Kaiser MD utilization[d] | 73.332 | 80.673 | 148.255 | 96.644 | 62.570 | 229.331 | 149.696 | 71.499 | 912.0 |
| 7. Estimated MDs per 100,000 eligible population[e] | 37.201 | 49.228 | 157.634 | 484.431 | 32.827 | 128.143 | 156.676 | 359.562 | 95.0 |
| 8. Eligible population, Navy[f] | 321,300 | 791,000 | 94,400 | 11,100 | 266,500 | 203,400 | 72,600 | 24,900 | 1,785,200 |
| 9. Estimated MDs, assuming Navy eligible population age-sex mix[g] | 119.5 | 389.4 | 148.8 | 53.8 | 87.5 | 260.6 | 113.7 | 89.5 | 1268.2 |
| | | | | | | | Aggregate physicians per 100,000 eligible population[h] | | 71.0 |
| | | | | | | | Age-sex adjustment factor: $\frac{71}{95}$ = | | 74.7% |

[a] Source: Somers, *op. cit.*, p. 203.
[b] Source: *Ibid.*, p. 209.
[c] Row 1 times row 3.
[d] Row 5 times number of Northern California Kaiser physicians. Source: Somers, *op. cit.*, pp. 101, 20.
[e] (Row 6 divided by row 1) times 100,000.
[f] Source: See footnote b, table 2.
[g] Row 8 times row 7.
[h] Line 9 (total) divided by line 8 (total).

are enrolled through their place of employment, and that employers must offer at least one alternative plan, with periodic opportunities for changing plans. Most employers pay all or part of the premiums to the plan the employee selects. The availability of these alternatives may be expected to minimize out-of-plan usage for reasons of inconvenience or dissatisfaction. In lieu of an accurate estimate, we have used the 10 percent estimate recently published by a Kaiser Foundation economist.[1] Therefore, in line 3 of table 1 we have adjusted the Kaiser ratio upward by 10 percent, from 83 to 91 physicians per 100,000 to take account of the out-of-plan usage.

A substantial portion of the population eligible for medical care in Navy facilities receives medical care in the civilian sector. Most of the care received in the civilian sector is undoubtedly under the Civilian Health and Medical Program of the Uniformed Services (CHAMPUS). All non-active duty beneficiaries may elect to receive out-patient care under CHAMPUS subject to an annual deductible amount of $50 per person and a coinsurance feature of 20 or 25 percent; outpatient care in military facilities is provided without charge. Retired personnel and their dependents may elect to receive in-patient care under CHAMPUS, but they must pay 25 percent of the charges, whereas the charge for hospitalization in military facilities is nominal. Dependents of active duty personnel residing with their sponsors (and within 30 miles of the nearest military medical facility) may receive in-patient care under CHAMPUS only if they are able to obtain a certificate indicating that such care is unavailable at the local military facility. Other dependents of active duty personnel are not subject to this constraint. Hospitalization under CHAMPUS is provided to active duty dependents at approximately the same (nominal) charge as care in military hospitals.

Appendix B presents an analysis of the choices made by non-active duty beneficiaries between care in Navy facilities and civilian care under CHAMPUS under these rather complex administrative and financial constraints during the fiscal years 1967 through 1971. It also presents projections of relative usage in fiscal years 1973 and 1974. We have estimated that the equivalent of 737,000 beneficiaries will receive all of their care under CHAMPUS in FY 1973 and 752,000 will do so in FY 1974.[2] Therefore, in step 4 of table 1 we have deducted these numbers from the eligible population to estimate the number actually receiving care in Navy facilities. These estimates are 1,745,380 for FY 1973 and 1,786,754 for FY 1974.

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[1] Carl M. Stevens, "Physician Supply and National Health Care Goals," Industrial Relations, Vol. 10, No. 2, May 1971.

[2] We have assumed that all active duty personnel receive all of their care in Navy facilities.

These are estimates of Navy beneficiaries receiving medical care in the civilian sector under CHAMPUS. However, there is an unknown amount of additional use of civilian medical facilities by Navy beneficiaries which is not included under CHAMPUS. There are at least two reasons why this additional use of civilian facilities occurs: (1) surveys have shown that many beneficiaries are unaware of the benefits available to them under CHAMPUS. Of these, some portion will use Navy facilities and others will use civilian facilities at their own expense. (2) CHAMPUS is a "residual insurance program," that is, the law requires that retired personnel and their dependents (who constitute about one-third of the total eligible population) having other insurance provided either by law or through employment must use those benefits before CHAMPUS can make any payment. Many retired personnel are employed, and group health insurance will often be available to them and their dependents at low cost. Also, beneficiaries over age 65 are covered by Medicare and no longer eligible for CHAMPUS.

We were unable to estimate the usage of civilian medical facilities which is not reported under CHAMPUS because of a complete lack of data, and our estimates are of CHAMPUS usage only. This procedure results in an underestimate of the number of Navy beneficiaries using civilian facilities and an overestimate of the number using Navy facilities.

3. Specialized Military Missions and Research

Within the Navy and the Marine Corps there are many specialized military missions for which it is prudent to provide physicians, even though the population to be served is small. There is no counterpart to these activities, of course, in the Kaiser Plan. On 31 December 1971, there were 555 Navy physicians (of a total of 4,594) serving these specialized military missions as follows: 260 were assigned to ships, 211 to the Fleet Marine Force, and 84 to air squadrons. Evidence from the Bureau of Medicine and Surgery suggests that this number could be reduced to 400 with little adverse affect; in many cases, independent duty hospital corpsmen could be utilized in place of physicians.[1] These physicians provide care to active duty personnel with a higher physician/population ratio than elsewhere in the Navy. We have assumed this ratio to be in the neighborhood of one physician per 200 active duty personnel, and therefore that these 400 physicians provide care for 80,000 people.

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[1] Briefing for the Chief of Naval Operations by the Bureau of Medicine and Surgery, Subject: Reductions in Strength of Health Professions," 22 March 1972. Several of these reductions have been made since our estimates were prepared in July 1972. In 1973, the Medical and Dental Officer Billet Requirements Study Group identified 194 billets in these areas which could be eliminated. At the time of their report, the total number of Navy physicians had been reduced to 4,286 (op. cit., p. 59).

The Navy also had 91 physicians in research billets at the end of 1971, whereas Kaiser has only a small number engaged full-time in research. We have no evidence on the value of the 91 physicians in research positions, but in view of the increasing cost of physicians to the Navy, it is likely that a number of these billets will no longer be justified. Therefore, we assumed a reduction of 21 physician research billets.[1]

The adjustments for Navy physicians in research positions and those serving specialized military missions (and the populations served by the latter) were combined with the adjustment for physicians and populations at small duty stations, in the manner explained at the end of the next section.

4. Adjustment for Dispensaries Serving Small Duty Stations

An important difference between the Navy and the Kaiser Plan is that the Navy eligible population is more widely dispersed geographically. Because of this, there will be areas in which the Navy's physician/population ratio is necessarily higher than that of the Kaiser Plan.

A large part of the adjustment for the geographical dispersion of the active duty Navy population and concomitant high physician/population ratios was made in the preceding section, in which we adjusted for special military medical requirements. Another part of the population which is geographically dispersed consists of dependents and retired personnel residing at places distant from Navy and other military medical facilities. This dispersion has been accounted for in the adjustment for the population served by CHAMPUS.

There remain a number of small duty stations where the eligible population is too small to achieve the Kaiser Plan ratio of roughly one physician per 1,000 population, but which are large enough to warrant the services of one or more physicians. In such cases, a certain amount of "indivisibility" of physicians' services may be encountered. Thus, it may be worthwhile to provide a physician to serve 500 persons. Again, a population of, say, 1,300 may not provide enough of a workload to keep two physicians fully occupied, but may result in a workload too heavy for one physician. As the numbers increase, indivisibilities become less of a problem.

Dispensaries serving small enough populations to result in a high physician/population ratio are not necessarily located in remote areas, i.e., in areas remote from concentrations of the civilian population. For example, the Naval Station dispensary at Keflavik, Iceland, reports an active duty population of 2,860 and a total population served of 5,337,

[1] The Medical and Dental Officer Billet Requirements Study Group estimated a decrease of 24 physician research billets. Most of these physicians were to be replaced with Medical Service Corps officers. (Ibid)

the balance being composed almost entirely of active duty dependents. Such a population is large enough to support 5 to 6 physicians at the Kaiser Plan ratio and, in fact, 6 are assigned. Other dispensaries may be located in areas of considerable concentration of the general population, but have a small Navy population, yet one which is large enough to warrant at least one physician. The Naval Air Facility in Detroit may be such an example.

In this section we do not attempt to specify the appropriate number of physicians at each dispensary.[1] Here we simply note the activities where a relatively small population is, in fact, currently provided with Navy physicians, in order to estimate the allowance for geographical dispersion of the population at small duty stations.

Many small duty stations and dispensaries are located in areas of considerable concentration of Navy eligible population and in which the total Navy medical facilities are also large. Thus, the Naval Air Facility in Washington, D.C., reports 2 physicians serving a population of 989, all on active duty. The Office of Naval Research reports 1 physician serving an active duty population of 39, plus 76 dependents and 3,453 "other" people. (These "other" people presumably consist in large part of civilian employees who are served only minimally.) All small dispensaries located in areas of considerable Navy population and medical facilities were considered as part of the Navy medical resources serving that area, and no adjustment was made for the ostensibly small population served. The Kaiser Plan, likewise, locates doctors' offices apart from hospitals within its service area where the population to be served in a subarea warrants this. Presumably, the decision about whether to operate a small dispensary within a large population area will be based on a weighting of the costs of operating it (which will rise in the future as Navy physicians' salaries rise), and the number of beneficiaries expected to make use of it and the benefits to them in terms of convenience and travel time and expense saved.

The basic data used in this study (which are not reproduced here) were provided by BuMed and consist of a listing of individual dispensaries having physicians assigned, the number of physicians assigned as of September 1971, and the total population served as of April/May 1972, by the following categories: active duty, retired, dependents (of active duty and retired personnel combined), and others. Some dispensaries did not furnish data on population. It is presumed that the number of active duty personnel at an activity served by a dispensary is known with accuracy. It is not known how the other categories were estimated, and for various reasons, they do not appear to be sufficiently accurate to be

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[1] This has subsequently been done by the Medical and Dental Officer Billet Requirements Study Group. (Ibid., pp. 38-47.)

given great weight for the purposes at hand. There were about 650 physicians assigned to 154 dispensaries in September 1971; 40 of these had one physician assigned and 26 had 2 physicians. (The three BuMed dispensaries are not included because these are all located in areas with a large Navy population.)

The procedure employed has been to examine each dispensary listed and, with the aid of a map of military installations, to identify those meeting all of the following criteria:

1. The active duty population is less than 1,000; and

2. The dispensary is not located in an area with a large Navy eligible population; and

3. The number of physicians assigned to the dispensary is either one, two, or three.

The reasons for selecting these criteria are now discussed briefly. Data on population served are of dubious accuracy at best. The active duty figures are probably accurate, and these were used even though they will understate the number served. However, a supplementary calculation was made later using the total population, exclusive of the category "other." Dispensaries in areas of large Navy populations are considered to be part of the resources serving that population, as noted. Finally, it is assumed that "indivisibilities" do not present much of a problem after 3 physicians have been assigned.

It was found that 33 dispensaries meet all three criteria: 51 physicians are assigned to these dispensaries, 19 having one physician, 10 with two, and 4 with three. Seven of these dispensaries do not list the active duty population, but the number is known to be small. The remaining 26 list 12,410 active duty personnel. If we assume 51 physicians assigned to these dispensaries are serving only 25,000 people, we get a physician/population ratio of 2 per 1,000 instead of 1 per 1,000. Thus, the additional allowance for physicians serving small duty stations would be 25.

As a supplementary calculation, we have taken the total population estimates provided by the dispensaries (excluding only the category "other"), and found that there are 57 physicians assigned to dispensaries located outside areas of large Navy populations and serving 3,000 beneficiaries or less.

It would appear that an additional 51 Navy physicians would be justified to take account of the lower physician/population ratios encountered at small duty stations in areas with a small Navy population.

In step 5 of table 1, the 25,000 beneficiaries served by small dispensaries are combined with the 80,000 personnel assigned to military missions also served with a high physician/population ratio, as estimated in the preceding section. These 105,000

beneficiaries are deducted from the number using Navy facilities to get an adjusted number of those using Navy facilities (table 1, line 6). It is this adjusted number of beneficiaries that could be expected to be served at the ratio of 91 physicians per 100,000 population shown on line 3. This ratio is then applied at line 7 to estimate the numbers of physicians to serve this population. These estimates are 1,495 physicians in FY 1973 and 1,533 in FY 1974. To these numbers we now add (line 8) 521 physicians, as follows: 51 physicians to serve populations at small duty stations; 400 physicians to serve specialized military missions; and 70 research physicians.

5. Rotation Base Allowances

Another difference between the Navy and the Kaiser Plan is the existence in the Navy of certain physician billets which are considered undesirable either because of geographical location or because the nature of the assignment is considered professionally unrewarding. Many of these assignments have been discussed in the preceding sections.

The existence of these billets constitutes the problem; the provision of a rotation base (i.e., a larger number of physicians to serve a given population than would be necessary if all billets were equally desirable) is one possible solution. As we discuss in appendix C, there are other solutions to the problem which do not entail the provision of extra physicians and which would be more efficient. However, these would require pay legislation which is probably not forthcoming; therefore, we have assumed that the rotation base approach will be used.

While the rotation base approach to the problem of undesirable billets has often been advocated and advanced as a reason for providing more physicians, we are not aware of any good estimates of the extra number needed to implement this solution. This is not surprising, for the problem is very complex and was not a pressing one under conscription. In the past, undesirable billets could be heavily staffed with junior officers who would probably not remain in the Navy in any event.[1]

Ideally, estimation of the additional number of billets to provide a rotation base would include identification of the billets generally considered undesirable, the proportion of the total that these billets represent, and the effects on procurement and retention of reducing either tour lengths or the probability of serving in undesirable billets, or both.

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[1] One possibility in the future is to staff these billets with medical scholarship recipients who are performing their obligated service. Such a policy would have to be weighed against its effect on attraction into the scholarship program. However, as this program becomes a major source of accessions, it may be possible to assign scholarship recipients to these billets for short tours without severely adverse effects on the attractiveness of the program. This would reduce the number of billets for rotation purposes below the estimate presented here.

Our analysis of the rotation base is presented in appendix C. Although we have been unable to solve the problem in a definitive way, we have been able to narrow it down considerably. We examined physician assignments by each specialty. It is shown that in most specialties there is no problem, either because there are no palpably undesirable billets or because the number of such billets relative to the total in the specialty is small enough so that an adequate rotation base already exists. Indeed, it appears as though the problem is largely confined to general medical officers. Our estimate is that an additional 400 physicians in this specialty would provide a sufficient rotation base; that is, because of the existence of these undesirable billets, the Navy would need 400 more physicians than it would if there were no undesirable billets. Therefore, 400 physicians have been added to the Navy total at item 9 of table 1.

At item 10, we add the estimated number of physicians to serve the Navy population at a ratio of 91 physicians per 100,000, the 521 physicians to serve small populations and special military missions where this ratio cannot be obtained, and the 400 physicians for the purpose of maintaining a rotation base. Our estimates of the number of post-graduate physician equivalents to serve the Navy population, before adjusting for transients, are 2,416 in FY 1973 and 2,454 in FY 1974.

6. Interns and Residents

The Navy physician estimates at item 10 of table 1 are for full-time physicians who are not undergoing graduate training. However, a large proportion of the Navy Medical Corps consists of interns and residents; at the beginning of 1972, interns constituted 3.4 percent and residents 13.6 percent of all Navy physicians. The Kaiser Plan also employs interns and residents (they are a much smaller proportion of Kaiser's total physicians), but the Kaiser physician/population ratio at item 1 of table 1 is based on full-time equivalent physicians.[1]

Interns and residents are not generally considered to be as productive as post-graduate physicians; therefore, an adjustment must be made for the interns and residents in the Navy Medical Corps. These physicians are undergoing training, but they are simultaneously performing valuable services. Although there is considerable debate about the relative value of interns and residents, the evidence from the civilian market clearly indicates that their value is in excess of the stipends they receive. This is not a competitive market, and every year the number of interns and residents hospitals seek to employ at the prevailing stipends substantially exceeds the number available. In lieu of a better method, we have estimated their value relative to post-graduate physicians on the basis of relative incomes in the civilian sector, although this procedure underestimates their value and therefore produces an upward bias in our estimates of total Navy physicians.

[1] Somers, op. cit., p. 97.

Our estimates of the relative value of interns, residents and post-graduates were based on 1970 earnings data of $7,000 per year for interns, $11,000 for residents, $41,000 for self-employed physicians and $26,000 for hospital based physicians (excluding interns and residents).[1] For physicians who have completed graduate training we used the midpoint of the latter two income figures ($33,500). On this basis, one intern is equivalent to .209 post-graduate physician and one resident is equivalent ot .328. If the Navy were to retain the current percentage mix of interns (3.4 percent), residents (13.6 percent), and post-graduates (83 percent), then the total number for FY 1973 (before adjusting for transients would be 2,742 and 2,785 for FY 1974, distributed by category as shown at item 11 of table 1.[2]

7. Transient Navy Physicians

The final adjustment shown in table 1 is to take account of the fact that at any given time some Navy physicians will be in transit from one duty station to another, whereas Kaiser Plan physicians are typically assigned permanently to given locations. In fiscal year 1971, the number of Navy physicians in the category of "transients, patients, and prisoners" averaged about 3 percent of the total.[3] We have assumed that this same rate will apply in the future, although there are indications that this rate may be too high.[4] Therefore, the final adjustment in table 1 (item 11) has been to adjust the physician estimates upward by 3 percent in each category, i.e., interns, residents and post-graduates.

8. Summary of Adjustments in Table 1 and Interpretation of Results

Item 1 of table 1 shows that the ratio of physicians to subscribers in the Kaiser Plan is 97.5 per 100,000. This is for the Northern and Southern California regions combined;

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[1] "Report of the 1971 Quadrenniel Review of Military Compensation: Special Compensation for Physicians...," Office of the Assistant Secretary of Defense (Manpower and Reserve Affairs), December 1971, Tables V-A-3 and V-A-4. (The incomes of interns and residents relative to post-graduate physicians have changed since then, but not by enough to substantially change our estimates; therefore, we have not revised them.)

[2] An illustration using our 1974 estimates may be helpful. Item 11, which preserves the current percentage composition of the Medical Corps, shows 95 interns, 381 residents and 2,309 post-graduates, for a total of 2,785 physicians. The 95 interns are equivalent to 20 post-graduates, using the weight of .209 established above, and the 381 residents are equivalent to 125 post-graduates, using the weight of .328; the 2,309 post-graduates, of course, have a weight of one. Adding these numbers, we get the 2,454 post-graduate equivalents shown at item 10 of table 1.

[3] Some Kaiser physicians will also be patients at any given time, but we have not estimated this for Kaiser.

[4] Only 1 percent of the Army's total physician strength was authorized in this category.

these regions include 87 percent of the total Kaiser Plan subscribers. In item 2, we adjust this ratio to take account of the differing age-sex composition of the Kaiser population. We examined the age and sex distributions of both the Navy and Kaiser populations. Based on physician and hospital utilization data by age and sex, we estimated that if the Kaiser Plan had the same age-sex distribution as the Navy population, the Kaiser population could be served with about 83 physicians per 100,000, or about 85 percent of the actual ratio.

Kaiser Plan subscribers receive some medical services outside of the Plan, and therefore its physicians are not providing all of the medical services received by all of the subscribers. This out-of-plan usage has been estimated at 10 percent, and the Kaiser ratio has been adjusted upward by this percentage, resulting in the estimate of 91 physicians per 100,000 Kaiser subscribers actually receiving care in Kaiser facilities, as shown at item 3. A considerable portion of the population eligible for medical care in Navy facilities actually receives care in the civilian sector. We were unable to estimate the total usage of civilian medical facilities by Navy beneficiaries, but we did estimate the number receiving care under the Civilian Health and Medical Program of the Uniformed Services (CHAMPUS). This number was deducted from the total eligible population at item 4 in order to estimate the numbers receiving care at Navy facilities.

The Navy Medical Corps provides support to military missions in situations where it is prudent to provide a physician, although the number of personnel to be served is relatively small. It is also the case that the Navy's population is more widely dispersed geographically than that of Kaiser. There are some smaller duty stations where the provision of one or more physicians may be warranted, even though the local Navy population is relatively small and a high physician/population ratio results. We have estimated both the population served under the above circumstances and the number of physicians serving them. At item 5, we deducted these populations (totaling 105,000 beneficiaries) from the total number using Navy facilities to arrive at an adjusted number of beneficiaries (item 6) which could be served with the ratio of 91 physicians per 100,000 shown at item 3. Applying this ratio to the populations at item 6 results in estimates of 1,495 physicians for 1973 and 1,533 for 1974, as shown at item 7.

Next we make several additions to the Navy physician estimates to take account of differences between the two systems. At item 8 we add 521 physicians to the Navy total; 400 of these are to allow for physicians serving specifically military activities such as sea duty, air squadrons and the Fleet Marine Force; 51 are to allow for the additional geographic dispersion of the Navy population at smaller duty stations ashore; the remaining 70 are for research billets. At item 9, another 400 physicians are added to the Navy total in order to provide a rotation base for those serving in billets generally considered undesirable for one reason or another. The addition of these 921 physicians over and above the estimated number to serve the Navy population at the adjusted Kaiser Plan ratio results in as estimate (item 10) of 2,416 post-graduate physician equivalents for the Navy in 1973 and 2,454 in 1974.

However, the Navy Medical Corps includes a higher proportion of interns and residents than does the Kaiser physician staff, and these physicians are generally considered to be less productive than post-graduates. Therefore, we have made an adjustment to reflect this in item 10, assuming that the porportions of interns, residents and post-graduates in the Medical Corps will be the same in 1973 and 1974 as in 1972. Finally, the estimates for these categories are increased by 3 percent at item 11 to take account of physicians in transit from one Navy duty station to another. Our estimates of physicians to serve the Navy population in 1973, therefore, are 97 interns, 386 residents, and 2,341 post-graduates for a total of 2,824 physicians. For 1974, these estimates are 98 interns, 392 residents, and 2,378 post-graduates, for a total of 2,868. These estimates result in a ratio of total Navy physicians to the population being served in Navy facilities of about 160 physicians per 100,000 in 1973 and 1974. The ratio of post-graduate physician equivalents (excluding transients) to the population being served in Navy facilities is 137 physicians per 100,000, compared with an unadjusted ratio of 97.5 per 100,000 in the Kaiser Plan and an adjusted ratio of 91 per 100,000.

The interpretation of the estimates at item 11 of table 1 is as follows: if the Navy were to serve that portion of its population receiving care in Navy facilities with the same efficiency as the Kaiser Plan, it should be able to do so with the numbers estimated. The Navy should, moreover, be able to provide a higher level of care than Kaiser with these physician staffing levels. The higher Navy physician/population ratio includes, for example, 400 more physicians than would otherwise be necessary to care for the Navy population in order to maintain a rotation base. These physicians would not, of course, be idle and to the extent that additional physicians result in an increase in the quality of care, the Navy should be able to achieve a higher level of quality of care.

It is recognized that a reduction of this magnitude in the number of Navy physicians would have to be accompanied by a recombination of the resources used to produce medical care, and that this recombination could not take place immediately. Therefore, we do not believe that it would have been possible to achieve this reduction in fiscal years 1973 and 1974. However, we do disagree with the statement of the Bureau of Medicine and Surgery that our estimates and methodology are not appropriate "now and for the forseeable future."[1] We also disagree with their contention that virtually no reductions in the number of physicians (from a total of about 4,500) is possible during these years; in fact, a reduction of about 500 has already taken place. We do maintain that our methodology and our estimates (adjusted for changes in the size, composition, and utilization patterns of the beneficiary population) are appropriate for the "long-run," that is, given time to appropriately recombine medical care inputs. We have not been able to specify precisely how long this adjustment would take, nor the time phasing of the physician reductions. This would require a

[1] Memorandum from the Surgeon General to the Chief of Naval Operations, Subject: "Reduction in Strength of Health Professionals," 20 Sept 1972, p. 3.

detailed examination of physician staffing and input substitution possibilities at each facility. Such an examination and estimate of the timing of reductions in the number of physicians has, however, been completed by the Medical and Dental Officer Billet Requirements Study Group.

B. Remaining Unadjusted Differences

In the preceding section we adjusted for several differences between the Navy and Kaiser Plan which affect physician staffing in the two systems. The net effect of these adjustments has been an estimated physician/population ratio for the Navy which is about 50 percent higher than that of the Kaiser Plan. There are numerous other differences between the two systems for which no adjustment was made, either because none was warranted or because the necessary data were unavailable. In the latter case, we have had to make what we consider to be reasonable assumptions about the nature and effect of these other differences. Our analysis has been criticized by analysts from the Naval School of Health Care Administration.[1] Their criticisms may be succinctly summarized: our analysis is invalid because we have not been able to identify and control for virtually every variable which could conceivably affect medical care utilization and physician staffing, and because we have not shown that both systems are equally effective, that is, that the quality of care is the same in both.

In this section, we shall discuss the unadjusted difference between the two systems and reply to some of the criticisms. The concern of the NSCHA analysts is that our estimates are too low. We agree that our analysis would be improved if the omitted variables could have been taken into account. We think it likely, however, that the net effect of these omissions and of the assumptions used in making the adjustments of the preceding section is to over-estimate Navy physician staffing. Nevertheless, we believe our method and estimates are reasonable in view of the uncertainties involved.

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[1] These critiques are presented in two papers: (1) James D. Bentley and Robert L. White, "An Evaluation of the Physician Staffing Requirements Recommended by the Center for Naval Analyses," Research Critique No. 2, First Draft, Naval School of Health Care Administration, National Naval Medical Center, Bethesda, Md., June 1972; and (2) Dennis D. Pointer, James D. Bentley, and Robert L. White, "Toward Defensible Navy Physician Manning Alternatives: Bases for BUMED Policy," Research Paper No. 5, NSHCA, July 1972. The latter paper was included as Section I of the memorandum from the Surgeon General to the Chief of Naval Operations on "Reduction in Strength of Health Professionals" of 20 September 1972. Our analysis was included as Section II of this memorandum.

## 1. Mobilization

It has often been said that one of the reasons a military medical organization should have more physicians to care for a given population (apart from those reasons already discussed), is the need to provide a mobilization base. That is, a military medical organization needs to be able to respond quickly to contingencies, with either active duty physicians or those who can be mobilized very quickly.

The number of additional physicians needed for this purpose and the nature of the contingencies to be provided for are seldom explicitly discussed. It is unlikely that we would want to have enough physicians in uniform to provide for a contingency on the order of magnitude of World War II, to say nothing of nuclear war. Most likely, the contingencies most people have in mind are more on the order of Vietnam or Korea.

We have been unable to think of a better way to provide for such contingencies than the way in which this has been done in the recent past. One of the arguments for providing medical care to dependents and retired personnel is that it does provide this mobilization capability. In the past, the non-active duty population has accounted for roughly half of the military medical workload, and we have anticipated that it will continue to do so in the future. Part of this workload, it is true, is performed by obstetricians, gynecologists and pediatricians, specialties which are not used for this sort of mobilization. But another large part is performed by various specialties which do contribute to the mobilization base. The analysis of the potential use of civilian physicians by the Navy presented in CNA Study 1030 indicates that a total of 2800 to 2900 physicians would provide an adequate mobilization base to meet a contingency of the magnitude of the Vietnam conflict. Moreover, even if 40 percent or more of these physicians were civilians, enough military physicians would remain in the appropriate specialties to meet such a contingency immediately.

This appears to be an adequate way of providing mobilization capability. During such times, of course, it will be necessary to let the quality of care decline somewhat and to shift more of the non-active duty workload to the civilian sector until the procurement machinery can build up the Medical Corps if the contingency is prolonged. For that matter, part of the active duty workload in the United States could be shifted to the civilian sector for a short time if necessary. The existing system does provide mobilization capability, and therefore no additional numbers of physicians have been added for this purpose.

## 2. Quality of Care

An ideal test of the quality of care, or effectiveness, of different systems would involve a comparison of their ability to keep identical populations in identical environments alive and healthy. As the NSHCA analysts have noted, we have been unable to demonstrate whether the Kaiser Plan is more or less effective in deliverying health care than the Navy according to such a test. It is possible that Kaiser is able to serve its population with a

relatively low physician/population ratio by providing a low quality of care and/or by denying medical services to its members. Although it is impossible to demonstrate comparability of quality according to the above criterion, we submit that: (1) it would be very difficult to support the proposition that the quality of care under Kaiser is inferior and inappropriately low for the Navy; and (2) our physician staffing estimates should permit the Navy to render a higher quality of care than Kaiser.

The possibility of inferior care or denial of services by Kaiser was considered by the National Advisory Commission on Health Manpower. They concluded:

> First, the study group found the quality of care to be high. Second, the rapid growth in Kaiser membership, coupled with Kaiser's mandatory policy of giving all group members a choice of an alternative health insurance plan, indicates a high level of consumer satisfaction - a state of affairs that would not exist if members were often denied medical services they desired.[1]

Membership in the Kaiser Plan has increased from 154,000 subscribers in 1950 to 808,000 in 1960 to 2,166,000 in 1970.[2] This growth has occurred despite the fact that enrollment has been closed to new groups in the Southern California region for the past several years, and only small groups have been accepted in the Northern California region.

Moreover, it should be possible for the Navy to provide a higher level of care than Kaiser with the number of physicians estimated in this paper. Our estimates result in a ratio of physicians to population which is 50 percent higher than the Kaiser ratio. This estimate included 400 physicians solely for the purpose of maintaining a rotation base; but these physicians would not be idle, and their presence may be expected to result in an increase in the quality of care. We have also made no adjustment for the fact that the active duty population of the Navy and Marine Corps is apparently healthier than the general male population in the same age groups, as discussed below.

3. Regional Dissimilarities

The Kaiser population is predominantly located on the West Coast, whereas the Navy population is dispersed throughout the United States and overseas. We examined the possibility that the Kaiser population may be concentrated in a geographical area experiencing lower morbidity rates than the rest of the United States. However, morbidity rates appear

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[1] Report of the National Advisory Commission on Health Manpower Vol II, Washington, D.C.: U.S. Government Printing Office, November 1967, p. 215.

[2] Somers, op. cit., p. 197.

to be higher in the western states than in other areas of the country. In particular, the number of physician visits per year is substantially higher in the West (5.4) than in any of the other three regions (the Northeast ranks second at 4.5) both on an unadjusted basis and after adjusting for age differences.[1]

This difference does not appear to reflect greater willingness or ability to pay for physicians' services as much as higher morbidity; for the West also ranks first in such morbidity categories as percentage of persons with limited activity due to chronic conditions, age-adjusted days of restricted activity per person per year, number of persons injured per 100 persons per year, number of persons injured in moving motor vehicle accidents per 100 persons per year, and incidence of acute conditions per 100 persons per year, to name a few.[2] Hence, the appropriate adjustment for regional difference between Kaiser and the Navy appears to be in the direction of reducing the Navy's ratio of physicians to eligible population, as compared to Kaiser's. However, in view of the uncertain effect of income upon the regional variation we observe in the utilization of physician services, we have not reduced the Navy physician staffing ratio to account for the higher morbidity rates in the West.

NSHCA analysts have objected that we used national statistics based primarily on fee-for-service medical care, and that we did not directly compare the Navy's world-wide population distribution with Kaiser's West Coast concentration.[3] The comparison was made for the purpose of ascertaining whether the Kaiser population is concentrated in a region with low morbidity rates, thus enabling Kaiser to serve its subscribers with fewer physicians. Our finding that this is not the case leads us to reaffirm that the direction of the bias introduced by this omission is toward a higher estimate of Navy physician staffing.

NSHCA analysts have also objected that we have not controlled for differences in the spatial distribution of populations around medical facilities for Navy and Kaiser populations.[4] This is a curious criticism in view of the 451 Navy physicians included in our estimates to take account of precisely this.[5]

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[1] Health Characteristics by Geographic Region, Large Metropolitan Areas, and Other Places of Residence: United States - July 1963 - June 1965, Public Health Service Publication No. 1000, Series 10, No. 36, Washington, D.C.: U.S. Government Printing Office, April 1967.

[2] United States Life Tables: 1959-61, Public Health Service Publication No. 1252, Vol I, No. 1, Washington, D.C.: U.S. Government Printing Office, December 1964.

[3] June 1972 paper, op. cit., p. 7.

[4] Ibid.

[5] See item 8, table 1, and discussion in text.

4. Conditions of Military Service

The conditions of military service may be such that military personnel could be expected to experience more or less illness than civilians in the same age groups, thereby affecting the use of physicians' services. However, in making this comparison we have avoided an investigation of utilization data because of inherent biases in such data which may reflect differing practices in the military and civilian sectors rather than differences in health.[1]

One measure which avoids such bias is the mortality rate. Whereas medical experts may disagree on whether a particular case warranted medical treatment, death is a largely unambiguous criterion. Therefore, we compare the extent to which more or less physicians may be warranted in the Navy than in the civilian sector by comparing mortality rates.

For fiscal years 1963 and 1964, two representative peacetime years, the mortality rates for active duty personnel in the Navy and the Marine Corps were 164.3 and 163.8 per 100,000 average strength, respectively.[2] On the other hand, age-specific mortality rates based upon 1959-1961 data for U.S. males,[3] applied to the relative frequency distribution of ages of active duty personnel in the Navy and Marine Corps as of 30 June 1964 produces an aggregate mortality rate of 199 per 100,000. Since this nationwide aggregate includes the lower military mortality rate, the civilian mortality rate will be well over 200 per 100,000 persons. This difference between the peacetime Navy/Marine Corps mortality rate and that for civilians would seem to reflect the high quality of medical care delivered by the Navy and the fact that the civilian population is not as healthy to begin with.

Although it would be difficult to incorporate this differential mortality experience directly into the physician staffing estimates, it is clear that the effect of such an adjustment would be to decrease rather than increase these estimates.

5. Other Characteristics of the Population

We have adjusted for age and sex difference between the Kaiser and Navy populations, two demographic characteristics which heavily influence the utilization of medical care. We were unable to adjust for other demographic and socio-economic characteristics because of unavailability of data. There are numerous other characteristics which could

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[1] These are discussed in the section on utilization below.

[2] "Mortality Rates, Navy and Marine Corps," table T-2, Statistics of Navy Medicine, Bureau of Medicine and Surgery, U.S. Navy, selected fiscal years.

[3] United States Life Table: 1959-1961, op. cit., pp. 10-11.

affect medical care utilization, and it is contended by the NSCHA analysts that the inability to adjust for these invalidates our analysis. They note that numerous studies have shown the following to affect medical care utilization: income, education, social class, occupation, exposure to risk, life style, health care value systems, and access.[1] Their position appears to be that unless one can control for all the independent variables which can conceivably affect a dependent variable, an analysis such as ours is not valid. We agree that inclusion of many of these variables would have improved the analysis, but we do not agree that their exclusion invalidates it. Indeed, no analysis of any problem can possibly take account of all potentially important variables.

Many studies have indeed shown that the variables mentioned are correlated with the utilization of medical care. We think serious doubts could be raised about our results if it were possible to show (or if there were strong reason to believe) that an omitted variable such as income: (1) has a strong independent effect on medical care utilization (that is, that income has a strong effect independently of other variables which are highly correlated with it such as ability to pay); and (2) that the populations under examination differ markedly with respect to the characteristics in question.

It is interesting to note that the Kaiser Plan does not regularly gather data on any of the variables listed by the NSHCA analysts for use in their planning process. They do collect monthly data on the size of the membership and on its age and sex composition. Utilization forecasts are important under the Kaiser system. The Kaiser Foundation Health Plan contracts with subscribers to provide medical services in return for premium payments, and it also contracts with physician groups to provide services to these subscribers for a fixed per capita amount. In negotiating the budget, it is important to estimate accurately the utilization which the covered population may be expected to generate. Data on income, education, and other variables could easily be collected, but this is not done regularly because these data serve no operating uses in the program.[2] This certainly suggests that these variables do not exert a significant enough effect upon utilization in a prepaid plan to warrant the small additional cost of collecting them.

We shall now discuss the possible effects of these omitted variables, and particularly whether their inclusion would be likely to result in higher physician staffing estimates for the Navy. It is our view that this is not likely.

(a) Income

Income is positively correlated with medical care utilization; however, this is largely because higher incomes provide the ability to pay for medical care or to purchase medical insurance. Ability to pay is not relevant in the case of the populations compared in this study, for both populations are members of prepaid health care systems. There may be

[1] June 1972 paper, p. 7 and July 1972 paper, p. 9.

[2] Somers, op. cit., p. 41.

an independent effect of income on medical care utilization, that is, it may be that those with higher incomes utilize medical services more heavily independently of ability to pay. However, the existence, much less the magnitude, of any such residual effect is hardly well established.

Even if such an effect were established, the omission of this variable would result in an underestimate of Navy physician staffing only if there were reason to believe that incomes of the Navy population were higher than those of the Kaiser population. The active duty portion of the Navy population is heavily weighted by those in the lowest pay grades (E-1 through E-4). The Kaiser population consists mainly of those enrolled through employment groups, with federal, state, and local government employees and trade union members being heavily represented. The Kaiser population, moreover, is concentrated in two high-wage geographical areas. We think it likely that the average income of the Kaiser population is higher than that of the Navy population, and that if the omission of this variable has any significant effect it is to overestimate Navy physician staffing.

(b) Education

Education is also positively correlated with medical care utilization. Part of this is the result of the correlation between education and income, but there is an independent effect. However, there is no reason to believe that the educational level of the Navy population is higher than that of the Kaiser population. About 85 percent of the active duty population consists of enlisted men and 15 percent consists of officers. The majority of officers are college graduates and relatively few of the enlisted men are. Among the groups heavily represented in the Kaiser population are employees of universities and local school districts. The Kaiser population may have both a higher proportion of college graduates and a higher proportion of non-high school graduates. There seems little reason to maintain that failing to control for this variable results in a downward bias of our Navy physician staffing estimates.

(c) Social class, occupation, etc.

The relationships between socio-economic status and utilization of medical care are generally the same as those for income and utilization.[1] Income and occupation are aspects of socio-economic status, and our discussion of the effect of income on utilization applies also to social class and occupation. It is not clear whether there is an important effect independent of income and the associated ability to pay for medical care. Moreover, it would appear that the socio-economic status of the Kaiser population is, if anything, higher than that of the Navy population.

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[1] The Utilization of Health Services: Indices and Correlates, National Center for Health Services Research and Development, Department of Health, Education and Welfare, December 1972, pp. 22-23.

Occupation may also affect utilization of medical care through its association with exposure to risk. Occupation, exposure to risk and life style may be expected to differ between the Navy and Kaiser populations, but we have no direct evidence as to how they differ and the effects of any differences on medical care utilization. We can only say that our earlier examination of injury rates, motor vehicle injury rates, and general morbidity rates in the western United States, and of age-adjusted mortality rates for military personnel and civilians do not support a presumption that these differences result in higher medical care utilization for the Navy population.

"Health care value systems" is another factor mentioned by NSHCA analysts. A summary of several studies shows that these variables "have little utility in predicting the use of health services."[1]

The last variable mentioned by the NSHCA analysts is "access." Presumably geographical access to facilities is intended here, for both populations have financial access to health services. Lack of convenient access would be partly reflected in out-of-plan usage of services; adjustments have already been made for such usage by both populations. We are unable to assess the differential effect of this variable on medical care utilization by the two populations, and we see no reason to expect that the differential will be significant. On the one hand, active duty personnel usually have convenient access to medical care while on duty, as do their dependents who live on or near a military base. On the other hand, civilians who find the inaccessibility of Kaiser facilities an important barrier to obtaining care would very likely not belong to Kaiser, but instead elect an alternative plan available to them.

6. Utilization of Medical Care by the Two Populations.

The NSHCA analysts have pointed out that medical care utilization, according to the usual measures, is much greater for the Navy population than the Kaiser population, both in total and on a per capita basis. Therefore, it is maintained that our physician estimates vastly understate the Navy's physician requirements. Our estimates are alleged to be low for two main reasons:

(1) We have greatly underestimated the population using Navy medical facilities; and

(2) Per capita utilization is much higher in the Navy. Several possible reasons are advanced to explain this, the most important of which is that "need" for medical care is much higher for persons using the Navy system than for those using Kaiser.

We shall first address the criticisms of our estimates of the size of the population receiving medical care in Navy facilities. In appendix B, we present a detailed analysis

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[1] Ibid.

of the relative use of Navy medical facilities and civilian facilities under the CHAMPUS program by beneficiary categories. For each category, relative usage and trends over the past several years were examined in arriving at our estimates of the proportion using Navy medical facilities. For example, we found that in 1971, 51 percent of the hospital admissions of dependents of retired personnel and 59 percent of the hospital bed days were in civilian facilities under CHAMPUS. We estimated, therefore, that the equivalent of 53 percent of these beneficiaries were receiving their medical care in the civilian sector and 47 percent in Navy facilities. Actually, this procedure underestimates the relative use of civilian facilities (and correspondingly overestimates the relative use of Navy facilities) because not all use of civilian facilities is reported under the CHAMPUS program. Appendix B, originally prepared in May 1972, contains the most thorough examination of relative usage and estimates of the numbers of beneficiaries using Navy medical care of which we are aware. In view of this, the criticism of the NSHCA analysts that a "beneficiary may utilize the CHAMPUS program only once during a given interval (utilizing Naval facilities for other care episodes) and be deducted from the base population at risk by the CNA methodology"[1] is utterly incomprehensible!

The NSHCA analysts also maintain that we have underestimated the population served in Navy facilities because we did not take account of services to other groups such as beneficiaries from the other uniformed services, authorized civilian employees, etc.[2] As explained in appendix B, we assumed that utilization of one service's facilities by beneficiaries of another "nets out" in the aggregate, an assumption supported by information furnished by Op-96. As table 4 shows, civilian employees and other beneficiaries accounted for only 3 percent of hospital admissions, 3.4 percent of occupied beds, and 6.9 percent of outpatient visits in fiscal year 1972. Most of the outpatient visits were by civilian employees,[3] probably at industrial facilities served by 82 civilian physicians employed by the Navy. Utilization by these other beneficiaries is relatively slight, and we believe it can safely be omitted, particularly in view of our underestimate of usage of civilian facilities by Navy beneficiaries.

We have maintained that the comparable magnitudes of the populations actually served by the Navy and Kaiser is one of the similarities which renders a comparison appropriate.[4] NSHCA analysts have asserted that the Navy's population is probably substantially larger.

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[1] July 1972 paper, p. 9.

[2] Ibid.

[3] Statistics of Navy Medicine, Vol. 28, No. 4, Fiscal Year 1972, p. 13.

[4] June 1972 paper, p. 6.

Our estimates in appendix B indicate that the total Navy population is about 2.5 million, of which the equivalent of 1.8 million receive their care in Navy facilities. The total Kaiser population in 1972 was about 2.2 million;[1] we used an estimate of 10 percent out-of-plan usage, therefore we estimate the population actually served in Kaiser facilities at about 1.9 million. If we doubled the estimated out-of-plan usage to 20 percent, which we believe is too high, the population served in Kaiser facilities would be approximately 1.7 million. These appear to us to be comparable magnitudes.

The second major criticism of our estimates is that per capita utilization of medical services is much higher for the Navy population than the Kaiser population. Examination of the three most commonly used indicators of utilization, viz., outpatient visits, hospital admissions, and hospital bed days (average daily patient load, or ADPL), shows this to be the case. This higher utilization occurs even though there is good reason to believe that the peacetime Navy population, and especially the active duty component, is healthier than the Kaiser population.

The question of medical care utilization, therefore, warrants discussion. Table 4 presents data on utilization of medical care in Navy facilities by type of beneficiary for fiscal year 1972. This is the latest full year for which data are available, and it is relatively free of the influence of Vietnam casualties.[2] Table 4 shows that active duty personnel account for a disproportionately high part of the workload, even in the absence of heavy casualties from hostile action. In 1972, they constituted about 33 percent of the total eligible population and accounted for 45-1/2 percent of the outpatients visits, 42-1/2 percent of the hospital admissions, 64.4 percent of the ADPL, and 49 percent of the composite work units. Dependents of active duty personnel constituted about 35 percent of the population, and accounted for about 35 percent of the outpatient visits and hospital admissions, but only 14 percent of the ADPL. About one-third of these admissions were for childbirth, which usually results in a brief hospital stay. The use of Navy medical facilities by retired personnel was less than their proportion of the elegible population, and the use by their dependents was much less. The growing segments of the Navy population, therefore,

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[1] Somers, op. cit., p. 197.

[2] The heaviest utilization during recent years was in fiscal year 1969, during the height of the Vietnam conflict. Over the period 1969-1972, the total eligible population has decreased by 9 percent; the active duty population decreased by 23-1/2 percent, active duty dependents decreased by 12 percent, and retired personnel and their dependents increased by 17 percent. Over this same period, hospital admissions decreased by 30 percent, ADPL by 46 percent, outpatient visits by 10 percent, and composite work units by 29 percent.

are those which use Navy medical facilities least and the declining segments are those which use these facilities most.[1]

In table 5 we compare the aggregate Navy utilization measures with those of the Kaiser Plan. The NSCHA analysts prepared a similar comparison, however, the Navy data they used was for fiscal year 1971, the latest available at the time. We have used 1972 Navy data because it reflects the decreased Navy population and because the influence of Vietnam casualties on utilization is much less.[2]

According to the utilization measures in table 5, per capita utilization of medical services is much higher for Navy beneficiaries, and this would be even more pronounced if we considered total usage (that is, care in both Navy and civilian facilities) because out-of-plan usage is substantially higher for Navy beneficiaries than Kaiser subscribers. The NSHCA analysts mention several possible causes for this higher per capita utilization:[3]

1. The Navy data reflect case severity resulting from combat injuries. (The FY 1972 data we used in table 5 are relatively free of this influence.)

2. The Kaiser system includes incentives to reduce the probability of overutilization.

3. The Navy system appears to stimulate heavy utilization.

4. "Need" per effective beneficiary is considerably greater in the Navy than for Kaiser.

They consider that this last factor is probably the most important one in explaining the higher per capita utilization for the Navy, whereas we have maintained that the Navy population is probably healthier than the Kaiser population. In support of this, they

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[1] Table B-5 of appendix B, which presents the population figures on which our physician staffing estimates were based, shows estimated Navy and Marine Corps active duty populations of 801,959 for FY 1973 and 791,815 for FY 1974. These estimates have turned out to be too high, for Navy and Marine Corps active duty strength at the end of FY 1973 was about 765,000. The estimated active duty dependent populations during these years will also be somewhat high. We have not revised our physician staffing estimates to take account of this.

[2] A curious criticism by NSHCA analysts is based on estimates of 6,588,100 outpatient visits and an ADPL of 1793 for 1974 which were imputed to us. Nowhere did we make any such estimates, nor can they be logically implied from our analysis!

[3] July 1972 paper, pp. 7-8.

## TABLE 4

## USE OF NAVY MEDICAL SERVICES IN FY 1972, BY TYPE OF BENEFICIARY

| Beneficiary category | Percent of eligible population | Utilization measures | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Admissions | | Occupied beds | | Outpatient visits | | Composite work units | |
| | | Number | Percent of total | Number | Percent of total | Number | Percent of total | Number | Percent of total |
| Active duty | 33 | 113,709 | 42.5 | 5,571 | 64.4 | 6,761,841 | 45.5 | 5,199,057 | 48.9 |
| Dependents of active duty[a] | 35 | 91,436 | 34.1 | 1,226 | 14.2 | 5,123,709 | 34.5 | 3,241,663[a] | 30.5 |
| Retired | 11 | 23,606 | 8.8 | 860 | 9.9 | 758,835 | 5.1 | 777,611 | 7.3 |
| Dependents of retired | 21 | 31,101 | 11.6 | 699 | 8.1 | 1,182,472 | 8.0 | 920,887 | 8.7 |
| Other | – | 7,993 | 3.0 | 291 | 3.4 | 1,021,924 | 6.9 | 492,722 | 4.6 |

[a]There were also 34,270 births in Navy medical facilities, which have been attributed to active duty dependents in the calculation of composite work units.

Sources: Population data from appendix B, table B-5; utilization data from *Statistics of Navy Medicine,* Vol. 28, No. 4, Fiscal Year 1972.

## TABLE 5

## UTILIZATION OF MEDICAL SERVICES IN NAVY AND KAISER FACILITIES

| Measure | Navy (FY 1972) | Kaiser (1971) | Navy/Kaiser ratio |
|---|---|---|---|
| Admissions[a] | 267,845 | 163,631 | 1.6 |
| Hospital bed days[b] | 3,156,155 | 1,000,000 | 3.2 |
| Births[a] | 34,270 | 38,550 | .89 |
| Outpatient visits | 14,848,781 | 7,600,000 | 1.9 |
| Annual composite work units[c] | 10,631,940 | 5,301,310 | 2.0 |

[a]Excludes data from Parma, Ohio and Inglewood, California hospitals which was not available.

[b]ADPL x 365.

[c]Weights are as follows: admissions = 10; hospital bed days = 1; births = 10; outpatient visits = .3.

Sources: Kaiser data from NSHCA paper of Jun 1972, *op. cit.,* p. 11; Navy data from *Statistics of Navy Medicine,* Vol. 28, No. 4, Fiscal Year 1972.

present data on the average length of hospital stay, which has been suggested by Milton I. Roemer and others as a valid proxy variable for need.[1] Actually Roemer noted that in order to serve as a proxy variable for need, average length of stay would have to be adjusted for certain "extraneous" factors, some of which are essentially economic, such as bed supply in the area and time pressure on the attending physician.[2] Whatever merit Roemer's suggestion may have in the general case, it appears to have none in the instant case, where "extraneous" factors are clearly a significant influence. In particular, we refer to the fact that because of the nature of military service, active duty personnel will often be hospitalized when civilians would not be and that they will be kept in the hospital for much longer periods of time.

In support of the proposition that "need" is greater among the Navy population, the NSHCA analysts note that the average length of stay per admission in the Navy system was 14.4 days in 1970, compared with 6.1 days in Kaiser. The 1970 data, of course, were heavily influenced by combat casualties; active duty personnel accounted for 56 percent of all admissions and 77 percent of the ADPL in that year, and their average stay was 19.9 days.[3] Table 6 presents the average length of stay per admission by class of beneficiary in fiscal year 1972.

The average length of stay for all beneficiaries has decreased from 14.4 days in 1970 to 11.8 days in 1972. This aggregate statistic is heavily influenced by the average length of stay by active duty personnel, which decreased from 19.9 days in 1970 to 17.9 days in 1972.[4] The extent to which the average length of stay in Navy facilities is dominated by active duty personnel is indicated in table 6, which shows the average stay for nonactive duty beneficiaries to be only 7 days, still somewhat higher than for Kaiser.

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[1] Milton I. Roemer, et al., "A Proposed Hospital Quality Index; Hospital Death Rates Adjusted for Case Severity," Health Services Research, Vol. 3, No. 2, Summer 1968, pp. 96-118.

[2] Ibid., pp. 105-106. We can think of several other economic factors which should be taken into account, such as whether the bill is to be paid by the patient or a third party, and lost earnings associated with hospitalization.

[3] Computed from Statistics of Navy Medicine, Vol. 26, No. 4, Fiscal Year 1970.

[4] Other measures also show very high utilization by active duty personnel. The hospital admission rate for active duty personnel was 139 per 1000 (FY 1972) compared with 78 per 1000 for the Northern California region of Kaiser (1969) and 129 per 1000 nationally (1969). Outpatient visits averaged 8.25 per person for active duty personnel (FY 1972), compared with about 3.6 for the Southern California region of Kaiser (1970) and 4.3 nationally (1969). (Navy data computed from Statistics of Navy Medicine, Fiscal Year 1972, Kaiser data from Somers, op. cit., pp. 63, 205, national data from Current Estimates from the Health Interview Survey; United States - 1969.

TABLE 6

AVERAGE LENGTH OF STAY PER ADMISSION IN NAVY MEDICAL FACILITIES BY CLASS OF BENEFICIARY, FISCAL YEAR 1972

| Beneficiary class | Average length of stay (days) |
|---|---|
| All beneficiaries | 11.8 |
| Active duty personnel | 17.9 |
| Dependents of active duty personnel | 4.9 |
| Dependents of retired personnel | 8.2 |
| Retired personnel | 13.3 |
| Retired personnel, and dependents of retired and active duty personnel, combined | 7.0 |

Source: Computed from Statistics of Navy Medicine, Vol. 28, No. 4, Fiscal Year 1972.

It seems clear, therefore, that the interpretation of the greater average length of stay in Navy hospitals as evidence of greater "need" for medical care by the Navy population is, to say the least, exceedingly strained. What, then, is a reasonable interpretation of the heavier Navy utilization data shown in table 5? Do the higher Navy utilization ratios shown in table 5 not imply proportionately higher Navy physician staffing? For example, Navy composite work units in table 5 are twice as high as for Kaiser. Our Navy physician staffing estimates are only about 1-1/2 times as high as the number of Kaiser physicians, and only about 1-1/4 times as high in terms of post-graduate equivalent physicians. Should not our Navy physician staffing estimates have been twice the number of Kaiser physicians?

Our interpretation of the utilization data is that the heavier utilization by the Navy population primarily reflects structural differences between the two systems, especially with respect to usage by active duty personnel. Here we refer to the fact that the conditions of military life are such that active duty personnel are often hospitalized for conditions which would be treated on an out-patient basis in the civilian sector, and that they remain in the hospital for recuperation which would not entail hospitalization in the civilian sector. It is also likely that to some extent these differences reflect the incentives to avoid overutilization in the Kaiser system.

But given that there are these structural differences, does this not still imply a proportionately greater number of Navy physicians? We think not, and the reason lies in the fact that to a large extent the service measures listed in table 5 do not measure the same thing. Consider the case of a simple fracture of the arm. A civilian would usually be treated on an outpatient basis; the initial visit and each subsequent visit would receive a weight of .3 in the "composite work unit." Five visits would generate 1.5 CWUs. A Marine infantryman may be admitted to the hospital and remain there until he is fit to return to duty. Let us suppose that the recuperation period is 30 days. This same condition would generate 40 composite work units, 10 for the admission and one for each day of hospitalization. On the other hand, an active duty dependent would probably also be treated as an outpatient for this condition, and would likewise generate 1.5 CWUs. This would explain why the composite work unit has been found to be a poor indicator for a resource allocation use, even among different Navy facilities.[1]

Even an outpatient visit is not comparable under the two systems. The outpatient visits reported for Kaiser in table 5 are based on the following definition:

> ...a doctor office visit...defined as medical treatment or examination provided by a staff physician. Excluded are optometry, allergy visits for treatments or tests, psychological visits, or visits to any other nondoctor, professional or technical employee.[2]

The Navy outpatient visits reported in table 5 are defined as follows:

> An outpatient visit is reported for each outpatient who presents himself at a medical treatment facility for medical advice, diagnosis, treatment or complete physical examination, or one who is treated or observed in his quarters by medical personnel. An individual visit is recorded each time a visit is made to a separate, organized clinic or to a facility where medical services are not formally organized as separate functions.[3]

It is clear that many of the Navy outpatient visits are not physician visits. Moreover, many of these "visits" will be for causes which would not result in a visit in the civilian sector. A visit will be recorded each time a sailor aboard ship visits a hospital corpsman to obtain an aspirin for a headache.

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[1] The Medical and Dental Officer Billet Requirements Study Group cites a research paper of the Naval School of Health Care Administration which demonstrates this. (Op. cit., p. 27.)

[2] Somers, op. cit., p. 62.

[3] Medical Statistics, U.S. Navy, 1968, Vol. 102, 1973, p. 117.

The NSHCA analysts have stated that "the naval health delivery system appears to stimulate the channeling of demands for services toward high cost, physician intensive hospital care."[1] The system does generate more hospital care, but there is no reason why this care should be any more physician intensive than in the civilian sector. There appears to be no reason, for example, why the case of the simple fracture discussed above should require more physician-intensive treatment merely because the patient is admitted to the hospital and recuperates there.

In many cases the Navy does avoid hospitalizing active duty personnel who would not be hospitalized in the civilian sector. Married personnel will often recuperate at home, and while they may be carried on the census of a medical facility, they will not occupy a bed in the facility or be counted in the ADPL. However, this is not possible for many young single men, who constitute a large part of the active duty population. It should be stressed that here we are not questioning the practice of admitting these active duty personnel to hospitals and quartering them there during recuperation. We do not know whether there are better ways to deal with this situation. Given this practice, more hospital beds and more ancillary personnel will be needed to care for a military population than a civilian population of comparable size. What we do reject is the assertion that admissions of this nature require more physician's services than they otherwise would.

We believe that this discussion explains much of the anomaly that the apparently healthier Navy population utilizes medical services to a much greater extent than does the Kaiser population. It probably does not explain all of it, but we do submit that our Navy physician staffing estimates cannot be rejected on the basis of a comparison such as that shown in table 5.

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[1] July 1972 paper, p. 7.

# IV. SUMMARY

## A. Method of Analysis

In this study, we have estimated Navy physician staffing levels in the all-volunteer environment. The occasion for the study is the end of conscription, accompanied by more stringent manpower limitations. Conscription has enabled the Navy to obtain physicians and many other types of manpower at artificially depressed prices; however, the Navy has always had to pay market prices for other resources used in the provision of medical care, notably, non-human resources, but including some types of manpower as well. The Navy health care system has evolved over a period of many years in response to the relative prices it has had to pay for resources, and the system reflects heavy utilization of those obtainable at artificially low prices. The efficient response to the new environment is to conserve on the use of those resources which are now relatively more expensive, notably physicians.

But while the direction of the adjustment is clearly to utilize fewer physicians, the magnitude of the reduction is less clear. Estimation of this magnitude is difficult because there are no widely agreed standards in the civilian sector concerning the appropriate number of physicians to serve a given population. Therefore, the method we have chosen is to compare Navy physician staffing with that of the Kaiser Plan. The Kaiser Plan is a prepaid, hospital-based, group practice, providing comprehensive medical care to a defined population comparable in size to the Navy's population. However, the Kaiser Plan has had to pay market prices for all of its inputs, as the Navy will have to do in the future. The evolution of the Kaiser system and its pattern of resource utilization reflects these prices. In particular, Kaiser has had an incentive to conserve upon the use of physicians which would not have been present had they also been able to conscript them. This important difference between the two systems, in addition to the several similarities, render a comparison of physician staffing in Kaiser and the Navy particularly appropriate as a guide to future Navy physician staffing.

Although we maintain that a comparison of the two systems provides a valid basis for estimating future Navy physician staffing, there are important differences in the structural characteristics of the two systems and in the populations served. Therefore, a simple comparison of physician staffing and populations served will be inadequate, and much of our effort has been directed toward adjusting for these differences. We are aware that many of these quantitative adjustments are somewhat crude; lack of data and/or time constraints often prevented more refined estimates. We have attempted to deal with these uncertainties by adopting a generally "conservative" approach, that is, by making assumptions which may overstate Navy physician staffing. We hasten to add that our attempts to make quantitative estimates of the implications of features peculiar to military medicine are preferable to the common practice of reciting them as justification for prevailing staffing levels.

Table 1 and Section III-A-8 summarize the quantitative adjustments we have made to take account of differing characteristics of the two systems. These include: (1) an adjustment for the differing age-sex distributions of the populations; (2) estimates of the proportions of the eligible populations of each system receiving care outside these systems; (3) an adjustment for physicians providing support for military missions which have no counterpart in civilian life; (4) an adjustment to take account of the geographical dispersion of the Navy population; (5) an estimate of additional Navy physicians to provide a rotation base to minimize tour length in unpopular assignments; (6) an adjustment to take account of the lower productivity of interns and residents, who constitute a heavy proportion of total Navy physicians; (7) an adjustment to take account of time spent by Navy physicians in transit from one duty station to another.

## B. A Limitation of the Analysis: Timing of Reductions in Staffing

Our physician staffing estimates are long-run equilibrium estimates. We do not believe that they could have actually been achieved in fiscal years 1973 and 1974, but we do believe that some reductions could take place in those years, and, indeed, there has been a reduction of about 500 physicians since FY 1972. As we have noted in appendix A, efficient adjustment to relative price changes entails using less of the resource which has become relatively more costly and more of those which have become relatively less costly. This adjustment involves greater use of both human resources, such as physicians' assistants, hospital corpsmen, and nurses, and of capital equipment, such as automated testing and screening devices and modernization of facilities. The nature of these adjustments is well known, and BuMed has been in the process of undertaking them.[1]

Rapid adjustment to the new relative prices of inputs would be more costly than a slower adjustment; some changes, such as increased use of hospital corpsmen, can be made in a relatively short time, while others, such as construction of new facilities, take a longer time. To specify the precise time path for the reduction of physicians would require a detailed examination of the provision of care at each facility, which we have been unable to do. The Medical and Dental Officer Billet Requirements Study Group has made such an examination and arrived at estimates of the timing of decreases in the number of physicians which do not appear to be excessively rapid.[2] We do maintain that our method of estimating long-run physician staffing and the resulting estimates (which are about 350 lower than those of the Study Group) are valid. They can also be easily revised when changes occur in the total eligible population and/or in the composition of the population by beneficiary category.

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[1] Memorandum from the Surgeon General to the Chief of Naval Operations, 20 September 1972, op. cit.

[2] Op. cit.

## C. The Estimates

The estimates we present, therefore, are to be interpreted as follows: if there had been time to make the necessary adjustments, the Navy could have served the FY 1973 and 1974 populations with the physician staffing levels shown. Put differently, the Navy should be able to serve populations of this magnitude, composition, and relative use of CHAMPUS with these staffing levels in the future.

We estimated that the population which received medical care in Navy facilities in fiscal years 1973 and 1974 could have been served by 2400 to 2500 post-graduate physicians, exclusive of transients. By post-graduates we mean physicians who are not undergoing internship or residency training. After allowing for transients and the lower productivity of interns and residents, and assuming that the proportion of interns, residents and post-graduates will remain the same in the future as in the past, we arrived at the following physician staffing estimates:

| | FY 1973 | FY 1974 |
|---|---|---|
| Interns | 97 | 98 |
| Residents | 386 | 392 |
| Post-graduates | 2341 | 2378 |
| TOTAL | 2824 | 2868 |

These estimates compare with BuMed estimates of about 4500 for these years, and an actual end strength of about 4000 in FY 1973. The result is a ratio of total Navy physicians to population served of 160 physicians per 100,000; the ratio of post-graduate equivalent physicians, exclusive of transients, is about 137 physicians per 100,000. The Kaiser Plan ratio is 97.5 physicians per 100,000 and the ratio after adjustment for out-of-plan usage and age-sex distribution is 91 physicians per 100,000 under Kaiser. The adjusted Navy ratio of 137 physicians per 100,000 is about 50 percent higher than the adjusted Kaiser ratio of 91 per 100,000.

## D. Other Differences Between the Systems and A Reply to NSHCA Criticisms

We have adjusted for what we consider to be the most important differences between the two systems which affect staffing levels, and concluded that these would result in a 50 percent higher physician/population ratio for the Navy. There remain many other differences for which it was not possible to make adjustments, and which could differentially affect medical care utilization and physician staffing. Analysts from the Naval

School of Health Care Administration have maintained that our analysis is invalid, essentially because of our inability to control for all differences which could conceivably affect utilization and staffing in the two systems.[1] We conclude that the omitted differences on balance would not significantly affect our staffing estimates; indeed, it appears that, if anything, their inclusion would result in lower Navy staffing estimates.

One set of criticisms concerns the inability to control for demographic and socio-economic variables (other than age and sex) which, in one context or another have been shown to affect medical care utilization. Income, for example, has been shown in many studies to have a strong positive correlation with medical care utilization. However, there is very little evidence on the effect of income independently of its influence through providing the means to pay for medical care. But ability to pay is not a relevant factor in a comparison of two prepaid medical care systems. Ability to pay surely accounts for most of the observed positive correlation between income and medical care utilization. But even if there is a residual independent effect, it appears that the average income of the Kaiser population is probably higher than that of the Navy population. Moreover, in neither population are the extremes in income distribution represented, that is, neither include significant proportions of the indigent or the wealthy.

Another criticism concerns the magnitude of the populations actually being served by the two systems. The Navy has a larger total eligible population, but because of heavy use of civilian facilities by Navy beneficiaries, the numbers being served in Navy facilities is, if anything, somewhat smaller. To the best of our knowledge, our estimates of the relative use of Navy and civilian medical facilities[2] are the best available. It is impossible to comprehend the NSHCA criticism that under our procedure a single use of civilian medical care by a Navy beneficiary results in a deduction of that beneficiary from the Navy population at risk. On the contrary, because of lack of data, our procedure has resulted in an overestimation of the proportion of beneficiaries receiving care in Navy facilities.

A third criticism is that the Navy population generates much heavier utilization of medical care than the Kaiser population, according to such standard indicators as outpatient visits, hospital admissions, and hospital bed days. This is true, and it also has been used in support of the contention that we have underestimated the number of beneficiaries receiving care in Navy facilities. The difficulty here is that the same words mean different things, not only as between the Navy and Kaiser, but even among different Navy facilities. Kaiser outpatient statistics exclude visits to non-physicians, whereas

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[1] These differences and the NSHCA criticisms are discussed at length in Section III-B, and we shall not repeat the entire discussion here.

[2] Appendix B.

Navy statistics include these. Furthermore, the conditions of military service are such that active duty personnel will often be admitted to hospitals for conditions which would be treated on an outpatient basis in the civilian sector, and they will remain in the hospital for recuperation which would take place outside the hospital in the civilian sector. It would appear that most of the heavier utilization in the Navy, as shown by the standard indicators, occurs for these reasons. These institutional differences do mean that the Navy will use more hospital beds and ancillary personnel to care for a given population than will the civilian sector. But they do not imply higher physician staffing levels over and above those already included in our estimates.

## E. Influencing Utilization

Our analysis has focused on the supply of physicians to care for the Navy population. We have taken as given the categories of beneficiaries to be served and the existing method of allocating medical care. An investigation of measures to alter utilization would require a separate study. Such measures would have an impact on staffing levels, and we shall briefly discuss two of them here. One is the adoption of administrative policies deliberately designed to alter the present relative use of Navy facilities and CHAMPUS. The other is the adoption of pricing (copayment) as an alternative to the present system of rationing medical care within Navy facilities, which is essentially a queueing system.

### 1. Increased Use of CHAMPUS

We have not considered the effects of adopting policies deliberately designed to shift more or less of the care of Navy beneficiaries to CHAMPUS, and in that way decreasing or increasing the number of Navy physicians. The reason for this is that we do not know whether this would be more or less costly for the Navy. Previous estimates have shown that care in military facilities is cheaper than under CHAMPUS, but they have contained serious deficiencies resulting in understatement of the true costs of care in military facilities. A study now being conducted for the Navy is addressing this question. If it is successful, it could have important implications not only for Navy physician staffing, but also for planned Navy hospital construction.

One important reservation which we have about increased use of CHAMPUS is that most of the care under this program is on a fee-for-service basis. There is considerable evidence that hospital utilization is much higher under fee-for-service than prepaid systems. This feature will not be reflected in standard estimates of cost per hospital admission or per hospital day.

We have taken account of autonomous trends in the relative use of Navy facilities and CHAMPUS in our estimates of the population served. These show increasing relative use of CHAMPUS by retired personnel and their dependents, the two segments of the

total population which are growing and which are not subject to administrative constraints on their use of civilian hospitals under CHAMPUS. If it were desired to shift more medical care from Navy facilities to CHAMPUS, it would be possible to do so without adversely affecting morale; indeed, this could be done in such a way as to increase morale. Instead of categorically excluding a class of beneficiaries such as dependents of retired personnel from care in Navy facilities, as has often been suggested, it would merely be necessary to remove the administrative constraints on the use of CHAMPUS hospitalization by active duty dependents. This could be expected to result in a sizeable decrease in the use of Navy facilities, particularly for maternity admissions, although the impact would differ according to the location of the facility, being greatest for those located in metropolitan areas.

2. Use of Copayment for Care at Navy Facilities

The present method of rationing outpatient care in Navy facilities is by queueing, or "first-come, first-served," with certain modifications such as priority for emergencies and for active duty beneficiaries in uniform. Queueing represents a real cost, at least to non-active duty beneficiaries, although the cost may or may not be in monetary form. The time cost is not the same for all beneficiaries, and among active duty dependents it is likely that this cost is regressive in nature. That is, to the extent that wives of enlisted men, and particularly those in the lower grades, are more likely to be in the labor force than officers' wives, the costs of queueing are higher for them.

An alternative method of rationing would be the introduction of a coinsurance feature for outpatient visits and ancillary services. Scitovsky and Snyder have recently reported the results of the introduction of coinsurance for physician visits and ancillary services in the Group Health Plan offered by Stanford University to its employees.[1] The price of these services was increased from zero to 25 percent of the customary charges, which was about $3.50 for a physician visit. This resulted in a decrease in physician visits of 25 percent and in ancillary services of 17 percent. This decrease was greatest among female dependents, who face lower time costs than either male or female subscribers (employees).

The possibility that a copayment system may be superior to the present system on grounds of both efficiency and equity suggests the desirability of a study of alternative

[1] Anne A. Scitovsky and Nelda M. Snyder, "Effect of Coinsurance of Use of Physician Services," Social Security Bulletin, June 1972. See also Charles E. Phelps and Joseph Newhouse, ibid., and "The Effects of Coinsurance on Demand for Physician Services," R-976-OEO, The RAND Corporation, Santa Monica, June 1972.

methods of rationing medical care in Navy facilities, but this was beyond the scope of this study.[1] Reduced utilization would permit a reduction in either physician staffing or waiting times or both. For example, in FY 1971 non-active duty personnel accounted for 7,855,000 outpatient visits, or 51 percent of all outpatient visits. If the introduction of a charge of $3.50 per visit reduced outpatient visits by 25 percent, as in the Stanford case, outpatient visits by these beneficiaries would have been reduced by 1,964,000. If the average Navy physician sees 173 patients each week for 48 weeks, the reduction in visits would release about 235 physicians per year; if he sees 133 patients per week, the number of physicians released would be 300.[2]

Interestingly enough, existing law provides for the institution of such charges for non-active duty beneficiaries. Section 1078(b), Title 10, of the U.S. Code states:

> As a restraint on excessive demands for medical and dental care under Section 1076 of this title, uniform minimal charges may be imposed for outpatient care. Charges may not be more than such amounts, if any, as the Secretary of Defense may prescribe after consulting the Secretary of Health, Education and Welfare, and after a finding that such charges are necessary.

It appears to be the intent of this section that any charges be below market prices, but high enough to reduce utilization without discouraging the seriously ill. Curiously, a charge of $1.75 per day of hospitalization is currently levied for dependents, a situation in which it does not serve effectively as a rationing device, for access to the hospital is controlled by the physician, whereas access to the physician is not controlled. One way in which the introduction of a fee for outpatient visits may be made more acceptable is simultaneously to eliminate the daily hospital charge.

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[1] We have suggested such a study in an informal memorandum, part of which was incorporated in the Medical and Dental Officer Billet Requirements Study Report, op. cit., pp. 93-95.

[2] The average number of patients seen per week by civilian physicians in all specialties was 133 in 1970 and for general practitioners the number was 173. (Reference Data on the Profile of Medical Practice, 1972 edition, American Medical Association, Chicago, p. 59.)

# APPENDIX A

# THE ECONOMICS OF EFFICIENT PRODUCTION AND A CRITIQUE OF STANDARD METHODS OF ESTIMATING STAFFING LEVELS

# I. INTRODUCTION

This paper was originally prepared as a critique of "Physician Requirements for the Navy Medical Department," by James D. Bentley and Robert L. White, in which four alternative methods of estimating physician staffing were presented.[1] Each of these methods resulted in staffing estimates which were about as high or higher than the number of physicians then on board (about 4500). They subsequently revised their analysis in a paper which was submitted as part of the memorandum from the Surgeon General to the Chief of Naval Operations on 20 September 1972.[2]

This revised version appeared to take account of several of our criticisms. Three of the approaches used in the original paper were eliminated and only the historical approach was used. However, these other approaches to staffing levels are so frequently advocated within the Navy that we thought it useful to include our critique of them, even though the NSHCA analysts did not advocate them in the revised version of their study. Moreover, much of our paper was concerned with a critique of the historical approach, and these criticisms remain valid.[3] Therefore, this appendix consists of our original critique.

The original Bentley-White paper presents four estimates of physician "requirements" for fiscal years 1972-74: (1) historical; (2) industrial engineering (based on shore manning surveys); (3) C. O. ideal requirements; and (4) standards of service. The historical approach is the basic foundation; the other three approaches are adjustments to the historical analysis. These approaches result in various estimates of physician "requirements" ranging from slightly under the number currently on board (4594 as of December

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[1] Research Paper No. 4, Naval School of Health Care Administration, Bethesda, Md., May 1972. Our original paper was entitled "A Critique of 'Physician Requirements for the Navy Medical Department,'" by E. J. Devine, G. F. Brown, Jr., and Brian Forst, (INS)1096-72, Center for Naval Analyses, July 1972.

[2] Dennis D. Pointer, James D. Bentley and Robert L. White, "Toward Defensible Navy Physician Manning Alternatives: Bases for BuMed Policy," Research Paper No. 5, Naval School of Health Care Administration, Bethesda, Md., July 1972.

[3] Our objections to their use of the historical approach may be summarized succinctly. Our conceptual objection to the approach is that it makes no allowance for adjustment to changes in the prices of inputs. We also objected on technical grounds for 3 reasons: (1) The number of data points used to generate their estimates (5) is too small to be valid; (2) most of the years examined included heavy Vietnam casualties; and (3) although the total Navy eligible population is not changing greatly, the composition of that population is changing; specifically, those segments which are relatively heavy users of civilian medical facilities are becoming an increasing proportion of the total.

1971) to 1000 more than this number. Regardless of whether the numerical estimates turn out to be substantially higher or lower or the same as the current number, the central question remains: Do these estimates (or any one of them) provide a firm basis for a minimum acceptable number of physicians which the Navy can confidently present and defend when subjected to critical scrutiny by other agencies? We think not, and in this paper we discuss our reasons for this with respect to each of these approaches.

We have two major and fundamental objections, one or both of which apply to at least three of the approaches in the Bentley-White paper. These concern the economically efficient method of adaptation to changing relative prices and the use of the concept of "needs" or "requirements." We believe that any competent outside review, undertaken from the economic viewpoint (i.e., from the viewpoint of allocating scarce resources), will focus on one or both of these basic objections. Therefore, in organizing our critique, we first discuss each of these objections, and then discuss each of the four suggested approaches.

## II. ECONOMIC ADAPTATION TO CHANGING RELATIVE FACTOR PRICES

Medical care, like other goods and services, is produced by means of a combination of a large number of inputs or "factors of production," usually subsumed under the headings of land, labor and capital. "Labor," for example, includes such diverse talents as physicians, nurses aides, janitors, orderlies, etc. Likewise, "capital" encompasses a large number of diverse resources, ranging from buildings to bandage scissors.

At this point, it is important to reiterate the scenario which has provided the impetus for the present study, viz., the end of conscription and the necessity for paying market prices for all factors of production, most notably for physicians. In the past, the Navy has been paying market prices for its non-human resources and even for many of its labor inputs. We have not "drafted" medical equipment at artificially depressed prices. Nor have we drafted civilian employees or members of the Navy Nurse Corps. The two major types of resources whose prices have been artifically depressed by the draft are hospital corpsmen and physicians, particularly in the initial obligation period of service. Salaries of hospital corpsmen have recently been adjusted upward, particularly in the beginning grades, and increases in physicians' salaries are pending. While prices of all resources will probably increase in the future, it is clear that the greatest relative price change will be in physicians' salaries, which were the most seriously depressed under conscription.

The basic premise of the historical approach is that the Navy will (should) continue to use physicians in the same way as in the past (relative to population and workload) despite a substantial increase in their relative prices. Under each of the other three approaches, the Navy would adjust to the rising price of physicians by using even more of them than it has at the greatly depressed historical prices! We can think of only two conditions under which the historical pattern of physician usage would be an economically appropriate one for the future:

(1) either the Navy has been responding "irrationally," from the point of view of its own budget, to the relative factor prices confronting it in the past under conscription; or

(2) medical care is a service which can only be produced by combining inputs in "fixed proportions."

Section VIII contains an exposition of the basic economics of efficient production techniques and adjustments to changes in the relative prices of inputs. There we discuss the reasons why we believe that the Navy has not been using resources in a manner grossly inconsistent with the relative factor prices confronting it.

It is likely that the authors have in mind, at least implicitly, the second condition, as is frequently the case in studies of health manpower which focus upon an individual occupation. Therefore, we shall discuss this possibility briefly here and at greater length and more rigorously in Section VIII. At the heart of the economics of efficient production is the "law of variable proportions," which states that alternative production techniques exist for the production of <u>any</u> good or service, i.e., there are numerous alternative combinations of inputs which will produce a given quantity (and quality) of output. Which of these combinations is the efficient, or least-cost, method of production depends upon relative factor prices and will change as relative prices change. In the present context, this means that the same quantity and quality of "medical care" can be produced with a greater or lesser (but not zero) number of physicians; however, if the given quantity and quality is to be provided with fewer physicians, more of other resources must be used in conjunction with these physicians. The efficient combination of physicians and other resources to be used depends upon their relative prices; when the price of physicians rises, the efficient production technique will be one which uses fewer of them. Moreover, the changes in production techniques will be greater in the long run than in the short run, that is, the changes will be more marked the longer the time period allowed for adjustment after the price change occurs.

It is not always appreciated that there are a great number of production methods available because we often observe the same methods being used in our narrow experience. However, great variety can be observed among different places where relative prices differ. Thus, steel manufacture will be more water-intensive in areas where water is relatively cheap, and more capital-intensive where it is relatively expensive. Highway construction will be more labor-intensive in Mexico than in the United States, not because of "backwardness," but because of different relative factor prices of labor and capital. (The economically efficient production technique is not to be equated with the one using the most sophisticated equipment.)

Fixed factor proportions in the production of a good or service is a theoretical possibility, and some observable implications of postulating fixed proportions are that we will see the good or service produced in the same manner whatever the prevailing factor

prices, and that there will be no changes in production techniques when relative factor prices change. Perhaps the elevator operators' union was operating on the basis of such a postulate when formulating their wage demands; one elevator might seem to require one operator, regardless of operator's wages. In this case, very little adjustment was possible in the short run; in the longer run, of course, capital was substituted for labor in the form of more capital embodied in automatic elevators.

It is interesting to note that when economists seek examples of fixed factor proportions to illustrate theoretical textbook discussions, they are reduced to such artificial examples as water, which requires two parts of hydrogen and one of oxygen. If medical care is indeed such a case, it will provide a practical example of a theoretical curiosity. However, available evidence does not suggest that such is the case. As the price of physicians' services in the U.S. has risen relative to other factors, we find a greater proportion of ancillary health personnel employed in the production of medical care.

In summary, neither of the two conditions which could justify the use of the same or a greater number of physicians (relative to the workload) despite an increase in their price appears to be present. Basic economic principles indicate that the appropriate adaptation to changed prices is toward less physician-intensive provision of medical care. Both the historical and the industrial engineering approaches used by Bentley and White are based on the use made of physicians when the price was greatly depressed. We submit that this criticism is so basic as to invalidate the use of either approach, and so firmly grounded upon elementary economics as to make it most unlikely that it will escape the attention of any competent outside economic analyst.

## III. THE CONCEPT OF "NEEDS" OR "REQUIREMENTS"

The concept of "needs" or "requirements" runs through all four approaches, although it is most clearly stated in the "C.O. Ideal Requirements" approach. Under this approach, medical department commanding officers are asked periodically to submit a list of physician requirements based on estimates of "pure need, unconstrained by present budget or billet limitations."[1] That is, it consists of an estimate of the number of physicians which it would be useful to have if physicians were a free good. Indeed, it is only a world in which such resources are free, and hence resource allocation (i.e., economics) irrelevant, that such an estimate could be said to constitute an "ideal." In a world of scarce resources, any allocation based on such an approach is not only far from ideal, but is strongly antisocial, despite having been advanced from the best of motives.

But the problem of allocating scarce resources is the occasion for this study, and no estimate based upon needs, regardless of cost, is defensible in such a context, not even as an upper boundary. Needless to say, consistency of opinion among C.O.'s as to the extent of such "needs" is likewise irrelevant.

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[1] Bentley-White Report, p. H-1.

In general, the cost of a resource (such as physicians) is a measure of its value in alternative uses. Under conscription, of course, the cost to the Navy of a physician greatly understates the value of a physician's services in alternative uses. To treat costly resources as though they were free is to ignore other, more valuable, uses or "needs" which could be satisfied by these resources. Under the logic of this approach (i.e., disregarding cost), the Navy should employ as many physicians as will provide some positive benefit, i.e., up to the point where the contribution of the last physician approaches zero. It would disregard the fact that many of these physicians could make vastly more valuable contributions in the civilian sector, that is, they could satisfy far more compelling "needs" elsewhere.

Even within the context of the Navy budget, as long as it is not unlimited, to employ this approach is to deny the existence of other, more valuable uses elsewhere in the Navy of the generalized resources represented by the budget. At the expense of what other "needs" or missions, should these physicians be provided? That other uses of resources may be more valuable was clearly indicated by the responses of Navy manpower claimants in 1971 to proposals to add more medical manpower at the cost of reductions in other billets.

Virtually every activity in the Navy can show that its "needs" or "requirements" are greatly in excess of the resources at hand, in the sense that if more were available they could be used in ways which would increase the ability to perform the mission. It is, moreover, quite natural that each activity should view its requirements as particularly pressing, i.e., it would be willing to have them satisfied at the expense of other activities.

Any estimate of resource "requirements" without regard to whether the value of these extra resources exceeds their costs (which is to say, their value in other uses) is irrelevant in the absence of the unlimited Navy budget upon which such estimates are based. They are not only indefensible against outside criticism, but they also provide no guidance within the Navy to the CNO, who must make decisions about allocating the Navy's budget among various competing uses.

## IV. THE HISTORICAL APPROACH

Under this approach the historical relationship among eligible population, workload, and physician staffing are examined as a basis for projections into the future. This is an appealing method, and a very useful one under certain circumstances. The conditions under which the approach would be valid are: (1) if it could be ascertained or assumed that resource use was efficient in the past; and (2) no great changes in technology were expected over the period for which projections are made; and either (3) relative factor prices are not expected to change greatly, or (4) medical care is produced under conditions of fixed factor proportions. These conditions can often be satisfied, particularly for short-run projections, but they are palpably not satisfied in the present case.

It is well known that relative factor prices are going to change substantially in the future, specifically, that the military will have to pay higher prices in the future for physicians. Therefore, the validity of the approach as used by Bentley and White rests implicitly on the assumption of fixed factor proportions. We have argued at length in Section II that this condition, which has the status of a theoretical curiosity in economics, does not appear to be present.[1]

These are our basic objections to the use of the historical approach and all other approaches based upon it, namely, that the conditions under which the approach would be valid are palpably not satisfied in the present case. We would, therefore, reject the Bentley-White results even if their regression analysis were technically flawless. However, we also find that their regression analysis has serious shortcomings. Our detailed critique of the regression analysis has been relegated to Section IX because of the preeminence of the objections raised in this section.

## V. THE INDUSTRIAL ENGINEERING APPROACH

The Shore Manning Documents are referred to as the "industrial engineering approach." Actually, this is a misnomer, for the Shore Manning Surveys include only a part of what would constitute an industrial engineering study. The SMD's define basic tasks and determine frequency of occurrence and standard times, as does an industrial engineering study. However, the object of an industrial engineering study is to devise more effective ways of using resources; procedures may be changed, tasks reassigned, and even the need for performing the task questioned. The SMD's, on the other hand, derive the physician requirement from time required to perform the task and standard workweek. A representative of OP-12 has made it quite clear that the SMD is a historical document which reflects existing procedures.

These documents accept the procedures as currently being performed and quantify them. The ways in which tasks are performed and the type of personnel used to perform them are not generally questioned, much less the value of performing the task at all. The SMD's, therefore, are not industrial engineering studies.

The Shore Manning Documents are subject to both of the major objections raised in Sections II and III. No resource or cost constraints are recognized, and, of course, no account is taken of changes in relative costs and the implications of such changes for efficient resource use. An industrial engineering approach (which recognizes costs) would be valid, but an SMD is not such a study. The SMD's would be useful under the same conditions specified for the historical approach in Section IV, but these conditions are not met in the present case.

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[1] We also present evidence in Section VIII that condition (1) does not appear to be met, that is, that resource use in the past was not efficient, although apparently rational from the Navy's point of view.

## VI. C.O. IDEAL REQUIREMENTS

This approach has been advanced by Drs. Bentley and White as an upper boundary for Navy physician requirements. We have discussed this approach extensively in Section III and set forth our reasons for rejecting it, even as an upper boundary.

## VII. STANDARDS OF SERVICE

We have raised fundamental economic objections to the use of each of the other three approaches (or adjustments to the historical approach) used in the Bentley-White paper. Our main objection to the standards-of-service estimate in the Bentley-White paper is that it is based on the historical approach, and therefore suffers from the defects of the historical base. However, there are no economic objections to considering the effects of various standards of service. On the contrary, a complete analysis ought to address the question of the costs and benefits of increasing (or decreasing) the standards of service. Unfortunately, while this question is susceptible to analysis in principle, the data are lacking to conduct such an analysis. For example, we do not even have data on what many of the prevailing standards of service are, such as the average waiting time at various Navy outpatient facilities. Even if this were known, the change in the number of physicians needed to achieve a specified reduction in waiting time is a difficult problem. It is not obvious whether it would take 1% more, 10% more, or 100% more doctors to cut waiting times by, say, 10%. This is a complex and important question, which we should like to explore further in a separate working paper.

## VIII. THE ECONOMICS OF EFFICIENT PRODUCTION

The basic principles of the economics of efficient production of any good or service may be simply illustrated with the aid of the graphical two-input, one-output model of figure A-1.[1] The two inputs, called "doctors" and "other resources," are represented on the two axes, and the output, "medical care," by a series of "isoquants." One such isoquant (the curved line labelled 100) is shown in figure A-1. The coordinates of each point along the isoquant represent the various combinations of the two inputs which may be used to produce 100 units of the output "medical care" (of a given quality). The entire graph would be covered with a "map" of such isoquants; those to the northeast of the one shown would represent greater quantity of output, and those to the southwest a lesser quantity. The entire map is known as the "production function," and it is drawn for a given state of technology, i.e., it summarizes all the known ways of combining the inputs to yield the output.

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[1] A more extensive, generalized presentation may be found in Alain C. Enthoven, "Appendix: The Simple Mathematics of Maximization," in Charles J. Hitch and Roland N. McKean, The Economics of Defense in the Nuclear Age, Cambridge: Harvard University Press, 1960.

Isoquants have two important properties: (1) they are negatively sloped; and (2) they are convex to the origin. The negative slope reflects the "law of variable proportions," which states that in the production of any good or service it is possible, within a certain range, to substitute one input for another and maintain output constant. The convexity property reflects the law of diminishing returns. The slope of an isoquant at any point is known as the "marginal rate of substitution," i.e., it indicates the rate at which one input may be substituted for the other while maintaining output constant. This rate diminishes along the isoquant in either direction because as more of either resource is substituted for the other, further substitution becomes increasingly difficult. The isoquants may eventually become vertical or horizontal, indicating that no further substitution is possible. Only the negatively-sloped part of the isoquant is shown, for this is the only economically relevant portion.

Each point on an isoquant, such as point A in figure A-1, is said to be "technically efficient." This means that the indicated output, 100 units, cannot be produced with less of one input unless more of the other is used simultaneously. Equivalently, with 75 doctors and 50 units of other resources, 100 units of output is the most which can be produced. But which of the infinity of technically efficient combinations of inputs (or production techniques) is uniquely the economically efficient one? It all depends on relative prices.

The line $B_1$ in figure A-1 is a budget line or exchange line; the position of this line represents the size of the budget, e.g., $1,000,000, and the slope reflects the relative prices of inputs. Thus, in figure A-1, the budget of $1,000,000 could be used to purchase the services of 100 doctors or 150 units of other resources, or any combination shown along the line at the exchange rate (relative prices) of 1.5 to 1. Higher (lower) budgets would be indicated by budget lines parallel to $B_1$ and to the northeast (southwest) of it. Let $B_1$ represent the relative prices of inputs under conscription; at these relative prices, the least-cost way for the Navy to produce 100 units of medical care would be to use the combination of inputs indicated by the coordinates of point A, that is, where the budget line is tangent to the isoquant. This may be easily seen; any other combination of inputs which would produce 100 units would lie on a higher budget line, i.e., would cost more, and indeed would be unattainable with the indicated budget. Any other attainable point along the budget line, such as point C, would not satisfy the tangency condition, and would be intersected by an isoquant representing less than 100 units of output. Output could be increased for the same budget by substituting other resources for doctors until point A was reached; further substitution beyond point A would again result in lower output.

Now assume that conscription ends and the Navy must pay a higher price for physicians, the price of other resources remaining the same. The slope of the budget line changes and the new line becomes, say, $B_2$. Note that the $1,000,000 budget will still buy 150 units of other resources, the price of which has not changed, but fewer doctors, the price of which has risen. If the budget is not increased, the old output level can no longer be attained; if the output of 100 is to be maintained, a larger budget will be necessary. The least-cost

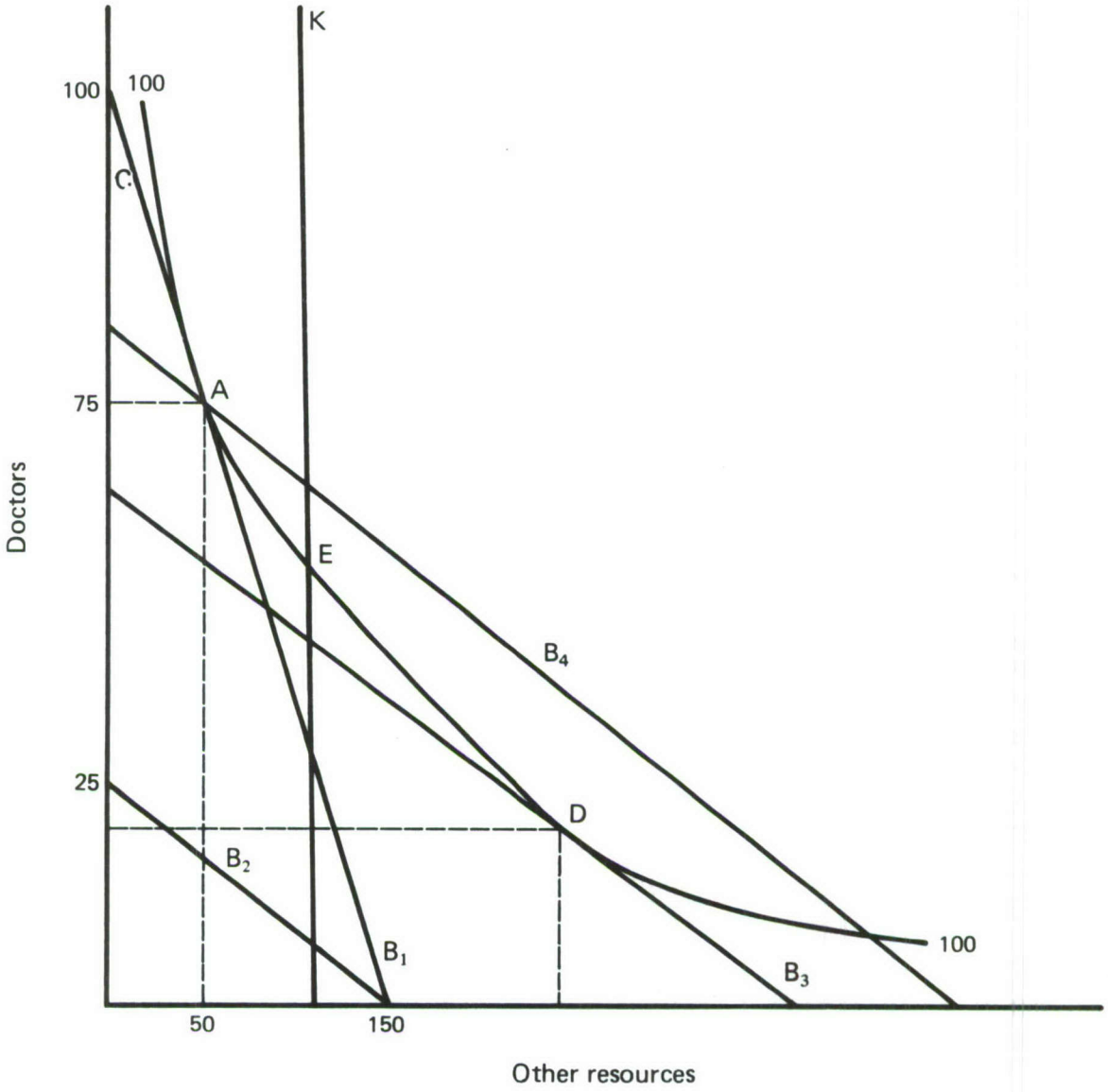


**FIG. A-1: TWO INPUTS, ONE OUTPUT VARIABLE PROJECTIONS**

way of producing the old output with the new relative prices may be found by making an outward parallel shift in budget line $B_2$ until it is tangent to the isoquant 100. This results in a larger budget, represented by budget line $B_3$, which is tangent to the isoquant at point D. This is the least-cost technique for producing the old output at the new prices, and it entails fewer doctors and more of other resources than the previous technique. That is, economic adaptation to the new price ratio entails substitution away from that input whose relative price has increased and toward that input whose relative price has decreased. On the other hand, if the former combination of inputs were to be used to produce 100 units, the tangency condition would not be satisfied and the cost would be greater, as indicated by budget line $B_4$, which intersects the isoquant at point A and represents a larger budget than $B_3$.

Suppose that in the short run inputs could not be varied optimally because of some constraint on the substitution of other resources, for example, a limitation on construction funds. Such a constraint is indicated by the vertical line labelled K. In that case, the lowest attainable cost of producing 100 units would be indicated by a budget line (not drawn) through point E, the intersection of the constraint line and the isoquant. This would be a larger budget than $B_3$. However, unless the constraint were set at the 50 units of other resources formerly being used, some substitution of other resources would always pay.

Figure A-2 represents the case of "fixed factor proportions" which appears to be the implicit theory underlying the historical approach of Bentley and White. The isoquant again represents 100 units of output, and the budget lines correspond to those used in figure A-1. Note that the isoquant forms a right angle, reflecting the fixed proportions assumption. Only point A on the isoquant has relevance; the coordinates of that point indicate that 100 units can be produced with a combination of 75 doctors and 50 units of other resources. The addition of doctors, reading up the vertical arm of the isoquant, would result in no increase in output; reading along the horizontal arm, the addition of other resources would likewise result in no increase in output. The change in relative prices accompanying the end of conscription changes the slope of the budget line, and $B_2$ becomes the new budget line. If 100 units of output are to be maintained, the budget must be increased to $B_3$, which intersects point A, the single relevant point on the isoquant. (This replaces the tangency solution to cost minimization.) The change in relative prices does not affect the input combination used.

How does one choose between the fixed proportions model of figure A-2 and the variable proportions model of figure A-1? The two have very different observable implications, as discussed in Section II of the text. The implications of the variable proportions model are that we will observe different production techniques used in places where relative factor prices differ, and also that we will observe changes in techniques over time as relative prices change. The fixed proportions model, on the other hand, implies that the same techniques will be used in different places and over time, regardless of relative prices. The choice is easy; the former model has a high degree of empirical validation in the

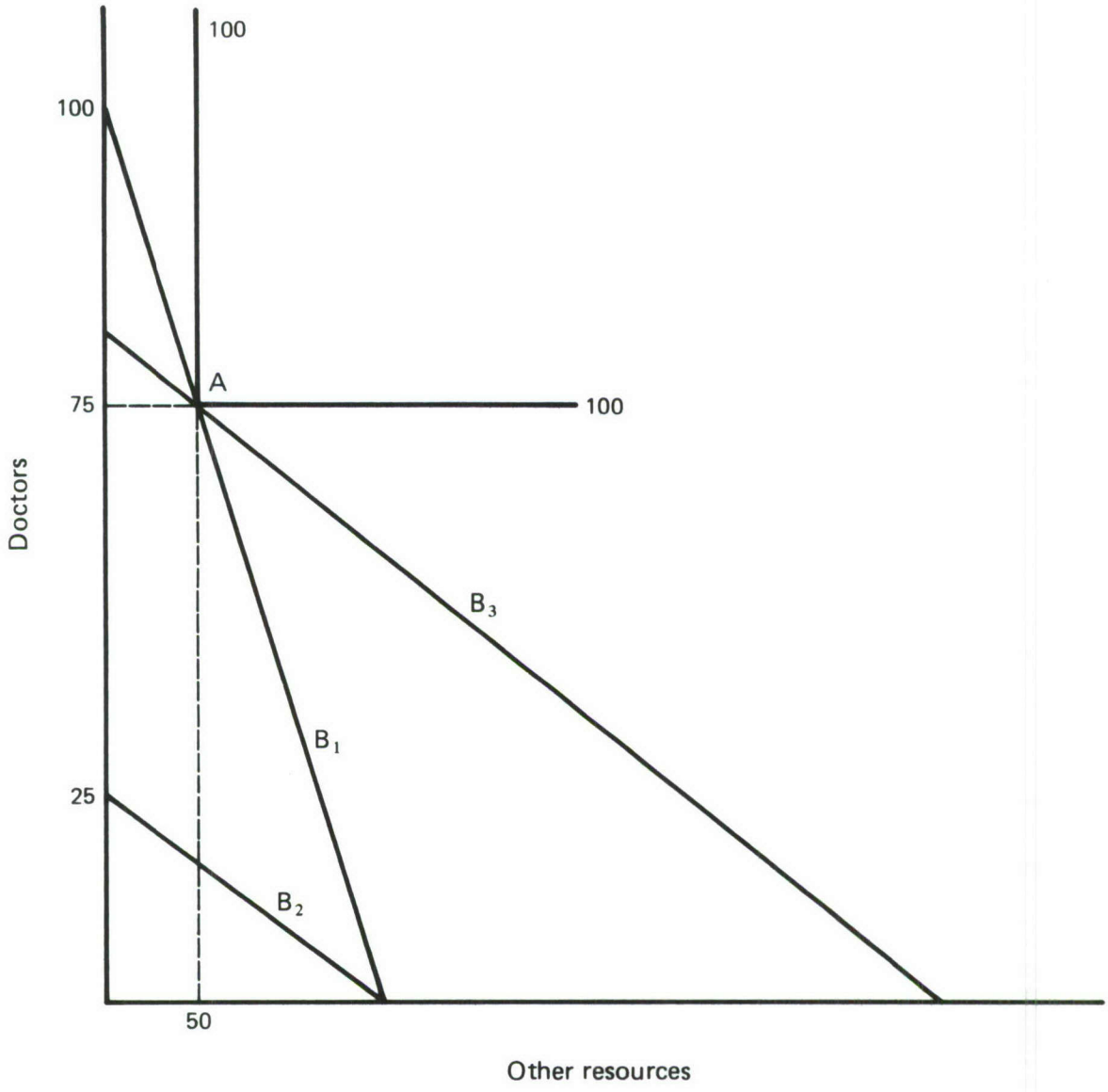


**FIG. A-2: TWO INPUTS, ONE OUTPUT FIXED PROPORTIONS**

production of a wide range of goods and services, and is consistent with the wider body of economic theory. In asserting that the Navy ought to use the same or greater numbers of physicians in the future as in the past, regardless of changing prices, Bentley and White appear to be implicitly theorizing on the basis of the fixed proportions model. Another possibility is that they are implicitly advocating that the Navy ought not to produce medical care in the least-cost way (for a given quality and quantity) for some unspecified reason, but we doubt that this is the case.

There remains one final possibility which warrants some discussion and it can be best illustrated with reference to figure A-1. The shape of the isoquant reflects propositions about physical input-output relationships. That the tangency condition is the solution to the cost-minimization problem has been logically demonstrated. The single behavioral postulate is that the organization whose behavior is to be explained will minimize costs, i.e., that it has the incentive to do so. This postulate is applicable to the profit-maximizing firm, for cost minimization is a necessary condition for profit maximization. We believe that there is indeed some validity to the objection that the Navy is not a profit-maximizing organization, and hence its incentives to minimize costs are attenuated. In terms of the diagram, the Navy may have no incentive to seek the tangency solution.

In figure A-1, after conscription the least-cost solution is to produce with the input combination indicated by the coordinates of point D. This solution is efficient from both the social point of view (which was the case even before the price change, for conscription artificially depressed the price of physicians, and the conscription price did not reflect the value in alternative uses) and from the point of view of the Navy's budget. Before conscription, cost-minimization, from the point of view of the Navy's budget, could be achieved by using the combination indicated by point A. But if the Navy does not have incentives to achieve cost minimization under any set of relative prices, how can it be said that economic adaptation to the new set of prices implies substitution of other resources for physicians?

Our answer is that while the Navy's incentives for cost minimization may be attenuated, they are not completely absent. In terms of the diagram, while the Navy may not have been using combination A with the draft, and may not shift to combination D after it ends, we assert that they would have used a combination closer to A with conscription (i.e., a physician-intensive production technique) and that they will shift to a combination closer to D after conscription. What is the basis for such an assertion? Examination of the behavior of other governmental units indicates that governments do react to an increase in the price of an input in much the same qualitative ways as business firms, even though they probably do not minimize costs at either the old or the new prices.[1] The Navy does

[1] E. J. Devine, Analysis of Manpower Shortages in Local Government Employment, New York: Praeger, 1970, esp. p. 20.

compete with other agencies for funds and different parts of the Navy compete with each other for a share of the Navy's budget, and this would seem to preclude total disregard for costs. More to the point is the evidence provided by the actions which the Surgeon General is currently undertaking or has planned in anticipation of the end of the draft. These actions are described in a recent memo[1] which provides strong evidence of historical personnel utilization which, while socially inefficient, was rational from the Navy's point of view under the artificial price structure resulting from conscription. The changes are in the direction indicated in figure A-1 (i.e., a movement from point A to point D), an adaptation which is both rational from the Navy's point of view and a move toward greater efficiency from the social point of view. Many of these actions involve substitution of paramedical and clerical personnel for physicians, and it is noted in the memo that this will result in staffing patterns comparable to those which have existed in the civilian health care sector for years. Among the specific items mentioned are use of physicians' assistants, nurse midwives, and pediatric nurse practitioners, increased secretarial assistance, introduction of an outpatient dictation system, and relieving highly trained paramedical personnel of janitorial chores. One may ask why physicians were performing clerical chores and paramedical personnel performing janitorial chores in the first place. That is, why weren't utilization patterns closer to those in the civilian sector? The answer is an implication of the theory of production presented here, viz, that the Navy was responding to the relative prices confronting it, and that this usage was rational from the Navy's point of view, although socially inefficient. This evidence is clearly consistent with the variable proportions model of figure A-1 and refutes the fixed proportions model of figure A-2. We consider this to be strong evidence that any estimate of "requirements" based on historical utilization of physicians must be flatly rejected.

## IX. CRITIQUE OF REGRESSION MODEL

In Section IV, we noted the conditions under which a historical analysis would be valid, and rejected the approach because these conditions are not satisfied. However, even if they were satisfied, that is, if medical care were produced with fixed input proportions or if factor prices were not expected to change, we submit that projections based on the Bentley-White methodology are suspect. First, we feel that the specification of the model ignores several important determinants of physician requirements. Second, even accepting the model as specified, the estimates of the unknown parameters cannot be accepted with any great confidence due to the small samples of data employed.

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[2] FN - Surgeon General to CNO dated 17 February 1972.

The Bentley-White methodology is briefly summarized as follows:

a. Let $M_i$ (i = 1, ..., 4) be various measurements of physician workload. For their work, $M_1$ = total admissions, $M_2$ = bed days, $M_3$ = outpatient visits, $M_4$ = births. Let TP be total eligible population. They ran four regressions:

$$M_i = \alpha_i + \beta_i(TP), \quad i = 1, \ldots, 4$$

b. Let CWU = composite work units. They calculated for each year

$$CWU = \sum_{i=1}^{4} W_i M_i$$

where the weights $W_i$ were assigned by a previous study.

c. Then, let P = physicians on board. They regressed

$$P = \nu + \delta(CWU)$$

d. From the regression estimates of the parameters, they use the following equation to predict physician requirements from estimates of total population as follows:

$$P = \hat{\nu} + \hat{\delta}\,(CWU)$$

$$= \hat{\nu} + \hat{\delta}\left(\sum_{i=1}^{4} W_i M_i\right)$$

$$= \hat{\nu} + \hat{\delta}\left(\sum_{i=1}^{4} W_i\,(\hat{\alpha}_i + \hat{\beta}_i\,(TP))\right)$$

$$= \Pi_0 + \Pi_1\,(TP)$$

where

$$\Pi_0 = \hat{\nu} + \hat{\delta} \sum_{i=1}^{4} W_i \hat{\alpha}_i$$

$$\Pi_1 = \hat{\delta} \sum_{i=1}^{4} W_i \hat{\beta}_i$$

e. They use several factors to inflate the projections of physician requirements to "account for" changes in quality of care, CO ideal requirements, etc.

f. Because their regression for births did not "seem reasonable," they assumed $\alpha_4 = 37,500$, $\beta_4 = 0$.

In developing a model such as the authors use here, there are several critical stages, including (á) model specification, (b) data collection, (c) estimation of parameters, (d) verification of the model, and (e) forecasting with the model. We feel that, in a number of these stages, factors not taken into account by the authors make the end product suspect.

Perhaps the most critical of these stages is the first, the specification of the model. As noted above, their model involves a set of linear relationships between single independent variables and the dependent variables to be predicted. For example, total admissions are linearly related to the total eligible population. For such a specification to be useful, it is hoped that the list of independent variables included in the regression equation does not omit any significant variables which affect the dependent variable, and further, that the structure of the model has not changed substantially over the period of observations. There are several reasons which lead us to suspect that these conditions may well be violated. First of all, the independent variable used in the regressions of stage 2(a), total eligible population, is an aggregation of the population in several different categories -- active duty personnel, dependents of active duty personnel, retired personnel, and dependents of retired personnel. As the authors of this study carefully point out in their critique of the comparative systems approach, it is quite likely that heterogeneous populations provide very different demands for medical services. One would expect different admission rates for each of these four stratifications. The aggregation of the four categories into a single variable may present very severe problems for future projections, particularly if the sizes and intensities of use of facilities in each of the four categories change over the prediction period.

There are additional variables which reasonably could be expected to affect various categories of workload and hence physician requirements. For example, the Vietnam conflict progressed through several stages of intensity during the period of their observations. It is reasonable to expect that the level of Vietnam activity might well have been a predictor of workload, especially within the active duty population. Another such example relates to the CHAMPUS program. During the period of their observations, there were changes in the degree to which members of the different populations were eligible to use CHAMPUS. Omission of variables can cause very serious problems for future predictions when such variables (e.g., Vietnam intensity and CHAMPUS use) may be expected to continue to change in the forecast period. In summary, it is reasonable to expect that the model specifications made in this analysis may be overly simple and could reasonably be expected to neglect certain important factors relevant to the prediction of physician requirements.

The data used for all the regressions noted above were yearly observations from the period 1967 to 1971, a total of five observations. By virtually any standards, five observations constitute a small sample for the purpose of estimating unknown parameters and testing hypotheses such as are advanced in the model specification. The size of the sample makes it difficult to place any reliability on estimates of coefficients obtained for the models being tested. That the authors found correlation coefficients in the range of .7 is really no surprise with such a small sample. Virtually any reasonable line in the neighborhood of the data points will lead the correlation coefficients close to this level. For example, connecting the 1968 and 1970 observations for the regression between total admissions and total eligible population, as shown in figure A-3, leads to a correlation coefficient of .55, almost as large as the result obtained by the authors. Yet this line has entirely unreasonable properties - even the "wrong" slope.

Other standard measures of confidence in the regression results lead to no better results. By the standard t-tests - for whatever they are worth - all of the slope coefficients are not significantly different from zero at even the 90% level. The authors do not report these results; hence we recalculated them.

While the model does produce point estimates as forecasts, use of them requires some measure of how accurate the forecasts are. Again, standard forecast confidence intervals can be calculated. We chose several of the regressions and did this:

(a) The point estimate of total admissions for 1972 from their model is 277, 274, but a 90% forecast interval is 197, 045 to 357, 504.

(b) The point estimate of physician requirements given their 1972 forecast of CWU's is 4267, but a 90% forecast interval is 3864 to 4669. Of course, a true 90% forecast interval for this variable will be much wider, since 1972 CWU's are themselves forecast with error, as is shown above in paragraph 2.

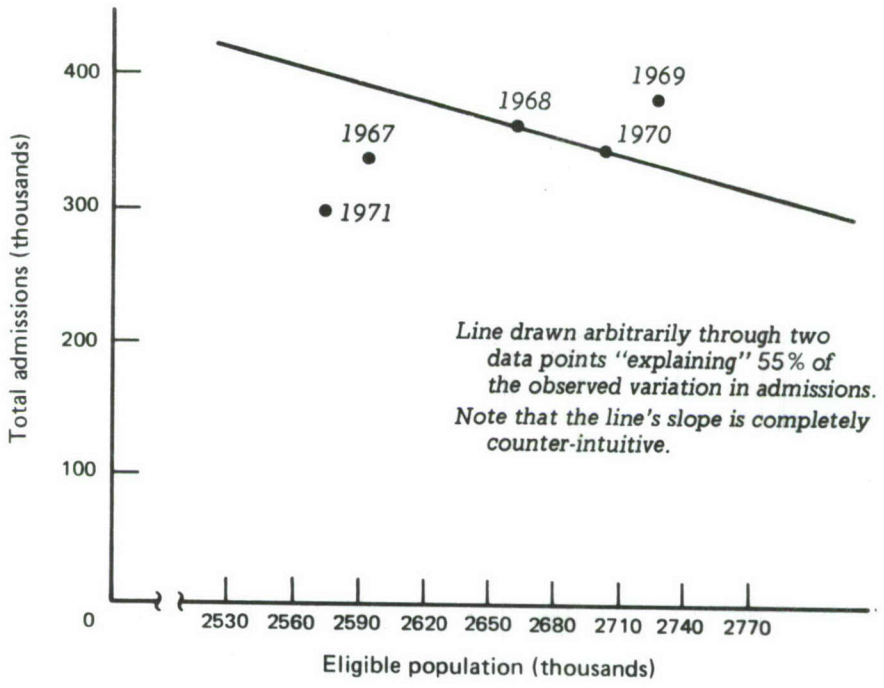


**FIGURE A-3**

By merely looking at the data, some of our earlier reservations may be seen more clearly. For example, the effect of the changing composition of the population on hospital admissions may be seen from figure A-4, which shows approximately the same number of admissions in 1967 and 1970, whereas the total eligible population in 1970 was about 107,000 greater than in 1967. In 1970, there were about the same number of active duty personnel, and their hospital admissions had declined slightly. There were fewer active duty dependents, and their admissions had declined slightly. However, there were a larger number of retired and retired dependents, and their admissions had increased, but less than proportionately to the increase in their numbers (and this segment of population will continue to grow relative to the others).

Another possible structural change is seen in figure A-5. Note that the 1967-1969 data and 1970-1971 data appear to follow two separate structures. Perhaps some of the omitted variables we have discussed account for this. Of course, we do not claim support for our model on the basis of 5 data points, but merely suggest that reasonable doubt persists.

As noted in paragraph 2 above, the Bentley-White methodology involves a complex set of manipulations leading to a prediction equation of the form

$$P = \pi_0 + \pi_1 (TP) \quad .$$

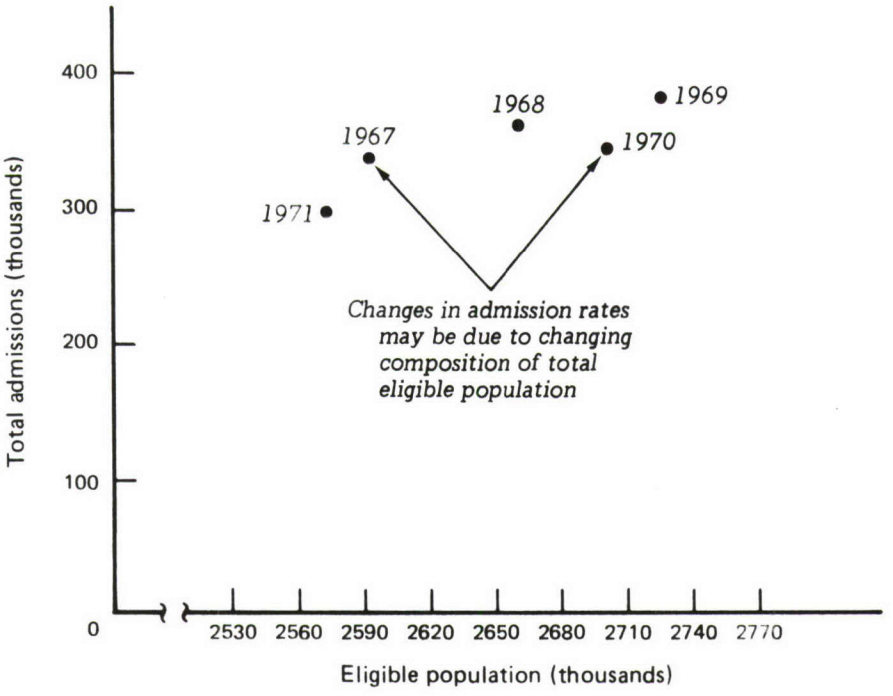


**FIGURE A-4**

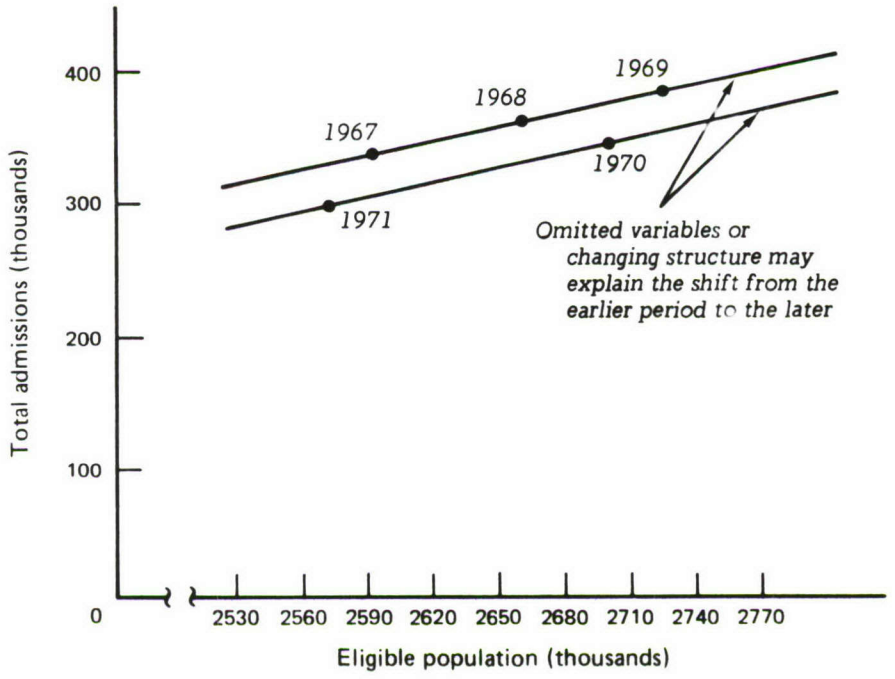


**FIGURE A-5**

In their method, the estimates of $\pi_0$ and $\pi_1$ are built up from 5 regressions and the assigned weights used to compute CWU's. An alternative, both simpler and free from some of the arbitrariness inherent in choosing these weights, is to treat the equation above as the "model" and just run a regression on it. We did this, and the results are:

$$P = -2303.53 + 0.002595\ (TP)\ ,$$

with an $r^2 = 0.85$ and a t-statistic for the slope coefficient of 4.143 - significant at the 99% level in the usual sense. The point forecast for 1972 is 3912, with a 90% confidence region of 3640 to 4185.

We do not believe in this result any more than we do in those of Bentley and White. The problems of model misspecification, structural changes, omitted variables and few data points are all still present. Yet by their own standards, this model performs better in every regard - $r^2$, t-tests, etc. We regard this exercise as merely pointing to the fact that with so few data points, many models will seem reasonable. It is here that good judgment in the choice of a model must be exercised; the data by themselves will not answer the question at hand.[1]

In summary, the problems that we see with regard to the model specifications (which are in fact to some degree supported by the data) and the limited nature of the data used to estimate the regression equations make it very questionable in our minds that their model would be useful in predicting future physician requirements for the Navy, even aside from the fundamental objections raised in the text.

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[1] In the revised version of their paper, the NSHCA analysts did, in fact, use this model. They then estimated ranges of physician staffing levels at the 80 percent, 90 percent, and 95 percent confidence limits. The latter, of course, results in the widest range. Using the upper limit estimates at the 95 percent confidence limit, BuMed then reported that it has been determined that the number of physicians needed is 4424 for FY 73 and 4569 for FY 74! (Memorandum from the Surgeon General to the Chief of Naval Operations, 20 September 1972, p. 2.)

# APPENDIX B

# AN ANALYSIS OF THE RELATIVE USE OF NAVY AND CIVILIAN MEDICAL FACILITIES BY NAVY DEPENDENTS AND RETIREES: FY 1967-71 AND PROJECTIONS FOR FY 1973-74

## A. INTRODUCTION

In this appendix we compare the relative use of various medical services in the civilian sector and in Navy facilities during the past five fiscal years by three classes of Navy beneficiaries: active duty dependents, retired personnel, and dependents of retired personnel. The purpose is to estimate the proportion of each class of the eligible population actually served by the Navy in the past and the proportions we may expect to serve in the future, as a necessary part of the foundation for establishing physician "requirements."

It is important to note that we address the question of relative usage of Navy and civilian facilities, not absolute usage of either one. Neither total medical care nor the relative use of Navy and civilian facilities are exogenous, i.e., both can be influenced by Navy, DoD and OCHAMPUS policies. Numerous studies in the literature show considerable variation in medical care utilization not explainable by differences in populations, incomes, financing mechanisms, or other variables known to have an effect. That is, within the bounds of sound medical practice, there can be considerable variation in whether a given diagnosis results in hospitalization or outpatient care, and also in the length of hospitalization for a given diagnosis. As a glance at table B-4 will show, there is no simple correlation between changes in the size of a beneficiary class and changes in medical care usage. Undoubtedly, administrative decisions strongly influence the data. As Dr. Milton I. Roemer has stated: "We know, of course, that the vast majority of surgical operations, and for that matter hospital admissions generally, are elective matters depending mainly on the doctor's judgment."[1] It is for this reason that the Kaiser Plan limits the number of hospital beds to somewhat under two per 1000 members. As a Kaiser Plan official has noted: "It is our firm conviction that if one has more beds than experience indicates is necessary to serve a given population, the utilization rate increases."[2] This is in a system in which the doctors, like Navy doctors, have no financial incentive to hospitalize patients. Thus there are no absolute "requirements" for medical care based on the size and composition of the population alone, hence, none for the number of doctors "needed" to serve that population.

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[1] Milton I. Roemer, "On Paying the Doctor and the Implications of Different Methods," Journal of Health and Human Behavior, Vol. III, Spring 1962.

[2] John J. Boardman, Jr., "Utilization Data and the Planning Process," in The Kaiser-Permanente Medical Care Program: A Symposium, Anne R. Somers, ed., New York: The Commonwealth Fund, 1971, p. 65.

Changes in relative usage of Navy and civilian facilities are also subject to considerable influence through Navy, DoD, and OCHAMPUS policy decisions. For example, the Navy may adopt more or less liberal policies with respect to the issuance of certificates of nonavailability of Navy medical care to active duty dependents. Another example is a reinterpretation of laws and regulations by OCHAMPUS in 1970 to greatly expand coverage for plastic and esthetic surgery and another reinterpretation in 1971 restricting coverage again. In 1970, OCHAMPUS reclassified intensive psychiatric day care and certain outpatient surgery as "inpatient" care for payment purposes (rendering it less expensive to beneficiaries) and waiving the requirement for a nonavailability certificate for active duty dependents for such care.[1] (These changes will affect both absolute and relative usage.) We have had, perforce, to address these issues. Whenever assumptions had to be made about policies affecting the projected relative usage, we have tried to specify the relevant assumptions. Should different assumptions be thought more appropriate or should important policy changes have been overlooked, the projections may be altered accordingly.

What began as a simple descriptive examination of the use of Navy and civilian medical facilities developed into a much longer and more difficult task than we had anticipated. This was both because of the complex administrative and costs constraints influencing the behavior of different classes of beneficiaries, and because of certain features of the CHAMPUS data reporting system. Because the basic data on relative use presented in table B-2 cannot validly be interpreted without awareness of these underlying factors, it has been necessary to devote a considerable portion of the paper to a discussion of them. The result has been a more detailed analysis of the choices made between civilian and military medical care under complex constraints than has been done before, to the best of our knowledge.

## B. CONCLUSIONS

The major conclusions are as follows:

1. Active duty dependents. During each of the past five years, roughly half of all hospital admissions have been in Navy facilities and half under CHAMPUS. It is believed that this understates their usage of Navy facilities for total medical care, because they probably use Navy outpatient care to a greater extent than civilian. In the future, a shift toward greater use of Navy medical care is projected. Specifically, it is projected that 60 percent of this population will obtain medical care primarily from the Navy in FY 1973, and 65 percent in FY 1974.

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[1] Office for the Civilian Health and Medical Program of the Uniformed Services (OCHAMPUS), "14th Annual Report," Calendar Year 1970, p. i.

2. Retired dependents. There has been an increasing use of the CHAMPUS program by these dependents ever since they became eligible in 1967. The trend is expected to continue and even accelerate. Moreover, CHAMPUS data understate their use of civilian facilities. It is projected that in FY 1973, 44 percent of this population will be receiving medical care primarily from the Navy, and that this will decline to 40 percent by FY 1974.

3. Retired personnel. This population makes the heaviest relative use of Navy medical facilities; however, this usage has been declining steadily since CHAMPUS eligibility in 1967, and the trend is expected to continue. CHAMPUS data understate total civilian usage. It is projected that 67 percent of this population will receive their medical care from the Navy in FY 1973 and 65 percent in FY 1974.

4. Dependents of both active duty and retired personnel use the CHAMPUS program more heavily than their Army and Air Force counterparts for both inpatient and outpatient care. The reasons for this are not known, but in the case of retired dependents, lack of access to a Navy facility does not appear to be a reason. Retired personnel use CHAMPUS to the same extent as Army and Air Force retirees.

5. Two objections frequently raised against increased use of CHAMPUS appear to be invalid. These are that it would affect morale adversely and that the civilian sector would be unable to accommodate any sizeable portion of the Navy's workload. A significant portion of the total Navy workload could be shifted to the civilian sector, and in such a manner that morale would be enhanced rather than impaired. The impact on particular Navy medical facilities would vary greatly. Such a shift would entail substantially higher costs to the government, and no judgment has been made about its desirability.

6. The behavior of Navy beneficiaries suggests that the "standards of service" generally prevailing in the civilian sector (with respect to waiting times, impersonality of care, etc.) are not worse than in Navy facilities. Rather, the opposite appears to be the case.

## C. FACTORS AFFECTING CHOICE OF MEDICAL CARE

The choices made by the eligible population between Navy care and CHAMPUS cannot be understood without some knowledge of the differing relative costs and administrative constraints applicable to different classes of the population.

The original CHAMPUS legislation (known then as the Dependents' Medical Care Program), became effective in December 1956, and applied only to active duty dependents. It provided comprehensive inpatient care and limited outpatient care. DoD had previously

estimated that about 40 percent of active duty dependents had been unable to avail themselves of military medical facilities.[1] In 1966, the CHAMPUS legislation expanded the program in two major ways. Benefits were expanded to include most outpatient care, and eligibility was extended to retirees and their dependents. The new provisions became effective on 1 January 1967, except expanded outpatient care for active duty dependents, which became effective 1 October 1966. The program provides for very comprehensive inpatient and outpatient care, with virtually the same benefits as provided in military hospitals. All beneficiaries continue to be eligible for care in military facilities. CHAMPUS coverage for retirees and their dependents ends at age 65, at which time they become eligible for Medicare.

### 1. Relative Costs to Beneficiaries

Table B-1 summarizes the cost-sharing features associated with CHAMPUS and military medical care for active duty dependents on the one hand, and retirees and their dependents on the other. For inpatient care in military facilities, the cost is virtually the same for all beneficiaries and is nominal. For active duty dependents, the costs of inpatient care under CHAMPUS are about the same as in military facilities, being slightly higher under CHAMPUS for hospital stays of under 15 days. However, retirees and their dependents pay 25 percent of the cost of inpatient care under CHAMPUS. Outpatient care is rendered without charge to all beneficiaries in military facilities. Under CHAMPUS, both groups must satisfy a deductible of $50 per person or $100 per family for outpatient care, and additional amounts are subject to a 20 percent coinsurance feature for active duty dependents and 25 percent for retirees and their dependents. Thus, both groups are required to pay more for outpatient care under CHAMPUS than in military facilities, but only retirees and their dependents pay more for inpatient care.

### 2. Supplemental Insurance

The substantial and growing use of hospital facilities under CHAMPUS by retired dependents shown in table B-2 may, at first glance, seem surprising in view of the 25 percent coinsurance feature. However, for many of these dependents (and retirees) the relative costs of using CHAMPUS rather than military hospitals are much lower than this, and at the time of decision may even be zero. There are two reasons for this.

The first reason is that CHAMPUS is a "residual" insurance program, i.e., the law requires that retirees and their dependents having other insurance provided either by law or through employment must use those benefits before CHAMPUS can make any payment.

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[1] Frank Van Dyke and Robin Elliott, Military Medicare, submitted by Columbia University School of Public Health and Administrative Medicine to the Department of Defense, June 1969, p. 39.

TABLE B-1

BENEFICIARIES' SHARE OF COSTS,
CHAMPUS AND MILITARY FACILITIES

| Type of CHAMPUS beneficiary | Type of facility: Military — Type of care: Inpatient | Type of facility: Military — Type of care: Ambulatory (includes drugs) | Type of facility: Civilian (CHAMPUS) — Type of care: Inpatient | Type of facility: Civilian (CHAMPUS) — Type of care: Ambulatory[a] (includes drugs) |
|---|---|---|---|---|
| Dependents of active duty personnel | $1.75 per day of stay | Zero | $25 per stay or $1.75 per day of stay, whichever is the greater | $50 deductible per person per year (maximum of $100 per family), plus 20% of remaining charges |
| Retirees, dependents of retirees and dependents of deceased personnel | $1.75 per day of stay[b] | Zero | 25% of total charges | $50 deductible per person per year (maximum of $100 per family), plus 25% of remaining charges |

[a] Ambulatory care related to hospitalization (including pre- and postnatal visits) is considered as inpatient care for the purpose of computing the patient's share of the charges.

[b] Retired officers and warrant officers pay only the cost of subsistence (approximately $1.30 per day); retired enlisted men pay no charge at all.

## TABLE B-2

## USE OF CHAMPUS AND NAVY MEDICAL FACILITIES BY NAVY AND MARINE CORPS BENEFICIARIES FISCAL YEARS 1967-1971

| | FY 1971 | | | | | FY 1970 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Navy facilities | | CHAMPUS | | Total | Navy facilities | | CHAMPUS | | Total |
| | Number | Percent | Number | Percent | | Number | Percent | Number | Percent | |
| Admissions | | | | | | | | | | |
| Active duty dependents | 93,364 | 51.9 | 86,582 | 48.1 | 179,946 | 90,088 | 49.1 | 93,242 | 50.9 | 183,330 |
| Retired dependents[a] | 30,897 | 48.9 | 32,349 | 51.1 | 63,246 | 27,565 | 50.5 | 27,062 | 49.5 | 54,627 |
| Retired | 21,360 | 69.1 | 9,545 | 30.9 | 30,905 | 19,264 | 71.0 | 7,852 | 29.0 | 27,116 |
| Occupied beds (ADPL) | | | | | | | | | | |
| Active duty dependents | 1,329 | 47.5 | 1,470 | 52.5 | 2,799 | 1,277 | 45.0 | 1,560 | 55.0 | 2,837 |
| Retired dependents | 641 | 41.3 | 912 | 58.7 | 1,553 | 628 | 45.0 | 769 | 55.0 | 1,397 |
| Retired | 789 | 75.6 | 254 | 24.4 | 1,043 | 778 | 79.1 | 205 | 20.9 | 983 |
| Outpatient visits[b] | | | | | | | | | | |
| Active duty dependents | 5,049,484 | | 182,774 | | | 4,854,142 | | 221,852 | | |
| Retired dependents | 1,084,338 | | 370,848 | | | 920,751 | | 268,059 | | |
| Retired | 638,811 | | 74,715 | | | 569,979 | | 61,058 | | |
| Births[c] | | | | | | | | | | |
| Active duty dependents | 38,115 | 51.3 | 36,185 | 48.7 | 74,300 | 37,240 | 48.2 | 40,074 | 51.8 | 77,314 |
| Retired dependents | | | 33,525 | | | | | 37,800 | | |
| Retired | | | 2,653 | | | | | 2,272 | | |
| | | | 7 | | | | | 2 | | |

| | FY 1969 | | | | | FY 1968 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Admissions | | | | | | | | | | |
| Active duty dependents | 92,235 | 50.4 | 90,845 | 49.6 | 183,080 | 91,706 | 51.7 | 85,664 | 48.3 | 1,773,370 |
| Retired dependents | 25,717 | 53.3 | 22,499 | 46.7 | 48,216 | 23,514 | 58.1 | 16,957 | 41.9 | 40,471 |
| Retired | 18,463 | 74.9 | 6,186 | 25.1 | 24,649 | 17,005 | 78.4 | 4,676 | 21.6 | 21,681 |
| Occupied beds (ADPL) | | | | | | | | | | |
| Active duty dependents | 1,345 | 47.3 | 1,500 | 52.7 | 2,845 | 1,377 | 49.9 | 1,384 | 50.1 | 2,761 |
| Retired dependents | 599 | 49.0 | 624 | 51.0 | 1,223 | 570 | 57.6 | 420 | 42.4 | 990 |
| Retired | 764 | 82.2 | 166 | 17.8 | 930 | 742 | 85.5 | 126 | 14.5 | 868 |
| Outpatient visits | | | | | | | | | | |
| Active duty dependents | 4,792,093 | | 191,000 | | | 4,612,227 | | 149,000 | | |
| Retired dependents | 821,546 | | 201,000 | | | 733,279 | | 126,000 | | |
| Retired | 509,034 | | 48,000 | | | 450,445 | | 30,000 | | |
| Births | | | | | | | | | | |
| Active duty dependents | 37,254 | 48.8 | 39,060 | 51.2 | 76,314 | 35,637 | 49.5 | 36,361 | 50.5 | 71,998 |
| Retired dependents | | | 37,084 | | | | | 34,831 | | |
| Retired | | | 1,974 | | | | | 1,528 | | |
| | | | 2 | | | | | 2 | | |

| | FY 1967 | | | | |
|---|---|---|---|---|---|
| Admissions | | | | | |
| Active duty dependents | 91,116 | 51.3 | 86,632 | 48.7 | 177,748 |
| Retired dependents | 22,730 | 78.6 | 6,179 | 21.4 | 28,909 |
| Retired | 15,950 | 90.3 | 1,711 | 9.7 | 17,661 |
| Occupied beds (ADPL) | | | | | |
| Active duty dependents | 1,404 | 51.9 | 1,300 | 48.1 | 2,704 |
| Retired dependents | 573 | 67.2 | 280 | 32.8 | 853 |
| Retired | 730 | 89.0 | 90 | 11.0 | 820 |
| Outpatient visits | | | | | |
| Active duty dependents | 4,370,790 | | 115,000 | | 4,485,790 |
| Retired dependents | 626,751 | | 37,000 | | 663,751 |
| Retired | 413,963 | | 10,000 | | 423,963 |
| Births | | | | | |
| Active duty dependents | 35,400 | 50.2 | 35,126 | 49.8 | 70,526 |
| Retired dependents | | | 34,681 | | |
| Retired | | | 445 | | |
| | | | NA | | |

[a]Retired personnel and their dependents became eligible on 1 Jan 1967, hence, 1967 data for these classes are for 6 months only.
[b]Outpatient visits in Navy facilities and under CHAMPUS not comparable because of differences in reporting systems.
[c]CHAMPUS data includes maternity admissions, whether or not births resulted. Navy data are not distributed by class of beneficiary; all births have been assigned to active duty dependents.

Sources: Navy data, *Statistics of Navy Medicine;* CHAMPUS data, Code 393, BuMed.

CHAMPUS will then pay the remaining allowable charges. Many of our retirees are employed, and group health insurance will be available to many of them and their families at low cost. Moreover, such insurance will often pay for all costs. Also, beneficiaries over 65 are covered by Medicare. Therefore, CHAMPUS data will understate the amount of health care received in the civilian sector. These considerations do not apply to active duty dependents.

Another reason why the relative costs shown in table B-1 do not necessarily represent those actually confronting the beneficiary is the development of insurance specifically designed to supplement CHAMPUS by the retired associations.[1] It is expected that coverage under these policies will grow, and with that growth will come increasing relative use of CHAMPUS. The Fleet Reserve Association first offered such a policy in October 1967, and the Retired Officers Association has offered one since January 1969. Members of these associations can elect either inpatient coverage alone or combined inpatient and outpatient coverage. The inpatient policies offered retired members of both associations cover the 25 percent coinsurance under CHAMPUS, as well as the $1.75 daily charge in military hospitals. Outpatient policies cover the 25 percent coinsurance, and the policy offered by the Fleet Reserve Association covers the deductible as well. Both associations also offer supplements to Medicare for members over 65 and policies to cover the dependents of active duty members of the associations. The annual premiums for retired officers are as follows:

| | Inpatient only | Inpatient plus outpatient |
|---|---|---|
| Member | $19.80 | $56.00 |
| Spouse | 29.60 | 68.00 |
| Each child | 11.80 | 44.00 |

Thus, a retired officer with a wife and two dependent children who elects to cover the whole family for inpatient care would pay annual premiums of only $73. For full coverage, he would pay $212 in premiums, plus a maximum of $100 in deductibles. The costs of inpatient coverage under the policy offered through the Fleet Reserve Association are the same as shown above, and are slightly higher for full coverage because the deductible is also covered. Moreover, members of the ROA may elect coverage for dependents only; in general, this is not true for members of the FRA.

[1] Based on information furnished by the Retired Officers Association and the Fleet Reserve Association.

Members of both associations elect inpatient coverage only about 2-1/2 times more frequently than combined coverage. The Fleet Reserve Association has a large number of active duty members; however, few of them purchase policies for their dependents. Of the small number who do, the majority elect combined coverage. It is not surprising that few active duty members purchase the policies, because their dependents cannot freely elect to use CHAMPUS. Approximately 17,000 retirees and their dependents (under age 65) are covered through the FRA policy, and about 125,000 through the ROA. If we estimate that about 1/3 of the latter group are Navy and Marine Corps retirees and dependents, about 70,000 Navy beneficiaries have supplemental coverage, or about 9% of the total number of retirees and their dependents.

3. Administrative Constraints

In addition to relative cost differences, differing administrative constraints must also be recognized in interpreting medical care utilization by different classes of beneficiaries. Three types of priority are established by law for care in military facilities: first priority, active duty personnel; second priority, active duty dependents, who must be provided care if it is available; third priority, retirees and their dependents, who may be provided care if it is available. The question arises as to whether the utilization patterns shown in table B-2 for retirees, and especially for their dependents, are strongly influenced by nonavailability of Navy facilities. Apparently, they are not. First, the table shows that retirees are relatively heavy users of Navy hospitals, and they have no higher priority than their dependents. Secondly, neither BuMed nor the Fleet Reserve Association receive many valid complaints about lack of availability of care in Navy facilities for retirees and their dependents. The choices exhibited by these beneficiaries in table B-2, therefore, may be regarded as genuine.

Another administrative constraint is the "nonavailability certificate." Dependents of active duty personnel residing with their sponsors (and within 30 miles of the nearest military facility) can receive inpatient care under CHAMPUS only if they are able to obtain a certificate that such care is not available at the local military facility. The certificate is not needed for outpatient care under CHAMPUS, nor for dependents not residing with the sponsor. What is the effect of this constraint on usage? In FY 1970, 39 percent of all Navy and Marine Corps active duty dependents admitted to hospitals under CHAMPUS reported that they were residing with their sponsor. This implies the issuance of about 35,000 nonavailability certificates that year, of which about 16,000 were for maternity admissions. How were so many certificates issued to these dependents, when beneficiaries with lower priority were having no difficulty being admitted? In part, of course, it may be that the active duty dependents use certain facilities more heavily than other beneficiaries (this is clearly true for maternity cases) and that these facilities were overcrowded, though others were not. Can we infer that on balance active duty dependents would prefer to use military facilities more heavily than they do, but are unable to because of lack of availability? It is clear that the opposite is the case, viz., that active duty dependents would prefer to use civilian hospital facilities more heavily, but are unable to because of this constraint.

If the constraint were removed at the present time, we would observe a considerable shift to civilian hospitals, with an attendant increase in morale, but also in the cost to the government. The cost to the active duty dependent is the same for inpatient care under CHAMPUS as in Navy facilities, and in maternity cases, prenatal and postnatal outpatient visits are paid for as inpatient care. DoD adopted the restriction in October 1958, less than two years after the initial Dependents' Medical Care Act, in response to Congressional pressure. According to van Dyke, the purpose was twofold: (1) to lower the cost to the government of care under CHAMPUS, and (2) to stop the declining use of military hospitals, especially for maternity care. The number of births in military hospitals had dropped from 40,000 during the quarter when the program began to 20,000 per quarter shortly before the restriction was introduced.[1] Births are a substantial part of total admissions of active duty dependents, accounting consistently for about 40 percent of their admissions in both Navy and civilian hospitals. The reason for this strong preference for civilian care in maternity cases is not hard to guess. The cost is the same, and women apparently place great weight on having the same doctor throughout the entire course of a pregnancy, which is not often the case in military facilities.

4. Lack of Information about CHAMPUS

One factor which has undoubtedly suppressed CHAMPUS usage greatly in the past, and probably continues to do so today to a lesser extent, is ignorance of entitlement and/or the claims procedure on the part of beneficiaries. Professor van Dyke was strongly critical of DoD, and especially OCHAMPUS, for failure to publicize the program adequately.[2] He cites a 1968 Army study which showed that 44-1/2 percent of married enlisted personnel were unaware of the existence of the program, and another 44-1/2 percent were aware of its existence, but exhibited no knowledge of its use. These were active duty personnel; ignorance of the program among retirees and their dependents can only be speculated upon. The most recent Navy survey to inquire about this matter was undertaken in 1970, and it showed lack of knowledge about the program to be less, but still substantial.[3]

It appears that knowledge of the program has improved and will continue to improve as increased efforts are being made to disseminate information by the Navy and other services. This same factor has retarded the growth of the supplemental insurance policies issued through the retired associations.

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[1] Op. cit., pp. 116-118.

[2] Ibid., pp. 142-144.

[3] Navy Personnel Survey 70-1, Naval Personnel Research and Development Laboratory, Bureau of Naval Personnel.

One can only speculate on the quantitative effect of this lack of information. In part, it would result in greater use of Navy facilities, and in part in greater unreported use of civilian medical care. As this factor diminishes in importance, we may expect increased use of CHAMPUS.

5. Special Features of the Data

In addition to the administrative constraints and differing relative costs, there are some special features of the data of which one should be aware.

a. Outpatient Visits

Originally it was intended to convert both Navy and CHAMPUS data on the four measures of medical care shown in table B-2 to "composite work units." This would have provided a comprehensive (even if imperfect) measure of the amount of total care being received by each class of beneficiaries from the Navy and CHAMPUS. Unfortunately, a valid comparison for outpatient care could not be made because of differences in reporting under CHAMPUS and by the Navy, the Navy's data being more complete. (However, an estimate has been made for FY 1971 in section D.) This is so for several reasons.

The deductible feature means that many outpatient visits under CHAMPUS will be unreported. Those satisfying the deductible will have had prior visits for which CHAMPUS does not pay and which will not be reported. Other beneficiaries will have had outpatient visits insufficient to meet the deductible. Others may exceed the deductible by some amount, but not file a claim because of the somewhat complex procedure for a claim of this sort.

Births account for about 40 percent of CHAMPUS hospital admissions; associated with each, there will usually be a considerable number of prenatal and postnatal outpatient visits. For payment and reporting purposes under CHAMPUS, such visits are included as a single admission and paid for as inpatient care. Navy statistics count such visits, quite properly, as outpatient visits. This will particularly depress the reported CHAMPUS outpatient visits for active duty dependents.

b. Reporting Lags

The CHAMPUS data for all service measures shown in table B-2 are current through 29 February 1972. The basic source of these data is a "phaseback" report issued by CHAMPUS. Data are recorded as of the time period in which care was rendered, not as of the data reported. Thus, reports issued at a later date will show higher figures than earlier reports covering the same time period. We are informed that the data are virtually complete after a 3-year lag. Thus, the CHAMPUS data shown in table B-2 are depressed, particularly for the last year shown. Trend reversals in 1971 in some of the series in table B-2, therefore, may not be real.

c. Care in Other Armed Forces Facilities

The Navy data shown for each class of beneficiaries includes beneficiaries of the other armed services. On the other hand, Navy and Marine Corps beneficiaries also receive care in the facilities of other services. It has been assumed that this interservice utilization "nets out" in the aggregate. OP-96 conducted a study several years ago supporting this assumption.

The result of the outpatient deductible feature and of lags in reporting CHAMPUS data are to understate the amount of care received under CHAMPUS. Moreover, because of the residual nature of the CHAMPUS program discussed above, the CHAMPUS data understate the use of civilian medical facilities, particularly by retirees and their dependents.

D. USE OF CHAMPUS AND NAVY MEDICAL CARE

Table B-2 presents the basic data on the use of various medical services under CHAMPUS and in Navy facilities by class of beneficiary over the period FY 1967-1971. It will be recalled that retirees and their beneficiaries first became eligible for CHAMPUS on 1 January 1967; therefore, the data cover the entire period of their eligibility. It should be noted that the FY 1967 data cover only 6 months of eligibility for these beneficiaries (but a full year for active duty dependents), thus accounting for much of the great increase in services between FY 1967 and FY 1968.

Because table B-2 is rather difficult to read, table B-3 has been prepared which shows only the percentage of use of CHAMPUS and Navy facilities for each service measure by each class of beneficiary. Table B-4 shows the year-to-year percentage changes in each of the three segments of the eligible population and in their use of various services in Navy facilities and under CHAMPUS. Table B-5 shows the population data used by categories, and projections for fiscal years 1973 and 1974.

Of the three inpatient service measures shown in table B-2, the greatest weight has been placed upon hospital admissions. This is the most "doctor-intensive" of all service measures, and, therefore, the most useful single measure for the purpose at hand.

1. Active Duty Dependents

Tables B-2 and B-3 show that over the period 1967-1971, hospital admissions for this group have been divided approximately 50-50 between CHAMPUS and Navy hospitals. This has been roughly true in each fiscal year, and there is no apparent trend in the data. The same is true for births, which is not surprising because these are a high proportion of admissions for this group. On the other hand, the average daily patient load has been somewhat greater under CHAMPUS for the past 4 fiscal years, and the relative use of CHAMPUS hospital beds has increased each year from FY 1967 through FY 1970.

TABLE B-3

RELATIVE USE OF CHAMPUS AND NAVY MEDICAL FACILITIES BY CLASS OF BENEFICIARY, FY 1967-71 (PERCENTAGES)

| | Admissions | | Occupied beds (ADPL) | | Births | |
|---|---|---|---|---|---|---|
| Year | Navy | CHAMPUS | Navy | CHAMPUS | Navy | CHAMPUS |
| Active duty dependents | | | | | | |
| 1967 | 51.3 | 48.7 | 51.9 | 48.1 | 50.2 | 49.8 |
| 1968 | 51.7 | 48.3 | 49.9 | 50.1 | 49.5 | 50.5 |
| 1969 | 50.4 | 49.6 | 47.3 | 52.7 | 48.8 | 51.2 |
| 1970 | 49.1 | 50.9 | 45.0 | 55.0 | 48.2 | 51.8 |
| 1971 | 51.9 | 48.1 | 47.5 | 52.5 | 51.3 | 48.7 |
| Retired dependents | | | | | | |
| 1967[a] | 78.6 | 21.4 | 67.2 | 32.8 | | |
| 1968 | 58.1 | 41.9 | 57.6 | 42.4 | | |
| 1969 | 53.3 | 46.7 | 49.0 | 51.0 | | |
| 1970 | 50.5 | 49.5 | 45.0 | 55.0 | | |
| 1971 | 48.9 | 51.1 | 41.3 | 58.7 | | |
| Retired | | | | | | |
| 1967[a] | 90.3 | 9.7 | 89.0 | 11.0 | | |
| 1968 | 78.4 | 21.6 | 85.5 | 14.5 | | |
| 1969 | 74.9 | 25.1 | 82.2 | 17.8 | | |
| 1970 | 71.0 | 29.0 | 79.1 | 20.9 | | |
| 1971 | 69.1 | 30.9 | 75.6 | 24.4 | | |

[a]CHAMPUS Data for 6 months only.

SOURCE: See Table B-2.

## TABLE B-4

## ANNUAL PERCENTAGE CHANGES IN BENEFICIARY POPULATION AND MEDICAL CARE MEASURES, CHAMPUS AND NAVY FACILITIES, FY 1967-1971

| From To | Population | Admissions | | | Occupied beds | | | Outpatient visits | | | Births | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Total | CHAMPUS | Navy | Total | CHAMPUS | Navy | Total | CHAMPUS | Navy | Total | CHAMPUS | Navy |
| Active duty dependents | | | | | | | | | | | | | |
| 1967 – 68 | –1.2 | –0.2 | –1.1 | 0.6 | 2.1 | 6.5 | –1.9 | 6.1 | 29.6 | 5.5 | 2.1 | 3.5 | 0.7 |
| 1968 – 69 | –1.1 | 3.2 | 7.7 | 0.6 | 3.0 | 8.4 | –2.3 | 4.7 | 28.2 | 3.9 | 6.0 | 7.4 | 4.5 |
| 1969 – 70 | –1.8 | 0.1 | 2.6 | –2.3 | –0.3 | 4.0 | –5.1 | 1.8 | 16.2 | 1.3 | 1.3 | 2.5 | 0.0 |
| 1970 – 71 | –2.7 | –1.8 | –7.1 | 3.6 | –1.3 | –5.8 | 4.1 | 3.1 | –17.6 | 4.0 | –3.9 | –9.7 | 2.3 |
| Retired dependents | | | | | | | | | | | | | |
| 1967[a]– 68 | 8.8 | 39.9 | 174.4 | 3.4 | 16.1 | 50.0 | –0.5 | 29.5 | 240.5 | 17.0 | | 243 | |
| 1968 – 69 | 7.8 | 19.1 | 32.7 | 9.4 | 23.5 | 48.6 | 5.1 | 19.0 | 59.5 | 12.0 | | 29 | |
| 1969 – 70 | 5.4 | 13.3 | 20.3 | 7.2 | 14.2 | 23.2 | 4.8 | 16.3 | 33.4 | 12.1 | | 15 | |
| 1970 – 71 | 4.7 | 15.8 | 19.5 | 12.1 | 11.1 | 18.6 | 2.1 | 22.4 | 38.3 | 17.8 | | 17 | |
| Retired | | | | | | | | | | | | | |
| 1967[a]– 68 | 8.8 | 22.8 | 173.3 | 6.6 | 5.9 | 40.0 | 1.6 | 13.3 | 200.0 | 8.8 | | | |
| 1968 – 69 | 7.8 | 13.7 | 32.3 | 8.6 | 7.1 | 31.7 | 2.9 | 15.9 | 60.0 | 13.0 | | | |
| 1969 – 70 | 5.4 | 10.0 | 26.9 | 4.3 | 5.7 | 23.5 | 1.8 | 13.3 | 27.2 | 12.0 | | | |
| 1970 – 71 | 4.7 | 14.0 | 21.6 | 10.9 | 6.1 | 23.9 | 1.4 | 13.1 | 22.4 | 12.1 | | | |

[a]1967 CHAMPUS data for 6 months only.

Source: See table B-2.

## TABLE B-5

## ACTUAL AND ESTIMATED NUMBER OF NAVY AND MARINE CORPS BENEFICIARIES ELIGIBLE FOR MEDICAL CARE IN NAVY FACILITIES, FY 1967-1974, AND ANNUAL PERCENTAGE CHANGES

| Fiscal year | Navy and Marine beneficiaries | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Active duty personnel | Percent change | Active duty dependents | Percent change | Retired personnel | Percent change | Dependents of retired | Percent change | Total | Percent change |
| 1967 | 1,025,427 | | 1,002,170 | | 202,577 | | 364,639 | | 2,594,813 | |
| 1968 | 1,050,192 | 2.4 | 989,904 | −1.2 | 222,171 | 8.8 | 399,908 | 8.8 | 2,662,175 | 2.5 |
| 1969 | 1,070,858 | 1.9 | 979,139 | −1.1 | 241,078 | 7.8 | 433,940 | 7.8 | 2,725,015 | 2.3 |
| 1970 | 1,027,223 | −4.1 | 961,253 | −1.8 | 254,864 | 5.4 | 458,755 | 5.4 | 2,702,095 | −1.0 |
| 1971 | 889,985 | −13.4 | 935,268 | −2.7 | 267,488 | 4.7 | 481,478 | 4.7 | 2,574,219 | −4.7 |
| 1972 | 818,933 | −8.0 | 864,735 | −7.5 | 283,116 | 5.5 | 509,609 | 5.5 | 2,476,393 | −3.8 |
| 1973 | 801,959 | −2.1 | 848,060 | −1.9 | 297,254 | 4.8 | 535,057 | 4.8 | 2,482,330 | 0.0 |
| 1974 | 791,815 | −1.3 | 874,357 | 3.0 | 311,392 | 4.5 | 560,506 | 4.5 | 2,538,070 | 2.2 |

Sources: FY 1967-1973 from FY 1973 OSD/OMB Submit, BuMed, 27 Oct 1971.
FY 1974 from BuMed APPORT & POM-74, 17 Apr 1972.

Two questions arise with respect to active duty dependents: (1) do the service measures in table B-2 adequately represent dependents' relative use of CHAMPUS and Navy facilities for total medical care during the years shown? (2) how can relative usage be projected for FY 1973 and FY 1974?

There is reason to believe that active duty dependents use Navy outpatient care more heavily than inpatient care, and therefore hospital admissions are less likely to be a satisfactory proxy for relative use of Navy and civilian facilities than is the case for retirees and dependents. There are two conflicting considerations affecting active duty dependents' use of Navy inpatient and outpatient care, which are peculiar to this class of beneficiary. On the one hand, the cost of inpatient care to the beneficiary is the same under CHAMPUS and in Navy facilities, but there are administrative constraints which serve to restrict the use of CHAMPUS. On the other hand, for outpatient care, there are no administrative constraints restricting CHAMPUS usage, but the costs to the beneficiary are higher. Moreover, active duty dependents are far less likely to have supplementary insurance. (For this same reason, CHAMPUS hospitalization data are a closer approximation to total civilian hospital usage than is true for retirees and their dependents.)

Usable CHAMPUS outpatient data are not available, and a number of conflicting factors make outpatient visits difficult to estimate. It may be seen from table B-2 that reported outpatient visits under CHAMPUS for active duty dependents have been lower than for retired dependents for the last 3 years, in spite of the fact that there are far more active duty dependents. On the other hand, reported outpatient visits are particularly depressed for active duty dependents because of the treatment of pre- and postnatal visits. It is also the case that our active duty dependents make heavy use of CHAMPUS relative to dependents of the other Armed Forces, and especially for outpatient care, as shown in table B-6. (The same holds true to a lesser extent for retired dependents compared with their Army and Air Force counterparts. The reasons for this are not known.)

Therefore we have assumed that active duty dependents use Navy facilities for outpatient visits twice as often as they use civilian facilities. We then converted the FY 1971 Navy and CHAMPUS data to composite work units,[1] making a slight upward adjustment in CHAMPUS data to compensate for the reporting lag. The calculations are as follows:

[1] For an explanation of composite work units, see "The Cost Spiral in U.S. Hospitals: 1963-1969," Resources Management Office, Office of the Surgeon General, Department of the Army, October 1970, pp. 51-52.

Navy facilities

| Service measure | Number of units | Weight | Composite work units |
|---|---|---|---|
| Admissions | 93,000 | 10 | 930,000 |
| ADPL | 1,300 | 1(x365) | 365,000 |
| Outpatient visits | 5,000,000 | 0.3 | 1,500,000 |
| Births | 38,000 | 10 | 380,000 |
| | | | 3,175,000 |

Civilian facilities

| Service measure | Number of units | Weight | Composite work units |
|---|---|---|---|
| Admissions | 88,000 | 10 | 880,000 |
| ADPL | 1,500 | 1(x365) | 548,000 |
| Outpatient visits | 2,500,000 | .3 | 750,000 |
| Births | 34,000 | 10 | 340,000 |
| Total | | | 2,518,000 |

The total composite work units are 5,693,000, of which 56 percent represent care in Navy facilities and 44 percent represent care in civilian facilities. This measure was used as a common denominator for weighting different types of medical care, although it is subject to serious criticism. Use of any of the other measures would result in a lower estimate of use of Navy facilities. Our estimate, therefore, is that the equivalent of 56 percent of the active duty dependent population received their medical care primarily in Navy facilities in FY 1971 and 44 percent in the civilian sector. This is believed to be a better estimate of the total medical care received in Navy and civilian facilities than the rough 50-50 division suggested by inpatient measures alone.

The second question is whether this relative usage for FY 1971 can be projected for FY 1973 and FY 1974 without modification. We do not believe that it can be. First, even without any policy shift concerning certificates of availability, fewer dependents will be residing apart from their sponsors than in the years covered by the data, and more will seek admission to Navy hospitals for maternity and other reasons because of increased proximity. Second, more space is becoming available as admissions of active duty personnel decrease. Data not presented in this paper show that the proportion of Navy hospital admissions for active duty dependents varies inversely with the proportion for active duty personnel. No doubt this reflects shifting policy to some extent. This is not true for other classes of beneficiaries. Therefore, it is projected that active duty dependents will receive 60 percent of their care in Navy facilities in FY 1973. We have not postulated any

drastic policy shift for the purpose of maintaining occupancy rates, and if there has been any such shift in FY 1972 or will be in the future, this estimate will have to be revised. As discussed previously, the certificate of availability can be used to influence relative usage greatly, and indeed, it was intended for this purpose. There are limits, however, because of the active duty dependents who will still be residing apart from their sponsors, and because of the adverse effects on morale of a massive policy shift.

An even greater shift of active duty dependents to Navy medical facilities is projected for FY 1974. The Surgeon General at the present time has several innovations either planned or in the early stages of implementation which will make care in Navy facilities more attractive to dependents. These are set forth in a memorandum to the CNO of 30 March 1972.[1] Because these improvements are so recent and many will take time before the effects are felt, they have not been incorporated in the FY 1973 projections. Two of the changes which are likely to have a considerable influence on active duty personnel are the establishment of evening clinics, which has already been implemented at several locations, and the institution of family practice clinics, which is just starting at three locations.

It is difficult to predict the impact of these improvements, but the potential impact of the family practice clinics for increasing the use of Navy facilities by active duty dependents (voluntarily) would appear to be great. In these clinics, it will be possible for military wives to receive much greater continuity of care throughout the course of a pregnancy than is now the case. It was seen that this was a major reason for their preference for hospitalization under CHAMPUS. Although it will take considerable time to fully implement this and other innovations, the effects should be felt by FY 1974. Therefore, it is projected that active duty dependents will receive 65 percent of their medical care in Navy facilities in FY 1974.

2. Retirees and Their Dependents

These two classes of the population may be discussed jointly, for although their behavior with respect to use of Navy facilities differs greatly, relative costs and other factors influencing them are the same. They are not subject to the certificate-of-availability constraint for either inpatient or outpatient care, hence their relative usage of facilities cannot be manipulated by this means. Their costs of using CHAMPUS are greater than for Navy facilities for both inpatient and outpatient care if they have no other insurance. The cost of using CHAMPUS outpatient care is always somewhat greater than the cost of inpatient care because the coinsurance feature is the same in either case, and the

[1] Memorandum to the Chief of Naval Operations from the Surgeon General, on SITREP Concerning Medical Retention, BuMed-1 30 March 1972.

TABLE B-6

RELATIVE USE OF CHAMPUS BY ACTIVE DUTY DEPENDENTS OF THE THREE ARMED SERVICES, CY 1970

| | Percent of population | Percent of outpatient care[a] | Percent of admissions |
|---|---|---|---|
| Army | 39 | 26 | 44 |
| Navy/Marine Corps | 25 | 39 | 33 |
| Air Force | 36 | 35 | 23 |

[a]Based on government costs for outpatient services; excludes outpatient prescription drug costs and program for the handicapped.

SOURCE: OCHAMPUS, 14th Annual Report, pp. 21, 20, 41.



TABLE B-7

RELATIVE USE OF CHAMPUS BY DEPENDENTS OF RETIRED PERSONNEL OF THE THREE ARMED FORCES, CY 1970

| | Percent of population | Percent of outpatient care[a] | Percent of admissions |
|---|---|---|---|
| Army | 38 | 30 | 35 |
| Navy/Marine Corps | 28 | 38 | 34 |
| Air Force | 34 | 32 | 31 |

[a]Based on government costs for outpatient services; excludes outpatient prescription drug costs and program for the handicapped.

SOURCE: OCHAMPUS, 14th Annual Report, pp. 21, 20, 41.

deductible applies only to outpatient care. (The relative cost difference declines as the total expenditure increases.) However the absolute cost difference is small, and for these beneficiaries inpatient care will serve as an adequate proxy for total care.

Tables B-2 and B-3 show the use of CHAMPUS increasing continuously and substantially for both groups throughout the entire period for all measures of medical care. It will be recalled that for these groups, CHAMPUS data understate total civilian usage of all services because of the residual nature of the CHAMPUS insurance. Taking both this and the reporting lag into consideration, it is clear that by FY 1971 retired dependents were receiving the major portion of their medical care in the civilian sector, in spite of the higher costs being borne by many of them. This was not true of retired personnel, who continued to be the heaviest relative users of Navy facilities, although their relative use is declining. Table B-7 shows that retired dependents use CHAMPUS outpatient and inpatient services more heavily than retired dependents of other services, as was true for Navy active duty dependents. Again, the reason for this is not known, but lack of access to Navy facilities is ruled out as a reason by comparing their utilization with that of retirees. Retirees use CHAMPUS facilities to approximately the same extent as those of the other services. Comparison of admissions data and ADPL data in table B-2 show that retired dependents particularly prefer civilian hospitals for longer lengths of stay, whereas the opposite is true of retirees. The greater use of Navy facilities by retirees than by their dependents, although the same relative costs confront each group, is undoubtedly due to their preference for the company of other military men.

Although the improvements in Navy medical care discussed in the preceding section should have some influence on retirees and their dependents, this will be much less than for active duty dependents and should be swamped by other factors. Continuity of care in maternity cases, in particular, will have no influence on retirees and only slight influence on their dependents. The trend toward increased use of civilian facilities should continue and probably accelerate, as awareness of both the CHAMPUS program and the supplemental insurance available through the retired associations increases. Indeed, it would appear that these beneficiaries have available better coverage and wider choice at lower cost than virtually any segment of the U. S. population, to the extent that they are aware of their options.

Tables B-2 and B-3 show that 51 percent of hospital admissions of retired dependents in FY 1971 were under CHAMPUS. There is no reason to believe that retired dependents or retirees use Navy outpatient care more heavily than inpatient care, as was the case for active duty dependents. In view of the reporting lag and the greater lengths of stay under CHAMPUS, it is estimated that retired dependents were using civilian facilities for at least 53 percent of their total medical care, and Navy facilities for 47 percent, in FY 1971. This does not allow for civilian usage which was not reported because of the residual nature of CHAMPUS. Making a minimal allowance for this underreporting, and taking into consideration the trend in usage and the fact that these beneficiaries are heavy

users of CHAMPUS (table B-7), it is projected that the proportion of retired dependents using Navy facilities for their medical care will decline to 44 percent in FY 1973 and 40 percent in FY 1974.

Tables B-2 and B-3 show that 31 percent of hospital admissions of retirees in FY 1971 were under CHAMPUS. This is accepted here as a proxy for their use of the civilian sector for medical care in FY 1971. Although there is a reporting lag in the CHAMPUS data, an offsetting factor is the longer stays in Navy hospitals. In view of the trend in relative usage and again making a minimal allowance for civilian usage which is not reported, it is projected that 67 percent of retirees will use Navy medical facilities in FY 1973 and 65 percent in FY 1974.

Estimates of civilian use are biased downward, perhaps significantly, because of unreported use. The only remedy that occurs to us is a survey of retirees and their dependents.

### 3. Numbers Receiving Navy Medical Care

The estimates of the proportions of each class of beneficiary receiving their medical care primarily from the Navy and in the civilian sector are summarized below.

| | FY 1971 | | FY 1973 | | FY 1974 | |
|---|---|---|---|---|---|---|
| | Navy | Civilian | Navy | Civilian | Navy | Civilian |
| Active duty dependents | 56% | 44% | 60% | 40% | 65% | 35% |
| Dependents of retired | 47 | 53 | 44 | 56 | 40 | 60 |
| Retired | 69 | 31 | 67 | 33 | 65 | 35 |

In table B-8, these estimates are applied to Navy population data in order to estimate the number of people receiving Navy medical care in fiscal years 1971, 1973, and 1974. The active duty population is assumed to receive all its care from the Navy. Both the total eligible population (including active duty) and the numbers receiving Navy medical care are somewhat lower in 1974 than 1971, although the 1974 figures show an increase over 1973. The proportion of the total eligible population receiving medical care from the Navy is constant at about 70 percent.

TABLE B-8

ESTIMATED NUMBERS OF ELIGIBLE POPULATION RECEIVING MEDICAL CARE IN NAVY FACILITIES, BY CATEGORY, FY 1971, 1973, 1974

| | Active duty | | | Active duty dependents | | | Retired dependents | | |
|---|---|---|---|---|---|---|---|---|---|
| FY | Number | % | Navy care | Number | % | Navy care | Number | % | Navy care |
| 1971 | 889,985 | 100 | 889,985 | 935,268 | 56 | 523,750 | 481,478 | 47 | 226,295 |
| 1973 | 801,959 | 100 | 801,959 | 848,060 | 60 | 508,836 | 535,057 | 44 | 235,425 |
| 1974 | 791,815 | 100 | 791,815 | 874,357 | 65 | 568,332 | 560,506 | 40 | 224,202 |

| | Retired | | | | | |
|---|---|---|---|---|---|---|
| FY | Number | % | Navy care | Total eligible population | % Navy care | No. Navy care |
| 1971 | 267,488 | 69 | 184,567 | 2,574,219 | 71 | 1,824,597 |
| 1973 | 297,254 | 67 | 199,160 | 2,482,330 | 70 | 1,745,380 |
| 1974 | 311,392 | 65 | 202,405 | 2,538,070 | 70 | 1,786,754 |

SOURCE: Population data, see table B-5.

It should be reiterated that we are not projecting absolute use of Navy medical facilities in this paper. However, the data could be used for that purpose, and a few words of caution are appropriate. Although the total eligible population and the numbers and proportions receiving medical care in Navy facilities are about the same in 1971 and 1974, the differences in the composition of this population can make a significant difference in the demands on Navy facilities. Active duty personnel are by far the heaviest absolute users of Navy facilities by all service measures except births, even in time of peace. Their representation in the eligible population will decline from 35 percent in 1971 to 31 percent in 1974. Active duty dependents are the second heaviest absolute users of Navy facilities; they will decline slightly as a percentage of the population, from 36 percent to 35 percent. The third heaviest users are retired dependents, and their representation in the population will increase from 19 percent to 22 percent. Finally, retired personnel make the lowest absolute demands on Navy medical facilities (with respect to admissions and outpatient visits -- they occupy a larger number of hospital beds than their dependents), although they are the heaviest users of Navy facilities relative to civilian facilities among the non-active duty population. Retired personnel will increase from 10 percent of the population in 1971 to 12 percent in 1974.

4. Some Implications of Observed Choices for Policy.

Although the main purpose of this paper is to estimate the population for which the Navy may be expected to provide medical care in the future, the analysis of choices by Navy beneficiaries and the constraints under which such choices are made has yielded some valuable by-products. These concern the related matters of the possibility of shifting a significant portion of the patient load to CHAMPUS, the effects of such a shift on morale, and the present "standards of service" in the Navy relative to the civilian sector generally. Although surveys can be very valuable, they are seldom a good substitute for observed behavior as a policy guide.

One of the proposed responses to an imposed reduction in medical staffing has been an increased use of CHAMPUS by non-active duty beneficiaries. Several arguments have been advanced against such a shift, but in light of the analysis of behavior contained in this paper, it appears that two of the major ones are invalid. These are the arguments concerning the adverse effect on morale and the inability of the civilian sector to handle the increased workload.

It is clear that forcing Navy beneficiaries to use CHAMPUS when they would prefer to use Navy facilities would have an adverse effect on morale. One possible response to staff reductions which has been mentioned, for example, would eliminate eligibility for Navy care categorically, i.e., by excluding all retirees and their dependents. However, it appears possible to shift a large portion of the patient load to CHAMPUS and simultaneously improve morale if this is done in a different way.

We shall consider first the potential effect of removing the certificate-of-nonavailability constraints for inpatient care for active duty dependents. It was noted earlier that Navy and Marine Corps active duty dependents use CHAMPUS to a much greater extent than their counterparts in the other services, for whatever reason. It was also noted earlier that the number of births in all military hospitals decreased by 50 percent from 1956 to 1958, after the introduction of the original Dependents' Medical Care Act. Indeed, this was the reason for introducing the restriction. It seems clear that removal of this restriction would again result in a considerable shift of active duty dependents to CHAMPUS voluntarily, and the additional option would enhance morale. If 20,000 of the 38,000 births in Navy hospitals in FY 1971 had been shifted to CHAMPUS, the decrease in total admissions to Navy hospitals would have been about 7 percent. Moreover, there are probably about 10 pre- and post-natal visits associated with each birth which also would be shifted to the civilian sector. There would also be a decrease in admissions for other causes, although this would be less than the decrease in maternity admissions, for the reasons discussed previously. Liberalization of this constraint could be accomplished by the Navy, but complete elimination would appear to require DoD or Congressional approval.

It has also been shown that retirees and their dependents have been making increased use of CHAMPUS ever since its inception, both relative to Navy facilities and in absolute terms, and that these beneficiaries are a large and growing segment of the total eligible population. They have made these choices in spite of the higher and not inconsiderable costs which confront many of them. It is clear that if the costs of using CHAMPUS and Navy facilities were equalized, there would be a very large shift to CHAMPUS for these beneficiaries, as well as a shift toward CHAMPUS outpatient care by active duty dependents. (van Dyke recommended that this be done by eliminating the cost-sharing features of CHAMPUS.)[1] A lesser shift could be induced by such variations as reducing the coinsurance percentage, eliminating or reducing deductibles, or eliminating the cost-sharing features only for outpatient visits of active duty dependents. These changes would clearly require Congressional action.

The main point is that it would be possible to shift a very great portion of the patient load to CHAMPUS without denying service in Navy facilities to any beneficiary, and that this could be done in a way which would improve morale, rather than cause it to deteriorate. Whether this decreased Navy patient load and improvement in morale would be worth the additional cost to the government is another matter. The government's cost would increase not only because of increased use of CHAMPUS, but also because it would bear a greater portion of the costs for those already using CHAMPUS. It is also the case that standards of service could be improved for those who continue to use Navy facilities.

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[1] Op. cit., p. 125.

The second major argument against increased use of CHAMPUS which observed behavior refutes is that the civilian sector would be unable to handle any significant part of the Navy patient load. The large and growing use of civilian facilities by retired dependents and retirees, and the earlier experience of active duty dependents, is evidence that many of our beneficiaries are able to find suitable accommodation in the civilian sector.

While it is clear that the potential shift to the civilian sector would be very great in the aggregate, there would be a very differential impact upon specific facilities. It has been pointed out that a majority of Navy medical facilities (though not necessarily of eligible population) are in areas where there are very limited civilian alternatives. In the short run, at least, one would expect relatively little of the aggregate shift to occur in these areas. (Removal of the constraints would, of course, reveal more clearly than surveys both the aggregate shift and the locations in which such shifts would occur. The shifts would be greater in the long run, if it were known that the removal of constraints was to be was to be permanent, in all locations.) Among the facilities which would experience the least shifting of patients to the civilian sector would be those serving the large east coast Marine Corps bases at Camp Lejeune, Cherry Point, and Parris Island. Active duty dependents have very limited civilian alternatives in these areas, and very few retirees have chosen to locate in these areas. This also suggests a disadvantage, viz., that a greater proportion of medical billets would be in less desirable locations.

The observed behavior also provides us with some insight into an area which has been very difficult to observe directly, and in which the interpretation of questionnaires is ambiguous at best. There were widespread criticisms about the standards of service in the general civilian sector concerning such matters as delays in obtaining appointments, time spent in waiting rooms, and brief and impersonal attention from physicians. However, the same complaints have been noted on surveys of Kaiser Plan subscribers and Navy beneficiaries. For example, a 1970 Navy survey[1] showed that more than half of both officer and enlisted respondents were dissatisfied with the care their dependents received during their last visit to a Navy medical facility. The major reason was length of wait, followed by "poor attitude shown by doctors." Such surveys are difficult to interpret because the same complaints arise in great volume under any system, and the respondents are not asked to judge one relative to another. Moreover, it has not been possible to get direct evidence about such matters as length of wait in the general civilian sector, or the Kaiser Plan, or the Navy. However, observed choices indicate that the shortcomings in the standards of service under the Kaiser Plan are not so severe, relative to the alternatives, to discourage membership. (However, this behavior may also be influenced by lower costs of the Kaiser Plan.) The behavior of Navy beneficiaries seems to indicate

[1] Op. cit.

that, on the whole, the deficiencies in the prevailing standards of service in the civilian sector are probably less than in Navy facilities. A majority of retired dependents elect civilian care, in spite of higher costs. It is unlikely that location explains this, for a majority of retired personnel elect care in Navy facilities. Moreover, it is not clear how retirees would choose if the relative costs were the same, although they would still be expected to use Navy facilities to a greater extent than their dependents. Relative costs of inpatient care are the same in each sector for active duty dependents, and it is clear that a majority of them would opt for civilian care if it were not for the administrative constraint, in spite of the fact that many of them are located in areas where there are very limited civilian alternatives.

In conclusion, this analysis of observed behavior provides evidence on the extent to which Navy beneficiaries would choose civilian care in the absence of constraints, upon the availability of such care, and upon the relative standards of service in the Navy and civilian sectors. It indicates that two commonly mentioned objections to a shift toward greater use of CHAMPUS are invalid, and that such a shift would be possible with an increase, rather than a decrease, in morale. It does not indicate that such a shift would be desirable; other valid objections remain, particularly with respect to costs.

# APPENDIX C

# THE QUESTION OF THE ROTATION BASE FOR PHYSICIANS

The problem of identifying optimal rotation policies (including length of undesirable tours and the size of the rotation base, if any, needed to support these billets) is an extremely complex and important one which confronts the entire Navy and has not as yet been solved. Nor have we been able to solve it satisfactorily here with respect to physicians, although we have been able to narrow the problem down considerably and make some progress toward a solution.

One of the differences between the Navy and the Kaiser Plan is the existence in the Navy of certain professionally unrewarding or otherwise undesirable physician billets. Many of these billets will be associated with peculiarly military requirements (e.g., sea duty, although not all peculiarly military billets are undesirable. Others may be undesirable because of the location of the activity; possible examples may be the hospital on Guam or the dispensary in Newfoundland. Again, dispensary duty per se may be undesirable to some individuals.

The military medical departments have often pointed to the undeniable existence of these billets as a reason why more physicians are needed than would otherwise be the case. However, the provision of extra billets to provide a rotation base (so that undesirable tours can be shorter and the percentage of such billets in the total reduced) is only one of at least three possible ways of dealing with the problem of undesirable billets, and probably the least efficient. Two other approaches to the problem are:

1. Pay whatever premium is necessary to attract volunteers to accept such duty for specified periods. Those who volunteer for undesirable tours are likely to be the ones who object least to these assignments.

2. Increase the general level of pay sufficiently to compensate for periodic rotation or a known risk of random rotation to an undesirable billet.

Neither of these solutions entails the provision of extra physicians solely for the purpose of maintaining a rotation base, i.e., for physicians over and above the number that would be necessary if all assignments were equally desirable. However, for the purposes of this paper, we assume that the pay legislation necessary to implement these approaches will not be forthcoming, and that we are confined to the "rotation base" approach.

While the rotation base approach to the problem of undesirable billets has often been advocated, and advanced as a reason for providing more physicians, we are not aware of any good estimates of the extra number needed to implement this solution. Such a procedure would have to include identification of the number of billets which are, with a high degree of unanimity, considered undesirable, the proportion these billets are of the total, and the effects (on procurement and retention) of reducing tour lengths and/or the probability of serving in undesirable billets.

The lack of numerical estimates is not surprising, for the problem is a very complex one and not a very pressing one under a procurement system based on conscription. Under such a system, the least desirable billets could be staffed very heavily with junior officers, who would probably not remain in the Navy in any event. (It is somewhat ironic that many of the peculiarly military physician billets have thus been filled largely by physicians who are essentially civilians in uniform.) This is a very sensible policy under conscription, for to assign these billets to officers who have completed their obligated service would only serve to deplete the already small numbers of career medical officers.[1]

Analysts who have attempted to deal with the problem of Navy rotation are immediately impressed with the fact that it cannot be adequately addressed on a "macro" or aggregate basis, but must be handled on a "micro" or specialty-by-specialty basis. This is true also within the Medical Corps. It is the policy of BuMed to assign physicians to billets utilizing their specialties insofar as possible, and it appears that this policy is adhered to reasonably well. Thus, in examining assignment by specialty in table C-1, we do not see obstetricians assigned to ships or other such evidence of gross misallocation. The remainder of this paper will be devoted to an examination of the data in table C-1. What this examination shows, briefly, is that provision of a rotation base appears to present a problem primarily with respect to general medical officers. Although the number of general medical officers is large, they constitute only about 30 percent of all medical officers who are not serving internships or residencies.

Table C-1 has been prepared from data furnished by BuMed; it shows the type of assignment (e.g., hospital, ships, FMF, etc.) by specialty for each specialty. The numbers represent on-board strength as of February 1972. There are seven types of assignments filled by 466 medical officers for which a breakdown by specialty was not furnished, which are listed at the bottom of the table. Fortunately, only 43 of these assignments (other mobile operating units, Seabees, and AFEES) appear to be of a nature which may be considered undesirable. The three major types of assignments (staff and administration, research, and education and training) do not appear to pose rotation problems, but rather to provide a rotation base.

Examination of table C-1 shows that the great majority of medical specialties are either very heavily or exclusively hospital-based, and therefore rotation to such potentially undesirable assignments as sea duty, FMF, and small dispensaries is not a problem. Some specialties are concentrated in only a few hospitals. This is not true only for general medicine (00), flight surgeons (05) and submarine medicine (08), and a few specialties with very few physicians. Each of these specialties is a "closed loop," i.e., it provides its own rotation base. Even for specialties which are solely hospital-based, of

[1] One possible course of action in the future is to fill these billets largely with medical scholarship recipients during the period of their obligated service. However, such a policy would have to be weighted against its effects on attraction into the scholarship program.

## TABLE C-1

## U.S. NAVY MEDICAL OFFICERS ON BOARD, FEBRUARY 1972, BY SPECIALTY AND ASSIGNMENT

| Specialty number | Specialty title | Hospitals | Number of hospitals | Residents | Interns | BuMed dispensaries | Regional medical center | Other dispensaries | Air squadrons | Ships | FMF | Other mobile operating units | MCB | AFEES | Staff and administration | Research | Education and training | TPP | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 00 | General medical officer | 474 | (38) | 11 | 154 | 34 | 67 | 411 | 2 | 172 | 99 | | | | | | | | 1424 |
| 05 | Aviation medicine (flight surgeon) | 24 | (12) | | | | 5 | 92 | 120 | 15 | 42 | | | | | | | | 298 |
| 06 | Aviation medicine (aviator) | 1 | (1) | | | | | 4 | 5 | 2 | | | | | | | | | 12 |
| 08 | Submarine medicine | 5 | (5) | | | 1 | | 20 | | 52 | | | | | | | | | 78 |
| 11 | Public health | | | | | | | 3 | | 1 | | | | | | | | | 4 |
| 13 | Occupation medicine | | | | | | 1 | 1 | | 1 | | | | | | | | | 3 |
| 17 | Tropical medicine | 1 | (1) | | | | | 1 | | | | | | | | | | | 2 |
| 19 | Nuclear medicine | 1 | (1) | | | | | | | | | | | | | | | | 1 |
| 20 | Internal medicine | 178 | (37) | 84 | | 3 | 2 | 7 | | 1 | | | | | | | | | 275 |
| 21 | Gastroenterology | 12 | (8) | 5 | | | | | | | | | | | | | | | 17 |
| 22 | Allergy | 4 | (4) | | | | | | | | | | | | | | | | 4 |
| 23 | Hematology | 7 | (5) | 5 | | | | | | | | | | | | | | | 12 |
| 26 | Pulmonary disease | 4 | (3) | 3 | | | | | | | | | | | | | | | 7 |
| 28 | Cardiovascular disease | 26 | (14) | 4 | | 1 | | 1 | | | | | | | | | | | 32 |
| 30 | Radiology | 102 | (34) | 37 | | 3 | 2 | 6 | | | 1 | | | | | | | | 151 |
| 37 | Radiobiology | 2 | (2) | | | | | 1 | | | | | | | | | | | 3 |
| 40 | Pathology (anatomical) | 66 | (26) | 27 | | | 1 | 3 | | | | | | | | | | | 97 |
| 45 | Physiology | | | | | | | | | 1 | | | | | | | | | 1 |
| 50 | Psychiatry | 127 | (32) | 19 | | 6 | 2 | 38 | | | 5 | | | | | | | | 197 |
| 56 | Neurology | 32 | (16) | 1 | | | | | | | | | | | | | | | 33 |
| 60 | General surgery | 162 | (38) | 68 | | | 1 | 13 | | 13 | | | | | | | | | 257 |
| 62 | Plastic surgery | 19 | (10) | 2 | | | | | | | | | | | | | | | 21 |
| 64 | Thoracic surgery | 26 | (15) | 5 | | 1 | | | | | | | | | | | | | 32 |
| 65 | Neurosurgery | 25 | (14) | 1 | | | | | | | | | | | | | | | 26 |
| 67 | Proctology | 1 | (1) | | | | | | | | | | | | | | | | 1 |
| 70 | Otolaryngology | 47 | (22) | 35 | | | | 1 | | | | | | | | | | | 83 |
| 77 | Ophthalmology | 59 | (27) | 27 | | 1 | 3 | 3 | | | | | | | | | | | 93 |
| 82 | Research | 1 | (1) | | | | | 2 | | | | | | | | | | | 3 |
| 84 | Pediatrics | 150 | (38) | 36 | | 6 | 2 | 19 | | | | | | | | | | | 213 |
| 85 | Physical medicine | 2 | (2) | | | | | | | | | | | | | | | | 2 |
| 89 | Dermatology | 46 | (23) | 18 | | 1 | 1 | 1 | | | 1 | | | | | | | | 67 |
| 91 | Orthopedic surgery | 116 | (33) | 58 | | | | 2 | | | | | | | | | | | 177 |
| 93 | Anesthesiology | 148 | (35) | 40 | | | | 5 | | 1 | | | | | | | | | 194 |
| 96 | OB-GYN | 137 | (36) | 51 | | 3 | 2 | 19 | | | 2 | | | | | | | | 214 |
| 97 | Urology | 44 | (23) | 24 | | | | 1 | | | | | | | | | | | 69 |
| 99 | Osteopathy | | | | | | | 1 | | | | | | | | | | | 1 |
| | No specialty information given | | | | | | | | | | | 16 | 12 | 15 | 177 | 82 | 158 | 6 | 466 |
| | Total | 2049 | | 561 | 154 | 60 | 89 | 655 | 127 | 259 | 150 | 16 | 12 | 15 | 177 | 82 | 158 | 6 | 4570 |

course, there may exist undesirable locations (perhaps Guam and Guantanamo Bay) for which a rotation base should be provided. However, at current strengths it appears that billets in other hospitals provide an ample rotation base and would continue to do so even if billets in that specialty were greatly reduced. Rotation among hospitals which are not considered to be in undesirable locations presents no problem.

In wartime, of course, the number and the proportion of undesirable billets will increase, but examination of 1967 assignment data shows that even then this increase primarily affects a relatively small number of specialties, notably general medicine, aviation medicine, internal medicine, general surgery, orthopedic surgery, and anesthesiology.

We shall now illustrate the rotation base available within most specialties by considering anesthesiology (93). Table C-1 lists 154 anethesiologists, exclusive of 40 residents, of whom 148 were assigned to hospitals, 5 to dispensaries, and 1 aboard ship. (It is not known how many anesthesiologists may have been in training and education, research or administrative assignments.) The 5 dispensary assignments are probably in large dispensaries with authorized beds, and it is not apparent that these are undesirable assignments, but let us assume that they are. Ten anesthesiologists are assigned to overseas hospitals, but again these are not necessarily undesirable locations. Let us assume that the 5 assignments at hospitals at Guantanamo Bay and Guam are so considered. Finally, assume that the 10 stateside hospital assignments at Camp Lejeune, Cherry Point and Beaufort are also considered undesirable. (Other than these, an examination of the locations of naval hospitals in the U.S. does not suggest any that are in palpably undesirable locations. In this respect, the Navy is undoubtedly more fortunate than the Army or Air Force.) This would result in 20 undesirable assignments out of about 160, so that one man in eight would have such an assignment at any time. Or we could say that if all specialists were rotated equally among desirable and undesirable positions, a man might expect to spend one year out of eight in an undesirable location. It is not apparent that this creates any need for a rotation base larger than the existing one. Similar results could be shown for most of the other specialties, except for the three mentioned as presenting possible rotation problems.

There are 4 hospital-based specialties which have somewhat larger numbers assigned to dispensaries, namely, psychiatry (50), obstetrics-gynecology (96), pediatrics (84), and general surgery (60). General surgery also has 13 assignments on ships. However, in each case these specialists are stationed at only a few of the several hundred dispensaries, presumably the larger ones which also provide inpatient care. (Psychiatry is not generally a hospital-based specialty in the civilian sector.) It is not clear that these relatively few dispensary assignments are unanimously regarded as undesirable.

We shall now discuss the three specialties for which rotation might present a problem, viz., general medicine, submarine medicine, and aviation medicine. Table C-1 shows 1635 physicians in these specialties (exclusive of interns and residents), and if we assume that the 43 physicians assigned to AFEES, MCBs and other mobile units are general medicine officers, this raises the number to 1678 out of a total of 3855, excluding residents and interns.

Table C-1 shows 78 specialists in submarine medicine, 52 of whom were aboard submarines in February 1972.[1] This specialty is not only uniquely military, it is uniquely Navy. However, it is not clear whether there has been a rotation problem in this specialty in the past. All assignments to submarines, including physicians, have been voluntary. If a physician chooses to specialize in submarine medicine, he presumably does not regard submarine duty in the same undesirable light as would most physicians. Moreover, physicians aboard submarines are reportedly to be replaced with independent duty hospital corpsmen in the future.

Table C-1 also shows 298 flight surgeons in February 1972; 177 of these were assigned to air squadrons, ships, and FMF, and 121 to hospitals and dispensaries. Aviation medicine is a heavily, though not exclusively, military specialty. A "duty cycle" in peacetime might consist of two years assigned to an air squadron (about half of which would be spent at the home base and half at sea or otherwise deployed), followed by two years of strictly shore duty. It is not obvious how onerous such a rotation schedule would be for a physician choosing to specialize in flight medicine. It is not clear whether any additional rotation billets are necessary, much less how many; therefore no additional rotation billets have been estimated for this specialty. This could easily be amended in light of better information.

The principal (and perhaps the only) rotation problem, in terms of both numbers and proportion of ostensibly undesirable duty stations is that of general medical officer assignments. There were about 1300 GMO assignments in February 1972 (excluding residents and interns); about 25 percent (313) were assigned to sea duty and FMF, 36 percent (474) to hospitals, and 39 percent (512) to various dispensaries and the ragional medical center in Norfolk. We assume that the sea duty and FMF billets are considered undesirable with a high degree of unanimity. Moreover, some of the dispensaries will be located in geographical areas which may be considered undesirable by many physicians. (An examination of a listing of about 150 dispensaries does not suggest a large number of dispensary assignments in locations which would be palpably and unanimously considered undesirable.)

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[1] Apparently, some physicians assigned to submarines were not specialists in submarine medicine, because 81 physicians were reportedly assigned to submarines. (BuMed briefing presented to the CNO on 22 March 1972, Subject: "Reductions in Strength of Health Professions.")

In addition, there may be an antipathy toward dispensary duty per se, compared with a hospital assignment. But it is difficult to assess how widespread this would be among general medical officers. For one thing, it would appear that the Navy does afford a larger proportion of hospital-based assignments for generalists than does the civilian sector. For another, such assignments are reported to provide considerable opportunity for moonlighting, so that in a sense the assignment affords a type of premium. If we assume that 100 of these dispensary assignments are undesirable, and add these to the FMF and sea duty billets, we get about 400 undesirable billets out of 1300, or about one-third. In this case, one-third of the general medical officers would be in undesirable billets at any given time. If each GMO were rotated equally between desirable and undesirable billets, each would spend every third year in an undesirable billet. If it were considered that spending every fifth year in such a billet would be tolerable, this would imply an increase of 700 billets to provide a rotation base for this specialty. Obviously, these assumptions are arbitrary, and the implications of other assumptions about the number of undesirable billets and probability of assignments to such billets may easily be substituted. This is why we said at the outset that we have narrowed down the problem, but not solved it.

However, the above exercise was conducted based on the present number of general medical officers and total medical officers. Our purpose is to estimate the additional number of billets to be added to the number thus far established in this study because of the rotation base. The number arrived at thus far is about 2100, exclusive of interns and residents, or slightly more than half of the corresponding number at the present time. If we assume that all specialties will be reduced in the same proportion, and that desirable and undesirable assignments will also be reduced in the same proportion, there would be about 650 general medical officer billets. One-third of these, or 220, would be in undesirable assignments; thus such an assignment would occur one year in every three. If we were to provide a rotation base so that an undesirable assignment would occur only one year in five, then a total of about 1050 GMO billets would be needed, or about 400 rotation billets. The calculations are again sensitive to the assumptions made, but other assumptions can easily be substituted and their implications traced out. It is likely, for example, that undesirable billets will be reduced to a greater extent than desirable billets.

While the rotation problem has not been solved we think it has been narrowed down considerably, and shown to be a problem primarily affecting general medical officer assignments. Actually, the problem is the existence of a certain number of undesirable assignments which are inherent in the Navy and Marine Corps. The use of a larger number of physicians than would otherwise be necessary in order to maintain a rotation base is one possible solution to this problem. We believe that our estimate of an additional 400 billets for this purpose is a reasonable one for the present time. As the scholarship program becomes a major source of accessions, it may be possible to reduce this number by using these physicians for short tours in the undesirable billets.