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Dear Dr. Smith:

This responds to your April 21, 1994, Freedom of Information Act (FOIA) request pertaining to a Rand Corporation report prepared for the Department of Defense. Our May 2 interim response refers.

The Office of the Assistant Secretary of Defense (Program Analysis and Evaluations) has provided the enclosed record as responsive to your request.

The administrative cost of processing this request was $75.91. Since the chargeable cost of processing was under $15.00, there are no assessable fees in this instance.

Sincerely,

SIGNED

D. J. Blakeslee
Acting Director
Freedom of Information
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The Demand for Military Health Care

Supporting Research for a Comprehensive Study of the Military Health Care System

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Prepared for the
Office of the Secretary of Defense

RAND

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PREFACE

This report documents supporting research for the Comprehensive Study of the Military Medical Care System, which was requested by the National Defense Authorization Act for Fiscal Years 1992 and 1993. Within the Department of Defense, the study was entrusted to the Director of Program Analysis and Evaluation, who asked RAND to undertake research on the utilization of health care by military beneficiaries and the costs of care provided through CHAMPUS (Civilian Health and Medical Program of the Uniformed Services). The analyses cover current utilization and costs, and they project utilization and costs for several analytic cases that alter the structure of the military system. This report contains the results for two of the four analytic cases: one that implements managed care in the current structure and a second that differs from the first by expanding military facilities. The final version of the report, covering all four cases, will be issued soon.

The work reported here has been carried out within the Defense Manpower Research Center, a component of RAND's National Defense Research Institute, a federally funded research and development center sponsored by the Office of the Secretary of Defense and the Joint Staff.

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SUMMARY

The Military Health Services System (MHSS) provides health care to active-duty service members, military retirees, and their dependents. Over the past several years, the system has faced the twin challenges of downsizing in consonance with the rest of the Department of Defense (DoD) and of controlling escalating health care costs. These challenges cannot, however, be dealt with independently. Closing military treatment facilities (MTFs) could drive non-active-duty beneficiaries to seek more expensive medical care from the civilian sector, care that is reimbursed by DoD through the Civilian Health and Medical Program of the Uniformed Services (CHAMPUS). In 1991, in response to a congressional request, the Director of Program Analysis and Evaluation (PA&E) undertook an evaluation of health care utilization and costs within the current system and of various possible alternatives to that system. PA&E turned to RAND's National Defense Research Institute (NDRI) for analytic support in responding to Congress. Specifically, we were asked to compare current utilization by military beneficiaries with use by civilians, to develop analytic cases to study alternatives to the current medical structure, and to assess costs and changes in utilization associated with these cases (with the exception of MTF costs, which are being assessed by the Institute for Defense Analyses).

We compared utilization data from a survey fielded as part of the PA&E study with data from ongoing civilian-sector surveys. After correcting for demographic differences and other factors unrelated to military service that might influence health care use, we were able to verify previous research findings that utilization by military beneficiaries is higher than that in the civilian sector. We found that the rates at which military beneficiaries used inpatient and outpatient services were on the order of 30 to 50 percent higher than those of civilians in fee-for-service plans. We suspect that these differences result from the more generous health benefits available in the military, from the greater risk of injury faced by service members in contrast to civilians, from military practice patterns and work-excuse rules, and

from the influence of those factors on the proclivity of military families to use health care services.

Surveys are not the only source of data on utilization by military beneficiaries. The MHSS collects its own data, data that suggest dramatically different utilization rates for some groups of beneficiaries. After careful review, we found that various aspects of MHSS data collection, recording, and reporting can make it difficult to draw reliable inferences from these data on health care utilization. These findings suggest that caution be exercised in the uncritical use of such data.

We developed analytic cases that incorporate four very different ways of providing military health care in the future:

- To continue the current system, but with nationwide implementation of managed-care options such as those now in place in California, Hawaii, the Southeast, and elsewhere. DoD has now amassed considerable experience with these options and expects that with some modifications, they will control costs while improving beneficiary satisfaction.
- To expand the number of MTFs as well as the size and staffing of selected facilities. This alternative takes the system in the opposite direction from the current downsizing trend in the interests of shifting more dependents and retirees from CHAMPUS coverage to MTFs, which are generally thought to be less costly. It raises the question, however, as to whether increasing access to MTFs, where care is free to beneficiaries, might increase the demand for health care and draw in beneficiaries now using private health insurance plans.
- To reduce the number of military hospitals from more than 100 to around 10, enough to handle casualties returning from an overseas conflict either through treatment or through referral to civilian-sector hospitals. Under this alternative, most hospitals at military installations would survive only as outpatient clinics. All non-active-duty beneficiaries would enroll in civilian managed-care health plans, and care for active-duty personnel beyond what the clinics could provide

would be furnished by civilian-sector providers under the supervision of the clinics. This alternative would greatly reduce MTF fixed costs while putting into place a mechanism for controlling civilian-sector costs.

- To establish competing health care plans: One health maintenance organization (HMO) operated by military hospitals and the others civilian plans. Service members would enroll in the military plan, while other beneficiaries would choose from among the military HMO and civilian plans. This would allow DoD to take advantage of the usual efficiency enhancements that result from competition.

In this version of the report, we compare utilization and CHAMPUS costs for the first two analytic cases only. Our analysis was based on what we know about the way in which utilization by military beneficiaries rests on the cost and availability of military and civilian health care resources. We projected that MTF utilization in the expanded-MTF case would be roughly 15 percent greater than that in the modified current system envisioned in the first case but that CHAMPUS-funded use would be less, albeit not by as much--only by enough to permit an 9 percent drop in CHAMPUS costs. For every CHAMPUS visit not made in the expanded-MTF case, 1.7 additional visits would be made at the MTF; for every CHAMPUS hospitalization avoided, 2.5 additional patients are admitted to the MTF. Comparisons of other alternatives will be made in the final version of this report.

1. INTRODUCTION

Section 733 of the National Defense Authorization Act for Fiscal Years 1992 and 1993 requires that the Secretary of Defense to conduct a comprehensive study of the military health care system to include two major elements: (1) a "systematic review of the...system required to support the Armed Forces during a war or other conflict and any adjustments to that system that would be required to provide cost-effective health care in peacetime"; and (2) a "comprehensive review of the existing...civilian health care...programs that are available as alternatives to...the existing military medical care system." Within the Department of Defense (DoD), this study was entrusted to the Director of Program Evaluation and Analysis (PA&E), who requested that RAND carry out supporting research on the peacetime demand for health care by military beneficiaries. The purpose of the current report is to document the first phase of this research. A subsequent version of the report will incorporate the rest of the research.

The congressional language also delineated some requirements for the content of the study report. With respect to the provision of peacetime health care, the report was to include:

- An evaluation of beneficiaries' utilization of inpatient and outpatient services, identifying deviations from utilization patterns in civilian health plans;
- A list of methods for providing care that are available as alternatives to the current military health care system;
- The relationship between the demand for health care and the availability of military medical resources;
- The likely response of beneficiaries to any planned changes in the costs they bear for care; and
- A comparison of the costs of providing care in military treatment facilities with those of indemnity plans or health maintenance organizations (HMOs).

We take these items up in order, following a brief description of the military health care system and of recent efforts to reform that

system (Section 2). Section 3 then compares health service utilization in the military system with that of civilian health plans, investigates potential reasons for the differences measured, and compares measures of military utilization derived from different data sources. Section 4 describes in some detail the alternative systems that were developed as analytical cases for the study. Although the general shape of these cases was determined by PA&E, the details needed for analysis were developed by RAND. Estimates of the effects of two cases on health care utilization and civilian care costs are provided in Sec. 5; the effects of the other cases will be included in the final report.[1] We did not estimate the costs associated with utilization of military health facilities. This task was carried out by the Institute for Defense Analyses (IDA), based on utilization estimates we provided to them. The report concludes in Section 6 with some observations about the results.

This study of the military health care system is being carried out as the nation considers major health-care reform. The legislation submitted last fall by the President would authorize DoD to establish one or more health plans and collect premium contributions from private employers of military beneficiaries who enroll in a military plan. DoD would have wide latitude in structuring its health program, so any of the alternatives developed as analytical cases for this study could be pursued with national health reform. However, national reform will alter DoD's health-care costs and may affect beneficiaries' use of the military system under all alternatives. A discussion of the implications of national reform is postponed to the final version of this report, which will include an analysis of all the analytical cases studied.

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[1]We did not analyze the effects of alternative systems on other health-care outcomes, such as patient satisfaction or health status. These outcomes are addressed elsewhere in the study.

2. STRUCTURE OF THE CURRENT MILITARY HEALTH SERVICES SYSTEM

The Military Health Services System (MHSS) provides health care to roughly 9.2 million beneficiaries, including active-duty military personnel and their dependents, retired military personnel and their dependents, and survivors of military personnel.[1] Approximately 8.5 million of these beneficiaries live in the United States, where at the end of FY92 the MHSS provided direct military care through 117 military hospitals and some 400 military clinics.[2] With military downsizing and base closures, the number of military facilities has declined and is expected to continue to decline such that by about 1997 only 101 military hospitals are expected to remain in operation.[3] The MHSS augments this military treatment facility (MTF) system with CHAMPUS,[4] a health insurance plan that finances civilian health care for most non-active-duty beneficiaries under the age of 65. Since MTF care is free whereas CHAMPUS requires beneficiary cost sharing, the real benefits available to military beneficiaries are greater for those living near an MTF.

HEALTH CARE SERVICES IN MILITARY TREATMENT FACILITIES

Military hospitals provide care to all military beneficiaries free of charge as capacity permits. By law, such hospitals accord first priority to active-duty personnel, followed by active-duty dependents and then retirees, their dependents, and other beneficiaries.

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[1]In addition, the MHSS provides health care for National Guard and Reserve members serving on active duty (and their families), civilian employees at selected DoD facilities, and other beneficiaries of government health care.

[2]The almost 400 military clinics mentioned here independently report workload and other data into biometrics military data systems; other clinics report data only through their parent hospitals. We have not included Coast Guard clinics or U.S. treatment facilities (formerly the Public Health Service hospitals).

[3]This assumes that all planned base closures are ultimately implemented, including those in the 1993 BRAC (Base Realignment and Closing) actions.

[4]Civilian Health and Medical Program of the Uniformed Services.

These hospitals vary widely both in size and in the range of services they can provide. The largest are medical centers, which have hundreds of operating beds each and which offer a comprehensive range of health care services; medical centers also provide graduate medical education (GME) to train many of the doctors who will be used by the military. The remaining hospitals can be classified either as small hospitals--those that operate fewer than 70 beds and provide basic medical care--or as medium hospitals that operate from 70 to about 200 beds and offer a broader range of services, albeit not as broad as those of medical centers. At the end of 1992, the MHSS had 69 small hospitals, 30 medium hospitals, and 18 medical centers; by 1997, the MHSS will have 60 small hospitals, 24 medium hospitals, and 17 medical centers.

Each military hospital has a defined service area--called a catchment area. This area generally includes the zip code areas within 40 miles of the hospital. Maps of the continental U.S., showing the location of the MTFs still open in 1997, may be found at the end of Sec. 4. Many MTFs located in the southeast and southwest. Most military beneficiaries live near an MTF. Military hospitals and their associated outpatient clinics serve 87 percent of all active duty personnel, 80 percent of their dependents, and 57 percent of retirees and all other beneficiaries. Including freestanding military clinics, these percentages rise to 90, 89, and 68, respectively.

A few catchment areas have extended their MTF capacity through PRIMUS/NAVCARE clinics. These clinics, which are operated by civilian contractors off-base, provide primary care at no cost to non-active-duty beneficiaries.

Some military bases have only a military outpatient clinic. Such military clinics provide care primarily to active-duty personnel; some provide little or no care to other beneficiaries, whereas others offer primary care and referrals as required to military or civilian specialists and hospitals. Some of the larger of these clinics also provide a "holding area"--an infirmary-like facility in which overnight care and observation can be provided, especially for active-duty personnel.

Outside of military hospitals and clinics, the military has a large number of corpsmen and doctors who serve as part of military units. For example, some doctors are assigned to ships, providing care for ship personnel both in port and while away from port. Finally, when necessary, the military also deploys "detached" medical facilities in the form of field hospitals and hospital ships. These facilities provide inpatient as well as outpatient services.

CHAMPUS

Non-active-duty beneficiaries under the age of 65 may also obtain health care from civilian providers through CHAMPUS. Beneficiaries living near an MTF, however, must use that MTF instead of CHAMPUS for high-cost outpatient services as well as for all inpatient services if such services are available there. This rule applies to all CHAMPUS-eligible beneficiaries who live in a given MTF's defined catchment area, which extends approximately 40 miles from that MTF. When military beneficiaries reach the age of 65, CHAMPUS eligibility automatically ends and Medicare coverage begins; eligibility for treatment at military facilities continues.

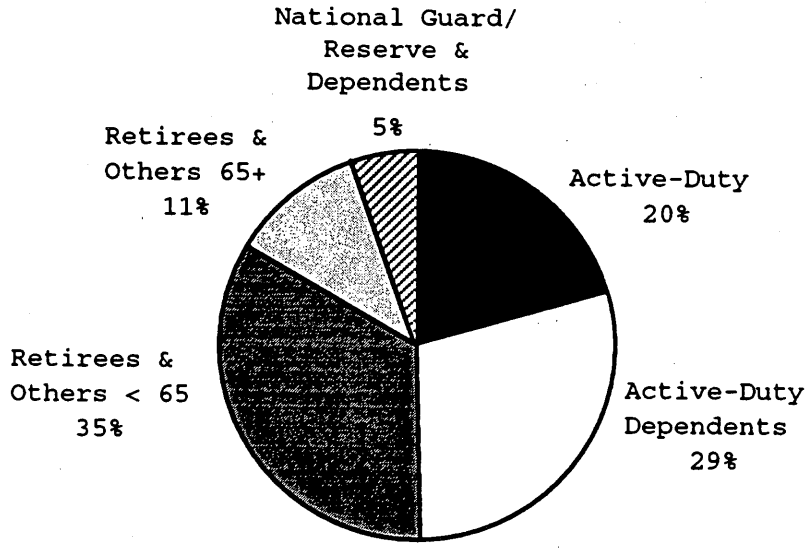

Figure 1--Composition of the Military Beneficiary Population, FY92

Under the standard CHAMPUS plan, beneficiaries who use a civilian provider for outpatient care face a small deductible along with a copayment of 20 to 25 percent. Active-duty dependents pay only a nominal copayment for civilian inpatient care, but retirees and dependents face the same copayment and deductible as that associated with outpatient care. The first column in Table 1 lists standard CHAMPUS benefits in more detail.

ONGOING REFORM IN THE MHSS

Since 1988, DoD has experimented with several new programs that offer beneficiaries managed-care alternatives to the standard CHAMPUS plan with more generous benefits. Programs that were in operation at the end of 1992 included the CHAMPUS Reform Initiative (CRI), which is offered in California and Hawaii;[5] the Catchment Area Management (CAM) program, which subsumes three catchment areas;[6] and a preferred-provider organization (PPO) in the southeast. CRI and CAM were also designed to encourage better coordination between the MTFs and CHAMPUS, to improve beneficiary access and satisfaction, and to make the system more cost-effective. Specifically, CRI offers beneficiaries the choice of (1) remaining in the standard MTF/CHAMPUS plan, which is enhanced with an optional PPO that lowers the CHAMPUS copayment for beneficiaries who use selected civilian providers, or (2) enrolling in an HMO that eliminates most cost sharing for civilian care but covers only care that is obtained from MTFs or from selected civilian providers. The CAM programs offer beneficiaries a choice of either the standard plan (without the PPO option) or an HMO plan (Air Force) and a PPO plan (Navy).[7] Table 1 also summarizes the benefits offered in the CRI and CAM enrollment plans as well as in the optional PPO available both in the CRI and in the southeast-region program.

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[5]For an evaluation of CRI, see Hosek et al. (1993) and Sloss and Hosek (1993). A similar evaluation of CAM is under way.

[6]The CAM demonstration program was implemented at five sites, but two of these sites were no longer operational by the end of 1992 because their demonstration authority had ended.

[7]The Army CAM program ended in FY92; its enrollment plan was an HMO.

On the basis of its experience with these programs, DoD has developed a permanent managed-care reform to the MHSS that is based on the CRI but encompasses some revision in its cost-sharing provisions. Most beneficiaries who enroll in the HMO option will pay a small annual enrollment fee and somewhat higher copayments for outpatient visits than they did in the early CRI programs. This reform is discussed further in Sec. 4. A related reform--capitation budgeting--will allocate health care resources to catchment areas on a per capita basis. This reform is just now being implemented.

A key characteristic of the MHSS lies in its blending of military and civilian health care options in a single health plan, for which all military beneficiaries are automatically eligible (the reform programs offer additional choices).[8] Although some of the analytic cases considered in this study maintain the current structure, others involve more radical changes.

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[8]Enrollment is simple and occurs automatically as part of routine personnel processing, so almost all eligible beneficiaries are enrolled.

Table 1

Benefits and Coverage of Various MHSS Plans, FY 1992

Benefit/ Coverage Element	Standard MTF/CHAMPUS Plan	CRI/CAM Enrollment Plans	PPOs
Enrollment Fee	None	None	None
Military Treatment Facility Care			
Copayment	None	None	None
Services for which MTF may be required	Inpatient care; some high-cost outpatient services	All outpatient specialty and inpatient care	Inpatient care; some high-cost outpatient services
Civilian Care			
Annual deductible	Deps of jr. enlisted: $50 individual, $100 family Others: $150 individual, $300 family	None in CRI, AF CAM 50% of standard deductible in Navy CAM	Same as standard deductible
Physician services copayment	Active-duty deps: 20% of CHAMPUS allowable Others: 25% of CHAMPUS allowable	CRI: $5 per visit AF CAM: free primary care; standard copayment minus 5% otherwise Navy CAM: standard copayment minus 5%	Standard copayment minus 5%
Outpatient mental health copayment	Same as physician services copayment	CRI: $10 per individual visit; $5 per group visit CAM: Same	Same as standard deductible
Coverage for preventive services	No coverage except well-baby care and routine eye exams	Routine physical exams, Pap smears, and similar preventive care	Same as standard coverage
Hospitalization copayment			
Active-duty dependents	Greater of $25 or $8.05/day	No copayment	No copayment
Retired and dependents	Lesser of $175/day or 25% of charges	$75/day to $750 max per admission	Lesser of $125/day or 25% of charges
Outpatient prescription copayment	Same as physician services copayment	CRI: $4 copayment CAM: Same	Same as standard copayment
Providers covered	Free to use any provider except if MTF is required	Must use network providers while enrolled	Must use network providers for episode of care
Paperwork required	Beneficiary often files own claim	No beneficiary claims filing	No beneficiary claims filing

3. HEALTH CARE UTILIZATION IN THE MHSS

Policy makers in DoD and Congress often ask whether military beneficiaries are underserved or overserved by the MHSS. Answering this question demands an assessment not just of the number of services beneficiaries use but also of the appropriateness and quality of the care provided. Nonetheless, utilization levels are broadly suggestive of the level of service available. Earlier studies of the military health care system found that utilization rates were substantially higher in the military than in the civilian population (Phelps et al., 1984; Congressional Budget Office, 1988); active-duty personnel appeared to make two to three times as many outpatient visits as did their civilian counterparts, in part because of the requirement for an unusually high state of health in the active-duty force. Active-duty dependents' utilization rates were also estimated to be 40 to 50 percent higher than those of the civilian population. Measured rates of retirees and their dependents were sometimes lower, but these rates did not account for all their use of health care services; the MHSS data used in the comparisons excluded utilization outside the military system. As part of the legislation mandating this study, Congress requested that a new comparison be made of military and civilian health care utilization. In this section, we present that comparison and explain the differences we found. We also show the sources of care used by military beneficiaries.

To compare military and civilian utilization rates, we used the beneficiary survey Congress included in its request for this study along with a national survey of the civilian population. To measure military utilization by source of care, we used the beneficiary survey together with routinely collected MHSS data. For various reasons, we found that these two data sources are not always comparable. Although greatly improved in recent years, MHSS data are prone to errors that limit their usefulness for calculating utilization rates, especially by geographic area. Because these limitations are likely to pose difficulties for

many kinds of analyses, we devote some space to them in the second half of this section.

MILITARY-CIVILIAN COMPARISON

We compared two measures of annual health care use: the average number of outpatient visits per person and the percentage of recipients who had received any hospital care. Calculations of these measures adjusted for differences in military and civilian populations in age, sex, and other characteristics known to affect utilization. We present comparisons for outpatient and inpatient use followed by some possible explanations for the differences we found. First, though, we review critical aspects of the surveys and comparison methodology.

Overall, this analysis tends to confirm the findings of earlier studies. Our results can be summarized as follows:

- Military beneficiaries use more health care than do comparable civilians. Much of this difference in utilization can be explained by the generosity of military health benefits, particularly the availability of free MTF care--although other factors may also come into play.
- Those beneficiaries with the highest priority for MTF care--active-duty personnel, followed by their dependents--obtain a large proportion of their care from MTFs and very little of that care from non-MHSS sources.
- Other beneficiaries--retirees, survivors, and their dependents --get less than half their care from MTFs if they live in catchment areas and almost none if they live in noncatchment areas. For those under age 65, CHAMPUS financed (at least in part) almost three-quarters of civilian outpatient care but only half as much civilian inpatient care. We should note, however, that these estimates are imprecise in that they rest on a comparison of CHAMPUS and survey data.
- Although MHSS data can generate reasonably accurate aggregate inpatient utilization rates for active-duty personnel and their dependents, the rates estimated by geographic location are unreliable. These data are similarly useful for measuring

aggregate utilization of MHSS inpatient services for other beneficiaries, but they cannot be used to estimate total utilization.

- MHSS data yield substantially higher MTF outpatient utilization rates than do the beneficiary survey data. The reasons for this discrepancy, which is even larger when rates are calculated for specific geographic areas, cannot be investigated with current MHSS outpatient data systems. Therefore, MHSS outpatient data should be used with caution.

Overview of the Surveys Used in the Comparison

Data for civilian utilization rates were derived from the National Health Interview Survey (NHIS), which is fielded annually by the federal government to a sample of the U.S. civilian noninstitutionalized population.[1] The NHIS assesses health status and health service utilization by interviewing a sample of approximately 50,000 households and 120,000 individuals each year. We used the 1989 NHIS because that year's data contained information regarding insurance coverage--information that is essential to ensuring the comparability of the samples. To determine whether the different time periods for the two surveys would affect the comparison, we reviewed NHIS data for the years 1987 to 1991 for evidence of a trend in utilization. We found that outpatient use by the civilian population (e.g., visits per person) had not changed during these years and that inpatient admission rates had also remained constant, while the average length of a hospital stay had declined. By comparing the percentage of recipients hospitalized but not the number of hospital days, we thus concluded that we could use the 1989 NHIS.

To facilitate comparison, the questionnaire for this study's military beneficiary survey included the same questions on utilization and health status as those in the NHIS. The military survey was fielded by mail in late 1992 and early 1993 to a sample of 45,000 military households, whose sponsors were active-duty personnel with and without

[1]See the National Center for Health Statistics (1990) for a description of the 1989 survey.

dependents, active and reserve retirees, and survivors of military personnel. We principally used the results from that portion of the survey which was directed toward one randomly selected member of each family. This portion asked for the number of outpatient visits, the number of hospital days (which we used to determine whether the person was hospitalized), and other information about this individual.

The sample for the military survey was randomly selected within each of 73 population strata, with different sampling rates used for the different strata.[2] To obtain estimates for the military population rather than just the survey sample, we weighted the survey data to account for different sampling and nonresponse rates. The methods we used to obtain survey weights are detailed in Appendix A.

Methods for Estimating Utilization Levels

We estimated utilization rates using NHIS and military survey data for individuals age 1 to 64 who lived in the United States. In the case of the NHIS, we excluded individuals without private-insurance coverage in efforts to render the civilian sample more comparable to the military sample, all of whose members have health insurance. We excluded from the military sample survivor and retired Reserve/National Guard households as well as active-duty personnel who were considered to be afloat (but not their families). We then used standard regression analysis techniques to express health care utilization as a function of whether an individual belonged to the military or civilian population and of other characteristics potentially related to utilization: education, income, family size, and self-reported health status. We also included information on whether the individual was covered by a fee-for-service (FFS) or an HMO plan (for civilians) to permit estimates to be made for these different types of civilian health plans. Using the regression results, we then estimated average utilization levels for military beneficiaries and for comparable individuals in the civilian population. These estimates are thus adjusted for any military-civilian

[2]The strata were defined by beneficiary category (e.g., active duty, retired), family status (with or without dependents), and military health program type (e.g., CRI, Army CAM, noncatchment area).

utilization differences other than whether or not an individual was a military beneficiary. Appendix B describes our methods in greater detail and reports the results of the regression analysis.

We compare utilization for five beneficiary groups: active-duty personnel, active-duty dependents, retirees under age 65, retirees' dependents under age 65, and retirees and dependents 65 and over. We report separate civilian utilization rates for HMOs and FFS plans for all the under-65 groups, as research has typically shown that HMOs experience higher outpatient utilization and lower inpatient utilization than do FFS plans. Since HMO enrollment rates are very low in the Medicare popualation, we do not report civilian rates by type of plan.

As a check on the comparability of these two surveys, we also compared utilization rates in the NHIS for civilians and the limited number of military beneficiaries included in the NHIS sample. In doing so, we were able to identify active-duty dependents but not military retirees. A comparison of utilization rates adjusted for age and sex (but not for health status) yielded results that were similar to those we obtained from comparing the military survey to the NHIS.

Comparison of Military and Civilian Outpatient Use

The first three columns of data in Table 2 show the average number of visits for each group of military beneficiaries and their counterparts in civilian FFS and HMO plans. For military beneficiaries, we include all visits, not just those made at MTFs or through CHAMPUS. As in earlier studies, we find that active-duty personnel and their dependents have substantially higher outpatient utilization levels. Compared with civilians in FFS plans, these differences--43 percent for active-duty personnel and 38 percent for dependents--are somewhat smaller than those previously measured. Outpatient utilization tends to be higher in HMOs than in FFS plans because the out-of-pocket cost is lower. Therefore, compared with civilian HMO enrollees, active-duty personnel and dependents make only 36 and 32 percent more visits, respectively.

When we consider all sources of care and not just MHSS sources, military retirees and their dependents under age 65 are also found to

Table 2

Comparison of Outpatient Utilization in the Military Population and Comparable Civilian Populations

Beneficiary Group	Average Visits per Person			Probability of Having Any Visits		
		Civilian			Civilian	
	Military	FFS	HMO	Military	FFS	HMO
Active-duty personnel	3.09	2.16	2.28	0.82	0.68	0.70
Active-duty dependents	3.84	2.78	2.92	0.89	0.78	0.80
Retirees under 65	4.37	3.32	3.49	0.84	0.73	0.76
Retired dependents under 65	4.33	3.27	3.42	0.90	0.81	0.83
Retirees & dependents over 65	5.70	4.51		0.91	0.91	

NOTE: Estimates control for differences in sociodemographic characteristics and health status between the military and civilian populations. For all beneficiary groups, the differences in average visits between the military beneficiaries and both civilian groups are statistically significant at $p < .05$.

have higher visit rates, but the differences are about five percentage points lower than those for active-duty dependents. The difference is even smaller (26 percent) for beneficiaries 65 and over, almost all of whom get some care whether or not they are in the military population.

Military outpatient utilization rates may be underestimated somewhat in relation to civilian rates. The military survey windsorized the data at 10 visits--i.e., limited the number of visits that could be recorded for each health-care location to 10 or more. We similarly limited the NHIS data. To the extent that the tendency for military beneficiaries to use more health care extends to those making more than 10 visits per year, we have underestimated military-civilian differences in utilization.[3]

[3]We considered correcting the military survey data instead of windsorizing the NHIS data. There are no similar data on military beneficiaries' self-reported utilization by source of care from which we could determine the frequency of visits above 10. Therefore, making this correction would have required that some assumptions be made about this frequency which would have led to unknown biases in the estimates. We chose instead to windsorize the NHIS data because this approach would

The last three columns of data in Table 2 show the fraction of beneficiaries with any outpatient visits in comparable military and civilian populations. Generally, about one-third to one-half of the military-civilian differential is due to a higher probability of having any outpatient use at all. The remainder is attributable to an increased number of visits for those with some use.

Utilization rates are often reported by age and sex without adjusting for other health-related characteristics. Figures 2 and 3 compare outpatient visit rates by age and sex in the military survey with those in the MHIS. The age-sex utilization profiles for the two populations generally have the same shape. With the exception of the youngest children, however, military beneficiaries of both sexes average a higher number of outpatient visits at all ages.

Comparison of Military and Civilian Inpatient Use

All four military beneficiary groups also tend to display higher inpatient utilization rates, as measured by the annual probability of being hospitalized, than do persons who are similar but unconnected with the military (Table 3). Within the civilian population, the rate of hospitalization is usually found to be lower in HMOs than in FFS plans --a pattern we also find here.[4] Focusing on those in FFS plans, we see that the differential in military inpatient use is about equal to the outpatient differential for active-duty dependents and Medicare eligibles, but is smaller for the other beneficiary groups. The military differential is considerably higher if the civilian comparison group consists of HMO enrollees.

Why Do Military Beneficiaries Use More Health Care?

One explanation usually advanced for the higher health care use found in the military population pivots on the availability of free MTF care. Typical civilian health plans include a deductible, often in the amount of about $200 per individual, as well as a copayment of 20

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yield a conservative estimate of military-civilian utilization differences.

[4]See, for example, Bradbury et al. (1991), Luft (1981), Manning et al. (1984), and Welch (1985).

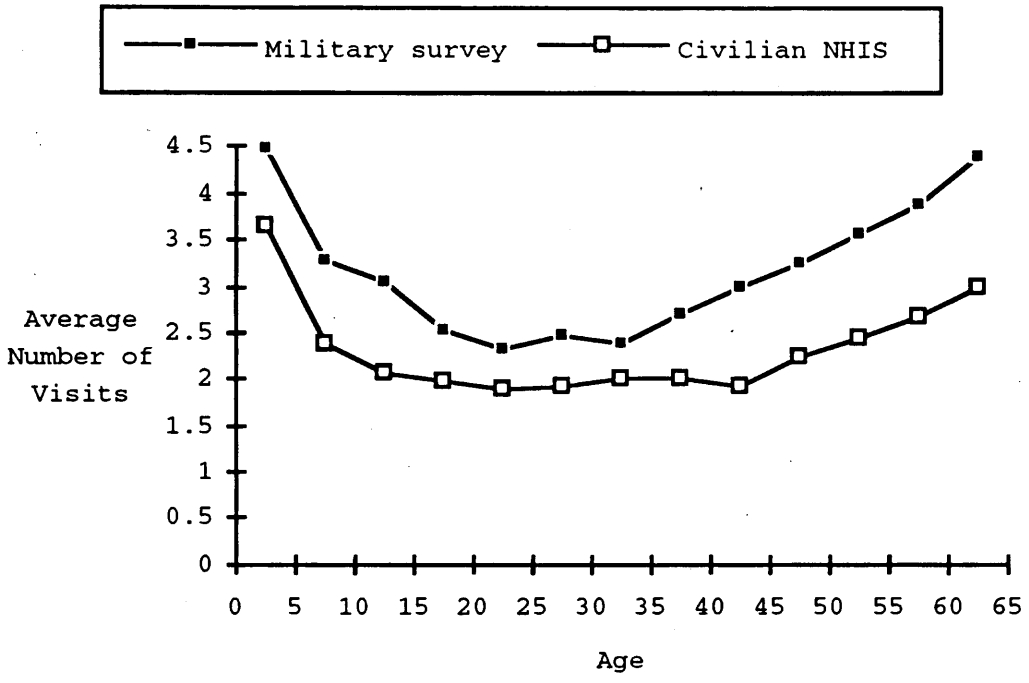

Figure 2--Average Self-Reported Outpatient Visits by Age and Sex, Males (windsorized at 10 visits)

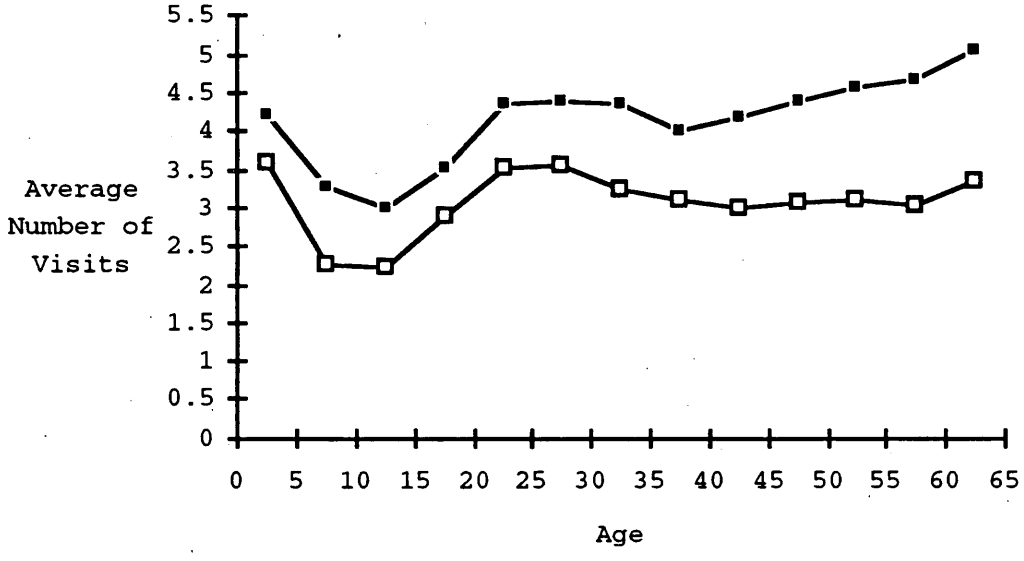

Figure 3--Average Self-Reported Outpatient Visits by Age and Sex, Females (excludes active duty) (windsorized at 10 visits)

Table 3

Comparison of Inpatient Utilization in the Military Population and Comparable Civilian Populations

	Probability of Having Any Overnight Hospital Care		
		Civilian	
Beneficiary Group	Military	FFS	HMO
Active-duty personnel	0.095	0.073	0.065
Active-duty dependents	0.113	0.086	0.076
Retirees under 65	0.151	0.122	0.109
Retirees' dependents under 65	0.112	0.091	0.081
Retirees & dependents over 65	0.24	0.18	

NOTE: Estimates control for differences in sociodemographic characteristics and health status between the military and civilian populations. For all beneficiary groups, the differences in average visits between the military beneficiaries and both civilian groups are statistically significant at $p < .05$.

percent. CHAMPUS has similar cost-sharing provisions, but, as shown below, MTFs provide roughly two-thirds of the care used by active-duty dependents and one-third of the care used by retirees and dependents. The differences we estimate--military utilization that is 32 to 43 percent higher than FFS outpatient use and 23 to 33 percent higher than FFS inpatient use--are generally consistent with evidence on the effects of cost sharing.

The best evidence on the effects of cost sharing can be found in a large health insurance experiment conducted in the 1970s. By randomly assigning families to insurance plans that differed only in their cost-sharing arrangements, the experiment estimated changes in the number of episodes of health care used due to cost sharing. Families assigned to a free plan had 41 percent more outpatient episodes than did families assigned to a plan with cost sharing and 21 percent more inpatient episodes (Keeler et al., 1988). Since not all the care military beneficiaries receive is from MTFs and therefore free, the effects of cost sharing on military utilization would be less than those for families in the experiment.

There are other possible explanations for the higher health care utilization rates found in the military population; one centers on different patterns of medical practice in the military. The health literature contains many studies that document the variability of medical practice, for example, by geographic area. In the military, there is some incentive to increase utilization because MTF resources are determined by historical utilization levels. A comparison of military and civilian practice patterns is, however, well beyond the scope of this study; thus, we mention practice patterns only as a possibility. Other potential explanations derive from the military's emphasis on good health, which may encourage broader health care use, as well as from family separations, which may lead active-duty spouses to more frequently seek medical advice, especially for their children.

MILITARY UTILIZATION BY HEALTH CARE SOURCE: MHSS DATA VERSUS THE BENEFICIARY SURVEY

Military beneficiaries have three major sources of care: MTFs, CHAMPUS, and non-MHSS sources. The beneficiary survey asked for visits and days of hospitalization according to the location of care: (1) an MTF or PRIMUS/NAVCARE clinic; (2) a civilian hospital, doctor's office, or clinic; or (3) a Veterans Administration (VA) hospital or clinic or other source. The survey also asked whether CHAMPUS paid for any portion of the civilian care used, although it did not ask how many of the reported visits and days were covered--information that is available from CHAMPUS claims data.[5] The survey is, however, the only source of data on total civilian utilization. To examine military utilization by source of care, we therefore looked both at the survey data and at regularly collected MHSS data. These two data sets yielded differences that have implications for other analyses of military utilization. The remainder of this section describes the MHSS data sources we used, the mix of health care sources used according to the survey and MHSS data, and the differences we found between the two types of data.

[5]Respondents cannot usually provide this kind of information in a self-administered survey.

MHSS Data Systems

The MHSS maintains a number of data systems that can be used to estimate health care utilization rates. Since these data omit civilian care not financed by CHAMPUS and care obtained through other government programs (e.g., Medicare and the VA), however, they offer an incomplete record of utilization for many military beneficiaries. The beneficiary survey data are more comprehensive and, as discussed earlier, more comparable to the data provided by civilian surveys. Such survey data are, however, subject to a number of biases. Our original intent in comparing these two data sources was to assess incompleteness in the MHSS data and bias in the survey data--but in carrying out this comparison, we uncovered a number of other problems in the MHSS data that, if not corrected, render such data inadequate to the task of measuring utilization rates even for MHSS services.

Calculating Utilization Rates Using MHSS Data Systems

Per capita utilization rates can be estimated by dividing aggregate utilization by the number of beneficiaries generating that utilization. Accurate estimates require accurate utilization and beneficiary population data; in particular, the utilization measure must be for the same beneficiaries included in the population data. A method that is more difficult but that ensures a match between utilization and population involves the averaging of data collected for individual beneficiaries. Since MTF outpatient data are not reported for individuals, however, only the first method can be used with routinely collected MHSS data.

The Defense Medical Information System (DMIS) is the principal source of routinely collected data on the MHSS. Within DMIS, the following sources provide the data needed to calculate utilization rates:

- The Defense Eligibility Enrollment Reporting System (DEERS) records basic information on each eligible beneficiary and reports beneficiary counts by geographic area. The FY92 counts we used to calculate utilization rates correct the DEERS counts for (1) new ZIP codes in several catchment areas; (2)

fluctuations in the active-duty population at training facilities such that counts reflect average training loads; and (3) mislocation of some active-duty dependents.[6]

- Two data systems--biometrics and the Medical Expense and Performance Reporting System (MEPRS)--record MTF utilization. As part of the biometrics data system, the MTFs generate a summary discharge record for each hospitalized patient; thus, patient-level data are available for inpatient utilization. However, that is not the case for outpatient utilization. The biometrics and MEPRS data systems also include annual counts by MTF of outpatient visits, admissions and/or discharges, and inpatient days. These counts are reported by clinical service or beneficiary category, although the data for CHAMPUS- and Medicare-eligible retired beneficiaries are combined and survivors and other beneficiaries are combined with retired dependents.
- CHAMPUS utilization is recorded on extracts of the individual claims submitted for payment. Quarterly summary reports display data assembled three months after the end of the fiscal year; since not all the claims have been submitted by that date, the CHAMPUS office estimates that the reports are only about 88 percent complete.

Outpatient Utilization by Source of Care

Since MTF services are less available in noncatchment areas and since the use of some civilian services may be lower in catchment areas, we sought to identify the sources of care used in both types of areas. From the survey, we can easily tie outpatient visits by source of care

[6]In 1992, DEERS showed almost double the number of overseas active-duty dependents as in previous years and an offsetting decline in active-duty dependents in the United States (especially in noncatchment areas). The change reflected new rules for locating dependents lacking a recent address. Our analysis of the survey data and other data sources suggested that the new rules incorrectly located enough dependents of active-duty personnel on unaccompanied assignments to noticeably bias noncatchment-area and some catchment-area population counts.

(e.g., MTF, civilian, or other) to individuals, thus allowing us to estimate average visits by source for both catchment-area and noncatchment-area populations. The MHSS data can support a similar calculation for CHAMPUS visits but not for MTF visits; we must therefore assume that outpatient visits at military hospitals are made by local catchment-area beneficiaries and that visits at outlying clinics are made by noncatchment-area beneficiaries. The result is a misestimation of the true utilization rates in both areas. Estimates of non-CHAMPUS civilian visits and other government visits are available only from the survey.

Figures 4 to 7 show the average number of visits recorded for the major beneficiary groups in the MHSS data in FY92 and in the survey in early FY93. Here we provide information for beneficiaries age 65 and over in addition to the other groups. The figures lead us to two general conclusions about the use of outpatient services, as measured by the two data sources. First, the military beneficiary groups rely to a varying extent on MTFs to meet their health care demands. Second, routinely collected MHSS data generate higher estimates of use than the survey shows. The difference is especially large for active-duty personnel and for MTF outpatient use.

Active-duty personnel obtain essentially all their health care from MTFs, whether or not they live in a catchment area; for the vast majority of active-duty dependents who live in a catchment area (87 percent), MTFs provide at least three-fourths of their outpatient care. Those living in other areas report that they do use MTFs; making one-third of their visits to such facilities. Retirees and their dependents of all ages are least reliant on MTFs for outpatient care, those living in catchment areas obtain half or more of their care from MTFs, but in noncatchment areas the civilian sector provides most outpatient care. Finally, military beneficiaries' utilization of VA and other providers' outpatient services is limited. Military retirees report that they make only about 5 percent of their visits to VA clinics.

Differences in MTF Visit Rates by Data Source. MTF visit rates estimated from MHSS data for catchment-area beneficiaries are considerably higher than survey estimates (the bottom portions of the

bars in Figures 4 to 7). Noncatchment-area clinics also record high visit rates for their active-duty population, but the visit rates for other beneficiaries are low in relation to survey estimates. As mentioned earlier, we were unable to verify that the population DEERS records for a catchment area is the population that is making the visits recorded by the MHSS data. Therefore, we believe that the catchment-area and noncatchment-area rates are misestimated; most probably, the former are overestimated and the latter underestimated. If we combine the areas to eliminate these locational problems, the MTF visit rates estimated from MHSS data are higher than the survey estimates by 200 percent for active-duty personnel, 90 percent for active-duty dependents, 70 percent for retirees, survivors, and dependents under age 65, and 50 percent for over-65 beneficiaries.

The differences in MTF visit rates measured from MHSS data and survey data probably result from errors in both data sources. The survey data underestimate the number of outpatient visits for two reasons. First, numerous studies have shown that recall bias causes mail-survey respondents to underestimate outpatient use by approximately 20 percent (Jobe et al., 1990; Siemiatycki, 1979; Yaffe et al., 1978). Second, adding to the effects of recall bias is this survey's design, which limits the number of visits that can be reported for each person to 10. In their report on the survey, Lurie et al. (1994) estimated what the visit rates would be without this limitation. A comparison of our survey estimates, which are unadjusted, with the survey report's adjusted estimates indicates that our estimates are as much as 15 percent too low. Since these two error sources taken together account for less than a 40 percent difference, however, other factors must play a role as well.

The differences in MTF utilization rates measured from MHSS data and the survey also reflect varying criteria for defining a visit and probably an incentive to overreport MTF utilization. MHSS data systems treat each outpatient encounter as a visit; the survey asked about visits "to a doctor or an assistant." Some examples of encounters that are recorded as visits in the MHSS data but not necessarily in the survey responses include picking up a prescription refill from a clinic,

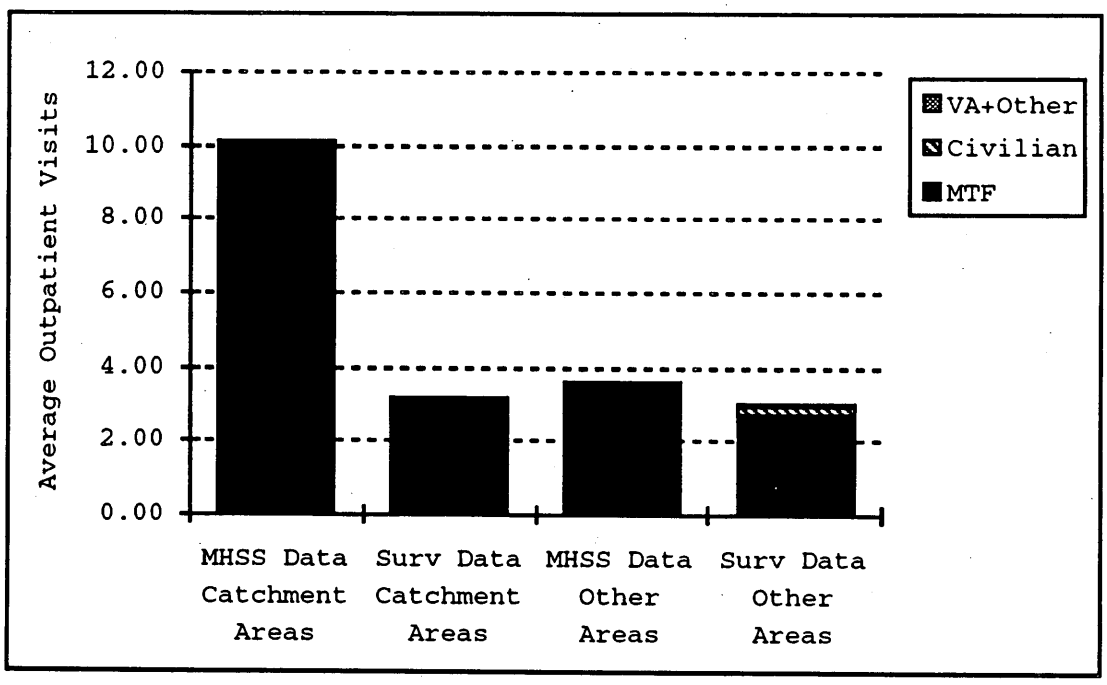

Figure 4—Active-Duty Outpatient Use by Source

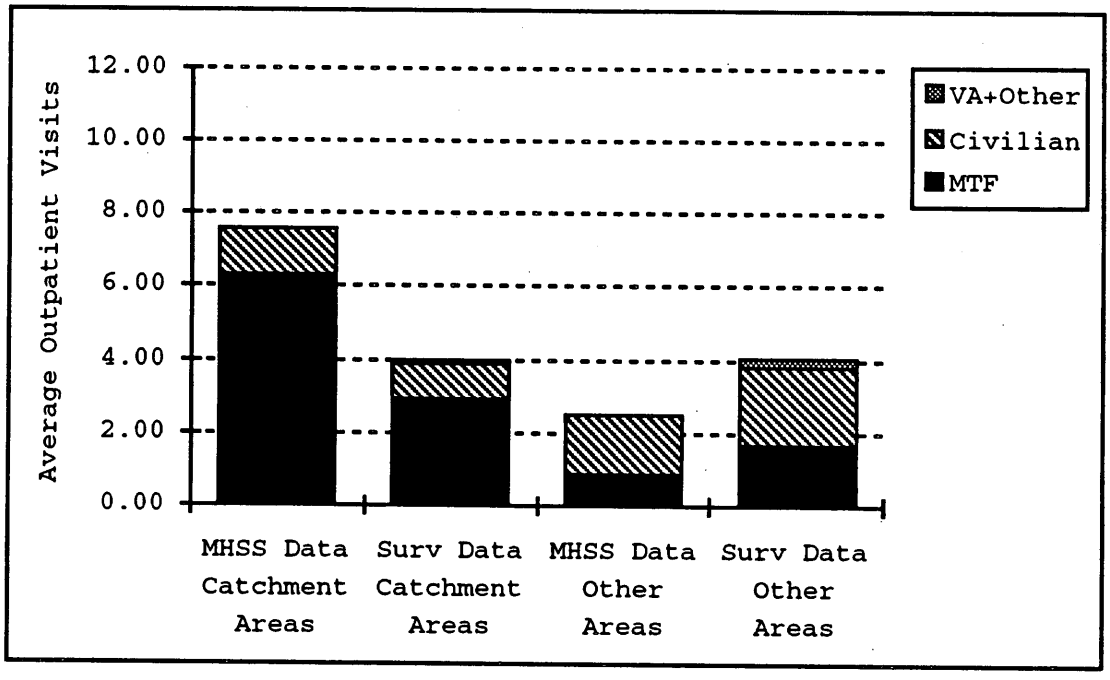

Figure 5—Active-Duty Dependent Outpatient Use by Source

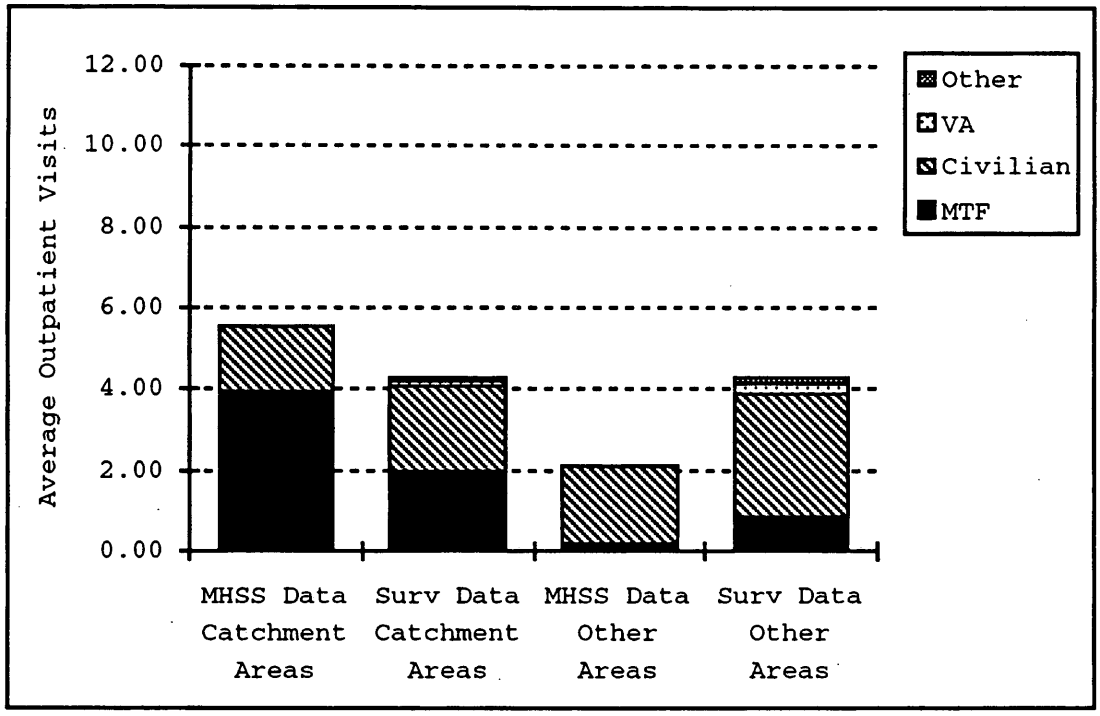

Figure 6—Retiree/Dependent/Survivor Under 65 Outpatient Use by Source

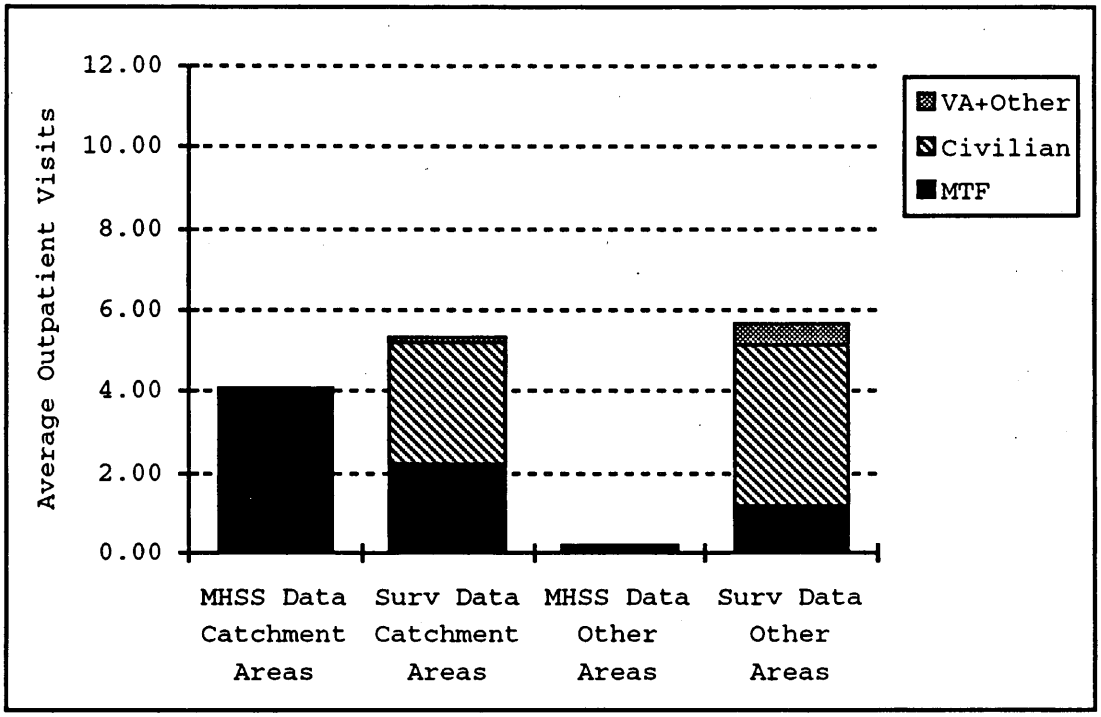

Figure 7—Medicare Outpatient Use by Source

a telephone inquiry, immediate follow-up care, or a telephone consultation with a second provider or clinic. Moreover, because funding of almost all MTFs during FY92 was based on historical workload, such facilities had an incentive to be as inclusive as possible in counting outpatient visits.

Other possible reasons for the differences include (1) incorrect recall of the location of a visit (MTF versus civilian) by some in the survey; and (2) use of a survey sample that is not fully representative of the beneficiary population from which it was drawn. Included in the first category would be misidentification of PRIMUS and NAVCARE clinic visits, which we include in the MTF counts as civilian visits.

Differences in Civilian/Other Visit Rates by Data Source. The only source of data we had on civilian utilization for active-duty personnel and Medicare-eligible beneficiaries was the survey. For the other beneficiaries, MHSS data systems record civilian utilization only if it is financed at least in part by CHAMPUS; by contrast, the survey asked for all civilian utilization, regardless of the payer. Few active-duty dependents have other insurance, but just over half of all retirees and dependents under age 65 report having other coverage. Thus, the civilian visit rates calculated from MHSS data are similar to the survey-based rates for active-duty dependents but are lower for other beneficiaries.

A comparison of the MHSS data on civilian care, which includes services obtained only through CHAMPUS, with the survey will yield an imprecise estimate of the CHAMPUS share of civilian care. The ratio of CHAMPUS visits to total civilian visits reported in the survey is actually above 1.00 for active-duty dependents and .70 for retirees and their dependents--.80 in catchment areas but only .60 in noncatchment areas.

Inpatient Utilization Rates by Source of Care

From the survey, we calculated the fraction of beneficiaries hospitalized for at least one night during a 12-month period. CHAMPUS routinely reports the number of beneficiaries with hospital claims. We counted the number of beneficiaries hospitalized in MTFs from individual

patient records, separating catchment-area residents from noncatchment-area residents using the ZIP codes listed in the records. Figures 8 to 11 plot these admission probabilities.[7] Estimates of civilian hospitalizations not financed by CHAMPUS and other government hospitalizations are available only from the survey.

The mix of sources of care used by each beneficiary group for inpatient care generally resembles that used for outpatient care. However, active-duty personnel report getting more inpatient than outpatient care from civilian providers, especially in noncatchment areas. As far as we can tell, these civilian hospitalizations are not recorded in MHSS data systems. The other notable difference in the mix of inpatient and outpatient sources lies in the heavier use of VA and other services for inpatient care; almost 10 percent of Medicare-eligible recipients reporting some hospital use in the survey list the source as "other."

Differences in MTF Hospitalization Rates by Data Source. The two estimates of MTF use are more similar for catchment-area populations of active-duty personnel and their dependents than for noncatchment-area populations. Further investigation showed that replacing the ZIP codes listed in the MTF inpatient data with the ZIP codes in DEERS decreases the number of hospitalizations attributed to noncatchment-area residents by two-thirds for active-duty personnel while increasing it by one-third for active-duty dependents. While this is sufficient to lower the active-duty hospitalization rate to a level below the survey estimate, it eliminates only some of the difference in the estimates for active-duty dependents. The ZIP-code source used to assign location makes less difference for retirees and other beneficiaries and for all beneficiaries in catchment areas.

If problems in locating beneficiaries are the principal source of the sizable differences in inpatient estimates in noncatchment areas,

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[7]We did not estimate utilization rates for National Guard and Reserve personnel. A match of the MTF inpatient and DEERS records showed that only about one-fourth of those hospitalized are listed in DEERS. Therefore, the utilization and population counts are not comparable. If we had the patient-level visit data to perform a similar check, we would expect to find the same mismatch.

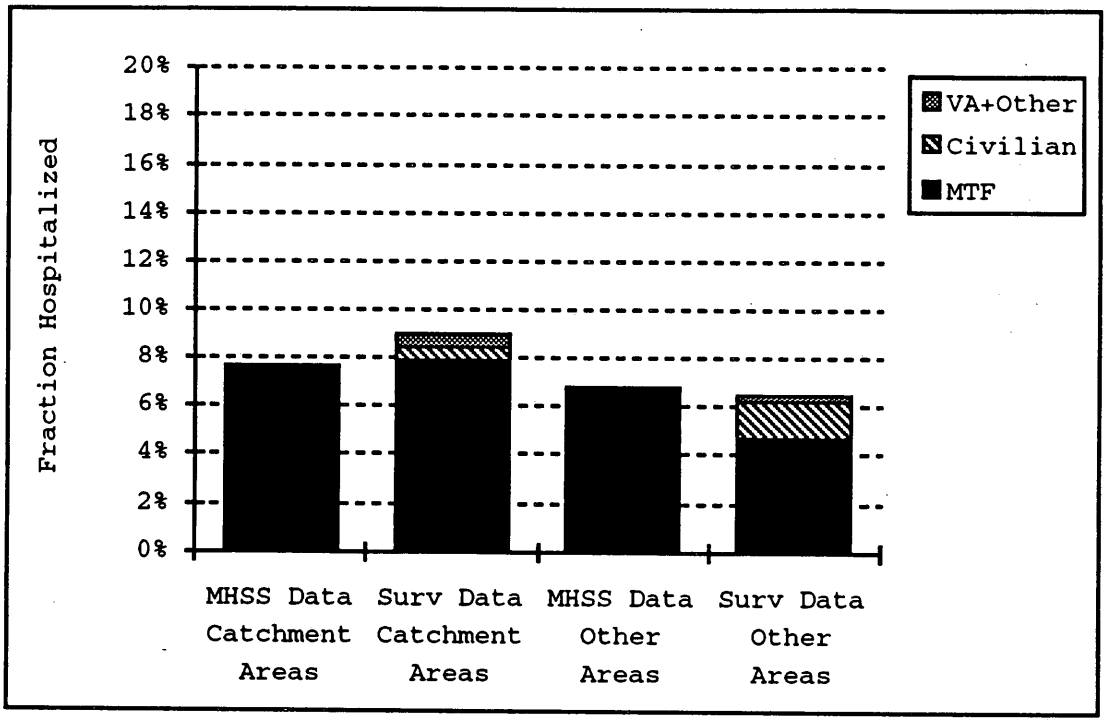

Figure 8—Active-Duty Inpatient Use by Source

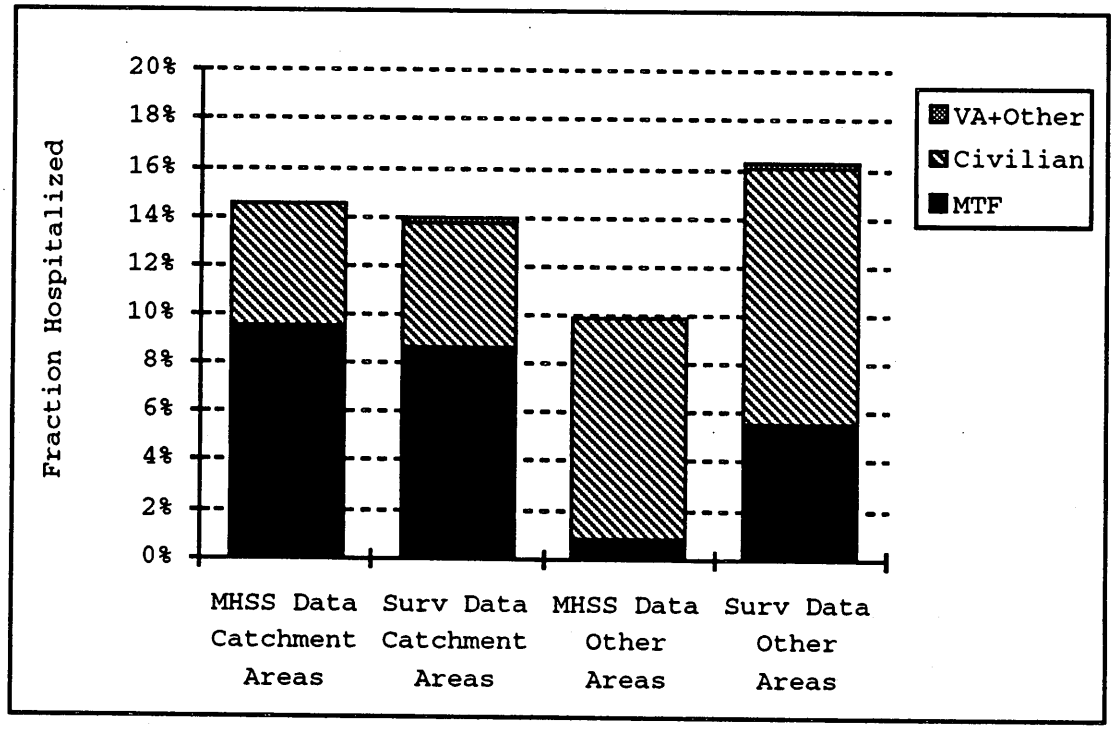

Figure 9—Active-Duty Dependent Inpatient Use by Source

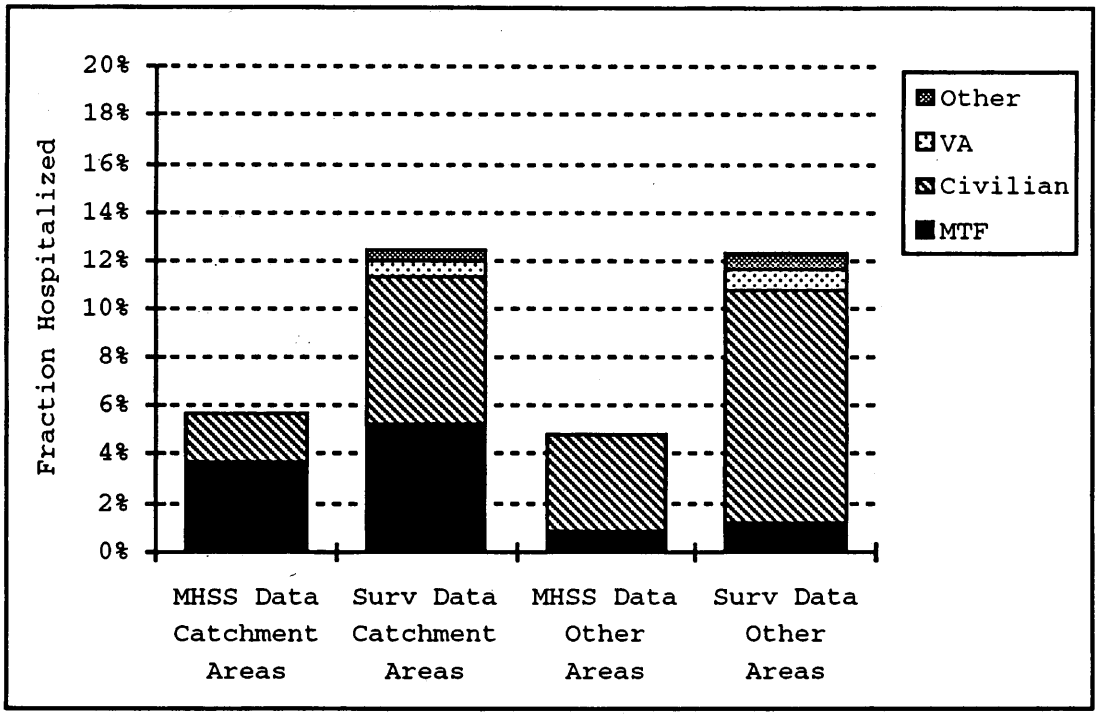

Figure 10—Retiree/Dependent/Survivor Under 65 Inpatient Use by Source

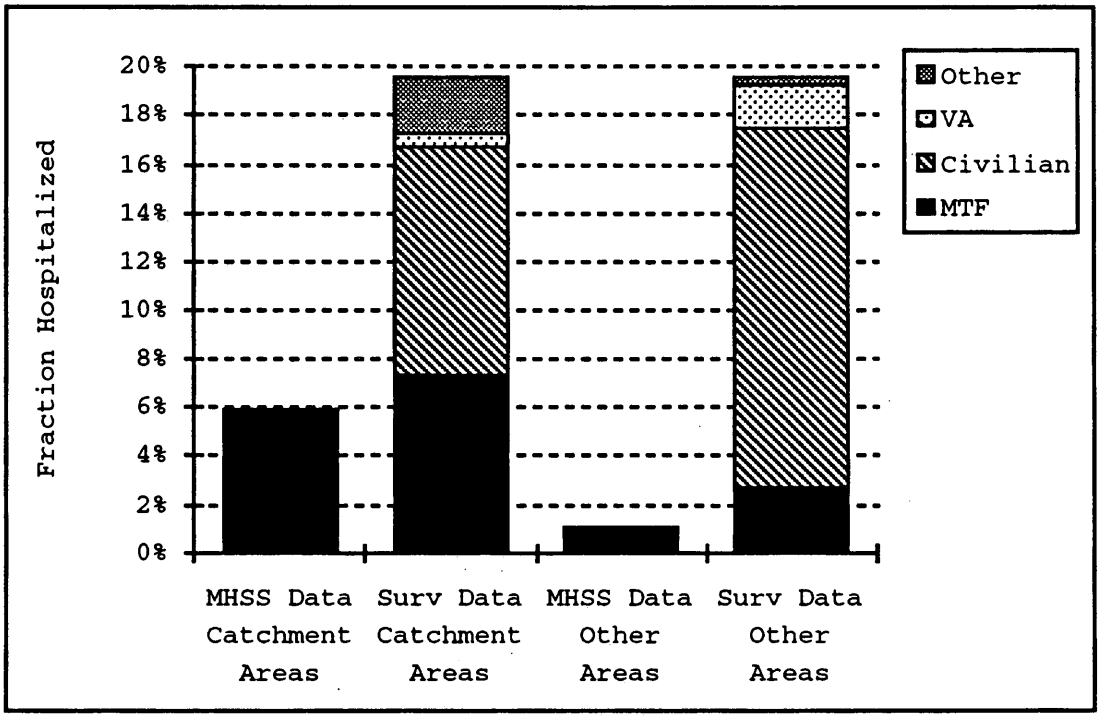

Figure 11—Medicare Inpatient Use by Source

such differences should disappear if we combine the two types of areas. The fractions hospitalized in all areas measured with the two data sources are within 3 percent for active-duty personnel and 10 percent for their dependents, but the MHSS-based rates are only 70 percent of the survey-based rates for retirees and their dependents. Possible explanations for the difference for this last group include (1) recall bias in the survey, with respondents reporting some hospitalizations that occurred more than one year previously; (2) incorrect recall of the location of hospitalization (MTF versus civilian) by some in the survey; (3) survey respondents counting non-overnight hospitalizations; and (4) a nonrepresentative survey sample.

Differences in Civilian/Other Hospitalization Rates. The estimates of civilian hospital use derived from CHAMPUS records and from the survey are similar for active-duty dependents, although the fraction of noncatchment-area residents with an MTF hospitalization may be underestimated in the MHSS data. For other CHAMPUS eligibles, the ratio of the fraction with CHAMPUS hospital use to that reporting any civilian use in the survey is under 40 percent overall--33 percent in catchment areas and 40 percent in noncatchment areas.[8] Even if we consider the "extra" MTF hospitalizations reported for catchment-area residents in the survey to be mistaken civilian hospitalizations, the fraction of those residents with a CHAMPUS hospitalization is at most 50 percent of the survey-based civilian hospitalization rate for retirees, survivors, and their dependents under age 65. Thus, the CHAMPUS share of these beneficiaries' civilian care is considerably smaller for inpatient than for outpatient services, probably because CHAMPUS inpatient benefits are less generous in relation to civilian plans. Beneficiaries with other insurance will often find it covers most inpatient costs but that they must turn to CHAMPUS to fill in gaps in outpatient coverage--especially for mental health and preventive care.

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[8]CHAMPUS cannot be used by Medicare-age beneficiaries, so we do not report CHAMPUS use in Figure 11.

4. ANALYTIC CASES DEVELOPED TO STUDY DEMAND IN THE MHSS

Numerous potential alternatives exist for restructuring the MHSS. Only a small number of alternatives were chosen as analytic cases for this study. The four principal analytic cases examined are:

1. A managed-care program like the one currently being implemented (the baseline case);
2. Maximum practicable health care provision in MTFs;
3. Minimum health care provision in MTFs with two options:
   a) Provision of only reception and referral centers in U.S. military hospitals during wartime, augmented by care in civilian and Veterans Administration hospitals, or
   b) Provision of all required care in U.S. military hospitals; and
4. Military-civilian competition in providing health care, with a choice of MTF HMOs and civilian HMO and fee-for-service (FFS)/PPO options.

Table 4 summarizes the health plans that would be available to beneficiaries in each case. In addition to varying the number and size of military health-care facilities, the cases vary how the MHSS structures health plans using MTFs and civilian providers. The current system, with its managed-care reforms, employs a structure that is retained in the second ("maximum military") case--one that combines in one or more health plans both MTFs and civilian providers, with care from the latter financed through a health-insurance program like CHAMPUS. The reform programs introduce a second health plan that beneficiaries may choose instead of the traditional option. This managed-care option combines MTFs with a much smaller civilian provider network, manages patients more aggressively, and offers beneficiaries enhanced benefits in return for more restricted provider choice. The third ("minimum military") case replaces this structure with civilian health plans for non-active-duty beneficiaries. The fourth case would allow beneficiaries to choose between an MTF-based plan and one or more commercial civilian plans. In this case, the MTFs are

converted to military HMOs that are responsible for providing all care to enrolled beneficiaries either through their own staffs or through civilian contractors. Beneficiaries have the choice of enrolling in this military HMO or in a commercial health care plan. This case therefore places MTFs in direct competition for beneficiary enrollment with the civilian market, which is not true of the first three cases. Although it was developed before the President's health reform plans, this case generally describes the choices military beneficiaries are expected to have when national health reform is implemented.

Base closures and personnel drawdowns will continue to affect the MHSS until 1997 and possibly beyond that date. In light of these ongoing changes, we have specified two versions of the cases. The first

Table 4

Health Plan Options Across the Analytic Cases

Case	Health Plan Options
1. Managed-care (baseline case)	In hospital catchment areas and most clinic service areas: the current MTF/CHAMPUS system with a managed-care enrollment option in all catchment areas In other areas: CHAMPUS
2. Maximum MTF	Same as case 1, but with more military hospitals, expanded beds at military hospitals that are particularly short, and expanded staffing at most hospitals
3. Minimum MTF	For active duty: direct provision of care at or through MTFs, many of which would be primary care clinics For other beneficiaries: commercial health plan(s)
4. Military-civilian competition	In hospital catchment areas and some clinic service areas: beneficiaries choose an MTF-based HMO or commercial plan. MTFs arrange all medical services for their enrollees and provide no services for commercial plan enrollees Outside these areas: beneficiaries choose a commercial plan.

is based on the current MTF system and beneficiary population, and the second incorporates the changes expected in both of these variables by 1997.[1]

The remainder of this section describes each of the cases in sufficient detail to support a broad analysis. Obviously, many details that would be necessary to actually implement the changes outlined in these cases are omitted by the scope of this report.

THE CURRENT MANAGED CARE CASE (#1)

As was described in Sec. 2, DoD is gradually implementing a managed-care program that is based on the CRI model.[2] This program would offer beneficiaries the choice of (1) the standard MTF/CHAMPUS plan along with an optional PPO that would offer discounts for beneficiaries who chose selected civilian providers or (2) an HMO that would combine military and selected civilian providers.[3] In addition to offering lower cost shares, the HMO plan would cover some additional services (e.g., adult preventive care). The proposed benefit package for the two plans is shown in Table 5.

Other key components of the current managed-care case include:

- Assignment of beneficiaries who choose the HMO to a primary care provider who serves as a "gatekeeper" to specialty care.

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[1]We based the 1997 estimates on planned base closures and the recent DoD "bottom up review."

[2]In reality, this alternative would also incorporate capitation budgeting, which is currently being implemented. Until recently, most MTF resources have been allocated based on the MTFs' workloads during the previous year. OSD has directed that in FY94 all MTFs receive a budget based on the number of MHSS users they serve. If strictly enforced, capitation budgeting should alter future utilization patterns and costs in this alternative. However, we have not incorporated capitation budgets because at this early stage we would be guessing at the changes that would occur. In the final version of the report, we will indicate how we expect capitation budgeting might affect our results.

[3]Actually, beneficiaries would automatically be enrolled in the first option unless they voluntarily enrolled in the HMO.

Table 5

Overview of Current Managed-Care Benefits for Civilian Care

	Active-Duty Dependents		Retirees and
	Jr. Enlisted	Other	Dependents
Standard plan			
Annual premium	$0	$0	$0
Deductible	$50/person; $150/family	$100/person; $300/family	$100/person; $300/family
Outpatient copayment	20%	20%	25%
Inpatient copayment	$9.30/day or $25[a]	$9.30/day or $25[a]	25% or $265/day[b]
Enrollment option			
Annual premium	0	$35/person; $70/family	$50/person; $100/family
Deductible	0	0	0
Outpatient clinic fee	$5/visit	$10/visit	$15/visit
Inpatient copayment	$9.30/day or $25[a]	$9.30/day or $25[a]	25% or $125/day[b]

[a]Whichever is larger.
[b]Whichever is less.

- A health care "finder service" that refers enrolled patients in need of specialized care to the most cost-effective providers and that may provide general referral information to nonenrolled patients.
- Quality assurance (QA) and utilization review (UR) programs to ensure that the care provided is appropriate, of high quality, and delivered in the most cost-effective setting.

The managed-care plan would be provided at 117 hospitals at the end of 1992 and at the 101 military hospitals that will remain open after BRAC 3 in 1997. Table 6 lists these hospitals. The managed-care plan might also be offered in areas served by a number of outlying military clinics. However, a managed-care plan may be impractical in some of these clinic areas, and there are insufficient data for predicting the costs for managed-care programs in clinic areas. In areas without a MTF, we have assumed that this case would offer only the standard plan.

Table 6

Military Hospitals for the Managed-Care Case

Hospital	Year 92	Year 97	Hospital	Year 92	Year 97	Hospital	Year 92	Year 97
Redstone Arsl, AL	H	H	Patrick AFB, FL	H	H	Ft. Bragg, NC	H	H
Ft. McClellan, AL	H	H	Ft. Gordon, GA	H	H	Seymour Jnsn, NC	H	H
Ft. Rucker, AL	H	H	Ft. Benning, GA	H	H	Camp Lejeune, NC	H	H
Maxwell AFB, AL	H	H	Ft. Stewart, GA	H	H	Cherry Point, NC	H	H
Ft. Wainwright, AK	H	H	Moody AFB, GA	H	H	Grand Forks, ND	H	H
Elmendorf AFB, AK	H	H	Robins AFB, GA	H	H	Minot AFB, ND	H	H
Adak NH, AK	H	H	Ft. Shafter, HI	H	H	Wright-Patt, OH	H	H
Ft. Huachuca, AZ	H	H	Mountain Hme, ID	H	H	Tinker AFB, OK	H	H
Luke AFB, AZ	H	H	Chanute AFB, IL	H		Altus AFB, OK	H	H
Davis Monthan, AZ	H	H	Scott AFB, IL	H	H	Ft. Sill, OK	H	H
Little Rock, AR	H	H	Great Lakes, IL	H	H	Newport NH, RI	H	H
Travis AFB, CA	H	H	Ft Ben Hrrsn, IN	H		Shaw AFB, SC	H	H
Beale AFB, CA	H	H	Ft. Riley, KS	H	H	Charlestn NH, SC	H	H
McClellan AFB, CA	H	H	Ft. Leavnwrth, KS	H	H	Beaufort NH, SC	H	H
Castle AFB, CA	H		Ft. Campbell, KY	H	H	Ft. Jackson, SC	H	H
Vandenbrg AFB, CA	H	H	Ft. Knox, KY	H	H	Ellswrth AFB, SD	H	H
Edwards AFB, CA	H	H	Barksdle AFB, LA	H	H	Millingtn NH, TN	H	H
March AFB, CA	H	C	Ft. Polk, LA	H	H	Ft. Bliss, TX	H	H
Presidio, CA	H	C	Loring AFB, ME	H		Ft. Sam Hstn, TX	H	H
Ft. Ord, CA	H	C	Andrews AFB, MD	H	H	Ft. Hood, TX	H	H
Camp Pendletn, CA	H	H	Bethesda NH, MD	H	H	Reese AFB, TX	H	H
Long Beach NH, CA	H	C	Patuxent Rvr, MD	H	H	Dyess AFB, TX	H	H
Oakland NH, CA	H	C	Ft. Meade, MD	H	H	Sheppard AFB, TX	H	H
Lemoore NH, CA	H	H	Ft. Devens, MA	H	C	Laughlin AFB, TX	H	H
San Diego NH, CA	H	H	K.I. Sawyer, MI	H		Bergstrm AFB, TX	H	
29 Palms, CA	H	H	Keesler AFB, MS	H	H	Carswell AFB, TX	H	
Ft. Irwin, CA	H	H	Columbus AFB, MS	H	H	Lackland AFB, TX	H	H
Fitzsmmns AMC, CO	H	H	Ft. Leonrd Wd, MO	H	H	Corpus Chsti, TX	H	H
Ft. Carson, CO	H	H	Whiteman AFB, MO	H	H	Hill AFB, UT	H	H
USAF Academy, CO	H	H	Offutt AFB, NE	H	H	Langley AFB, VA	H	H
Groton NH, CT	H	H	Nellis AFB, NV	H	H	Ft. Eustis, VA	H	H
Dover AFB, DE	H	H	Ft. Monmouth, NJ	H	H	Ft. Lee, VA	H	H
WR-Washington, DC	H	H	McGuire AFB, NJ	H	H	Ft. Belvoir, VA	H	H
Pensacola NH, FL	H	H	Kirtland AFB, NM	H	H	Portsmouth, VA	H	H
Jacksonville, FL	H	H	Holloman AFB, NM	H	H	Ft. Lewis, WA	H	H
Orlando NH, FL	H	C	Cannon AFB, NM	H	H	Bremerton NH, WA	H	H
Eglin AFB, FL	H	H	West Point, NY	H	H	Oak Harbor, WA	H	H
Tyndall AFB,FL	H	H	Plattsburg, NY	H		Fairchld AFB, WA	H	H
MacDill AFB, FL	H	H	Griffiss AFB, NY	H	C	FE Warrn AFB, WY	H	H

Note: An "H" means hospital, while a "C" means clinic only.

THE MAXIMUM-MTF CASE (#2)

The maximum-MTF case has the same basic structure and benefit package as that defined for the managed-care case, but features an expanded number of military hospitals and an increase in the size and staffing of existing military hospitals. To lend practicality to this case, we established a minimum-size criterion for adding new hospitals: that the catchment-area beneficiary population must support at least 70 beds.[4] In determining where to add facilities, we considered:

- The size of the non-Medicare beneficiary population. We determined that roughly 1.5 beds per 1,000 beneficiaries represented a reasonable planning factor for determining hospital size.[5]
- Providing the military hospitals enough capacity to allow Medicare beneficiaries the same MTF access that they currently enjoy. This access varies significantly with the service and with the size of the military hospitals; we added 1.9 beds per 1,000 Medicare beneficiaries, the average for DoD's midsize hospitals.[6]

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[4]Inasmuch as the research literature on hospital economies of scale inadequately adjusts for patient mix and other cost factors, it is difficult to determine whether small hospitals are in fact inefficient. However, we decided not to consider very small hospitals because the literature does suggest that quality improves with volume in hospitals, and it seemed unlikely that constructing small hospitals serving few beneficiaries would appreciably decrease MHSS costs. See Luft et al. (1979), Luft (1980), and Keeler et al. (1992).

[5]HMOs typically use fewer than 2 beds per 1,000 enrollees. The estimate of 2 beds per 1,000 is compatible with the assumptions that the population under 65 years of age uses 350 hospital days per year per 1,000 enrollees and that the population 65 or older uses 2,430 days per 1,000; see Kronick et al. (1993). By way of comparison, in 1990 the military operated about 1.7 beds per 1,000 non-Medicare beneficiaries. To calculate this figure, we used workload by beneficiary category to allocate 85 percent of the MTFs' 14,000 beds to this population. Hospitals with 70 or more beds that are not medical centers operated 1.5 beds per 1,000 (with an interquartile range of 1.3 to 1.8). Given our principal interest of adding facilities of this type, we used 1.5 beds per 1,000 non-Medicare beneficiaries as our planning factor.

[6]In FY90, medium-size MTFs averaged 1.3 occupied beds per 1,000 Medicare beneficiaries, with the interquartile range running from 0.8 to 3.1 (Navy MTFs averaged considerably fewer beds occupied by Medicare beneficiaries than Army and Air Force MTFs). On average, the medium-

- Increasing the physician-to-bed ratio for most hospitals up to the 90th-percentile level.

These factors imply that we would establish new hospitals in areas where at least 47,000 noncatchment, non-Medicare military beneficiaries are located within a 40-mile catchment area, with a smaller threshold in cases where Medicare beneficiaries require a significant number of beds. We found seven areas in which the beneficiary numbers in the late 1990s will meet this criterion, as shown in Table 7. With the exception of Atlanta, the one area that qualified for the addition of a military hospital in 1992, all of these areas are served by military hospitals that will be closed between 1992 and 1997. The areas that fall just below our criterion in 1997 are New York, New York (54 beds), Miami, Florida (49 beds), Harrisburg, Pennsylvania (44 beds), New Orleans, Louisiana (43 beds), Austin, Texas (43 beds), and Monterey, California (40 beds).

Table 7

Added Military Hospitals in Maximum-MTF Case

			Beds Required				
					Non-Medicare		
City	St	Hospital	Total	Medicare	Active Duty	Active Duty Dependents	Retirees/ Dependents
1997							
Los Angeles	CA	West L.A. VA	122	38	15	22	47
San Bernardino	CA	March AFB	85	30	4	6	45
San Francisco	CA	Presidio	74	30	6	7	31
Orlando	FL	Orlando NTC	82	33	2	2	45
Atlanta	GA	Ft. McPherson	83	20	6	14	43
Boston	MA	S. Boston VA	86	23	12	18	33
Dallas	TX	Carswell AFB	99	26	3	6	64
1992 and 1997							
Atlanta	GA	Ft. McPherson	99	19	9	22	49

size MTFs averaged 0.69 bed occupied per operating bed. Dividing the 1.3 by the 0.69 yields the required number of beds per 1,000 Medicare beneficiaries.

In some cases, MTFs might also be expanded to better serve the beneficiary populations. We expanded MTFs if they met the following criteria: (1) if the beneficiary population could support at least 70 beds; (2) if a substantial expansion of the MTF is indicated, i.e., the capacity needed for the non-Medicare population must must be at least half again the current capacity; and (3) if the catchment area did not noticeably overlap with that of another MTF.[7] We used the criterion of 1.5 beds per 1,000 non-Medicare beneficiaries to determine which hospitals to add or expand, but we also included 1.9 beds per 1,000 Medicare beneficiaries in establishing the number of beds for each of these hospitals. Table 8 shows these bed criteria.[8] The resulting list of hospitals warranting expansion totals 16 in 1992 and 13 in 1997, as shown in Table 9 (where the category of "beds required" includes both non-Medicare and Medicare beds).

We also examined the current staffing at the military hospitals and determined that there were substantial variations in full-time equivalents (FTEs) per operating bed. Many hospitals might well be better able to serve military beneficiaries if their physician levels

Table 8

FY90 Bed Requirements Per 1,000 Medicare Beneficiaries

	Medium-Size MTFs			Medical Centers		
Service	Beds Occupied	Avg Census	Beds Reqd	Beds Occupied	Avg Census	Beds Reqd
Army	2.5	82%	3.0	8.2	81%	10.0
Air Force	1.6	67%	2.4	8.0	69%	11.6
Navy	0.6	55%	1.15	2.8	62%	4.5

[7]Both Fort Belvoir and Fort Meade would otherwise be on the expansion list, but many of the beneficiaries from their catchment areas actually receive care at either Walter Reed Army Medical Center or Bethesda Naval Hospital, and this pattern would likely continue even if Fort Belvoir's and Fort Meade's operating capacities were expanded.

[8]We used the average bed usage per 1,000 Medicare beneficiaries rather than current usage at the specific facilities because as these facilities expand, we would expect them to provide a wider range of medical specialists and thus to require that fewer Medicare beneficiaries be referred to other MTFs (especially medical centers).

Table 9

Military Hospitals With Likely Expansion Requirements

Hospital	St	Current Operating Beds	Beds Required: Medical Center	Beds Required: Other	Beds Required: Total	Expanded Wartime Beds
1997						
Luke AFB	AZ	55	29	77	106	190
Travis AFB	CA	220	241	111	352	480
McClellan AFB	CA	35	28	73	101	106
Camp Pendleton	CA	128	50	195	245	624
San Diego NH	CA	393	273	381	654	764
MacDill AFB	FL	55	53	92	145	150
Patrick AFB	FL	15	23	49	72	83
Scott AFB	IL	115	78	68	146	422
Offutt AFB	NE	50	6	70	76	123
Nellis AFB	NV	35	12	66	78	50
McGuire AFB	NJ	36	31	100	131	617
Tinker AFB	OK	25	13	62	75	90
Ft. Hood	TX	126	8	174	182	1770
1992						
Luke AFB	AZ	55	32	63	95	190
Davis Mon AFB	AZ	35	19	53	72	112
McClellan AFB	CA	35	31	83	115	106
March AFB	CA	80	31	81	111	190
Long Beach	CA	120	30	166	196	692[a]
MacDill AFB	FL	55	59	111	170	150
Patrick AFB	FL	15	25	52	77	83
Scott AFB	IL	115	69	89	158	422
Ft. Devens	MA	35	35	70	106	116[a]
Offutt AFB	NE	50	7	74	81	123
Nellis AFB	NV	35	16	76	91	50
McGuire AFB	NJ	36	43	101	145	617
Ft. Bragg	NC	206	61	222	283	400
Tinker AFB	OK	25	15	74	89	90
Ft. Eustis	VA	42	11	66	78	100
Ft. Lee	VA	52	16	56	73	121

[a]Numbers from 1988.

were simply increased. We decided to increase the FTEs per bed up to the 90th-percentile level, which in FY92 was 1.2 FTEs per bed in small hospitals and 0.9 FTE per bed in medium-size hospitals and medical centers.

In developing this case, we also considered increasing the number of military clinics located in noncatchment areas. In FY92, there were 74 of these clinics. Using a criterion of at least 5,000 military

beneficiaries within a 20-mile service area, we identified 41 additional locations for military clinics. However, for reasons discussed in the next section, we did not include the added clinics in the final version of this case.

THE MINIMUM-MTF CASE (#3)

The minimum-MTF case attempts to shift as many military beneficiaries as possible to civilian health care while retaining the military's capacity to perform its wartime medical mission. The facilities and staff required for the wartime mission are employed in peacetime to provide primary care for active-duty personnel. Since active-duty workloads may be inadequate to fill the facilities and maintain the skills of military personnel, this case incorporates strategies for employing any excess capacity.

Civilian Health Plans

In this case, DoD would select from among the large number of civilian health plans available within the United States. Although some plans combine features from more than one type, these are of three major types:

- Fee-for-service plans, which historically have dominated the civilian market. These plans cover services obtained from any health care provider, with payment made according to the nature and extent of the services provided. Today, most FFS plans incorporate some managed-care features, such as prior authorization for hospital treatment.
- Preferred-provider organization plans, which modify FFS plans by establishing a network of providers who negotiate discounted payment rates and agree to submit their treatment decisions to utilization review. Most PPOs are "point of service"--that is to say, plan members may elect to use a network or a non-network provider at the point of service. If members do elect to use the network, the plan usually pays a higher fraction of the cost and may cover some services that would not otherwise be covered.

- Health maintenance organization plans that were developed many years ago. The key feature of an HMO resides in its payment mechanism; unlike FFS and PPO plans, payment is per capita (per patient) rather than per service, and the patient's choice of provider is limited. There are two major types of HMOs. The first, independent practice associations (IPAs), contract with physicians in private practice; primary care physicians (e.g., family practitioners and pediatricians) receive a per capita payment, and specialists and hospitals are paid per service. The second, group-model and staff-model HMOs, effectively employ their own providers and usually maintain hospitals. These two types of HMOs differ only in the way their providers are organized.

As Figure 12 shows, PPOs enjoy a large share of the civilian market. FFS plans are available everywhere, but PPOs and HMOs are not found in rural areas or even in some small cities. DoD could, however, encourage PPOs and HMOs to operate in areas with sizable military

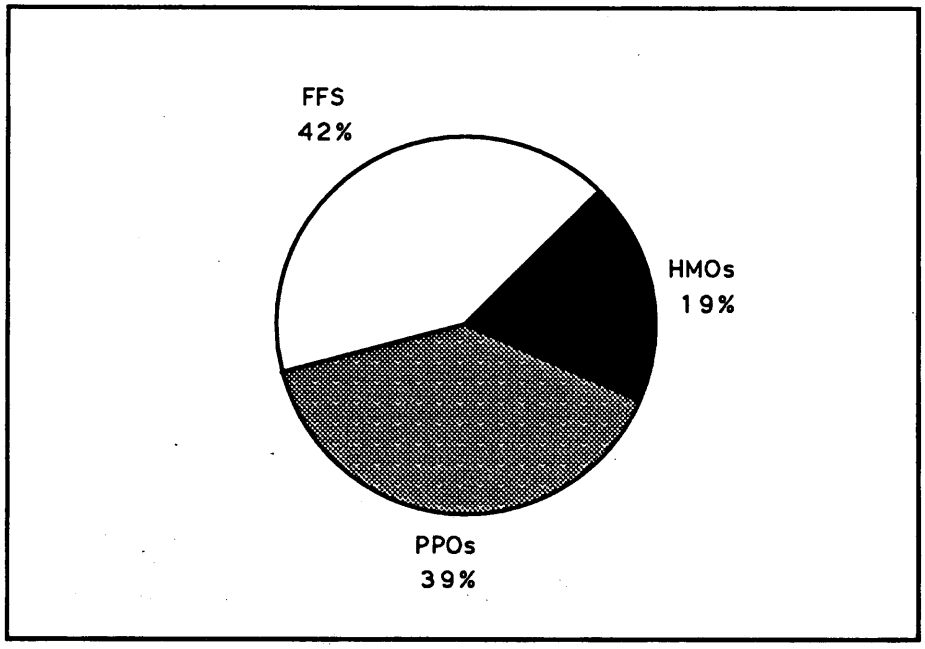

Figure 12—Shares of the Current Civilian Health Care Market

populations, and these plans are likely in any event to spread with national health reform.

Benefit Package

Under the minimum-MTF case, active-duty personnel would continue to receive free comprehensive care at or through military facilities. The benefits for other beneficiaries would depend on the type of civilian plan chosen. This case was specified to be consistent with the current MHSS benefit package. FFS plans are assumed to require the same cost sharing and to cover the same services that CHAMPUS does now. As in CRI and the FI-PPO program, use of an optional PPO in these plans would lower the coinsurance rate by five percentage points. HMO plans would have the same benefits as the managed-care enrollment option in cases 1 and 2; this would mean that standard HMO packages would have to be modified, particularly to expand mental health benefits.[9]

MTFs Needed to Meet Wartime Requirements

We define two options for meeting the wartime military bed requirement in the United States. In the first option (reception and referral), military facilities would serve as reception facilities for casualties being returned to the United States, provide some casualties with additional treatment, and refer the remainder to civilian or Veterans Administration hospitals. This option would maintain six military hospitals to fulfill this requirement, all located near military airlift bases and balanced both geographically and along service lines, as shown in Table 10.[10] We also assume that Dover will remain a major airlift base on the East Coast, but since its hospital is so small, we have added Walter Reed as the major medical center close to Dover to provide in-depth reception ability. In neither list are the

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[9]National health reform would lead to changes in the benefit packages in civilian plans and probably in the MHSS as well.

[10]Bethesda Naval Hospital is not included in either of the options. Although the capabilities of this facility cannot be disputed, there does not appear to be a wartime need for two medical centers in the Washington, D.C. area.

Table 10

Military Hospitals, Minimum-MTF Case

Reception-and-Referral		Military Care	
Hospital	St	Hospital	St
San Diego NH	CA	San Diego NH	CA
Dover AFB	DE	WRAMC-Washington	DC
WRAMC-Washington	DC	Jacksonville NH	FL
Lackland AFB	TX	Ft. Shafter	HI
Portsmouth NH	VA	Ft. Campbell	KY
Ft. Lewis	WA	Ft. Bragg	NC
		Camp Lejeune	NC
		Ft. Hood	TX
		Lackland AFB	TX
		Portsmouth NH	VA
		Ft. Lewis	WA

hospitals definitive; if others were chosen instead, however, there would be little change in the analysis.

The second option (military care) provides a sufficient number of military hospitals to meet the wartime bed requirements for CONUS care within the expanded bed capacities of the hospitals;[11] these hospitals are also distributed across the United States to allow recovering casualties to be as close to family members as possible. The list of hospitals in Table 10 generally includes newer and better-equipped facilities.[12] The 1992 and 1997 versions of this case include the same list of hospitals.

Under this concept, the 11 hospitals identified in Table 10 would provide most of the care for active-duty personnel in their catchment areas and would likely expand the services they provide to military personnel from other areas. In addition, as discussed below, they could provide care for non-active-duty beneficiaries under contract to the civilian health plans that cover these beneficiaries. At other military

[11]The overall DoD requirement is somewhat less than the service-specific bed requirements because the timing of the service requirements differs among services. The Army and Navy totals from this list are somewhat less than their service-specific requirements given the lower DoD total.

[12]An even more radical option would be to ignore the service-specific bed requirements and simply choose the best military hospitals regardless of their service. Such an approach would yield only a few changes from the list in Table 10.

bases that now have military hospitals (listed in Table 11), only a clinic facility would be retained to care for active-duty personnel.

Table 11

Military Hospitals Converted to Clinics in the Minimum-MTF Case

Clinic	Year 92	Year 97	Clinic	Year 92	Year 97	Clinic	Year 92	Year 97
Redstone Arsl, AL	C	C	Ft. Gordon, GA	C	C	Griffiss AFB, NY	C	
Ft. McClellan, AL	C	C	Ft. Benning, GA	C	C	Ft. Bragg, NC*	C	C
Ft. Rucker, AL	C	C	Ft. Stewart, GA	C	C	Seymour Jnsn, NC	C	C
Maxwell AFB, AL	C	C	Moody AFB, GA	C	C	Cmp Lejeune, NC*	C	C
Ft. Wainwright, AK	C	C	Robins AFB, GA	C	C	Cherry Point, NC	C	C
Elmendorf AFB, AK	C	C	Ft. Shafter, HI*	C	C	Grand Forks, ND	C	C
Adak NH, AK	C	C	Mountain Hme, ID	C	C	Minot AFB, ND	C	C
Ft. Huachuca, AZ	C	C	Chanute AFB, IL	C		Wright-Patt, OH	C	C
Luke AFB, AZ	C	C	Scott AFB, IL	C	C	Tinker AFB, OK	C	C
Davis Monthan, AZ	C	C	Great Lakes, IL	C	C	Altus AFB, OK	C	C
Little Rock, AR	C	C	Ft Ben Hrrsn, IN	C		Ft. Sill, OK	C	C
Travis AFB, CA	C	C	Ft. Riley, KS	C	C	Newport NH, RI	C	C
Beale AFB, CA	C	C	Ft. Leavnwrth, KS	C	C	Shaw AFB, SC	C	C
McClellan AFB, CA	C	C	Ft. Campbell, KY*	C	C	Charlestn NH, SC	C	C
Castle AFB, CA	C		Ft. Knox, KY	C	C	Beaufort NH, SC	C	C
Vandenbrg AFB, CA	C	C	Barksdle AFB, LA	C	C	Ft. Jackson, SC	C	C
Edwards AFB, CA	C	C	Ft. Polk, LA	C	C	Ellswrth AFB, SD	C	C
March AFB, CA	C		Loring AFB, ME	C		Millingtn NH, TN	C	C
Presidio, CA	C		Andrews AFB, MD	C	C	Ft. Bliss, TX	C	C
Ft. Ord, CA	C		Bethesda NH, MD	C	C	Ft. Sam Hstn, TX	C	C
Camp Pendletn, CA	C	C	Patuxent Rvr, MD	C	C	Ft. Hood, TX*	C	C
Long Beach NH, CA	C		Ft. Meade, MD	C	C	Reese AFB, TX	C	C
Oakland NH, CA	C		Ft. Devens, MA	C		Dyess AFB, TX	C	C
Lemoore NH, CA	C	C	K.I. Sawyer, MI	C		Sheppard AFB, TX	C	C
29 Palms, CA	C	C	Keesler AFB, MS	C	C	Laughlin AFB, TX	C	C
Ft. Irwin, CA	C	C	Columbus AFB, MS	C	C	Bergstrm AFB, TX	C	
Fitzsmmns AMC, CO	C	C	Ft Leonrd Wd, MO	C	C	Carswell AFB, TX	C	
Ft. Carson, CO	C	C	Whiteman AFB, MO	C	C	Corpus Chsti, TX	C	C
USAF Academy, CO	C	C	Offutt AFB, NE	C	C	Hill AFB, UT	C	C
Groton NH, CT	C	C	Nellis AFB, NV	C	C	Langley AFB, VA	C	C
Dover AFB, DE**	C	C	Ft. Monmouth, NJ	C	C	Ft. Eustis, VA	C	C
Pensacola NH, FL	C	C	McGuire AFB, NJ	C	C	Ft. Lee, VA	C	C
Jacksonville, FL*	C	C	Kirtland AFB, NM	C	C	Ft. Belvoir, VA	C	C
Orlando NH, FL	C		Holloman AFB, NM	C	C	Bremerton NH, WA	C	C
Eglin AFB, FL	C	C	Cannon AFB, NM	C	C	Oak Harbor, WA	C	C
Tyndall AFB,FL	C	C	West Point, NY	C	C	Fairchld AFB, WA	C	C
MacDill AFB, FL	C	C	Plattsburg, NY	C		FE Warrn AFB, WY	C	C
Patrick AFB, FL	C	C						

*These MTFs are clinics only in the "reception & referral" option.
**These MTFs are clinics only in the "military care" option.

In setting up this case, we required that an outlying clinic have a noncatchment population of 1,600 active-duty personnel to remain open.[13] This would mean closing 57 of the 74 outlying clinics existing in FY92.

Employing Excess MTF Capacity and Sustaining the MTF's Case Mix

The minimum-MTF case considers a substantial reduction in the size of the military system and, as a result, raises additional issues. An important issue is: to what degree would military hospitals need other than local, active-duty patients to fill their capacity in peacetime?

In FY92, the eleven hospitals in the military-care option admitted about 224,000 patients, while the six hospitals in the reception-and-referral option admitted over 135,000 patients. In each case, about 28 percent of the admissions were active-duty personnel--not a sufficient number to sustain the staffing of these hospitals. They would clearly require a significant number of other patients. While some would argue that the roughly 200,000 active-duty hospitalizations in 1992 would fill the military hospitals in the reception-and-referral option and nearly fill them in the military-care option, such an approach would lead to the wrong case mix for the physicians required in wartime and would involve tremendous costs of moving large numbers of military personnel around the United States. We therefore reject such an approach as inefficient and likely to generate excessive costs.

To provide workload and the right case mix, this case assumes that DoD's contracts with civilian health plans would require that they reimburse for services provided in MTFs and that their managed-care plans refer to the MTFs to fill capacity. Versions of both provisions already exist. Military hospitals are reimbursed by private insurance for military patients with such insurance and for nonmilitary patients, although collecting from the many private plans is difficult. A requirement to refer patients to the MTFs when possible is included in current CRI contracts. Such an arrangement allows us to include the

[13] In some cases, we list a clinic even though DEERS does not show the required number of personnel because current active-duty workloads suggest that the population estimates are in error.

cost of any MTF care provided to non-active-duty beneficiaries in civilian plan rates.

THE MILITARY-CIVILIAN COMPETITION CASE (#4)

The fourth case would offer most non-active-duty beneficiaries the choice of a military HMO plan based on the MTFs or one or more commercial health plans. All active-duty personnel would be enrolled in the military HMO if assigned to an MTF area; otherwise, they would receive care through small clinics as in the third case. MTFs would be responsible for all health care for beneficiaries who chose to enroll in the military plan, although some services would be provided by civilian providers at MTF expense. The MTFs' budgets for peacetime health care delivery would be based on a per capita "payment" for each enrollee.

Non-active-duty beneficiaries who preferred civilian care would be offered one or more commercial plans (if possible, at least one HMO and one PPO and/or FFS plan). These beneficiaries would receive all of their care through the commercial plan they chose, and they would not be eligible for any care at the MTF. In areas where the military plan could not be offered, only commercial plans would be available.[14] All beneficiaries would receive health care only within the plan they chose, with no health care provided outside the enrolled plan.[15] CHAMPUS would be terminated.

We assumed the different plans in this case would have benefits (e.g., deductibles, copayments, coverages) similar to current plans:

- Military HMO: the benefits offered in CRI Prime (the HMO option),

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[14]Some beneficiaries in noncatchment areas, especially those living just beyond catchment-area boundaries, may prefer enrollment in an MTF HMO rather than one of the civilian options. Although the analysis could consider such a choice as a variant of this basic alternative design, it would affect costs only if there were a significant number of such beneficiaries and if the MTF plan were significantly more or less expensive than commercial plans.

[15]DoD could ensure that all active-duty dependents are covered by mandating a default enrollment choice for all eligible dependents; this requirement could be waived for those who offer proof of private insurance coverage. With national health reform, DoD might collect premium contributions from private employers and even contribute the premium for employer plans.

- FFS plans: current CHAMPUS benefits,
- Civilian HMOs: the benefits offered in HMOs available through the Federal Employees Health Benefits Plan.

If military beneficiaries are ever given a direct choice between military and civilian health plans, premiums will be the most direct policy tool for ensuring sufficient enrollment in the military plan to fill MTF capacity. Therefore, in this case we varied the premium contribution beneficiaries would have to pay for these plans to see how differential premium costs might affect enrollment in the military HMO. We considered two premium structures: equal premiums for all plans (either none or about 20 percent of the typical plan's cost) and premiums only for civilian plans (again, about 20 percent).

The per-capita cost of care in the military HMO would depend on the level of utilization by enrollees. As we described in Sec. 3, current utilization levels for military beneficiaries are high. Reorganizing the MTFs to operate like the most cost-effective civilian HMOs would lower inpatient utilization levels in particular. Alternatively, the military plans might require enrollees to pay a share of the costs of their care, forgoing the tight utilization controls associated with an HMO. To explore the cost implications of these different approaches, we estimated three sets of utilization rates for military HMO enrollees, based on: (1) current utilization by the military population, (2) civilian HMO utilization, and (3) utilization under cost-sharing arrangements.

For this case, the MTF hospitals will be as specified in Table 6 for case 1. All military clinics would remain open to treat active-duty personnel, but we have not assumed that they would offer the HMO plan. Conceivably, some of these clinics could operate an HMO by directly providing primary care and either arranging for more specialized services within the MTF system or contracting with civilian providers for such services as civilian IPAs do now. However, our data were not adequate for estimating utilization and costs for clinic-based HMOs.

A COMPARISON OF THE FOUR ANALYTIC CASES

Tables 12 and 13 show the number of MTFs and the proportion of the population who are expected to live near them in 1997. Figures 13-15 map the hospital catchment areas and clinic service areas in 1997.[16]

The managed-care case (Figure 13) would serve a large fraction of military beneficiaries in the U.S. Most active-duty personnel and their

Table 12

Estimated Number of MTFs Under Each Case

Case	1992 Hospitals	1992 Clinics	1997 Hospitals	1997 Clinics
1. Managed care	117	74	101	86
2. Maximum MTF	118	74	108	86
3. Minimum MTF				
a) Reception/referral	6	128	6	118
b) Military care	11	123	11	113
4. Military-civilian competition	117	30	101	86

Table 13

Percent of Military Beneficiaries in 1997 Catchment/Service Areas

Case	Active Duty	Active Duty Dependents	Retirees and Dependents
1. Managed care	87%	80%	57%
2. Maximum MTF	89%	83%	64%
3. Minimum MTF			
a) Reception/referral	25%	--	--
b) Military care	41%	--	--
4. Military-civilian competition	87%	80%	57%

NOTE: Percentages are shown for active duty personnel only for case 3 because other beneficiaries are enrolled in civilian health plans and would get care from MTFs only through contract with their civilian plan.

[16]These figures assume that all catchment areas reach out 40 miles, whereas in reality catchment areas are defined by ZIP codes and may have a smaller radius based on physical barriers (such as rivers and bays), state boundaries, and overlaps with other catchment areas. In cases of overlaps, ZIP code assignments sometimes vary by service; for example, naval personnel in Washington, D.C. are assigned to Bethesda Naval Hospital, whereas Army personnel are assigned to Walter Reed Army Medical Center.

dependents would live in areas with a hospital (Table 13).[17] Just over one-half of retiree and survivor families would live near an MTF. The military-civilian competition case would cover essentially the same fraction of the population as the baseline case. The maximum-MTF case (Figure 14) would have its greatest effect on the retired population and their dependents, raising the fraction who have access to a military hospital to almost two-thirds. The military hospitals retained in the minimum-MTF case (Figure 15) would serve only about 25 to 40 percent of active-duty personnel. However, with the added clinics the system would cover 90 percent in the United States (not shown)--only slightly less than the baseline managed-care case.

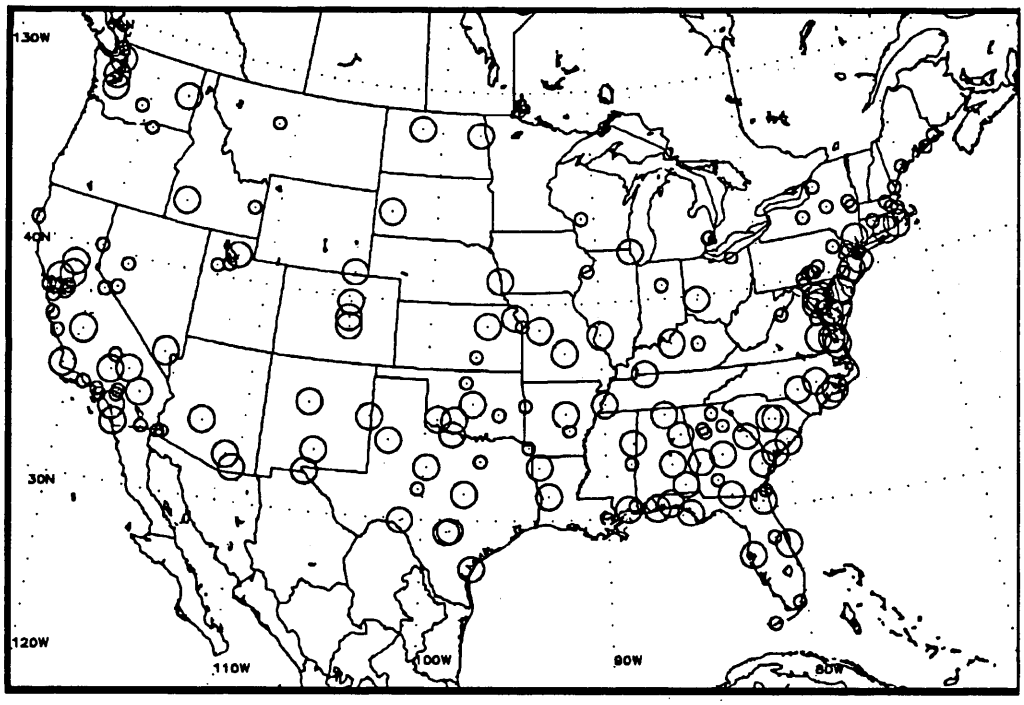

Figure 13—Locating 1997 MTFs for the Managed-Care and Military-Civilian Competition Cases

[17]The fractions would be even higher if we were to include areas with a military clinic in Table 13--94 percent for active-duty personnel and 89 percent for their dependents.

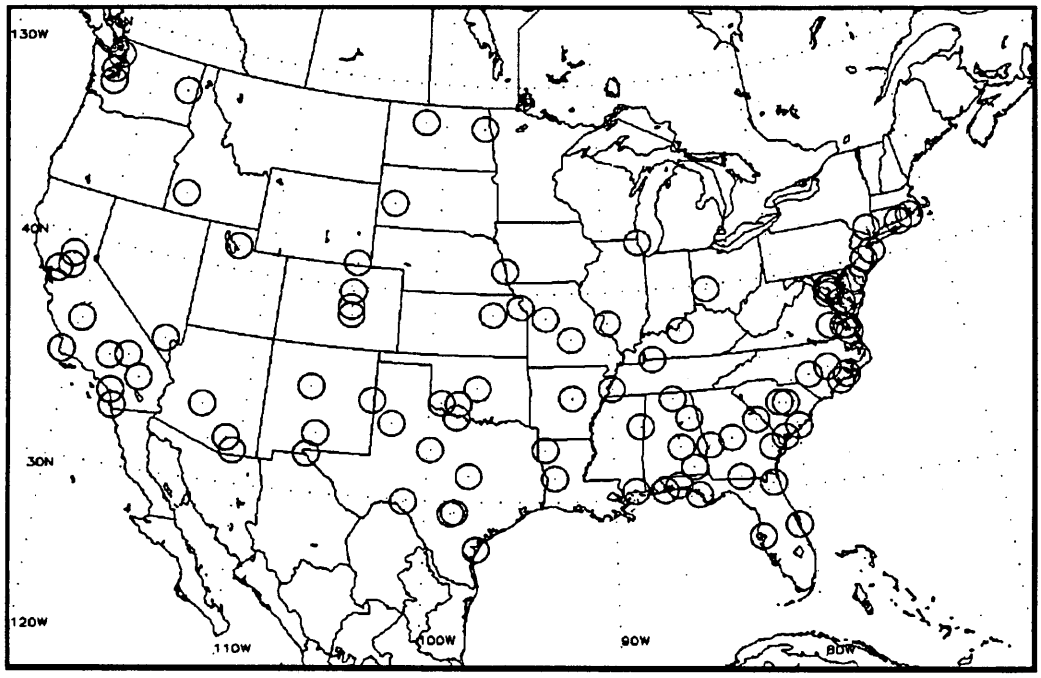

Figure 14—Locating 1997 MTFs for the Maximum-MTF Case

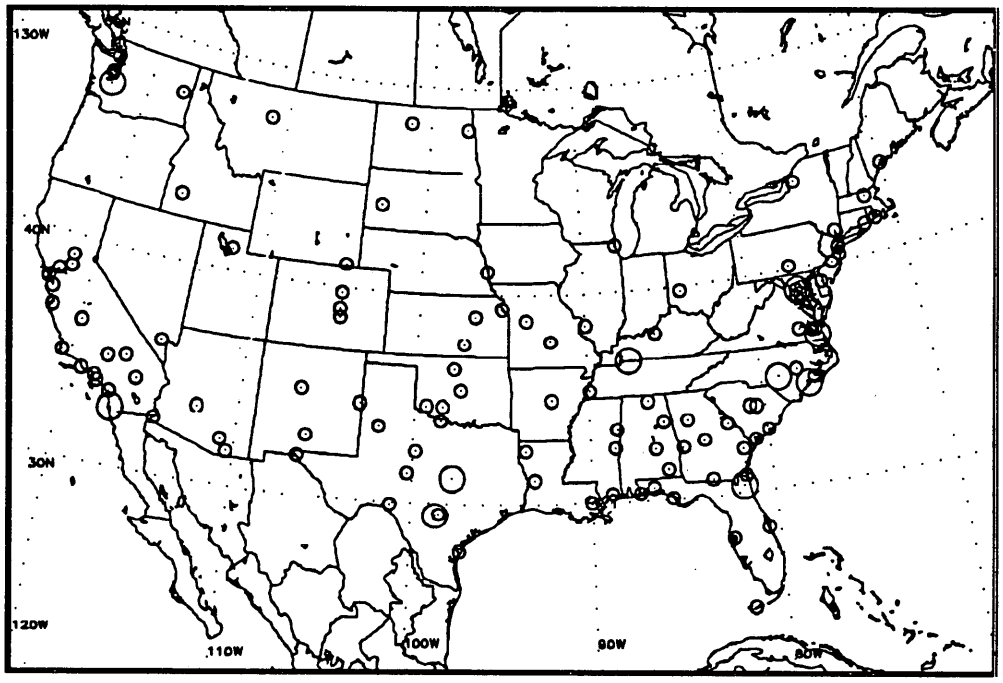

Figure 15—Locating 1997 MTFs for the Military Care Option of the Minimum-MTF Case

5. THE EFFECTS OF CHANGES IN THE MHSS ON HEALTH CARE DEMAND

Military beneficiaries' demand for health care is determined by numerous factors (as we discussed in Section 3), including:

- Personal characteristics,
- Family characteristics,
- Local (military and civilian) health system characteristics, and
- Health plan characteristics.

Although these factors are the same as those that shape health care demand in nonmilitary populations, the precise effects of each factor may differ in the two populations. Within the military population, there would also appear to be demand differences across the services that are not explained by these factors.

To illustrate effects on military health care utilization, Table 14 shows how demand for health care on the part of retirees and their dependents (under age 65) varies with two of these factors--health status and MTF capacity. Health status is measured by the number of reported health conditions (0-2 versus 3 or more) and MTFs are categorized according to whether their operating beds per 1,000 beneficiaries is above or below the median for all MTFs. The table shows that MTF utilization is higher in areas with more MTF capacity in relation to the beneficiary population, whereas civilian utilization is lower. At the same time, utilization in both sectors is higher for less healthy beneficiaries. These data are based on the beneficiary sample surveyed for the study and are weighted to reflect the population of retirees and dependents under age 65 in the United States.

Our task was to predict the effects of changing a subset of these factors--e.g., the size of the MTF system, nationwide implementation of managed care, or offering a choice of current health plans and commercial plans--on health care utilization and civilian health care costs. To do this, we had to be able to estimate the effects of changing these factors while holding all other factors constant. As an example, consider the prediction of utilization and cost in a system

Table 14

Average Health-Care Utilization by Health Status and MTF Capacity Retirees and Dependents under Age 65 Living in U.S.

	Non-catchment areas	Catchment areas: MTF beds/1,000 beneficiaries	
		1.34 & under	over 1.34
Healthier beneficiaries			
MTF visits	0.74	1.10	1.47
Civilian visits	1.40	1.05	0.79
Total MHSS visits	2.14	2.15	2.26
MTF hospital days	.007	.098	.295
Civilian hospital days	.083	.049	.070
Total MHSS days	.090	.147	.365
Less healthy beneficiaries			
MTF visits	0.82	2.62	3.21
Civilian visits	3.54	2.55	1.55
Total MHSS visits	4.36	5.17	4.76
MTF hospital days	.109	.232	.627
Civilian hospital days	.302	.185	.227
Total hospital days	.411	.417	.854

with a larger MTF capacity. To simulate only the effect of expanding MTFs, we would need to hold constant health status and other factors that influence demand. To do so, we could construct average utilization rates by demand factor and beneficiary group, but sorting out all the important factors would require a very large table; for many of the cells, there would be insufficient data to measure utilization rates. Instead, we applied statistical methods to these data to accomplish the same purpose.

METHODOLOGY

Although the analytic methods we used were similar for all the analytic cases studied, such methods did differ depending on whether a given case was structured like the current MHSS--with MTFs and civilian health care financed by CHAMPUS (cases 1 and 2), or whether it incorporated commercial health plans as well (cases 3 and 4). This section first describes the methods we used to study cases based on the

current system and then summarizes the results.[1] Our analysis involved the following four steps:

1. Structuring the analysis through the determination of the components of demand and the beneficiary groups to be analyzed;
2. Development of measures of demand (utilization and cost) and of the factors that affect demand;
3. Estimation of demand equations for each demand component and beneficiary group that describe the independent effects of individual, family, and health system factors on utilization and civilian care costs in the MHSS; and
4. Use of the equations derived in step 3 to predict utilization and civilian care costs in the analytic cases that represent alternative military health care systems.

The study's beneficiary survey served as the principal data source for this analysis. As described earlier, the survey was fielded during the winter and spring of 1992-93 and provided information on about 16,000 active-duty, retiree, and survivor households eligible for military health care.[2] We augmented the survey data with information from CHAMPUS claims, the MEPRS and biometrics data systems, and the 1990 Area Resource File.

STRUCTURING THE DEMAND ANALYSIS

The two "sectors" of the current MHSS--the MTFs and CHAMPUS--differ in the range of health services they cover, in the extent of beneficiary access, and in their cost both to beneficiaries and to DoD. Within each sector, beneficiaries may obtain outpatient care, measured in visits, as well as inpatient care, measured in hospital admissions. We further decomposed each of these four components of utilization--MTF visits, MTF admissions, CHAMPUS visits, and CHAMPUS admissions--into two components: the probability of having some utilization, and the level of utilization only for those beneficiaries who had some utilization. This

[1]Our final report will include a second section that focuses on alternatives that encompass commercial health plans.

[2]This excludes overseas populations, single active-duty personnel, and reserve retirees. See Lurie et al. (1994) for more information regarding this survey.

decomposition of health care utilization into probability and level of use for outpatient and inpatient care is frequently used by health researchers. We similarly structured our analysis of CHAMPUS costs[3] in two parts: the probability of incurring nonzero CHAMPUS costs and the level of costs for those who had some costs. This structure resulted in ten components of demand.

As Table 15 shows, we conducted a full analysis for only eight of the ten components thus derived. Since very few beneficiaries are admitted to the hospital more than once per year, and since other studies have shown that the level of inpatient utilization is relatively unresponsive to demand factors, we did not attempt to analyze the number of admissions either in the MTFs or in CHAMPUS. Instead, this component of demand was held constant across the cases studied.

The demand analysis focused on active-duty dependents, retirees and their dependents, and survivors and their dependents living in the United States.[4] We assumed that because of the readiness mission, active-duty personnel would receive the same health care services they now obtain in all cases. Total active-duty utilization therefore varies only with the number of active-duty personnel. With the data available, an analysis of MTF utilization by beneficiaries living overseas, DoD's civilian employees, retired Reserve personnel, or other populations was

Table 15

Components of Demand Analyzed

MHSS Sector	Components	
MTF	Utilization:	1. Probability of using any outpatient care 2. For outpatient users only, number of visits 3. Probability of using any inpatient care
CHAMPUS	Utilization:	1. Probability of using any outpatient care 2. For outpatient users only, number of visits 3. Probability of using any inpatient care
	Costs:	4. Probability of incurring any costs 5. For those with costs, the level of costs

[3]MTF costs are estimated by IDA in a separate report (Goldberg et al., 1994).

[4]The 50 states and the District of Columbia.

not possible; hence the per capita utilization rates of such personnel were also held constant across the cases.

The beneficiaries whom we studied were grouped as shown in Table 16 to accommodate differences in the structure of their health care demand. The analysis separated beneficiaries who live in MTF catchment areas from those in non-catchment areas because of the obvious difference in their access to MTF services. Further groupings differed for the MTF and CHAMPUS analyses. For MTF utilization, which we measured for individual beneficiaries, we grouped the catchment-area population according to CHAMPUS eligibility and age. Owing to their small sample size, the non-catchment-area population was studied in one group. In all instances, we assigned survey respondents to these groups according to the home ZIP code they reported in the survey rather than according to the location reported by DEERS.

For CHAMPUS utilization and cost, we had data for entire families, not just individuals. Our use of family-level data facilitated the analysis of civilian health costs in particular. Since costs are highly variable, they are difficult to predict with any precision; summing costs across family members allowed us to effectively increase the

Table 16

Population Groups Whose Demand Was Analyzed Separately

MTF Utilization
(unit of observation is the individual beneficiary)

	CHAMPUS Adult Eligibles	Children	Medicare Eligibles
Catchment Areas	I	II	III
Non-Catchment Areas	IV		

CHAMPUS Utilization and Costs
(Unit of observation is the family)

	Active-Duty Families	Retired Families
Catchment Areas	I	II
Non-Catchment Areas	III	IV

number of people being studied and decrease the proportion of the sample with zero costs. In addition, it was easier for us to match claims records to families, which is done by sponsor social security number, than to individuals, which also requires a series of difficult matches on sometimes inaccurate birthdate and sex information.[5]

The population of families with CHAMPUS-eligible members was grouped as shown in Table 16. Owing to the differences in CHAMPUS cost-sharing requirements, separate analyses were conducted for active-duty and retiree families in catchment areas; the sample in non-catchment areas was too small to separate the two family groups.

DEFINING MEASURES OF DEMAND AND FACTORS AFFECTING DEMAND

Utilization and cost data were obtained from the self-reported survey data on MTF outpatient utilization and FY92 MTF inpatient records and CHAMPUS claims records for the survey respondents. We used a CHAMPUS hospital-episode file created by the Army's Directorate of Health Care Studies and Analyses, but we processed the outpatient claims ourselves. We defined a CHAMPUS outpatient visit for each same-patient/same-provider/same-day combination if the procedure codes indicated that an encounter with a provider had occurred. If only ancillary services had been provided, we did not define a visit. We summed costs from all hospital and professional inpatient claims and outpatient claims for each family and random family member.

Table 17 lists the variables that were included in the demand regressions as determinants of utilization and costs. Not all variables were included in every equation; for example, the MTF variables were not included in regressions for people living in non-catchment areas. In addition, some variables were deleted from some or all of the equations because they did not significantly affect demand. Education has elsewhere been shown to affect demand in other populations but did not do so in this population; the variable for officers (as opposed to

[5]Family-level analysis was not possible for MTF utilization because the survey asked for utilization by source of care only for a single family member.

Table 17

Individual, Family, and Health Care Characteristics Included in Demand Regressions

Type	Variable
Individual characteristics[a]	Age
	Sex
	Number of reported health conditions
Family characteristics	Age of spouse or (if no spouse) sponsor[b]
	Sponsor is an officer
	Sponsor not affiliated with military service that operates MTF (catchment areas only)
	Sponsor (retired only) or spouse is employed full time
	Income
	Number of family members
	Enrolled in CRI Prime
	Living in CRI area but not enrolled
	Enrolled in Air Force CAM plan
	Living in Air Force CAM area but not enrolled
	Enrolled in Navy CAM plan
	Living in Navy CAM area but not enrolled
	Minimum health status for any family member[b]
MTF characteristics	Military service
	Operating beds per 1,000 military population in catchment area
	Clinical staff per operating bed
	County has military clinic that provides outpatient care (>1 visit per year) to non-active-duty beneficiaries[c]
Civilian health characteristics	Beds per 1,000 total population in county
	Physicians (active) per 1,000 total population in county

[a]MTF regressions only.
[b]CHAMPUS regressions only.
[c]Non-catchment areas only.

enlisted personnel) includes the effects of education as well as other military-specific effects.

We did not include variables measuring premiums, deductibles, and copayment levels because there is little variation in cost-sharing currently in the MHSS. We did identify those individuals who were subject to different cost-sharing arrangements through CRI and CAM. We did not include a variable indicating those with other insurance coverage because the decision to take such coverage is influenced by health care utilization. Instead, we included a variable indicating

those who might have access to other insurance because someone in their family is employed on a full-time basis. Finally, the survey did not include a question about distance or travel time to the nearest MTF--an important factor in demand for care in the MTFs and CHAMPUS.

We defined many of these variables in an obvious manner from the survey information. However, some were obtained from other data sources or require additional explanation.

Individual Characteristics

We defined a number of age variables that capture the relationship between age and health care use shown in Figure 3. For all groups, we included a variable for age squared as well as for age. For regressions that included active-duty spouses, we also included a variable to indicate women of child-bearing age (18 to 34) because their use is high during these years. When we combined children and adults--e.g., in non-catchment areas--we defined different age variables for the two groups. We experimented with several ways of representing information on health conditions; we used a simple count of the number of conditions reported because it was effective in explaining demand and because it allowed us to keep the variable list short--an advantage for statistical reasons.

Family Characteristics

With the exception of the CRI and CAM enrollment variables, the family variables are straightforward. The survey question combined CRI's CHAMPUS Prime (the enrollment plan) and CHAMPUS Extra (the optional PPO) options in the same answer, but we wanted to identify just those who had enrolled in Prime. We also found that respondents who lived in CAM areas sometimes reported that they were enrolled in Prime, which happens to be the name of the Navy's enrollment plan as well. In addition, we modified the survey data to make them more consistent. If the ZIP code reported by the respondent was in a CRI area, we considered the family to be enrolled if (s)he reported that the family used CHAMPUS Prime/Extra. We included all of these people because doing so gave us enrollment rates that were very close to those reported by the CRI contractor at the time of the survey. If the ZIP code was in a CAM area, we considered the family to be enrolled if they reported use of

either CHAMPUS Prime/Extra or the appropriate CAM program. As for CRI, the enrollment rates we obtained in this way were consistent with other information on enrollment.

MTF Characteristics

We used the MTF data available through the DMIS data systems with some modifications. Since the recorded number of operating beds was out of date for many MTFs, we replaced it with information collected more recently by Health Affairs. We also corrected the DEERS catchment-area population counts for the more important discrepancies described in Sec. 3. We used MEPRS MTF staffing data for FY92, combining the data for hospitals and clinics in the same catchment area and, where possible, deleting staffing in satellite clinics located outside catchment areas. We also combined several catchment areas that substantially overlapped; these included areas in and near the District of Columbia, San Antonio, and Colorado Springs.

For the non-catchment population, we determined whether areas were served by a military clinic by matching respondents to counties using reported ZIP codes and by identifying those counties with a military clinic. We deleted clinics that reported under one visit per non-active-duty beneficiary in the FY92 Biometrics reports. We also explored the possibility of further differentiating areas with clinics that provide a higher level of service to these beneficiaries, but our sample proved too small to make this feasible.

Civilian Health Characteristics

Again using ZIP-code information, we matched respondents to county data on hospital beds, physicians, and population in the 1990 Area Resource File--the most recent data available in a single source.

ESTIMATING DEMAND EQUATIONS

The structure developed in step 1 required that we estimate twelve MTF utilization equations (three components of demand for each of four groups of individual beneficiaries), twelve CHAMPUS utilization equations (the same three components for each of four groups of families), and eight CHAMPUS cost equations (two components of cost for

the four family groups). Each equation quantifies the relationship between a component of utilization or cost and the factors--the independent variables in the equation--that determine that particular component. The equations are estimated separately using standard multiple regression techniques, as described more fully in Appendix C.

PREDICTING UTILIZATION AND COSTS FOR THE ANALYTIC CASES

Utilization and costs for the analytic cases were generated from the demand equations. The first step lay in determining which demand factors would change in each case and how they would change. (The manner in which this was done for the expanded-MTF case is described below.) Then, for each individual or family in the survey sample, we substituted revised values for the variables that measure the factors that change. The updated variables were entered into the demand equations to obtain a prediction for each individual or family for each component of demand and, subsequently, for the utilization and cost measures of interest: MTF visits, MTF admissions, CHAMPUS visits, CHAMPUS admissions, and CHAMPUS costs. We estimated per capita utilization and costs for the population by averaging the predictions for individuals (MTF) and families (CHAMPUS), weighting the survey sample so that it reflected the DoD population as a whole, not just survey participants. Finally, we estimated total utilization and costs by multiplying the per capita averages for the population by the total number of individuals and families in the population.

The base case used in our analysis is the current military system with managed care--specifically a CRI-type program--in all catchment areas. Since 1988, the military health care system has adopted a number of reforms, the most important of which is managed care. Only a part of the system now has managed-care programs, but DoD is moving rapidly to expand CRI-like programs nationwide. Since information about the expansion of managed care to non-catchment areas is limited, we did not attempt to estimate utilization and costs with managed care in these areas. As part of the regression analysis, the change in demand associated with managed care was estimated from the current CRI programs. However, since DoD plans some changes in future CRI programs,

and to the extent that there is some uncertainty regarding our estimates of the effects even of the current CRI program, we also investigated the sensitivity of our results to the type of program we chose to simulate.

Although we sought to replicate as closely as possible DoD's immediate plans, our primary purpose in simulating nationwide implementation of managed care for case 1 (the "baseline" system) was technical: to keep other conditions the same when predicting the effects of the changes envisioned in case 2. Unless we simulated proportional increases in MTF capacity in all areas, we might otherwise "grow" managed-care areas more or less than "standard" areas and mistakenly attribute the results entirely to changes in case 2. Instead of CRI, we could have simulated a baseline case without managed care in any area. We chose to base case 1 on CRI because it is most similar to current DoD plans for the future. In addition, CRI has been tested in numerous catchment areas (instead of two currently for CAM), so our estimates of program effects are less likely to be affected by local circumstances unrelated to managed care.

The specific procedure used to predict utilization and costs for the analytic cases depended on the specific changes envisioned in each case. The following describes the procedures used for the expanded-MTF case. Like the base case, the expanded-MTF case incorporates managed care. In addition, as described in Sec. 4, it supposes an expanded version of the FY92 MTF system that included the following:

- A military hospital in Atlanta, Georgia;
- Expanded physical capacity (as measured by the number of operating beds) at 16 existing military hospitals; and
- Increased staffing levels at most hospitals.

Prediction of utilization and costs for this case required only limited changes in the variables in the demand equations. For example, we reassigned the beneficiaries in our sample who live in the Atlanta catchment area from the non-catchment-area group to the catchment-area group and assumed that they would have access to an MTF with operating beds and staff appropriate to the Atlanta catchment-area military population. Their utilization and costs are then predicted using catchment-area demand equations. Beneficiaries already living in a

catchment area stay in the same population group, and their utilization and costs are predicted using the demand equations for that group, but the variables that describe their MTF might change.

In both the baseline and expanded-MTF cases, we needed to incorporate the effects of expanding CRI to all catchment areas. We assumed that each active-duty dependent has a 35 percent probability, and each retiree and dependent a 26 percent probability, of enrolling in the managed-care plan; these are the enrollment rates reported in the survey for CRI populations. Each person's utilization (or cost) is predicted to be a weighted average of utilization if enrolled and utilization if not enrolled, with the enrollment probability used as the weight.

The final prediction step is a series of adjustments to the predictions. For MTF utilization, this step adds the predicted utilization for the population groups studied to the current utilization for the groups held constant or not studied--e.g., active-duty personnel and overseas beneficiaries. It also adjusts the predicted visits and admissions, derived from the survey data, to make them compatible with the data that are reported in MEPRS, and it allocates the utilization to the individual MTFs. The survey-MEPRS adjustment is necessary because IDA uses MEPRS data in estimating the cost functions that are applied to our utilization estimates to obtain MTF costs. Appendix D provides more information about these MTF utilization adjustments. CHAMPUS utilization is not adjusted, but CHAMPUS costs are inflated both to include claims processing and other overhead costs and to correct for any incompleteness.[6]

EFFECTS OF DEMAND FACTORS: SUMMARY OF REGRESSION RESULTS

To aid in understanding the utilization projections for the different analytic cases, we summarize here the effects of the variables listed above on past utilization, as reflected in the demand equations.

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[6]We estimated completed costs from the CHAMPUS Health Care Summary Report using the completion factor calculated by CHAMPUS for that report. We then multiplied our cost estimates by the percentage our estimate of current CHAMPUS costs differed from the adjusted CHAMPUS figure. Like the CHAMPUS reports, our data were incomplete.

Tables 18 to 20 indicate whether each factor increases or decreases each component of demand. The sample sizes, estimated coefficients, and standard errors for the regressions are reported in Appendix C.

The estimated coefficients for age generally mirror the patterns seen in Fig. 3.2. Poor health status is strongly and positively associated with higher utilization and costs. Members of the families of officers and sponsors from the same military service that operates the MTF typically are more likely to seek care; however, the higher propensity of officers' families to use MTF care is not statistically significant for most groups. As expected, those in a family with a full-time civilian worker are less likely to receive their care from MTFs, but that does not necessarily apply to CHAMPUS. Family income has no consistent relationship to demand, although higher-income families are more likely to use CHAMPUS.

Most measures of the propensity to use MTFs are lower for Army MTFs and almost all are lower for Navy MTFs than for Air Force MTFs. The managed-care programs (CRI and CAM) have no significant effect on MTF utilization, but enrollees use more CHAMPUS outpatient care. Inpatient CHAMPUS utilization seems to be lower for nonenrollees. MTF demand increases with MTF capacity, as measured by beds and clinical staffing per thousand beneficiaries in the area. By contrast, CHAMPUS demand decreases with capacity, suggesting that the two are substitutes. In non-catchment areas, access to a military clinic increases the propensity to use MTF outpatient care but does not decrease CHAMPUS outpatient use. The CHAMPUS cost results generally follow from the utilization results.

PREDICTED DEMAND IN BASELINE AND EXPANDED MTF CASES (1 & 2)

Tables 21 to 25 summarize our predictions of utilization in the MTFs and CHAMPUS, and of CHAMPUS costs, for cases 1 and 2. As described in Sec. 4, case 1 is the current system with a nationwide managed-care program based on CRI. Case 2 is the same managed-care program with expanded MTF capacity. The outpatient utilization tables (Tables 21 and 23) show the predicted per-person visit rate for MTF services and the

Table 18

Summary of Regression Results for MTF Outpatient Visits and Hospital Admissions

Variable	Catchment adults			Catchment children			Catchment Medicare			Non-catchment (all)		
	Visits		Adm.	Visits		Adm.	Visits		Adm.	Visits		Adm.
	>0	no.	>0	>0	no.	>0	>0	no.	>0	>0	no.	>0
Age	+	(+)	(-)	(-)	-	-	-	+	(+)	(+)	-	(-)
Age squared	-	(+)	(+)	(-)	+	+				(-)	(+)	+
Retiree/dependent	-	-	(-)	(+)	-	-				-	(+)	(-)
Medicare eligible										+	+	(+)
Female retiree/dep	+	+	-				(-)	+	-	+	(-)	(-)
Female age 18-34	+	+	(+)									+
Health status	+	+	+	+	+	+	(+)	+	+	+	+	
Officer	(+)	(-)		+	(-)		(+)	-	-	(-)	-	(-)
Not MTF's service	-	(+)	-	(+)	(+)	(-)	-	(+)	(-)			
Employed full-time	-	-	-	-	(+)	+				(-)	-	(-)
Income	(+)	-	(-)	(+)	(-)	-				(-)	(+)	(+)
Income--retired	-	(-)	(-)	-	(-)		(-)	+	+	(+)	(-)	(-)
No. in family	+	+	(+)	+	+	(+)	-	-	-	-	-	(-)
CRI/enrolled			(+)			(+)						
AD dependents	(-)	(+)		(-)	-							
Retirees/others	(+)	(+)		(+)	(+)							
AF CAM/enrolled			(-)			(-)						
AD dependents	(-)	(+)		(-)	(-)							
Retirees/others	(-)	(+)		(+)	(-)							
Navy CAM/enrolled			(-)			(-)						
AD dependents	(+)	(-)		(-)	(-)							
Retirees/others	(+)	(-)		(+)	(-)							
Army vs. AF MTF	-	+	(+)	-	(+)	-	(+)	-	-			
Navy vs. AF MTF	-	(+)	(-)	-	(-)	-	-	(-)	-			
MTF beds/1000	+	+	(+)	+	+	+	+	(+)	+			
MTF MDs/bed	+	+	(+)	+	+	+	(-)	(+)	(+)			
Mil. clinic										+	-	(-)

NOTE: () indicates that the coefficient is not statistically significant at the .05 level. Variables with no sign were not included in the regression.

Table 19

Summary of Regression Results for CHAMPUS Outpatient Visits and Hospital Admissions

Variable	Catchment-area active-duty			Catchment-area retired			Non-catchment areas (all)		
	Outpatient		Adm.	Outpatient		Adm.	Outpatient		Adm.
	>0	no.	>0	>0	no.	>0	>0	no.	>0
Spouse/sponsor age	+	(+)	(-)	+	(-)	(+)	(+)	(+)	(+)
Sp. age squared	-	(-)	(+)	(-)	(+)	(-)	(-)	(+)	(-)
Fam. health status	+	+	+	+	+	+	+	+	+
Officer	+	+	(+)	+	+	(-)	+	+	+
Employed full-time	(+)	+	-	-	(+)	(-)	+	(-)	(+)
Income	+	(+)	(-)	+	+	(+)	+	(+)	(+)
No. in family	+	+	+	+	(+)	+	+	+	(+)
CRI/enrolled	+	+	+	+	+	+			
CRI/standard	-	+	-	-	(+)	(-)			
AF CAM/enrolled	(+)	(+)	(-)	+	(-)	(+)			
AF CAM/standard	(-)	(-)	(-)	(+)	(+)	(-)			
Navy CAM/enrolled	+	(+)	(-)	(+)	(+)	(+)			
Navy CAM/standard	(+)	(-)	+	(+)	(+)	(-)			
Army vs. AF MTF	(-)	(+)	(+)	(-)	(-)	(+)			
Navy vs. AF MTF	+	+	+	+	+	(+)			
MTF beds/1000	-	-	-	-	-	-			
MTF MDs/bed	-	-	-	-	(-)	(-)			
Mil. clinic area							(+)	(+)	(-)
Civ. beds/1000	(+)	(-)	(+)	+	(+)	(+)	(+)	(-)	(+)
Civ. MDs/1000	-	+	(+)	-	(-)	(-)	-	+	-

NOTE: () indicates that the coefficient is not statistically significant at the .05 level. Variables with no sign were not included in the regression.

Table 20

Summary of Regression Results for CHAMPUS Costs (Paid by DoD)

Variable	Catchment-area active-duty		Catchment-area retired		Non-catchment areas (all)	
	>$0	$ Amount	>$0	$ Amount	>$0	$ Amount
Spouse/sponsor age	+	(+)	+	-	(+)	+
Sp. age squared	(-)	(-)	(-)	+	(-)	-
Child < 1 year old	+	+	(+)	(-)	+	+
Retired					-	(+)
Fam. health status	+	+	+	+	+	+
Officer	+	(+)	(+)	+	+	+
Employed full-time	(-)	-	(-)	(-)	+	-
Income	(-)	(-)	+	(-)	-	(-)
Income--ret.					(+)	(-)
No. in family	+	+	+	+	+	+
CRI/enrolled	+	+	+	+		
CRI/standard	-	(+)	-	+		
AF CAM/enrolled	(+)	(+)	+	(-)		
AF CAM/standard	-	(+)	(-)	(+)		
Navy CAM/enrolled	+	(-)	(+)	(+)		
Navy CAM/standard	(+)	(+)	(-)	(-)		
Army vs. AF MTF	(-)	(+)	(+)	(-)		
Navy vs. AF MTF	(-)	+	+	+		
MTF beds/1000	(-)	-	(-)	-		
MTF MDs/bed	-	-	(-)	(-)		
Mil. clinic area					(+)	(+)
Civ. beds/1000	(+)	(+)	+	(+)	(+)	(+)
Civ. MDs/1000	-	(+)	-	(-)	-	(+)

NOTE: () indicates that the coefficient is not statistically significant at the .05 level. Variables with no sign were not included in the regression.

per-family rate for CHAMPUS services for cases 1 and 2 in the first two columns. The other four columns show predicted values for the two components of the visit rate: the probability of having any visits and the number of visits conditional on being a user. The inpatient utilization tables (Tables 22 and 24) show only the probability that a person or family has any hospital care.

MTF Utilization

Although overall utilization rates differ somewhat, the differences in utilization between the baseline and expanded-MTF cases are the same in 1992 and 1997.[7] For beneficiaries living in catchment areas in either year, we predict an increase of approximately 15 percent in MTF outpatient-service use by non-active-duty personnel with the added MTF capacity and higher staffing levels in case 2 (Table 21).[8] Sixty percent of the outpatient increase represents additional users and 40 percent higher levels of use. Many of the added visits are for CHAMPUS-eligible retirees and dependents. These beneficiaries have a lower priority for MTF care than do active-duty dependents, so it is not surprising that they benefit most when MTF capacity expands. It is surprising, however, that Medicare-eligible retirees and dependents do not show the same increase as the younger retired group. It may be that their utilization is constrained more by the lack of resources appropriate to treat the elderly in the many small military hospitals than by access to the services the MTFs can provide.

We found only minor differences in MTF utilization between standard and either CRI or CAM areas, so these results would not change appreciably if we substituted the standard program or CAM for CRI in these two cases. We estimate, for example, that MTF outpatient utilization with CRI is under 1 percent higher than without CRI for CHAMPUS beneficiaries in catchment areas. The CRI evaluation also found a small increase in MTF outpatient utilization (just over 2 percent) two

[7]For the baseline case, average use for all beneficiaries will be lower in 1997, primarily because a larger fraction of beneficiaries will be living in non-catchment areas.

[8]Recall that the survey truncated the visits data at 10. The figures we report in these tables do not correct for this truncation.

Table 21

MTF Outpatient Demand in Baseline and Expanded Cases (1 & 2)
(FY 1992 and 1997 MTFs and Populations)

Beneficiary Category	Visits/Person		Probability of Use		Visits/User	
	Baseline (1)	Expanded MTF (2)	Baseline (1)	Expanded MTF (2)	Baseline (1)	Expanded MTF (2)
			1992			
Catchment areas	2.35	2.70	0.57	0.62	4.11	4.36
AD dependents	2.84	3.09	0.70	0.73	4.04	4.23
Retirees & deps	1.95	2.50	0.47	0.56	4.05	4.44
Medicare	1.96	2.06	0.42	0.43	4.69	4.75
Other areas	0.97	0.97	0.24	0.24	4.00	4.01
All areas	1.95	2.22	0.47	0.51	4.10	4.31
			1997			
Catchment areas	2.39	2.75	0.57	0.62	4.17	4.42
AD dependents	2.90	3.17	0.71	0.75	4.07	4.20
Retirees & deps	2.08	2.63	0.49	0.58	4.17	4.38
Medicare	1.87	2.00	0.40	0.43	4.60	4.84
Other areas	0.93	0.93	0.23	0.23	4.08	4.09
All areas	1.84	2.10	0.44	0.48	4.15	4.36

Table 22

MTF Inpatient Demand in Baseline and Expanded Cases (1 & 2)
(FY 1992 and 1997 MTFs and Populations)

Beneficiary Category	Probability of Hospital Use	
	Baseline (1)	Expanded MTF (2)
	1992	
Catchment areas	0.062	0.075
AD dependents	0.086	0.104
Retirees & deps	0.036	0.045
Medicare	0.062	0.074
Other areas	0.016	0.016
All areas	0.049	0.059
	1997	
Catchment areas	0.063	0.077
AD dependents	0.091	0.110
Retirees & deps	0.038	0.047
Medicare	0.058	0.071
Other areas	0.014	0.014
All areas	0.045	0.055

years into the program after controlling for preprogram differences in utilization between CRI and other areas (Hosek et al., 1993).

The overall increase in the proportion of catchment-area beneficiaries who use the MTFs' inpatient services in case 2--17 percent (Table 22)--is comparable to the outpatient increase of 15 percent. Here the difference is larger for active-duty dependents; the regression results show that inpatient utilization by adult retiree family members is more responsive to MTF capacity than that of adult active-duty family members, but the opposite is the case for the retirees' children.

As we discussed earlier, we considered a version of case 2 that would add 41 outpatient clinics as well as add one or more hospitals and expanded the hospitals' staffing. The regression analysis showed that MTF inpatient utilization actually declines when military outpatient clinics are added. MTF outpatient utilization increases by perhaps 10 percent; more people obtain MTF care, but users have fewer MTF visits. As Table 23 shows, the MTF outpatient increase is complemented by a slight increase in non-catchment-area CHAMPUS outpatient utilization. These results suggest that beneficiaries in areas without a clinic may try to get their referral care in the MTFs but that beneficiaries who use outlying military clinics may be more likely to be referred to the local civilian community. We urge that caution be exercised in interpreting the predictions for non-catchment areas, however, because they are based on a small sample, and some uncertainty remains about the actual location of active-duty families in particular. It is also possible that people who live near a military clinic and people who live away from any MTF differ in other ways not captured in the regressions, and that these differences are engendering the utilization patterns we observe. For these reasons, we did not include the added clinics in the final version of case 2.

CHAMPUS Utilization

As expected, we project that beneficiary families living in catchment areas would decrease their CHAMPUS utilization if MTF capacity were expanded as envisioned in case 2. The results for 1992 and 1997 are very similar. We saw above that retirees and their dependents

Table 23

CHAMPUS Outpatient Demand in Baseline and Expanded Cases (1 & 2)
(FY 1992 and 1997 MTFs and Populations)

Beneficiary Category	Visits/Family		Probability of Use		Visits/User Family	
	Baseline (1)	Expanded MTF (2)	Baseline (1)	Expanded MTF (2)	Baseline (1)	Expanded MTF (2)
			1992			
Catchment areas	4.05	3.48	0.39	0.36	10.35	9.73
Active duty	3.72	3.31	0.39	0.36	9.66	9.21
Retired < age 65	4.40	3.66	0.40	0.35	10.98	10.20
Other areas	5.83	5.81	0.52	0.52	11.10	11.08
All areas	4.54	4.11	0.43	0.40	10.61	10.18
			1997			
Catchment areas	3.79	3.27	0.38	0.35	9.96	9.41
AD dependents	3.58	3.14	0.38	0.35	9.51	9.08
Retirees & deps	4.21	3.50	0.39	0.35	1.73	9.96
Other areas	5.84	5.79	0.53	0.53	11.02	10.93
All areas	4.42	4.00	0.43	0.40	10.37	9.97

especially would use more MTF outpatient services, and Table 23 shows that they would also have the largest decrease in CHAMPUS outpatient use. CHAMPUS inpatient utilization also decreases in case 2--by about the same fraction for both catchment-area groups (Table 24). Especially for active-duty dependents, the decrease in outpatient use is smaller than the decrease in inpatient use.

To estimate how total military-system utilization (MTF and CHAMPUS) in catchment areas would change with MTF expansion, we need to convert the per-family visit rates that we estimated for CHAMPUS to per-person rates. The average active-duty family has 2.59 CHAMPUS-eligible members, and the average non-Medicare retired family has 2.37 members. In catchment areas, then, the decrease in CHAMPUS use is 0.16 visit per active-duty dependent and 0.31 visit per retired family member--64 percent and 56 percent, respectively, of the increase in MTF visits.[9]

[9]Both our MTF and CHAMPUS visit estimates are subject to some error. As discussed in Sec. 3, the MTF data are subject to recall error and are therefore underestimated. CHAMPUS claims may be submitted for some time after the date of service; the data we received should be over 90 percent complete. With accurate data, we might expect that the decrease in CHAMPUS would be a somewhat smaller fraction of the increase

With CHAMPUS outpatient use decreasing less than MTF use increases, we conclude that total demand for outpatient services by CHAMPUS eligibles increases as MTF capacity expands.

DoD defines the ratio of the change in MTF utilization to CHAMPUS utilization when MTF capacity is increased as the "tradeoff factor." Previous estimates of this factor were derived from aggregate MTF and CHAMPUS data and were for all beneficiaries. Using these beneficiary-level data, we can estimate the tradeoff factor just for CHAMPUS-eligible beneficiaries living in catchment areas. Taking ratios of the estimated increase in MTF visits to the decrease in CHAMPUS visits as we move from case 1 to case 2, we calculate tradeoff factors of 1.56 for active-duty dependents and 1.79 for retirees, survivors, and their dependents. The tradeoff factor for the two combined is 1.67.

Table 24

CHAMPUS Inpatient Demand in Baseline and Expanded Cases (1 & 2)
(FY 1992 and 1997 MTFs and Populations)

Beneficiary Category	Probability of Use: Baseline (1)	Probability of Use: Expanded MTF (2)
	1992	
Catchment areas	0.038	0.031
AD dependents	0.042	0.034
Retirees & deps	0.034	0.027
Other areas	0.076	0.076
All areas	0.048	0.043
	1997	
Catchment areas	0.036	0.029
AD dependents	0.038	0.030
Retirees & deps	0.033	0.026
Other areas	0.080	0.081
All areas	0.050	0.044

in the MTFs. Therefore, the tradeoff factor should be higher with more accurate data.

Inclusion of other beneficiaries, such as those covered by Medicare for civilian care, would increase the tradeoff factor because there is no decrease in CHAMPUS to offset their increased MTF use.[10]

To calculate the tradeoff factor for inpatient services, we first multiply the probabilities in Tables 22 and 24 by the number of hospitalizations per person and family, respectively, with at least one hospitalization. Then, using the same calculation method we used for outpatient visits, we estimate that there would be an increase of 17 MTF admissions and a decrease of 5 CHAMPUS admissions per 1,000 beneficiaries in the expanded-MTF case. The tradeoff factor is 2.5--50 percent higher than the outpatient tradeoff factor.

In both cases, CHAMPUS utilization and costs vary more across program types (standard, CRI, CAM) than does MTF utilization. The catchment-area outpatient utilization rates shown in Table 23 for the baseline case, which are based on CRI, are 18 percent higher than the rates we measure in the standard program; if we were to simulate a CAM program instead, the baseline rates would be 7 to 10 percent higher than the standard program (not shown). In contrast, CHAMPUS inpatient utilization rates are lower in the managed-care programs; the baseline probabilities of hospitalization with CRI, as shown in Table 24, are 25 percent lower than without managed care. This pattern of higher outpatient utilization and lower inpatient utilization is characteristic of HMO plans.

CHAMPUS Costs

The 9 percent decrease in CHAMPUS costs that we predict for case 2 (versus case 1) is slightly lower than the percent decrease in CHAMPUS utilization. Table 25 shows per-family costs and total program costs in the two cases--first costs to DoD and then total costs to all payers. The latter, which include payments by CHAMPUS and others for all costs allowed by CHAMPUS, exclude billed charges that exceed CHAMPUS fee limits and services not covered by CHAMPUS. These cost estimates have

[10]Viewed from a government-wide perspective, there is presumably an offsetting decrease in Medicare-financed utilization by beneficiaries 65 and older.

been adjusted for incompleteness and include administrative costs, as mentioned earlier in this section.

Like CHAMPUS utilization, costs for the baseline case vary with the managed-care program we simulate. There are few differences in the results for 1992 and 1997; cost per household is higher in 1997 because more beneficiaries live in non-catchment areas, but the total population is smaller and so total costs are almost the same. Total CHAMPUS costs paid by DoD for case 1 (with CRI) are predicted to be 11 percent higher than actual estimated costs for FY92, which were $2.83 billion for beneficiaries living in the United States. Two studies conclude that the benefits changes DoD has made in its new CRI programs and other changes expected to affect costs should largely eliminate these higher costs in the future (Congressional Budget Office, 1993; Lewin-VHI, 1993a and 1993b).

Although not shown here, we did use our regression results to simulate a CAM program instead of CRI, based on the limited CAM data we had. Using CAM as the model for managed care, we predict that CHAMPUS costs would be closer to actual costs for FY92. As suggested earlier, the CAM estimates may be influenced by other factors, since we have data for only one Navy site and one Air Force site. However, we can use the

Table 25

CHAMPUS Cost in Baseline and Expanded Cases (1 & 2)
(FY 1992 and 1997 MTFs and U.S. Populations)

Beneficiary Category	Government Paid		Total Cost	
	Baseline (1)	Expanded MTF (2)	Baseline (1)	Expanded MTF (2)
		1992		
Cost/family	$1,428	$1,299	$1,739	$1,578
AD dependents	1,492	1,342	1,607	1,454
Retirees & deps	1,363	1,255	1,871	1,739
Total cost (bil.)	$3.14	$2.86	$3.82	$3.47
		1997		
Cost/family	$1,446	$1,318	1,782	$1,619
AD dependents	1,480	1,315	1,592	1,421
Retirees & deps	1,419	1,320	1,937	1,781
Total cost (bil.)	$3.20	$2.92	$3.95	$3.59

CAM results as an indication of what the CHAMPUS savings in case 2 would be in a less costly program than CRI. With CAM, we would still predict a drop in CHAMPUS costs of 8 percent in case 2--a savings of about $230 million instead of $282 million for the CRI case.

Total costs, including those paid by the beneficiary and other insurance as well as DoD, are over 20 percent higher than DoD costs alone. The difference is considerably smaller for active-duty dependents (8 percent) than for other beneficiaries (37 percent) because the CHAMPUS benefits for active-duty personnel are more generous and because such beneficiaries are much less likely to have private insurance.[11] Compared with case 1, total allowed costs are $352 million, or 9 percent, lower in case 2 with CRI.

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[11]For both groups, the difference between DoD costs and allowed costs would be higher without managed care.

6. INTERIM CONCLUSIONS

All groups of military beneficiaries are heavier users of medical care than are comparable civilian populations. The research on the effects of cost-sharing on health-care demand suggests that much of the difference--30-40 percent for outpatient visits and 20-30 percent for the fraction hospitalized--can be attributed to the availability of free care in MTFs. However, other factors may also be playing a role: a higher incidence of certain health conditions (e.g., injuries) coupled with an emphasis on health maintenance for active-duty personnel, frequent family separations, and the incentive inherent in medical resource allocation to maximize MTF workload counts.

If free MTF care is an important factor, as seems likely, expanding the availability of MTF care should increase demand. Our analysis of the 1992 Military Beneficiary Survey data shows that CHAMPUS-eligible beneficiaries respond to higher MTF resource levels (beds and staff) by increasing their MTF utilization and decreasing their CHAMPUS utilization. However, the MTF increase is considerably larger than the CHAMPUS decrease--70 percent higher for outpatient care and 150 percent higher for inpatient care. Medicare-eligible beneficiaries also use more MTF services. We were not able to estimate the change in their civilian utilization, but any civilian-sector savings now accrue to Medicare rather than the MHSS.

This finding that demand for MHSS services increases with the availability of free care is supported by previous reports on DoD's experience with two programs that increased the availability of free or almost-free care: PRIMUS/NAVCARE clinics, in which civilian contrators provide primary care to military beneficiaries, and the CHAMPUS Reform Initiative, which offered an enrollment option with low CHAMPUS charges. Both programs led to increased utilization (Kennell et al., 1991 and Hosek et al., 1993).

How beneficial is the added health care used when MTF care is more readily available? Answering this difficult question was beyond the scope of this study. The health insurance experiment conducted in the

1970s invested a considerable effort to assess the relationship between health-care use and health status. After three to five years, individuals given more generous insurance used considerably more care, but there was at most small changes in their health status (Brook et al., December 1984). Most of the improvements observed were for the poor.

As we have indicated throughout, this report omits some aspects of our research. Our final report will add to the material in this interim report in several ways, the most important of which are:

- Additional estimates of the tradeoff factor between MTF and CHAMPUS utilization;
- Estimates of the costs of an analytic case that provides all non-active-duty health care through civilian health plans;
- Estimates of the number of military families who would choose an MTF-based health plan instead of a civilian-only health plan, and the costs of these plans.

Appendix

A. SURVEY WEIGHTS

OVERVIEW OF METHOD

We calculated survey weights to ensure that our utilization and cost estimates would reflect the characteristics of the population from which the sample was drawn, assuming simple random sampling within cells. Using the parametric approach to calculating nonresponse weights as described below allowed us to account for differential rates of response (e.g., by sponsor race) that were not included in the weights provided with the survey data.

Our approach to weighting proceeded in two steps. First, we calculated weights based on the sampling fraction from the survey design:

w_j = (number in population in cell j) / (number sampled in cell j)

W_j is the inverse of the sampling fraction. Cells indexed by j are defined in the sampling grid by sponsor status and region. Second, we found nonresponse weights from a logistic regression with response status as the dependent variable and independent variables reported on the survey header.[1] The nonresponse weight, γ_i for household i is calculated as $1/\hat{p}_i$ where

$$1 - \hat{p}_i = \frac{e^{(\alpha+\Sigma\beta_t X_{it})}}{1 + e^{(\alpha+\Sigma\beta_t X_{it})}} \qquad (1)$$

Here, $1 - \hat{p}_i$ is the probability of nonresponse, and $\hat{p}_i$ is the probability of response.

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[1]Separate models were fit for active duty sponsors and retirees/survivors since information was missing for all non-active duty sponsors for some of potential predictors of nonresponse: education, race, and number of dependents.

The weight for household i in cell j is the product of $w_{j_{(i)}} * \gamma_i$, scaled by a multiplicative constant, k, where

$$k = \#\ \text{respondents} / \sum_i (\gamma_i \times w_{j_{(i)}}).$$

This scales the weights to the original sample size. Omitting k, the household weights would then sum to the total population of households.

SAMPLING WEIGHTS

Sampling weights, 1/sampling fraction, are reported in Table A.1. The reader is referred to Lurie et al. (1994) for details regarding survey sampling methods for this study.

NONRESPONSE ANALYSES

A total of 44,293 sponsors were included in the survey sample. Of these, 58.7 percent were respondents, 17.2 percent were postal return nonrespondents, and 24.1 percent were other nonrespondents or refusals. A 0/1 logit model was specified, categorizing respondents (0) versus all categories of nonresponse (1). Model coefficients are reported in Tables A.2 (active duty) and Table A.3 (retirees, survivors).

For each predictor variable, the odds ratio for nonresponse versus response, controlled for other predictor variables in the model, is given by the anti-log (the exponential) for the estimated logit regression coefficient. For a dichotomous predictor variable such as "FEMALE," this leads to the odds ratio for the two groups defined by the predictor variable (FEMALES versus MALES). For a continuous predictor variable such as AGE, this leads to the odds ratio for two groups which differ by one unit on the predictor variable.

Active Duty Households

Overall, 51 percent of active-duty households were respondents and 49 percent were included in one of the nonresponse categories.

Positive relationships between sponsor characteristics and probability of nonresponse were identified for the following variables: reservists, blacks, and those sampled from the Tricare-Tidewater and Air Force CAM regions.

Negative relationships between sponsor characteristics and probability of nonresponse were found for the following: age, female, married, those sampled from Army CAM locations, and all other service-rank groups.

These rates control for other predictors in the model. The joint effects of these variables can be calculated using equation 1. For illustration, the estimated probability of nonresponse for an unmarried, non-black male, age 20, Navy E1-E4 was 70 percent, while the estimated probability of nonresponse for a married, non-black Air Force officer, age 30, was 39 percent.

Retirees, Survivors

For retirees and survivors, 74 percent were respondents and 26 percent were included in one of the nonresponse categories.

As indicated above, retirees generally showed lower rates of nonresponse than the active duty sponsors. For example, the estimated probability of nonresponse for a retired, nondisabled Naval officer aged 50 residing in CONUS was 21 percent.

POSTAL RETURN NONRESPONSE

A separate set of household weights were calculated by IDA which excluded postal return nonrespondents from nonresponse weight calculations. This approach assumes that postal return nonrespondents are effectively missing "at random." To test this assumption an analysis of postal return nonresponse was performed.

Results suggest that predictors of postal returns show similar patterns as for overall nonresponse for retirees/survivors. For active duty sponsors, the effects of some demographic and location variables are similar between the models predicting postal returns and overall nonresponse. Other results are detailed below.

Differences between the two types of nonresponse for active duty sponsors are shown in stronger effects for "region" and reversed directions of coefficients for Army E5-E9, Army officers, and Navy E1-E4 (Table A.4). Those with post-graduate education are less likely to be postal return nonrespondents, where no effect of educational level was found in the nonresponse model. Marital status was not a significant

predictor of postal returns; however, other demographic variables (age, female, black) showed similar patterns to the combined nonresponse analysis. Data show that those sampled from Air Force CAM sites were more likely to be postal return nonrespondents. Controlling for this effect, Air Force officers were not significantly different from Army E1-E4 in likelihood of postal nonresponse.

For retirees/survivors, those in Air Force CAM sites were also more likely to be postal return nonrespondents. Otherwise, these predictors showed similar relationships to postal return nonresponse as in the original nonresponse analyses (Table A.5).

Although some differences in models were noted, there does not appear to be compelling evidence to distinguish postal return nonrespondents from other nonresponse subjects in the survey design. Also, the assumption that postal returns are missing at random does not appear to be supported by the analyses reported here.

Tables A.6 and A.7 report the household weights we received with the data and the weights we calculated.

Table A.1

Sampling Weights

REGION	BENEFICIARY GROUP					
	E1-E4 w/deps	E5-E9 w/deps	OFFICER w/deps	E1-E4 no deps	E5-E9 no deps	OFFICER no deps
Army CAM	1832.9	6945.6	3723.8	3051.8	732.4	1061.9
CRI	11834.0	42333.6	15429.5	19867.6	9288.5	5336.2
Army GTC	7963.1	27402.9	9572.0	12971.3	3775.3	3287.7
Tricare	2631.7	11662.0	4597.9	2957.0	2305.6	662.0
Overlapping	8113.9	34695.0	21833.1	9217.2	6687.8	5638.6
Southeast PPO	5336.4	22175.8	8988.3	5139.4	4356.1	2604.2
New Orleans CRI	73.0	534.8	175.0	-	101.5	86.0
PRIMUS/NAVCARE	6947.8	19414.3	7267.8	7384.8	3321.5	2520.1
Noncatchment	2832.0	12601.3	4477.4	2968.2	2084.4	1145.6
Overseas	17162.5	58800.4	17056.2	17712.4	9845.9	5477.2
Navy CAM	782.7	2913.9	740.8	931.3	369.2	153.6
Air Force CAM	735.4	1910.1	631.5	291.0	416.3	184.0
No Initiatives	17339.1	45190.6	17055.4	18439.8	8199.8	4806.3
Naval Afloat	10926.7	39672.3	9018.6	23410.6	12037.9	4364.2

REGION	BENEFICIARY GROUP					
	Retirees under 65	Retirees over 65	Reserve ret <65	Reserve ret 65+	Survivor under 65	Survivor over 65
Army CAM	13134.7	4296.0	145.6	435.6	-	536.8
CRI	89638.7	52174.1	3540.6	13660.4	2417.7	13709.1
Army GTC	43374.2	14005.6	1356.8	3569.7	2468.7	2521.2
Tricare	21824.1	6815.9	236.7	794.3	1335.0	1348.3
Overlapping	95135.1	43563.7	6110.3	15622.7	4269.7	8289.6
Southeast PPO	106830.5	47111.0	5467.9	14173.0	2682.7	8679.3
New Orleans CRI	2275.0	865.1	237.3	538.0	-	-
PRIMUS/NAVCARE	52716.6	20249.7	1599.2	5124.5	1618.5	4313.2
Noncatchment	183127.0	66836.8	17569.0	37394.0	6777.2	14114.6
Overseas	10922.2	2800.0	626.4	758.1	-	233.0
Navy CAM	6032.5	1677.2	133.3	325.0	337.0	301.5
Air Force CAM	14642.7	6206.9	610.3	1899.2	648.0	981.0
No Initiatives	102706.1	34110.9	6307.1	13303.8	1964.9	5866.3
Naval Afloat	-	-	-	-	-	-

Table A.2

Logistic Regression of Nonresponse for Active-Duty Sponsors

Variable	Parameter Estimate	Standard Error
Intercept	1.7747	0.0755
Air Force Reserve	0.1180	0.0837
Army Reserve	0.1231	0.0830
Navy Reserve	0.3015	0.0833
Age	-0.0327	0.0024
Female	-0.3512	0.0450
Black	0.5018	0.0349
Married	-0.0729	0.0361
Army CAM	-0.1565	0.0532
Tricare	0.2853	0.0519
Air Force CAM	0.2615	0.0536
Army E5-E9	-0.6886	0.0610
Army Officer	-0.5915	0.0753
Navy E1-E4	-0.2843	0.0592
Navy E5-E9	-0.9817	0.0585
Navy Officer	-1.3617	0.0675
Air Force E1-E4	-0.9804	0.0590
Air Force E5-E9	-1.2919	0.0657
Air Force Officer	-1.1589	0.0713

Table A.3

Logistic Regression of Nonresponse for Retirees/Survivors

Variable	Parameter Estimate	Standard Error
Intercept	6.4820	0.4155
Navy	0.1052	0.0426
Air Force	-0.1137	0.0438
Age	-0.2636	0.0138
Age squared	0.0021	0.0001
Enlisted paygrade	0.5967	0.0413
Permanent disability	0.5403	0.0569
Temporary disability	-0.9361	0.2543
Survivor	1.3297	0.0881
Overseas	0.3294	0.0660

Table A.4

Logistic Regression of Postal Return Nonresponse for Active-Duty Sponsors

Variable	Parameter Estimate	Standard Error
Intercept	-0.6107	0.0824
Age	-0.0156	0.0027
Female	-0.1323	0.0512
Black	0.1389	0.0383
Graduate education	-0.1829	0.0570
Army CAM	-0.3576	0.0655
CRI	-0.2853	0.0629
Army Gateway to Care	-0.2074	0.0595
Tricare	0.3555	0.0624
Southeast PPO	0.2244	0.0598
New Orleans CRI	-0.6006	0.0959
PRIMUS/NAVCARE	-0.1730	0.0628
Noncatchment areas	0.2457	0.0604
Navy CAM	-0.1049	0.0699
Air Force CAM	0.2984	0.0651
Navy afloat	-0.5502	0.0730
Army E5-E9	0.1839	0.0573
Army Officer	0.7006	0.0601
Navy E1-E4	0.2201	0.0638
Navy E5-E9	-0.3681	0.0643
Navy Officer	-0.2922	0.0730
Air Force E1-E4	-0.4542	0.0599
Air Force E5-E9	-0.3759	0.0663
Air Force Officer	0.0086	0.0648

Table A.5

Logistic Regression of Postal Return Nonresponse for Retirees/Survivors

Variable	Parameter Estimate	Standard Error
Intercept	2.4149	0.5711
Navy	0.3977	0.0159
Air Force	-0.0159	0.0765
Age	-0.1791	0.0195
Age squared	0.0014	0.0002
Enlisted paygrade	0.5859	0.0768
Permanent disability	0.6967	0.0852
Temporary disability	-0.1885	0.3020
Survivor	0.3179	0.1676
Overseas	0.6159	0.0990
Air Force CAM	0.3477	0.1129

Table A.6

Original Household Weights

REGION	BENEFICIARY GROUP					
	E1-E4 w/deps	E5-E9 w/deps	OFFICER w/deps	E1-E4 no deps	E5-E9 no deps	OFFICER no deps
Army CAM	6384.9	12347.1	5408.1	9606.3	1874.2	1757.3
CRI	37894.5	70967.1	22965.2	64041.9	15055.2	9180.4
Army GTC	26488.0	54678.6	18503.7	45680.4	8991.6	5762.0
Tricare	8764.0	24549.0	7833.3	12317.8	5214.2	1932.5
Overlapping	21809.4	57893.8	34826.9	32113.6	12114.4	9999.0
Southeast PPO	13654.3	33915.3	15027.1	18738.4	5973.0	5167.1
New Orleans CRI	177.3	1008.0	258.1	-	181.1	87.5
PRIMUS/NAVCARE	20547.8	35657.1	11682.9	30791.3	5902.6	3584.2
Noncatchment	6867.8	20644.8	7113.2	8078.6	3452.6	1985.8
Overseas	51016.6	106954.0	27000.0	87873.6	22449.1	10241.3
Navy CAM	1823.7	4798.5	1052.9	2235.1	919.5	371.6
Air Force CAM	1555.2	3282.7	1123.7	1496.7	557.3	439.4
No Initiatives	35663.9	71792.6	29111.4	44821.9	11304.1	9001.7
Naval Afloat	35050.9	72626.8	13200.4	88108.9	21112.2	6611.3

REGION	BENEFICIARY GROUP					
	Retirees under 65	Retirees over 65	Reserve ret <65	Reserve ret 65+	Survivor under 65	Survivor over 65
Army CAM	17828.3	5474.6	197.8	501.8	-	1362.3
CRI	139949.4	70440.2	3936.6	13781.3	5501.9	26826.3
Army GTC	64920.3	18448.4	1811.5	4627.9	4188.3	4954.6
Tricare	30479.4	9356.4	405.8	1021.5	696.8	3420.5
Overlapping	139143.6	60855.8	8753.1	14570.1	10941.1	21940.3
Southeast PPO	159011.3	63703.1	6728.3	14302.1	5008.2	18435.1
New Orleans CRI	3521.0	1319.5	304.3	710.2	-	-
PRIMUS/NAVCARE	76236.8	26656.2	1774.2	8185.5	3647.8	6801.5
Noncatchment	265920.6	94823.1	18333.3	43034.0	14317.7	29202.2
Overseas	17325.2	4472.3	728.3	1255.7	-	744.0
Navy CAM	8979.5	2217.3	95.2	414.2	637.6	679.7
Air Force CAM	20412.9	8267.1	608.6	2247.4	2122.1	2113.6
No Initiatives	149279.7	47413.6	8470.4	12759.3	4643.6	15147.6
Naval Afloat	-	-	-	-	-	-

Table A.7

RAND Household Weights

REGION	BENEFICIARY GROUP					
	E1-E4 w/deps	E5-E9 w/deps	OFFICER w/deps	E1-E4 no deps	E5-E9 no deps	OFFICER no deps
Army CAM	5424.7	12567.5	6152.1	11910.7	1645.1	1914.5
CRI	33488.6	75754.3	24548.1	66245.9	17232.6	9190.2
Army GTC	29071.8	56711.3	19209.8	50720.1	8144.0	7553.4
Tricare	9546.3	23717.3	7738.9	12559.4	4965.7	1127.2
Overlapping	22782.3	62188.8	34796.6	31632.5	12498.4	9987.4
Southeast PPO	12550.3	37350.3	14598.0	16223.2	8474.1	4348.2
New Orleans CRI	232.0	982.8	254.6	-	282.0	139.8
PRIMUS/NAVCARE	20246.8	34955.1	11822.9	27297.7	6515.1	4668.0
Noncatchment	6758.8	22056.4	7345.7	7579.3	3605.5	2053.7
Overseas	47926.7	107795.3	30142.1	53006.3	18491.6	11484.3
Navy CAM	1855.0	4921.7	1122.3	2125.0	629.4	248.4
Air Force CAM	1615.5	3265.8	1081.5	607.3	746.2	394.6
No Initiatives	36885.7	75148.5	28388.0	53246.3	13689.2	8206.5
Naval Afloat	33864.5	70644.7	13596.8	78249.5	23055.4	7350.4

REGION	BENEFICIARY GROUP					
	Retirees under 65	Retirees over 65	Reserve ret <65	Reserve ret 65+	Survivor under 65	Survivor over 65
Army CAM	18603.0	5653.5	178.5	551.9	-	1320.9
CRI	128511.6	71300.4	4333.4	17574.7	4976.5	29249.6
Army GTC	61747.2	19059.4	1712.7	4532.1	4864.2	5740.7
Tricare	31826.1	9184.2	292.9	1023.2	3217.7	3042.6
Overlapping	139318.8	58985.8	7691.6	19896.9	9138.5	18787.5
Southeast PPO	151492.0	62933.6	6851.6	18116.9	5776.0	18039.9
New Orleans CRI	3370.5	1172.7	294.3	685.0	-	-
PRIMUS/NAVCARE	76045.3	27252.1	1978.0	6500.8	5709.3	9018.4
Noncatchment	284415.5	90427.4	21872.7	47418.9	16947.0	30860.2
Overseas	17617.8	4308.7	836.7	1102.3	-	2665.5
Navy CAM	8602.2	2274.5	160.4	426.3	695.7	512.6
Air Force CAM	20326.9	8075.0	757.0	2447.1	1539.6	2102.6
No Initiatives	144102.2	44940.5	7819.7	16938.6	4109.3	13225.7
Naval Afloat	-	-	-	-	-	-

B. MILITARY/CIVILIAN UTILIZATION COMPARISONS: DATA AND METHODS

DATA SOURCES

Military Beneficiary Survey

For the purposes of this study, a beneficiary survey was fielded to active-duty, retiree, and survivor households.[1] For one randomly selected family member, the survey asked for counts of visits and inpatient nights by location of care. These locations include: MTF, including clinic, hospital, or field/fleet hospital, PRIMUS or NAVCARE clinic, civilian providers, Veterans Administration hospitals, or other, unspecified locations. For active duty sponsors, visits to military facilities for sick call are distinguished from visits for other medical reasons. For each source, respondents could indicate the number of visits up to "10 or more" during the previous year. Therefore, the survey underestimates the number of visits made by high frequency users.

In addition to health services measures, the beneficiary survey provides information regarding household socioeconomic status (household income, sponsor education) and health status for the randomly selected individual (5 point health status scale, number of acute and chronic health conditions).

National Health Interview Survey

Data for civilian utilization rates are taken from the National Health Interview Survey (NHIS). Fielded annually by the U.S. Public Health Service, this survey assesses health status and health services utilization for a civilian non-institutionalized sample of approximately 50,000 households and 120,000 individuals. The survey obtains the same information as the military survey on household socioeconomic status and health status for each individual in the household.

We selected the subsample of households from the NHIS which were covered by private insurance for comparisons to the military beneficiary

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[1]While included in the survey, data for reservists and OCONUS beneficiaries are not included in this report.

survey. This required us to use the 1989 NHIS, as only this year's data collection contains information regarding insurance coverage. Since we found no secular trends in civilian outpatient use or inpatient admissions between 1987 and 1991, the 1987 data can be compared to the military survey. We randomly selected one person from each civilian household for this analysis. Thus, corrections for intracluster correlation in utilization within households are not required to adjust standard errors of estimates.

METHODS

We estimated logistic regressions for the probability of any outpatient visits (Table B.1) and the probability of any inpatient admissions (Table B.4). Our exploratory analysis indicated that the military and civilian samples could be pooled. However, we could not pool the samples for the least-squares regressions we estimated to model the number of outpatient visits, conditional on any visits occurring. Therefore, we estimated separate models for the conditional number of visits for the military group (Table B.2) and the civilian group (Table B.3). The dependent variable for these regressions was the natural logarithm of number of visits.

Since the military survey permitted answers only up to 10 visits for each source of care, we truncated the data in both data sets to make them more comparable. We carried out the analysis with truncations at 10 and 30 visits. The results were similar, and so we report only the results for the truncation at 10.

We used the regression models to calculate the military and civilian utilization rates shown in Sec. 3 in Tables 2 and 3. The method we used in these calculations differed slightly for the outpatient and inpatient estimates. To estimate per capita visits, we first predicted the probability that each person in the military sample would have any visits from the logistic regression model in Table B.1 if that person were:

- a military beneficiary,
- a civilian in a FFS plan, and
- a civilian in an HMO plan.

The next step was to estimate from the regression models in Table B.2 and B.3 the number of visits (s)he would have, conditional on having some visits, under the same three scenarios. For that person, we calculated the predicted number of visits in each scenario by multiplying the predicted probability of having any visits times the expected numbers of visits, conditional on having any. The final step was to calculate the average predicted number of visits within each military population group in each scenario.

To estimate the fraction with inpatient care in each of the three scenarios, we first predicted the probability of having any inpatient use for each individual in the military sample under that scenario. We then calculated the average probability of inpatient use within each military population group.

REGRESSION VARIABLES

Three measures were used in assessing health services utilization: a 0/1 indicator of any outpatient care; a 0/1 indicator of any inpatient care; and number of outpatient visits winsorized[2] at 10.

Preliminary analyses showed that the relationship between utilization and age is nonlinear, and that it differs by gender. While other functional forms were considered to control for these demographic variables (e.g., modeling via splines, with separate terms by gender) the final models specify age by groups--ages 0-17, 18-44, and 45-64--with separate coefficients for males and females for each group. Separate models were fit for Medicare eligibles (beneficiaries over age 64).

Measures of health status include a five-point scale (excellent, very good, good, fair, poor) of self-reported health status and self-reported acute and chronic conditions.

Household income, educational attainment for head-of-household (civilian) or sponsor (military), and number in household are indicators of household socioeconomic status. Preliminary analyses showed that a linear specification was adequate for these variables.

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[2]Winsorization accumulates observations at a truncation point. See, for example, Amemiya, 1985.

For civilians, an indicator variable is included which distinguishes those covered by HMO plans versus FFS plans. This indicator is present only for the non-Medicare population.

Finally, we included indicator variables for observations with missing socioeconomic or health status variables.

Table B.1

Any Outpatient Visits
Military and Civilian Populations

Variable	Estimated Coefficient	Standard Error
Intercept	0.4686	0.1384
Civilian	-1.0321	0.0831
Ages 0-17	0.7833	0.0524
Ages 45-64	0.0916	0.0444
Female	0.4676	0.0393
Female, child-bearing age	0.5056	0.0588
Active duty indicator	0.6865	0.0687
Female active duty indicator	-0.0802	0.2146
Junior enlisted	-0.4760	0.1478
Black	-0.3326	0.0902
Other ethnicity	-0.1736	0.1133
Black civilian	0.3041	0.1072
Other civilian	-0.2051	0.1436
Catchment	0.0592	0.0673
Health status (1=excellent,5=poor)	0.2221	0.0188
Acute conditions	0.1891	0.0243
Chronic conditions	0.3400	0.0257
Military acute conditions	1.1094	0.0570
Military chronic conditions	0.0085	0.0693
Income	0.0056	0.0011
Education	0.0626	0.0066
Number in household	-0.0157	0.0130
HMO	0.1627	0.0422
Military missing condition	0.2182	0.0835
Civilian missing income	-0.0851	0.0552
Civilian missing education	-0.3337	0.1641
Military missing income	-0.1665	0.1743
Military missing education	-0.1585	0.1824
Civilian missing health status	-1.1878	0.2674
Military missing health status	-0.7459	0.1795
Number of observations	33473	

Table B.2

Log(Number of Outpatient Visits)
Military Beneficiaries With Some Visits
Visits Truncated at 10

Variable	Estimated Coefficient	t-statistic
Intercept	0.7972	23.54
Ages 0-17	0.0761	5.26
Ages 45-64	-0.0089	-0.63
Female	0.0896	9.20
Female, child-bearing age	0.0734	4.62
Active duty indicator	-0.0245	-1.50
Female active duty indicator	0.1792	5.81
Junior enlisted	-0.0272	-1.21
Black	0.0216	1.64
Other ethnicity	-0.0554	-2.98
Catchment	0.0324	3.55
Health status (1=excellent 5=poor)	0.1474	34.63
Acute conditions	0.1277	27.77
Chronic conditions	0.1107	24.58
Income	0.0007	2.45
Education	0.0017	0.78
Number in household	-0.0252	-7.85
Military missing conditions	0.0229	2.71
Military missing income	0.0257	0.89
Military missing education	0.1333	5.55
Military missing health status	0.0361	0.97
Number of observations	12550	
R^2	0.1978	

Table B.3

Log(Number of Outpatient Visits)
Civilians With Some Visits
Visits Truncated at 10

Variable	Estimated Coefficient	t-statistic
Intercept	0.2908	10.63
Ages 0-17	0.1006	9.06
Ages 45-64	-0.0144	-1.20
Female	0.0853	9.17
Female, child-bearing age	0.1866	14.11
Black	-0.1808	-14.23
Other ethnicity	-0.1169	-5.87
Health status (1=excellent 5=poor)	0.2082	45.48
Acute conditions	0.0650	16.97
Chronic conditions	0.1303	29.83
Income	0.0014	5.27
Education	0.0093	5.91
Number in household	0.0195	-6.39
HMO (civilian only)	0.0272	3.16
Civilian missing income	-0.0591	-4.67
Civilian missing education	-0.0183	-0.38
Civilian missing health status	-0.1087	-1.59
Number of observations	14150	
R^2	0.1253	

Table B.4

Any Hospital Stays
Military and Civilian Populations

Variable	Estimated Coefficient	Standard Error
Intercept	-3.2653	0.1721
Civilian	-0.2494	0.0805
Ages 0-17	-0.3579	0.0808
Ages 45-64	0.1836	0.0673
Female	-0.0953	0.0536
Female, child-bearing age	0.8251	0.0738
Active duty indicator	-0.2056	0.0941
Female active duty indicator	0.5406	0.1525
Junior enlisted	0.6701	0.1715
Black	0.0579	0.1022
Other ethnicity	-0.0749	0.1296
Black civilian	-0.2974	0.1405
Other civilian	0.0454	0.2016
Catchment	-0.0785	0.0666
Health status (1=excellent 5=poor)	0.4209	0.0211
Acute conditions	0.0781	0.0263
Chronic conditions	0.2077	0.0232
Military acute conditions	0.1011	0.0403
Military chronic conditions	-0.0741	0.0346
Income	-0.0044	0.0015
Education	-0.0179	0.0093
Number in household	0.0887	0.0175
HMO (civilian only)	-0.1390	0.0701
Military missing conditions	0.5123	0.0570
Civilian missing income	-0.0294	0.0929
Civilian missing education	0.0894	0.2946
Military missing income	-0.2719	0.1931
Military missing education	0.2143	0.1661
Civilian missing health status	0.2959	0.5227
Military missing health status	0.2665	0.2126
Number of observations	33473	

Table B.5

Means and Standard Deviations for Regression Variables

Variable	Mean	Standard Deviation
Civilian indicator	0.540	0.498
Indicator age 0-17	0.212	0.409
Indicator age 45-64	0.291	0.454
Female indicator	0.501	0.500
Female child-bearing age	0.198	0.399
Active-duty	0.129	0.335
Female active-duty	0.014	0.118
Junior enlisted	0.011	0.104
Black	0.103	0.304
Other ethnicity nonwhite	0.047	0.212
Black civilian	0.064	0.246
Civilian of other ethnicity	0.022	0.148
In catchment area	0.367	0.482
HMO	0.156	0.363
Income (in $1000)	36.402	16.412
Education (in years)	13.804	2.620
Number in household	2.806	1.410
Health status (1=excellent, 5=poor)	1.953	0.985
Acute conditions scale	0.006	0.999
Chronic conditions scale	0.008	1.005
Acute conditions--military	0.006	0.678
Chronic conditions--military	0.006	0.682
Military missing conditions	0.146	0.353
Civilian missing income	0.067	0.250
Civilian missing education	0.006	0.079
Military missing income	0.010	0.100
Military missing education	0.010	0.098
Civilian missing health status	0.002	0.043
Military missing health status	0.007	0.082
Any outpatient visits	0.827	0.378
Any inpatient stays	0.084	0.277
Number of visits (range 0-10)	3.116	3.079

C. REGRESSION METHODS FOR PREDICTING DEMAND IN ALTERNATIVE SYSTEMS

STATISTICAL MODEL

In the subsequent discussion, we willuse the following variables:

y_i = health expenditures (or utilization) for individual i,

$\boldsymbol{x_i}$ = vector of individual characteristics,

$\boldsymbol{d_i}$ = vector of military and civilian health-care variables .

The goal of this analysis is to evaluate the impact of system changes (included in the vector $\boldsymbol{d_i}$) on the mean level of health care expenditures (y_i) and to perform some simple policy simulations. To accomplish this task, we need to account for the nonnormal statistical properties of health data. In particular, the observed distribution of health care expenditures has a mass point at zero, and for positive values it has excess weight in the tail that is inconsistent with a truncated normal distribution. Because these data are similar to those found in the RAND Health Insurance Experiment, we employ similar methods (Manning et al., 1987, and Duan et al., 1982).

The following specification determines whether an individual has positive expenditures, where the subscript i has been suppressed for convenience:

$$I^* = \boldsymbol{x}\alpha_x + \boldsymbol{d}\alpha_d + \epsilon_I$$

$$\epsilon_I \sim N(0,1)$$

If $\begin{pmatrix} I^* > 0 \\ I^* \leq 0 \end{pmatrix}$, then we observe $\begin{pmatrix} y > 0 \\ y = 0 \end{pmatrix}$.

Conditional on an observation of positive expenditures (or equivalently a realization of ε_I), we model the distribution of (log) expenditures as follows:

$$\log(y) \mid (y > 0) = xb_x + db_d + \epsilon_2$$

$$\epsilon_2 \mid y > 0 \sim F(0, \sigma^2)$$

where $F(0, \sigma^2)$ denotes a distribution (possibly non-normal) with mean 0 and variance σ^2.

In this model, we assume $\boldsymbol{x}$ and $\boldsymbol{d}$ are nonstochastic.[1] The assumption of normality yields a convenient representation for the conditional mean of the untransformed expenditures:

$$E[y|\mathbf{z}, y > 0] = \exp(\mathbf{z}\beta)\gamma$$

$$\beta = (\beta_x, \beta_d); \quad \boldsymbol{z} = (\boldsymbol{x}, \boldsymbol{d}); \quad \gamma = E\left[\exp(\varepsilon^2)\right]$$

where γ is the retransformation factor which adjusts the bias in taking the anti-log for the logarithmic-scale prediction $z\beta$.

Therefore, the unconditional mean of y can be computed as

$$E[y|\mathbf{z}] = \Phi(\mathbf{z}\alpha)\exp(\mathbf{z}\beta)\gamma$$

$$\alpha = (\alpha_x, \alpha_d),$$

where $\Phi(\bullet)$ denotes the standard normal cumulative distribution function.

POINT ESTIMATION

We estimate the two-part model sequentially. In the first stage, we use maximum likelihood techniques under the assumption of normality (weighted probit) to compute an estimate of α. In the second stage, we estimate ordinary least squares regressions with (log) utilization or cost level *for those individuals with positive use* as the dependent

[1]The vector $\boldsymbol{d}$ contains dummy variables indicating membership in the CRI and CAM enrollment programs. Enrollment is endogenous to utilization because beneficiaries base their enrollment decision on expected utilization. We could not control for this endogeneity.

variable and the same covariates to get an estimate of β. We compute a consistent estimate for the retransformation factor, γ, using the smearing estimator.[2] As a result, we obtain a consistent estimate of the mean health care utilization or cost of an individual with demographic characteristics $\boldsymbol{x_i}$ and dummy specification $\boldsymbol{d_i}$ using

$$\hat{E}(y_i|\mathbf{z}_i) = \hat{\text{Prob}}(y_i > 0|\mathbf{z}_i)\hat{E}(y_i|\mathbf{z}_i, y_i > 0) = \Phi\left(\mathbf{z}_i'\hat{\alpha}\right)\exp\left(\mathbf{z}_i'\hat{\beta}\right)\hat{\gamma}.$$

For policy simulation, we use the estimated coefficients to predict utilization and costs for the survey sample, weighted to reflect the total population. We first specify new values for the variables in the $\boldsymbol{d}$ vector of health-system variables, incorporating the changes we want to simulate. If $\boldsymbol{z_i} \equiv (\boldsymbol{x_i}, \boldsymbol{d_i})$, then $\hat{E}(y_i|\boldsymbol{z_i})$ denotes the mean level of expenditures for a particular survey participant. We can then construct the vector $\boldsymbol{z_i^*} \equiv (\boldsymbol{x_i}, \boldsymbol{d_i^*})$, where $\boldsymbol{d_i^*}$ differs from $\boldsymbol{d_i}$ only in that it incorporates the changes to be simulated. Thus, for example, $\boldsymbol{z_i^*}$ may be thought of as a pseudo-individual who differs from the original $\boldsymbol{z_i}$ only in that $\boldsymbol{z_i^*}$ is now in a CRI plan instead of the standard program or is now served by a new military hospital instead of no MTF. The quantity $\hat{E}(y_i|\boldsymbol{z_i^*})$ denotes the predicted utilization of this pseudo-individual under standard CHAMPUS. The difference $\hat{E}(y_i|\boldsymbol{z_i}) - \hat{E}(y_i|\boldsymbol{z_i^*})$ represents the expected change in mean health care utilization for individual $\boldsymbol{z_i}$ under a changed system, relative to the baseline situation. If w_i denotes the population weight associated with a survey participant, then an overall estimate of the mean impact of the simulated change may be computed as

$$\Delta \equiv \frac{1}{\sum w_i}\sum_{i=1}^{k} w_i\left[\hat{E}(y_i|\boldsymbol{z_i}) - \hat{E}(y_i|\boldsymbol{z_i^*})\right].$$

[2]The smearing estimator is the sample average of the exponentiated residuals (i.e., $\hat{\gamma} = \frac{1}{N}\sum\exp(\hat{\varepsilon}_i)$). Duan (1983) discusses this estimator in detail.

Tables C.1 to C.10 contain the point estimates and *t*-statistics for all equations estimated.

Table C.1
MTF Visits for CHAMPUS-Eligible Adults in Catchment Areas

	Probability of Visits>0		No. Visits if Visits>0		Probability: Hosp. Nights>0	
Variable	Coefficient	Stand. Error	Coefficient	Stand. Error	Coefficient	Stand. Error
Intercept	-0.50330	0.22927	0.38089	0.15636	-1.42981	0.36598
Retired	-0.29566	0.11116	-0.29662	0.07706	-0.20371	0.17320
Retired female	0.09681	0.04334	0.10105	0.03254	-0.23984	0.07756
Officer	0.04218	0.05187	-0.00302	0.03651		
Not MTF service	-0.23934	0.04119	0.03739	0.03041	-0.15897	0.07172
Employed	-0.11023	0.03959	-0.05859	0.02783	-0.21963	0.06382
Family income	0.00827	0.01746	-0.04684	0.01116	-0.02309	0.02295
Family size	0.07709	0.01462	0.03365	0.00946	0.01620	0.02229
Age	0.03372	0.00970	0.01183	0.00681	-0.01183	0.01592
Age squared	-0.00038	0.00012	0.00002	0.00008	0.00023	0.00019
Female age 18-34	0.20764	0.06832	0.20395	0.04478	0.13298	0.10383
No. health cond.	0.11465	0.01629	0.15474	0.00885	0.08475	0.01728
AFCAM enrolled	-0.42700	0.76411	0.13526	0.47626	-0.03102	0.41320
NAVCAM enrolled	0.56900	0.69206	-0.70287	0.30193	-0.40251	0.71260
CRI enrolled	-0.01388	0.12824	0.13721	0.07887	0.15682	0.12183
AFCAM--ret.	0.03546	0.79898	0.06705	0.51654		
NAVYCAM--ret.	-0.10938	0.82494	0.53868	0.41121		
CRI--ret.	0.11587	0.16672	-0.04895	0.10996		
Army MTF	-0.17098	0.04455	0.07056	0.02955	0.08657	0.06947
Navy MTF	-0.31971	0.04642	0.03562	0.03247	-0.04458	0.07687
log(MTF beds/pop)	0.10688	0.06731	0.12957	0.03920	0.15398	0.09270
log(beds/pop)--ret.	0.31857	0.07645	0.01390	0.04886	0.10501	0.11383
log(MTF MDs/bed)	0.26271	0.11502	0.22326	0.06945	0.20551	0.16561
log(MDs/bed)--ret.	0.23662	0.13910	-0.00044	0.09814	0.04664	0.22280
Income--ret.	-0.06318	0.01788	0.03144	0.01174	0.00444	0.02679
Health cond.--ret.	-0.01259	0.01881	-0.03923	0.01145	-0.05099	0.02303

Table C.2
MTF Visits for CHAMPUS-Eligible Children in Catchment Areas

	Probability of Visits>0		No. Visits if Visits>0		Probability: Hosp. Nights>0	
Variable	Coefficient	Stand. Error	Coefficient	Stand. Error	Coefficient	Stand. Error
Intercept	0.28965	0.12309	1.06130	0.06818	-0.21093	0.17730
Retired	0.24234	0.16564	-0.23645	0.10759	-0.33170	0.17584
Officer	0.19114	0.08501	-0.06832	0.04633		
Not MTF service	0.01886	0.07056	0.00873	0.03933	-0.01257	0.11504
Employed	-0.14548	0.06011	0.01395	0.03452	0.18296	0.09499
Family income	0.00789	0.02114	-0.00344	0.01161	-0.04828	0.02628
Family size	0.02614	0.02076	-0.02746	0.01229	-0.03276	0.03493
Age	-0.01663	0.01845	-0.05008	0.01045	-0.28567	0.02824
Age squared	-0.00026	0.00107	0.00156	0.00060	0.01252	0.00177
No. health cond.	0.35513	0.02712	0.27240	0.01259	0.06190	0.03281
AFCAM enrolled	-0.30640	0.54436	-0.03155	0.31580	-0.59270	1.07884
NAVCAM enrolled	-0.37034	0.53916	-0.01182	0.31777	0.02828	0.88608
CRI enrolled	-0.00832	0.10392	-0.15169	0.05479	0.04358	0.15086
AFCAM--ret.	0.69934	1.05825	0.82536	0.60264		
NAVYCAM--ret.	0.56979	1.34909	-0.06042	0.81203		
CRI--ret.	0.02785	0.27382	0.38646	0.18622		
Army MTF	-0.20227	0.06514	0.00424	0.03470	-0.25923	0.09487
Navy MTF	-0.24879	0.06849	-0.01405	0.03716	-0.52123	0.11364
log(MTF beds/pop)	0.28134	0.06096	0.06344	0.03187	0.45055	0.08921
log(beds/pop)--ret.	0.40827	0.11854	0.11694	0.05921	-0.47187	0.25481
log(MTF MDs/bed)	0.53372	0.10701	0.57225	0.15142	0.45089	0.17268
log(MDs/bed)--ret.	0.16338	0.22540	0.11115	0.07389	-0.35571	0.50106
Income--ret.	-0.03657	0.02937	0.05470	0.01766		
Health cond.--ret.	-0.29217	0.04298	0.04276	0.03277		

Table C.3
MTF Visits for Medicare Eligibles in Catchment Areas

	Probability of Visits>0		No. Visits if Visits>0		Probability: Hosp. Nights>0	
Variable	Coefficient	Stand. Error	Coefficient	Stand. Error	Coefficient	Stand. Error
Intercept	0.72758	0.36728	0.04210	0.27968	-3.01164	0.60249
Officer	0.12264	0.07027	-0.25667	0.05062	-0.28850	0.11791
Female	-0.09778	0.06112	0.08290	0.04430	-0.19876	0.09703
Not MTF service	-0.37418	0.05871	0.07692	0.04401	-0.10597	0.09720
Family income	-0.00364	0.01563	0.07402	0.01104	0.10554	0.02139
Family size	-0.11852	0.06938	-0.30716	0.05266	-0.32468	0.12907
Age	-0.01124	0.00514	0.01004	0.00396	0.01555	0.00848
No. health cond.	0.01169	0.01165	0.13082	0.00851	0.08385	0.01732
Army MTF	0.03979	0.06915	-0.12876	0.04732	-0.27268	0.10786
Navy MTF	-0.51342	0.07412	-0.03557	0.05844	-0.43881	0.12642
log(MTF beds/pop)	0.31131	0.05263	0.042715	0.03983	0.38831	0.08259
log(MTF MDs/bed)	-0.05662	0.10515	0.05221	0.08922	0.12064	0.17625

Table C.4
MTF Visits in Noncatchment Areas

Variable	Probability of Visits>0		No. Visits if Visits>0		Probability: Hosp. Nights>0	
	Coefficient	Stand. Error	Coefficient	Stand. Error	Coefficient	Stand. Error
Intercept	-0.32341	0.20290	1.75087	0.16154	-1.23268	0.39660
Retired	-0.59340	0.17697	0.19601	0.15228	-0.58411	0.38341
Retired female	0.14021	0.06394	-0.01608	0.06280	-0.34453	0.17963
Medicare eligible	0.24189	0.13345	0.36487	0.13563	0.16996	0.32541
Officer	-0.06476	0.07849	-0.16151	0.07019		
Employed	-0.10904	0.06811	-0.12690	0.05943	-0.03619	0.17105
Family income	-0.00534	0.03942	0.00989	0.02983	0.03453	0.06145
Family size	-0.04354	0.02344	-0.13819	0.02231	-0.10023	0.06269
Age	0.00761	0.00740	-0.01456	0.00647	-0.00290	0.01592
Age squared	-0.00014	0.00010	0.00005	0.00008	0.00003	0.00022
Female age 18-34	0.18497	0.11839	-0.18303	0.08973	0.08115	0.26214
No. health cond.	0.11945	0.04716	0.19904	0.03457	-0.06863	0.09819
Age--child	0.09128	0.03655	-0.07166	0.02998	0.02879	0.08494
Age squared--child	-0.00643	0.00236	0.00416	0.00194	-0.00404	0.00632
Health cond.--child	0.03236	0.06065	-0.00791	0.04850	0.03798	0.13912
Income--ret.	0.00296	0.03978	-0.00934	0.03089	-0.10791	0.07633
Health cond.--ret.	-0.09876	0.04788	-0.10840	0.03598	0.10351	0.10151
Mil. clinic area	0.47009	0.09457	-0.18864	0.06330	-0.12556	0.19912

Table C.5
CHAMPUS Use Catchment Active-Duty Families

	Probability of Visits>0		No. Visits if Visits>0		Probability: Hosp. Nights>0	
Variable	Coefficient	Stand. Error	Coefficient	Stand. Error	Coefficient	Stand. Error
Intercept	-1.80957	0.24327	-0.02561	0.33233	-2.28821	0.34135
Officer	0.14866	0.05034	0.19925	0.06168	0.09770	0.08657
Employed	0.03500	0.03538	0.10465	0.04392	-0.17378	0.06426
Family income	0.02293	0.01174	0.00101	0.01473	-0.03742	0.02134
Family size	0.09117	0.01209	0.09690	0.01568	0.04673	0.01969
Family age	0.03968	0.01511	0.02776	0.02073	0.00234	0.02088
Family age squared	-0.00055	0.00023	-0.00031	0.00031	0.00001	0.00031
Family health	0.10892	0.01407	0.08791	0.01729	0.10373	0.02250
Child < age 1	0.09826	0.04700	-0.10121	0.05757	0.91366	0.05997
AFCAM	-0.33482	0.27757	-0.00740	0.40703	-0.04177	0.46498
AFCAM enrolled	0.66900	0.42199	0.25429	0.54373	-0.00533	0.74979
NAVCAM	0.12691	0.11968	-0.04720	0.13483	0.39208	0.16133
NAVCAM enrolled	0.69471	0.34496	0.10456	0.30190	-0.12048	0.44885
CRI	-0.16270	0.04820	0.13883	0.06402	-0.45187	0.09929
CRI enrolled	0.72367	0.07194	0.30954	0.08090	0.65689	0.12209
Army MTF	-0.01575	0.03856	0.02248	0.04967	0.05665	0.06697
Navy MTF	0.38966	0.04404	0.26802	0.05250	0.33064	0.07172
log(MTF beds/pop)	-0.24586	0.03323	-0.08407	0.04105	-0.36669	0.05517
log(MTF MDs/bed)	-0.21993	0.05818	-0.14528	0.06319	-0.31301	0.08654
log(Civ beds/pop)	0.00817	0.00556	-0.00198	0.00706	0.00957	0.00901
log(Civ MDs/pop)	-0.03760	0.01889	0.04959	0.02493	0.02439	0.03149

Table C.6
CHAMPUS Use Catchment Retiree Families

Variable	Probability of Visits>0		No. Visits if Visits>0		Probability: Hosp. Nights>0	
	Coefficient	Stand. Error	Coefficient	Stand. Error	Coefficient	Stand. Error
Intercept	-2.18029	0.32507	1.17683	0.53112	-3.37253	0.80145
Officer	0.20305	0.06087	0.17601	0.06954	-0.01209	0.11250
Employed	-0.14456	0.04850	0.02559	0.05633	-0.05814	0.08638
Family income	0.03656	0.00962	0.04881	0.01106	0.01491	0.01738
Family size	0.20372	0.02046	0.03237	0.02404	0.08467	0.03486
Family age	0.02782	0.01384	-0.02101	0.02201	0.02527	0.03314
Family age squared	-0.00015	0.00015	0.00021	0.00023	-0.00015	0.00035
Family health	0.12729	0.02058	0.18126	0.02417	0.20562	0.03675
Child < age 1	-0.03094	0.30121	-0.32266	0.34014	0.31911	0.42333
AFCAM	0.01478	0.20958	0.16272	0.26268	-0.10581	0.41764
AFCAM enrolled	0.61949	0.32839	-0.19545	0.35733	0.25441	0.57344
NAVCAM	0.11664	0.20725	0.06985	0.23448	-0.16052	0.46020
NAVCAM enrolled	0.25517	0.47846	0.07408	0.49271	0.44319	0.81961
CRI	-0.40983	0.07148	0.08842	0.09576	-0.28036	0.15216
CRI enrolled	1.46073	0.14073	0.38246	0.12862	0.71072	0.20265
Army MTF	-0.02048	0.05382	-0.02016	0.06885	0.00888	0.09728
Navy MTF	0.37087	0.06030	0.28204	0.06947	0.03504	0.10835
log(MTF beds/pop)	-0.25689	0.04036	-0.20163	0.05081	-0.27341	0.07650
log(MTF MDs/bed)	-0.28787	0.07899	-0.13437	0.08823	-0.19472	0.13489
log(Civ beds/pop)	0.01561	0.00712	0.00576	0.00779	0.00641	0.01224
log(Civ MDs/pop)	-0.13220	0.02946	-0.02951	0.03539	-0.09449	0.05546

Table C.7
CHAMPUS Use Noncatchment All

Variable	Probability of Visits>0		No. Visits if Visits>0		Probability: Hosp. Nights>0	
	Coefficient	Stand. Error	Coefficient	Stand. Error	Coefficient	Stand. Error
Intercept	-1.14600	0.29514	0.34161	0.31405	-2.30383	0.50472
Officer	0.22159	0.07625	0.46085	0.07135	0.46731	0.11246
Employed	0.25151	0.05545	-0.05116	0.05467	0.12480	0.08671
Family income	-0.07356	0.03645	-0.02653	0.03710	-0.18030	0.05662
Income--ret.	0.07420	0.03640	0.02593	0.03702	0.09075	0.05711
Family size	0.12775	0.02200	0.11862	0.02120	0.05229	0.02886
Family age	0.02305	0.01430	0.00784	0.01560	0.04877	0.02551
Family age squared	-0.00010	0.00016	0.00001	0.00017	-0.00045	0.00028
Family health	0.14595	0.02238	0.15014	0.02146	0.10954	0.03392
Child < age 1	0.71504	0.13801	0.28813	0.10665	0.82126	0.14554
Mil. clinic area	0.03018	0.08706	0.06441	0.08516	-0.07399	0.12841
Retired	-0.53955	0.15230	0.14463	0.15988	-0.74090	0.23426
log(Civ beds/pop)	0.00965	0.00815	-0.01080	0.00748	0.01803	0.01114
log(Civ MDs/pop)	-0.08315	0.02438	0.08284	0.02512	-0.10270	0.04140

Table C.8
CHAMPUS Costs Catchment Active-Duty Families

	Probability of Visits>0		No. Visits if Visits>0	
Variable	Coefficient	Stand. Error	Coefficient	Stand. Error
Intercept	-1.00579	0.20000	4.12380	0.33997
Officer	0.09952	0.04929	0.13489	0.08546
Employed	0.00776	0.03437	-0.08887	0.06016
Family incom	-0.01176	0.01145	-0.02137	0.02068
Family size	0.11950	0.01172	0.11241	0.02122
Family age	0.02821	0.01214	0.02340	0.02029
Family age s	-0.00033	0.00018	-0.00029	0.00029
Family healt	0.09397	0.01379	0.15762	0.02316
Child < age	0.41912	0.04736	0.73859	0.07320
AFCAM	-0.57718	0.25555	0.19389	0.54190
AFCAM enroll	0.05293	0.40750	0.31381	0.76898
NAVCAM	0.04284	0.12043	0.10584	0.20516
NAVCAM enrol	0.92930	0.39493	-0.34293	0.46320
CRI	-0.44949	0.04636	0.05004	0.09249
CRI enrolled	0.76747	0.07179	0.66889	0.12244
Army MTF	-0.06899	0.03724	0.09321	0.06340
Navy MTF	-0.01056	0.04355	0.59551	0.07413
log(MTF beds	-0.01838	0.03205	-0.41641	0.05321
log(MTF MDs/	-0.12588	0.05728	-0.28116	0.09329
log(Civ beds	0.00270	0.00548	0.00415	0.00897
log(Civ MDs/	-0.05010	0.01825	0.03031	0.03431

Table C.9
CHAMPUS Costs Catchment Retiree Families

	Probability of Visits>0		No. Visits if Visits>0	
Variable	Coefficient	Stand. Error	Coefficient	Stand. Error
Intercept	-2.43217	0.34521	6.44535	0.79919
Officer	0.08010	0.06085	0.28092	0.09862
Employed	-0.02928	0.04801	-0.07550	0.07772
Family incom	0.02966	0.00953	-0.00538	0.01546
Family size	0.19990	0.02057	0.08897	0.03362
Family age	0.04537	0.01467	-0.07832	0.03275
Family age s	-0.00030	0.00016	0.00089	0.00034
Family healt	0.15487	0.02035	0.21728	0.03419
Child < age	0.53304	0.32964	-0.45132	0.41763
AFCAM	-0.29374	0.20866	0.03825	0.40705
AFCAM enroll	1.08929	0.35003	-0.58368	0.52785
NAVCAM	-0.00851	0.20765	-0.36452	0.35221
NAVCAM enrol	0.42034	0.48689	0.09331	0.71458
CRI	-0.71872	0.07210	0.42553	0.15467
CRI enrolled	1.46532	0.13627	0.46986	0.20497
Army MTF	0.07995	0.05265	-0.14726	0.09057
Navy MTF	0.14767	0.05999	0.32901	0.10209
log(MTF beds	-0.07058	0.03942	-0.21954	0.06743
log(MTF MDs/	-0.13848	0.07842	-0.20321	0.12682
log(Civ beds	0.01344	0.00702	0.00177	0.01123
log(Civ MDs/	-0.13601	0.02887	-0.08612	0.04919

Table C.10
CHAMPUS Costs Noncatchment All

	Probability of Visits>0		No. Visits if Visits>0	
Variable	Coefficient	Stand. Error	Coefficient	Stand. Error
Intercept	-1.12812	0.30039	3.71696	0.50140
Officer	0.25997	0.07670	0.55198	0.11739
Employed	0.26458	0.05609	-0.31644	0.08996
Family Incom	-0.10460	0.03708	-0.05719	0.05689
Income--ret.	0.11307	0.03708	-0.00886	0.05706
Family size	0.13889	0.02246	0.14770	0.03385
Family age	0.02484	0.01455	0.05462	0.02514
Family age s	-0.00007	0.00016	-0.00063	0.00028
Family healt	0.18720	0.02281	0.24952	0.03588
Child < age	0.95784	0.15076	0.82101	0.16603
Mil. clinic	0.13406	0.08875	0.09744	0.13134
Retired	-0.98735	0.15598	0.33623	0.25134
log(Civ beds	0.00115	0.00821	0.01788	0.01279
log(Civ MDs/	-0.08214	0.02471	0.04472	0.04269

Table C.11

Weighted Means and Standard Deviations for Variables in MTF Regressions

	Catchment Areas						Non-Catchment Areas	
	CHAMPUS-Eligible Adults		Children		Medicare Eligibles		All Beneficiaries	
Variable	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Any visits	0.5288	0.4984	0.6455	0.4725	0.4122	0.4830	0.2418	0.4216
log (visits)	1.1710	0.7306	1.0748	0.7045	1.2592	0.6878	1.1481	0.6569
Any inpatien	0.0565	0.2309	0.0653	0.2472	0.0543	0.2267	0.0158	0.1246
Retired	0.6699	0.4703	0.2579	0.4376			0.8225	0.3892
Retired fema	0.3300	0.4703			0.5277	0.4905	0.4264	0.4946
Medicare							0.1884	0.3911
Officer	0.2040	0.4030	0.1829	0.3866	0.4324	0.4955	0.2174	0.4125
Not MTF serv	0.2582	0.4377	0.1756	0.3805	0.3907	0.4880		
Employed	0.4752	0.4982	0.2971	0.4570			0.3223	0.4674
Family incom	4.3089	0.0175	3.3842	1.9513	3.3735	2.1256	3.6011	2.3219
Family size	3.0152	1.4301	4.1749	1.4017	0.0162	0.0223	2.7910	1.5602
Single					0.3481	0.4765		
Age	43.2124	14.0893	7.8237	5.0853	72.3642	5.9810	44.1336	23.1304
Female age 1	0.2447	0.4289					0.0770	0.2626
No. conditio	2.2936	2.2447	1.4737	1.4352	3.1355	2.3572	2.3699	2.2792
AFCAM enroll	0.0059	0.0763	0.0027	0.0523				
NAVCAM enrol	0.0025	0.0498	0.0020	0.0448				
CRI enrolled	0.0481	0.2141	0.0678	0.2514				
AFCAM--ret.	0.0054	0.0733	0.0012	0.0339				
NAVYCAM--ret	0.0016	0.0394	0.0004	0.0191				
CRI--ret.	0.0277	0.1641	0.0124	0.1108				
Army MTF	0.3820	0.4859	0.4193	0.4935	0.3489	0.4767		
Navy MTF	0.2749	0.4465	0.2847	0.4513	0.3064	0.4611		
log(MTF beds	0.4143	0.7179	0.4393	0.6855	0.4219	0.7379		
log(beds/pop	0.2707	0.6548	0.0988	0.4325				
log(MTF MDs/	-0.3340	0.3694	-0.3321	0.3627	-0.3254	0.3899		
log(MDs/bed)	-0.2301	0.3497	-0.0875	0.2474				
Area w/ clinic							0.0920	0.2891
Income--ret.	3.1424	3.2137	0.9387	2.0109			3.0444	2.6253
Health cond--chld							0.3230	0.8569
Health cond.	1.6180	2.2030	0.4481	1.2306			2.0552	2.3588

Table C.12

Weighted Means and Standard Deviations for Variables in CHAMPUS Regressions

	Catchment Areas				Non-Catchment Areas	
	Active Duty Families		Retired Families		All Families	
Variable	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Any visits	0.3591	0.4798	0.4053	0.4910	0.6034	0.48930
log (visits)	1.4337	1.0144	1.6550	1.0401	1.7806	1.07290
Any inpatien	0.0622	0.2415	0.0391	0.1939	0.1091	0.31180
Any govt. co	0.5361	0.4987	0.4916	0.5000	0.6099	0.48790
log (govt. c	5.6712	1.7114	5.6603	1.5787	6.2287	1.82560
Any costs	0.5726	0.4947	0.5347	0.4989	0.6721	0.46950
log(total co	5.8606	1.6432	6.1560	1.5968	6.5308	1.69010
Officer	0.1844	0.3878	0.1968	0.3976	0.2771	0.4476
Employed	0.2755	0.4468	0.5120	0.4999	0.3186	0.4660
Family incom	3.2464	1.8982	4.5681	2.7431	3.8776	2.2979
Family income--ret.					1.6340	2.6694
Family size	3.6008	1.3148	2.5048	1.1885	3.1405	1.3636
Family age	30.9373	7.3634	50.5150	9.7165	40.1596	12.7471
Family healt	2.3458	1.0827	2.8082	1.0816	2.5014	1.1391
Child < age	0.1242	0.3299	0.0050	0.0702	0.0454	0.2081
AFCAM	0.0052	0.0719	0.0167	0.1282		
AFCAM enroll	0.0019	0.0438	0.0063	0.0792		
NAVCAM	0.0170	0.1295	0.0131	0.1137		
NAVCAM enrol	0.0020	0.0449	0.0022	0.0472		
CRI	0.1931	0.3948	0.1696	0.3753		
CRI enrolled	0.0651	0.2467	0.0399	0.1958		
Army MTF	0.4329	0.4955	0.3598	0.4800		
Navy MTF	0.2978	0.4673	0.2704	0.4442		
log(MTF beds	0.4464	0.6244	0.3923	0.7517		
log(MTF MDs/	-0.3240	0.3509	-0.3343	0.3756		
Area w/ clinic					0.2462	0.4309
Retired family					0.3954	0.4890
Civ beds/pop	4.4272	3.2950	4.3828	3.6593	5.2418	3.2778
Civ MDs/pop	1.6427	0.9692	1.7120	0.8801	1.9117	1.2928

D. ADJUSTMENTS TO MTF UTILIZATION ESTIMATES FOR COSTING BY IDA

The demand analysis yielded estimates of per-capita MTF visits and the fraction of beneficiaries hospitalized. Before these estimates could be sent to IDA for costing, we needed to modify them in four ways:

1. Adjust the per-capita estimates derived from the survey to make them compatible with MEPRS workload data,
2. Multiply by the number of beneficiaries to get total MTF workloads for the beneficiaries studied,
3. Add the workloads for active-duty personnel and "other beneficiaries," and the workloads in the U.S. for overseas beneficiaries, and
4. Allocate the total workload to individual MTFs.

The third step is self-explanatory, so this appendix focuses on the other three steps.

ADJUSTING TO MEPRS WORKLOAD LEVELS

An adjustment was necessary because all of our predictions of utilization are based upon the survey (the only source of utilization outside of the MTFs and CHAMPUS), while all of the estimates for costing the MTFs are based upon workload derived from the accounting systems (specifically MEPRS).

The method we used to determine the adjustment factors was simple. First, we used the demand regressions (described in Section 5 and Appendix C) to predict the average number of visits and the fraction of beneficiaries hospitalized for each type of beneficiary under the 1992 conditions. The beneficiary groups were: active-duty dependents; retirees under age 65; retirees' dependents, survivors, and their dependents under age 65; and all beneficiaries 65 and older. We then calculated a second set of per-capita utilization figures--in this case, average number of visits and admissions--by dividing the utilization reported in MEPRS by the DEERS-based population estimates described below. For each beneficiary group, the adjustment factors equaled the MEPRS/DEERS utilization estimates divided by the utilization estimates

predicted from the regressions. We examined all areas in the United States, excluding only overseas hospitalizations and outpatient visits.

Factors for Outpatient Care

The outpatient visit adjustment factors are shown in Table D.1. These numbers are what the survey-derived estimates of outpatient visits must be multiplied by to produce the per capita number of MEPRS outpatient visits for each of these types of beneficiary. These factors include: (1) an adjustment for the windsorized survey data (at 10), (2) downward bias in the survey data because of imperfect recall, and (3) the inclusion of more types of patient encounters in MEPRS.

Table D.1

Outpatient Adjustment Factors

Active Duty Dependents	Retirees under 65	Retired Dependents/Survivors under 65	Beneficiaries 65 and over
1.80	2.07	1.33	1.48

Since IDA's analysis showed that outpatient costs are lower in Navy MTFs, we looked to see whether the adjustment factors differed by service. Table D.2 compares the factors for outpatient visits by service for all non-overlapping catchment areas. The Navy factors are lower, suggesting that there may be some modest difference in the accounting procedures among the services.

Table D.2

Service Differences in Outpatient Exchange Factors

Service	Exchange Factor
Army	1.87
Air Force	1.61
Navy	1.29

We also looked for other possible differences (e.g., whether medical centers varied consistently one way or another), but we did not find any consistent patterns.

Factors for Inpatient Care

The raw inpatient exchange factors are shown in Table D.3. These numbers are what the survey-derived estimates of the average probabilities of being hospitalized must be multiplied by to produce the per capita number of MEPRS inpatient admissions for each beneficiary group. These multipliers include: (1) same-day hospitalizations--included in MEPRS but not in the data used in the regressions, and (2) the average number of hospitalizations per person hospitalized.

Table D.3

Inpatient Exchange Factors

Active Duty Dependents	Retirees under 65	Retired Dependents/Survivors under 65	Beneficiaries 65 and over
1.33	1.25	1.21	1.25

ESTIMATING THE NUMBER OF BENEFICIARIES

Table D.4 compares the estimates of FY92 beneficiary populations in the official DEERS data, our adjusted figures for FY92, and a late-90s estimate of the beneficiary populations assuming the closing of all MTFs affected through BRAC 3 and a reduction in the DoD population consistent with DoD's recently completely "Bottom-Up Review."

The short-record DEERS record that is archived and released for analysis records the sponsor's zip code for all active-duty dependents. This ignores the fact that many active-duty members are sent overseas each year for unaccompanied duty, their family often returning to live with relatives in non-catchment areas. In FY90, this assumption increases the number of active-duty dependents counted as being overseas by some 300,000, with nearly the same reduction in the non-catchment

areas.[1] We used a modified version of the short record that provides actual locations for active-duty dependents. We adjusted these data at the individual zip code level because:

Table D.4

Beneficiary Populations

Type of Beneficiary	Location	FY92 DEERS	Adjusted FY92 DEERS	Late-90s Estimate
Active Duty	Catchment	1,350,489	1,383,956	1,117,418
Active Duty Dependent	Catchment	1,930,885	1,958,358	1,520,383
Nat'l Guard/Reserve	Catchment	110,211	113,092	66,166
NG/Reserve Dependent	Catchment	152,503	153,049	92,770
Retired < 65	Catchment	711,217	714,178	579,748
Retired 65+	Catchment	318,331	319,738	293,190
Other < 65	Catchment	1,222,749	1,227,917	1,049,148
Other 65+	Catchment	310,453	311,681	289,543
Active Duty	Noncatch	136,798	123,077	130,649
Active Duty Dependent	Noncatch	286,837	438,061	321,419
Nat'l Guard/Reserve	Noncatch	100,251	90,622	63,426
NG/Reserve Dependent	Noncatch	96,044	95,498	86,072
Retired < 65	Noncatch	415,441	412,480	491,687
Retired 65+	Noncatch	216,177	214,770	305,303
Other < 65	Noncatch	599,737	594,569	723,702
Other 65+	Noncatch	152,246	151,018	226,213
Active Duty	Overseas	307,920	307,920	182,093
Active Duty Dependent	Overseas	349,332	169,078	131,594
Nat'l Guard/Reserve	Overseas	1,469	1,469	1,787
NG/Reserve Dependent	Overseas	6,799	6,799	3,822
Retired < 65	Overseas	11,125	11,125	14,828
Retired 65+	Overseas	1,468	1,468	3,820
Other < 65	Overseas	17,838	17,838	17,064
Other 65+	Overseas	892	892	3,079
Total	All	8,807,212	8,818,654	7,714,924

NOTE: Total does not includes beneficiaries in unknown locations.

- A distance check of the zip codes around military hospitals showed that several zip codes with large numbers of beneficiaries were well within 40 miles of the hospital, and yet treated in DEERS as though these areas were non-catchment areas. An examination of the zip codes with the largest military populations showed that they had been introduced since

[1]This problem is related to the change in counting active duty dependents in FY92 that is noted above.

1990, and thus were omitted from the catchment area directory of zip codes. We have corrected the more obvious of these problems, transferring roughly 1,000 active duty personnel, 7,000 active duty dependents, and 11,000 retired and other beneficiaries from non-catchment to catchment areas.

- While the year-end DEERS theoretically reports beneficiary location on September 30th of the given year, it is actually compiled some months thereafter, reflecting the movement of any beneficiaries who have reported to new locations. However, because DEERS also includes information on personnel recruited but not yet inducted into the military, the DEERS data must be handled with a strict date of effectiveness, which we have chosen to retain at September 30, 1992. But since the data on location is actually many months later for many individuals, training bases (such as Ft. Jackson, Great Lakes, Lackland AFB, or Parris Island) have very low counts of trainees (those of E-1 rank, both active duty and National Guard/Reserve) because many of the trainees have moved on by the time DEERS was compiled. We therefore used DoD and Army estimates of personnel in the training pipeline and actual personnel at selected bases to adjust the DEERS estimates for both active-duty personnel and active-duty dependents. For example, DEERS shows Ft. Jackson with only about 7,000 active duty personnel at the end of FY92, whereas Army and DoD figures would suggest a number closer to 13,000 (counting National Guard and Reserve personnel, in each case). Besides the basic training facilities, we have also made population adjustments at training facilities such as Ft Irwin, where the Army reports that the DEERS numbers of active duty beneficiaries are only about half of the active duty population, on average, at Ft. Irwin. These adjustments cause a net increase in active duty and Guard/Reserve personnel and their dependents in catchment areas, and a decrease in non-catchment areas.
- The 1992 DEERS counts show a substantial increase in the number of overseas active-duty dependents compared to previous years,

and an offsetting decline in active-duty dependents in the United States (especially in non-catchment areas). The change is reportedly an accounting change, whereby dependents lacking a recent address update are now located at the unit address of their sponsor. DEERS thus considers many dependents of sponsors on overseas, unaccompanied tours to be overseas as well. Because this change appears wrong, we have adjusted the active-duty dependent numbers to more closely reflect the pattern of location in previous years, shifting about 180,000 active duty dependents back to the United States (mostly to non-catchment areas).

To project beneficiaries for the late 1990s, we began with the FY92 DEERS data and an aggregate RAPS (Resource Analysis and Planning System) estimate of beneficiaries by catchment area. We adjusted these to reflect the results of BRAC 3 and the problem with the training bases noted above. The result is a zip-code-level projection of the beneficiary population for the late 1990s, which can be aggregated to catchment area or grand total levels (the latter shown in Table D.3 above).

Our explorations uncovered several problems in using the DEERS data that either did not affect the beneficiary groups we studied or could not be corrected:

- Because military personnel move fairly often, are promoted regularly, add dependents, and so forth, DEERS is almost always somewhat out-of-date. Civilian health plans have similar problems, as individuals move and/or change employers. HMOs, which must plan using per-capita information by location, go to considerable effort to update addresses (e.g., checking them at each encounter with the beneficiary).
- Some advanced education locations like the Army War College at Carlisle Barracks apparently only have their staff properly located in DEERS; their students appear to be shown as part of a training command located elsewhere. The same is true for the many military personnel involved in detached training at various locations around the country.

- The location given for active-duty beneficiaries may be a unit address or home address. If an active-duty beneficiary lives in Northern Virginia in the Ft. Belvoir catchment area but works in Washington DC in the Walter Reed catchment area, he might be counted in either area. (He also might get care in either area.)
- In recent years, over 200,000 active-duty Navy personnel have been considered "AFLOAT," which apparently means that they are assigned to a ship. The average surface ship appears to be at sea about 40 percent of the time, and in its home port only about half of the remaining time. Therefore, many of these personnel are not, at any given time, living in their assigned catchment area.
- For FY92, DEERS lists some 230,000 Army National Guard and Reserve personnel on active duty, whereas the National Guard Bureau suggested that the number may be perhaps only a third as much. Apparently some Guard and Reserve personnel not on regular active duty are included in DEERS, and some are not.
- The definitions of catchment areas have some potential flaws. For example, there is no catchment area for Ft. Drum, which has a clinic but has arranged for its providers to treat patients in the local civilian hospital, but there is a catchment area for Newport NS, which has a similar arrangement. Catchment areas are defined for several of the U.S. Treatment Facilities (former Public Health Service hospitals). Unless many military beneficiaries use these facilities, creating these catchment areas causes an underestimate of the non-catchment population and of the catchment-area population for facilities which overlap (such as Ft. Meade).

DISTRIBUTING WORKLOAD TO MTF'S

The workloads at the MTFs for the analytic cases are predicted for all beneficiaries living in aggregated U.S. catchment or non-catchment areas. For inpatient use, the aggregation is to type of beneficiary in either catchment or non-catchment areas. For outpatient use, the

aggregation is to type of beneficiary in 10 catchment-area groups (small hospitals, medium hospitals, and medical centers for the Army, Navy, and Air Force, plus an overlapping catchment-area group), and also a non-catchment-area group. For costing, we needed to distribute the aggregate workloads to the individual MTFs and by broad specialty categories.

To make this distribution for case 1, we developed a "referral" matrix. The inpatient referral matrix was calculated from FY90 biometrics data to show the fraction of people from each catchment-area group hospitalized in that group and other groups. For example, 59 percent of retirees under 65 living in small Navy catchment areas were hospitalized in those facilities, while 25 percent were hospitalized in MTFs with overlapping catchment areas, 5 percent in Navy medical centers, and 4 percent in medium Naval hospitals. We estimated a similar matrix for outpatient referrals by comparing our predicted workloads by group with MEPRS workloads for the same groups (the latter do not report the location of people receiving outpatient care at the various MTFs). These matrices were used for case 1, but not case 2, because there was no reason to expect that the added workloads in case 2 would follow the referral patterns described in the matrices.

An example of how we used these matrices to distribute the MTF workloads predicted for case 1 may be helpful. If Air Force medical centers had 1,000,000 outpatient visits by active-duty dependents in FY90, and Scott AFB had 150,000 of these, then we allocated to Scott 15 percent of the case 1 visits we predicted for Air Force medical centers.

For case 2, we used regression analysis to estimate MTF production functions that we could use to predict the increase in each MTF's inpatient and outpatient workloads that would result from an increase in operating beds and staffing. We then allocated the increase in predicted workloads from case 1 to case 2 in proportion to the workload increase that we predicted from the production function. For example, if we predicted 120,000 added visits at Scott AFB and a total increase at all MTFs of 6,000,000 extra visits, then if the total number of active-duty-dependent visits increased by 1,000,000 in case 2, Scott would receive 50,000 of these added visits.

Finally, we allocated the workloads by specialty category--medical, obstetrics and gynecology, pediatrics, psychiatry, and surgery--according to the historical specialty distribution at each MTF. For example, if the hospital at Scott AFB had 12 percent of its outpatient workload in surgery in FY90 and total outpatient visits increased from 300,000 in case 1 to 350,000 in case 2, then Scott would have 42,000 visits in surgery.

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