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GRADUATE SCHOOL

19971031 043

**An Examination of the Medical Offset Resulting from
Mental Health Use in a Military Population**

A THESIS

**SUBMITTED TO THE FACULTY OF THE GRADUATE SCHOOL
OF THE UNIVERSITY OF MINNESOTA**

BY

Alan Raymond Constantian

**IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY**

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July 1997

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ABSTRACT

The purpose of this study was to examine the need and use of outpatient mental health services by active duty members and active duty family members and to determine if the so called “offset effect” could be detected in this population. Using a subset of the worldwide 1994-95 Department of Defense Health Beneficiary Survey numbering over 26,000 observations, several hypotheses were examined.

Several important findings were made. First, in spite of expectations of a more mentally fit active duty force, active duty members and family members have approximately the same mental health needs. Moreover, the aggregate mental health need (based on mental health status) was not statistically different from that of the general population. These findings defy the expectation that military members are more mentally fit due to entry level screening and programs designed to boost force morale. Second, DoD beneficiaries exhibit lower levels of usage of mental health services general population. The active duty force’s underutilization of mental health care is more marked than the underutilization attributable to active duty family members. Paradoxically, the Air Force, the Service with the highest mental health status on average, had the highest mental health utilization rates. The lack of consistency between need for and use of mental health services in the DoD requires further exploration.

The underutilization of ambulatory mental health services suggests that programs for expanding access to care should be considered. Expanding access might result in a cost savings if the so called "offset effect" was detected in the population, whereby users of mental health care with mental health problems generated fewer costs than nonusers of such care because unnecessary physical health visits were reduced. However, no evidence of an offset effect was found in the aggregate or any subgroups examined. Instead, expansion of mental health access to those in need of such care, while perhaps beneficial from a quality of care and force readiness perspective, is unlikely to be beneficial from a financial perspective. The absence of an offset effect means that remedying the mental health underutilization problem will not be accomplished easily or inexpensively.

Acknowledgment

Everyone seems to want to build bridges these days. President Clinton is building a bridge to the Twenty-First Century. Residents of the national capital area want to build a new bridge to replace the aging Woodrow Wilson Bridge between Maryland and Virginia. I want to build bridges too. I hope to join a small, but growing, group of individuals who wish to build a series of strong bridge between health services researchers of the academic community and the Department of Defense. This dissertation represents the efforts of a neophyte bridge engineer in the construction of his first span.

No one builds a bridge of any value by himself or herself. I have enjoyed the support from many talented and dedicated master craftsmen of various disciplines and professions on both the military and the academic sides of the ravine I sought to cross. The purpose of these words is to etch permanently into a cornerstone the special contributions of a number of individuals without whom this effort could not be undertaken. I hope that this cooperation represents only the beginning of a lasting and productive relationship.

My first acknowledgement goes to the Air Force and its medical service, which funded my studies at the University of Minnesota. Without investment in time and money, bridges simply remain unfulfilled dreams. The commitment of the Air Force and its leadership to organizational improvement and growth, a trait

reflected in this human capital investment, is the attribute that makes me proud to be a member of that organization. I hope that this experience will allow me to make strong contributions toward the continued improvement of this excellent organization.

My second acknowledgement goes to the faculty, students and staff of the Graduate Program of Health Services Research, Policy and Administration, who have constructed an excellent infrastructure for educating and training nascent bridge builders of all types. The interdisciplinary approach of health economics, management, public policy, and sociology was especially engaging for an engineer of eclectic edifices. The generosity of these busy individuals with their time and support has made these years here truly satisfying. Two people deserve special note. Janet Shapiro, the program coordinator and organizational genius, provided expert guidance in ensuring that my bridge was built according to code. Dr. Will Manning, while not a member of my committee, carefully reviewed my “construction plans” at various critical phases of the project and provided top notch guidance. These two individuals in particular helped to ensure the delivery of this project on time and under budget.

My third acknowledgement goes to the members of my dissertation committee. My high expectation regarding the abilities of the members who consented to be my principle guides in this endeavor were surpassed on numerous

occasions. My advisor, Dr. Vernon Weckwerth, with his incisive questions and unwavering support, proved to be the spirited and sensible teacher that I sought. Dr. Mike Finch sweated alongside me as the model and methods for this research were meticulously constructed, providing a sturdy framework and foundation for the bridge we were building. Dr. Nicole Lurie's clinical expertise caught numerous flaws in the initial design of the project, thus saving long hours of rework. In addition, her careful reading of the drafts and invitations to consider my research from other angles provided an opportunity for a great deal of perspective-enriching intellectual growth. Her generosity in sharing professional contacts, most notably with Colonel (Dr.) Kurt Kroenke of the Uniformed Services University of the Health Sciences, added another valuable dimension to the bridge which will add to its strength. Dr. Phil Bromiley's support and insight throughout the course of this project were exceptional. His enthusiasm for research was infectious and his willingness to discuss ideas in process was wonderful. His insights from the field of strategic planning made the process of construction an enjoyable task. Finally, Dr. Arthur Leon's personal experience and familiarity with military medicine as a long time member of the Medical Corps of the United States Army provided the essential boundary spanning role for this project. Dr. Leon inspected the bridge from both sides of the ravine to ensure its soundness. His recommendations at the outset of this effort regarding the design

of the structure for this project avoided numerous re-engineering tasks later on.

The team of engineers from the academic world was never less that excellent.

My fourth acknowledgement goes to my colleagues on the military side of the ravine. The support of staff of the Office of Program Review and Evaluation, who conducted the survey that provided the bulk of the data for this research and took great pains to make the data usable for independent analysts such as myself was invaluable. Dr. Bob Opsut and Dr. Amy Graham of that office have generously provided excellent guidance in support of this effort. I look forward to a continued association with them. I am also grateful for the support of friends at the Air Force Surgeon General's Office, Lt Col Mike Kilcommons, Lt Col Chet Gooding and the late Mrs. Luan Houser. These friends used their personal contacts on numerous occasions to get me critically needed information quickly, a task that would have been impossible without their intervention. The unexpected death of Luan late last year reminded me how precious human relationships are in our lives. Her zest for living and dedication to quality work were a shining example that having fun and doing quality work are not mutually exclusive activities. It is a lesson which many of us need to relearn over and over again.

My fifth and most important written acknowledgement, goes to my family. Building interprofessional bridges can be intellectually stimulating and even enjoyable at times, but it cannot replace the delight and sense of satisfaction of

building interpersonal bridges. Without interpersonal bridges, life is drab and uninspiring. My wife, Carol, and my children, Peter and Emily, have provided numerous days and hours of sunshine during my studies here, even during the long and cold Minnesota winters. No level of professional or academic achievement can substitute for the human connections we enjoy. Building and maintaining interpersonal bridges is a prerequisite for building other types of bridges because they provide us with the insight and energy which enables us to accomplish our goals in other spheres. However, they are not to be valued for what they enable, but as things unto themselves which are precious in their own right. I am grateful to have these three very special people in my life and I want to acknowledge them formally. But words to express my love for them are too difficult and too private to express here, a statement which applies to the One for Whom there are no words in this formal missive, but without Whose unflinching support I cannot imagine having completed this undertaking.

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I. Introduction

A. General Issue

Organizational leaders are constantly faced with resource allocation decisions. This is particularly true in the current budgetary environment in public sector, where pressures to increase efficiency while minimizing the negative impact to beneficiaries of public services are endemic (Bryson, 1995). Strategic planning in the public sector is an essential element in moving organizations in directions which are thought to be good for the organization and the individuals it serves (Bryson, 1995). Recently, the DoD has embraced a comprehensive strategic planning process which seeks to develop a vision for the military services and their supporting elements in the year 2020 (Aenschbacher, 1996). In this fecund strategic planning environment, the medical departments of the three Services have embarked on established detailed strategic plans which detail their desired future role in the military, involving the investment of large amounts of time and effort on the part of senior leadership and supporting staff (Aenschbacher, 1996). These efforts are commendable. However, quality decisions in a strategic planning process are the result of vision informed by empirical facts; vision without empirically validated information to guide the direction charted for the future is a potentially risky undertaking. A key role of researchers in the DoD is to use of available data and produce from these data information which will inform decision makers and help them make better strategic planning decisions (Opsut, 1996). The production of information from data on order to

permit informed choices by high level decision makers in the DoD is the purpose of this research effort.

The cost of mental health problems are high and are borne by many parties other than the individual patient (Betrus and others. 1995; Mumford and Schlesinger, 1987). Costs include the loss of work time due to visits to health care providers and days of missed work as well as days during which the worker's performance was impaired due to the mental health problem of the beneficiary. In the DoD environment, the military Services bear both the direct cost of treatment and the indirect organizational cost of decreased employee productivity. Decreased productivity is the result both in cases where the active duty member has the problem as well as in cases in which an active duty family member has an unresolved mental health problem, since concern over the family member results in distraction from the service member's duties in the assigned unit (Hart and Conners, 1996). Therefore, examining issues related to the effectiveness of mental health services would seem to be expedient.

Informed choices regarding any budgetary program need to be made in light of the total impact of that program. If the use of mental health services results in a decreased use of other medical assets, then strategic resourcing decisions need to take these reductions into account. This dissertation attempts to discover whether or not mental health services influence the use of other medical services. In the health services research literature, this phenomenon is known as the medical offset of mental health services or, more simply, "offset" (Jones and Vischi, 1979). The medical offset of the use of mental

health services is the phenomenon to be examined in this dissertation in the unique context of the military health services system.

B. Specification of the Phenomenon of Interest and Supporting Behavior Model

It is important at the outset to make clear the type of "offset" being considered, for the term is used by different researchers to mean different things. In this study, "offset" is present if the utilization of physical health services falls as a result of mental health services utilization, regardless of the intensity of mental health utilization. This operational definition of the term is the most commonly accepted definition of offset (Fiedler and Wight, 1989). For the purposes of this investigation, mental health services are whatever the patient says they are. Mental health services are delivered whenever the patient believes that these are services which are the primary reason for his or her visit. The stereotypical setting of care may be the mental health clinic, in which psychiatrists, clinical psychological and psychological social workers see patients, but this is not necessarily the case. Mental health services can and often are delivered in a primary care setting (Regier et al, 1978; Engel and Kroenke, 1994). Indeed, data from the National Center for Health Services Research funded National Medical Care Expenditure Study was used to estimate that approximately 60 percent of all users of mental health services identified a primary care setting as their venue of care (Horgan, 1985). However, the setting is not particularly critical to this study, since no attempt is made to compare the effectiveness of mental health specialists in treating mental health problems with the effectiveness of primary care. Instead, the retrospective insight of the patient that,

regardless of venue, a mental health visit has taken place is the critical issue, since it is this insight which is the basis for subsequent utilization behavior which forms the underlying behavioral model which is critical to this study.

The behavioral model which undergirds this study is that individuals in emotional distress will eventually seek relief for their discomforts. To the extent that this search for relief is directed toward the health care system, they will either seek mental health care or care for a problem they perceive to be somatic in nature. While the patient's chances of getting effective treatment is increased if he seeks out the services of a mental health specialist, since studies have shown that primary care practitioners often fail to recognize psychosocial or psychological disorders (Durham, 1995; Wells et al, 1989; Rogers et al, 1993; Kirmayer et al, 1993) and often treat them inappropriately (Mumford and Schlesinger, 1987; Callahan et al, 1992). However, primary care practitioners also can be effective in treating mental health problems, provided that the patient is amenable to treatment of these problems (Orleans and others, 1984). According to Mumford and Schlesinger (1987), the excess utilization which takes place in the absence of a mental health visit takes place for two reasons. First, the patient misuses the system by making repeated visits to a primary care clinician for a variety of somatic complaints. Second, the patient presses the primary care physician for a somatic answer to his or her complaints, demanding a physical diagnosis which induces the provider's misuse of the system through numerous diagnostic and follow-up visits in a vain attempt to find a somatic explanation of the patient's problem. In either of these cases, offset is possible

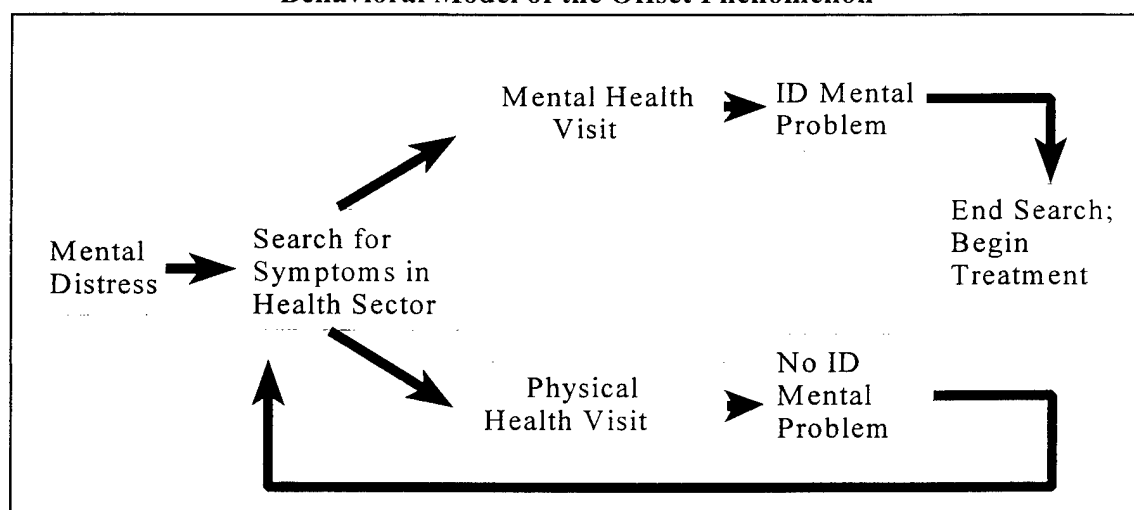
because the true underlying (psychological) etiology of the patient's problem remains untreated.

A critical enabling element for achieving offset is what Budman (1982) calls psychotherapeutic insight. In many cases, this insight may immediately precede the actual visit and occurs within a social context of friends and family who validate the appropriateness of a decision to seek mental health treatment (Scheff, 1963). This insight takes place when the patient acknowledges that he or she has a mental health problem which must be addressed. Budman (1982) argues that insight can occur with very few visits to a mental health professional, which explains why the magnitude of offset is often greatest for patients with the fewest mental health visits (Goldberg et al, 1970; Cummings, 1977; Budman et al, 1982, 1984). According to Budman (1982), even with a single mental health session, "a reframing process begins," and that "the patient's attendance at one or two meetings brings with it a message that 'some of your complaints and discomforts may not be physical in nature.'" Once the reframing of the discomfort is understood by the patient, the vain search for a somatic solution abates or ends.

Diagrammatically, the behavioral model is as shown in Figure 1 below:

It is immaterial for an offset study to ascertain whether the undiagnosed underlying mental health problem fools the patient or the provider (or both) into searching extensively for somatic problems which are either absent or are secondary causes of the untreated mental health distress. Either case can lead to a lengthened search and, therefore, excess visits for physical health reasons. The above diagram is admittedly simplistic, since mental health visits will sometimes fail to identify mental health problems and physical health visits sometimes do identify mental health problems in the course of examination and treatment. Nevertheless, the diagram in figure one generally depicts what researchers suggest as the underlying behavior which leads to an unobserved causal chain which makes the offset phenomenon possible. Offset can occur if either the beneficiary or the provider fail to recognize nascent mental health problems,

Figure 1
Behavioral Model of the Offset Phenomenon



since unrecognized mental health problems can result in subsequent visits which seek to provide relief from the physical symptoms, real or imagined, which arise from the mental or emotional malaise. This study will use as the dependent variables for its analysis the total number of outpatient medical visits for physical reasons (e.g. for illness/injury or a physical exam). The basic test of the central hypothesis will be made by comparing physical health utilization between groups of beneficiaries who did and who did not receive mental health treatment in the preceding twelve month period. A discussion of specific tests and methods will be presented in detail in Chapter III.

C. The Research Problem

In spite of the contributions of other researchers to our understanding of the “offset” phenomenon, it appears that this outcome is quite sensitive to the organizational and cultural context of the patients and the health care system being used. Given the uniqueness of the military health services system and the military subculture, it is not appropriate to generalize results found in other contexts to the population of interest, particularly if the organizational setting is one as idiosyncratic as that of the military. Determining the presence of “offset” in the military health care setting is an essential prerequisite for assessing whether shifting some emphasis and/or resources from the treatment of physical disorders to the treatment of emotional, behavioral and mental disorders may enhance the overall health and well-being of active duty members and their

families and reduce overall DoD health care expenditures. The research problem is to determine the extent to which offset seems to occur within the military health services system and, where possible, to pinpoint it to specific subgroups (e.g. family members, Navy beneficiaries, enlisted members) in which the offset effect is strongest in order to facilitate a targeted response to the misallocation of resources from physical health treatment to mental health treatment that the presence of offset suggests.

The issue of offset has typically been considered from a micro-analytic perspective, observing a small cohort of patients over time and noting their health care utilization patterns. In most cases, researchers of the offset phenomenon have observed the changes in physical health usage patterns in the months preceding and following mental health treatment, where individuals served as their own controls. In contrast, this study seeks to take a cross-sectional, macro-analytic view of the subject. If offset is a real phenomenon which affects individuals suffering from mental health impairment not confined to only the most severe range of the spectrum, then it follows that it should be detectable in the aggregate if one controls for differences between the mental health user and nonuser populations. In other words, if Mr. Smith, an individual whose mental health status suggests that he might benefit from mental health treatment, reduces his demands for physical health services following a mental health visit, then it follows that for people with a need for mental health care, those who actually use mental health care should have fewer physical health visits than nonusers. According to the theory of the "offset effect," this occurs because these users will not engage in a vain search for somatic explanations for their discomfort, assuming that the study controls for relevant covariates.

This study takes the macro-analytic, or population health, perspective for two reasons. First, from a practical perspective, the data set available for this study is cross-sectional in nature and does not allow for a time-series approach. Second, the problem this study seeks to address is not so much the clinical issue of how inappropriate usage affects the effective and efficient use of health services for individuals but, instead, whether the offset phenomenon can be exploited to achieve desired (reduced) cost and (increased) quality outcomes through expanded mental health access which will accrue to the benefit of the Department of Defense and its mission. If the offset effect is a real phenomenon, but one which occurs only in those few individuals with extreme levels of mental illness, the identification of an offset effect, while perhaps interesting from a clinical perspective, is no longer of great interest from the policy perspective taken by this research. Therefore, this research will test for an offset effect which is relatively pervasive across a broad spectrum of mental health impairment and, therefore, would be directly relevant from a policy perspective. A null finding from this study regarding offset, therefore, does not necessarily contradict studies which have detected the presence of an offset effect, but simply represents a finding that an offset effect of sufficient magnitude and pervasiveness so as to be capable to make an impact on aggregate health care costs or usage for DoD beneficiaries does not exist. The aim of this research, therefore, is not to identify the clinical phenomenon of offset, but to identify an offset phenomenon which is capable of making an impact on DoD health policy. The difference in perspective, while subtle, is important since it will play a significant role in the evaluation of the study

findings and the recommendations for action which will be presented in the final chapter.

D. Overall Research Objectives

The proposed research has two overarching objectives. The first is explicit and related to outcomes. Essentially, it seeks to determine the extent to which the use of mental health services is associated with the use of medical services for physical complaints. The issues underlying this purpose are straightforward. If individuals obtaining a mental health visit have less demand for medical visits of a somatic nature, the phenomenon known in the literature as the “offset effect”, then further investigation to determine if the cost of mental health treatment exceeds the cost of the physical health visits is warranted. If total costs of mental health treatment exceed the total costs of ineffective physical health treatment, then the principle of economic efficiency would dictate that those who can be better helped by mental health interventions should get the type of treatment they need so as not to burden the health care system with misplaced demand. Scarce resources, in this case, physician time, budget dollars and clinic resources, must be allocated in a manner which provides maximum benefit, particularly when budgets are contracting. More importantly, ensuring that military members and their families are treated appropriately is a readiness concern which takes precedence over financially-based cost-effectiveness calculations. If a service member or a member of his or her family suffers from an untreated illness, mental or physical, the readiness of the unit declines (Hart and Connors, 1996). Since maintaining military readiness is the primary purpose of DoD’s medical departments (GAO, 1995), appropriate treatment of

illnesses is always of paramount importance. This is particularly the case if appropriate treatment can reduce the overall cost of care to the health system.

Offset may be found in inpatient or outpatient utilization or both. However, for reasons which will be discussed below, only outpatient visits will be used as a measure of offset. The consideration of offset from this more narrow perspective is not uncommon in the literature (Mechanic et al, 1982; Smith, 1980) and is often pursued due to limitations in the available data, as is the case here. Other approaches in offset studies sometimes consider ancillary services, particularly lab and X-ray utilization, but these studies typically reflect offset effects for ancillary services to be either similar in magnitude (Goldberg, 1970) or greater in magnitude (Fink, 1977; Patterson, 1978) than the offset in physician visits alone for the same sample. Therefore, an examination of physician visit offset provides a conservative estimate of the total offset for a given sample. The explanation for the existence of offset is relatively straightforward and was presented in the behavioral model shown earlier. In words, it can be described as follows. Psychiatric distress which is perceived incorrectly by the patient to have a somatic origin may result in the patient seeking physical health care for these real or imagined problems. It may also trigger increased use of ancillary services by demanding patients or physicians seeking somatic solutions to patient complaints. If offset occurs, it is because the patient seeks inappropriate relief in the health care sector, typically in the outpatient arena. Indeed, repeated outpatient visits may be made in search of a physiological basis for their mental distress. In any case, pursuing a secondary or a somatized mental health

complaint is not an efficient use of resources (Mabe and others, 1990) when more effective providers of care are available for a given malady of psychiatric origin.

This study will consider offset only from the perspective of outpatient use. Although it recognizes the validity of other approaches, this study will not examine them. There is no data available in the data set being used for this research which identifies the number of ancillary visits (e.g. lab or x-ray). Therefore an analysis of offset for these services is not feasible for the current study. Data on inpatient utilization does exist in the data set; however, it is not adequate for an inpatient study. Mumford et al's (1984) meta-analysis of the offset literature showed inpatient offset studies to come in two principle varieties: the population based study and the inpatient psychological intervention using experimental designs. Dührssen and Jorschwieck (1965) is an example of the former, population-based, inpatient offset study. Because of the relative paucity of inpatient visits in a population in a given year, this type of study typically follows patients for five years following a psychiatric intervention to detect the offset effects of inpatient utilization. A more common type of inpatient offset investigation is the examination of the effects of psychological intervention on inpatients awaiting a particular medical or surgical intervention to determine if the intervention has an affect on average length of stay (Mumford et al, 1984). In this case, a lengthy post-intervention data collection period is not necessary because the study participants are already hospitalized. However, the current study includes a population of beneficiaries as its sampling frame, not a sample of hospitalized beneficiaries undergoing a particular procedure. Therefore,

feasibility of inpatient offset should be considered based on other population-based studies of this phenomenon.

The current study uses a population-based design which collects, among other things, information from patients regarding the health care utilization in the foregoing twelve month period. In this period of time, fewer than fifteen percent of the sample was hospitalized. Given the nature of the population and historical trends, it is likely that the most typical reason for hospitalization was for a birth (Opsut, 1994). Using previous population-based studies as a guide for feasibility of inpatient offset in the current study, the conclusion was reached that a consideration of inpatient offset is not feasible for this study. While inpatient offset effects from mental health therapy may theoretically exist, the data was collected over too brief an interval to manifest any effects from this therapy.

Another common approach for offset studies is an analysis of total physical health costs (Jones and Vischi, 1979; Mumford et al, 1984; Fiedler and Wight, 1989). There is no cost data in the data set to be used for this research. Average outpatient costs can be used to obtain an estimate of the magnitude of offset in dollar terms. An approach was considered which would seek to combine inpatient and outpatient utilization using dollar weights for inpatient days. Using historic CHAMPUS costs as a guide, the average inpatient bed-day could be estimated to be approximately 13.45 times the cost of an outpatient visit (Optenberg and Moon, 1994). Therefore, an overall offset might be evaluated by multiplying each bed-day times 13.45. However, the resulting figure would be a crude estimate and difficult to interpret. Moreover, the inclusion of birth-related inpatient stays might add a strong spurious influence on the results. For these reasons, the

idea of investigating the presence of a composite health utilization offset effect on the basis of relative costs was dropped.

Investigating the presence of offset in a military population, the first general purpose of this study, is interesting for very practical reasons of resource efficiency and medical readiness. If seeing a mental health professional reduces the number of outpatient visits for somatic causes or inpatient utilization of military beneficiaries, then more emphasis should be placed on improving usage of mental health services, so as to reduce the number unnecessary physical health visits. Equally important is the readiness issue. If individuals in need of mental health care do not receive that care, force readiness is compromised. Force readiness is compromised directly, when the active duty member does not receive mental health care when required, or indirectly, when family members do not receive proper care and become a source of distraction and concern for the active duty member. This readiness and efficiency-based conclusion would apply in almost any setting, but is particularly salient for a government operated health care system, such as the Military Health Services System (MHSS), with its funding drawn directly from a federal budget perennially under pressure for deeper cuts and increased efficiencies. Therefore, an obvious question of interest is whether we find evidence of “offset” for a military beneficiary population which has been found by researchers in other settings.

The second purpose of this study is implicit and arguably more important. It seeks to decompose overall offset into offset levels found in discrete subgroups in the military population. This effort is important because it may permit a targeted effort to those groups who seem to avoid mental health care more than others in spite of apparent

need. Essentially, this second purpose is to identify where an effort to change the status quo might provide the greatest benefit. Such an investigation regarding origins of the offset phenomenon begins with an investigation of differences between subpopulations of beneficiaries in the military services with regard to mental health status and utilization. Ostensibly, active duty military members are free from serious mental health problems as a result of a combination of accession screening and extensive morale programs. A multitude of free services, including mental health services, is available to beneficiaries of the MHSS to ensure that they stay healthy and fit. Maintaining a combat ready force is the justification for a medical service as part of a military organization. Soldiers, sailors and airmen who have health problems or who are distracted from their duties by family members who have health problems are not as combat ready than others not burdened with these problems, other things equal (GAO, 1995). Therefore, encouraging usage of appropriate health care serves the organizational goals of the DoD's medical department, regardless of the presence of any offset. The presence of an offset, if discovered, simply reinforces the need to encourage beneficiary subgroups with low utilization rates to seek out mental health services when it is needed. If, other things equal, differential rates of mental health utilization are found, then cultural determinants which may hint at why such differences are observed is an important area for investigation. Identifying any culturally imposed barriers to usage among certain subpopulations (e.g. Navy personnel, recent arrivals to bases) is an important element in this research because there is reason to believe that culture plays an important role as to whether or not an individual seeks out mental health treatment (Mechanic, 1992; Noyes et al, 1995). Furthermore, pinpointing

groups with high levels of offset should aid DoD health care leaders in focusing clinical and administrative efforts for discovering appropriate solutions which reduce barriers to mental health service usage among groups for which the greatest benefit can be obtained from such an intervention.

E. Research Questions

Pursuant to the research objectives described above, three major areas of inquiry arise. First, and most fundamentally, does an “offset” in medical services exist in the military population? Second, if it is found to exist, which groups experience the greatest magnitudes of offset. Finally, in order to gain appreciation for the problem in context, a more basic inquiry describing current levels of mental health morbidity and usage of mental health services among military beneficiaries must be examined. These major areas of inquiry provide overall direction but no clear statement of what will be investigated. Toward that end, five principal research questions have been developed and are identified below. The five basic research questions to be pursued by this research are:

1. To what extent do active duty members and active duty family members of the three Services differ regarding their emotional well being and their utilization of professional mental health services? [Area of inquiry #3]
2. Can evidence of a medical “offset” resulting from mental health access be detected in a military beneficiary population of active duty members and adult family members?
[Area of inquiry #1]
3. Among those individuals with mental health status scores in a range indicating need for mental health services (which will be defined as those in the lowest quartile of this

sample), how do those who see a mental health provider differ from those who do not in terms of the number of medical visits for illness and injury? To what extent do differences in offset exist among subgroups, and do these differences conform to the expectations of social psychological theory? [Area of inquiry #2]

4. What is the difference in the number of medical visits by the population experiencing greater than average levels of psychological distress and who visit a mental health provider versus those in the same distress category who do not see a mental health provider? [Area of inquiry #1]

5. What is the estimated annual cost of the excess utilization associated with not treating DoD beneficiaries not making needed mental health visits in terms excess utilization of non-mental health services? [Area of inquiry #1]

F. Specific Research Hypotheses and Other Specific Issues for Determination

Specific research hypotheses and specific issues are drawn from the more general research questions presented in the previous subsection. They were developed using inference based on a reading of the literature reviewed and the idiosyncracies of the data set available for this research effort. Where hypothesis testing is inappropriate for the research question, a short discussion regarding the determination of the answer to the question is presented. The hypotheses (and other statements of intent, denoted as issues) represent the deliverables of this dissertation. They are organized under the general research question to which they contribute some insight. The research questions are repeated here for the convenience of the reader. They are italicized to help distinguish them from the specific hypotheses and issues introduced for the first time in this section.

A rationale for each specific research deliverable is presented to aid the reader in linking the hypothesis to relevant issues which will be raised in the literature review in Chapter II.

Research Question 1. To what extent do active duty members and active duty family members of the Services differ regarding their emotional well being and their utilization of professional mental health services?

Hypothesis 1A: Active duty members have higher emotional well-being than family members. Rationale: Rigorous screening upon entrance in the military and throughout a military career ensures that those with chronic mental problems are eliminated, since their retention in the armed forces could potentially put themselves and/or their comrades at risk in the event of wartime or other crisis situations. The absence of screening measures to ensure the mental well-being of family members will result in lower mental health status, on average, relative to their active duty counterparts.

Hypothesis 1B: Active duty men and women utilize mental health services less than male and female family members. Rationale: Cultural barriers to mental health utilization are stronger for the active duty member than they are for the family member. This relationship will persist even when utilization is compared within gender categories, so as to eliminate the influence of the important covariate of gender on the analysis.

Hypothesis 1C: Mental health morbidity and utilization will be least for Air Force families and active duty members and greatest for Navy beneficiaries. The Army's utilization and morbidity will be between the experiences of the other services.

Rationale: The mission of the Navy requires many of its personnel to go on extended

shipboard tours of duty. The Navy group will be considered both with and without Marine Corps beneficiaries, since although Marine Corps personnel fall under the jurisdiction of the Department of the Navy, their organizational culture is quite dissimilar (Coates and Pellegrin, 1965). The resulting separation of the active duty member from familiar surroundings and, for some, family, increases the stress on these individuals and their families and leads to reduction in emotional well-being and elevated demand for mental health services. Army deployments and training exercises have the same impact on individuals and their families. Air Force personnel experience less disruption in their lives due to mission requirements and, therefore, will have higher emotional health and lower demand for mental health services.

Hypothesis 1D. The level of emotional well-being scores for active duty members will be higher than that of the U.S. population average. Rationale: The military's emphasis on combat readiness ensures that only a mentally and physically fit force is accessed and maintained. Active morale and welfare programs promote a positive emotional well being level among the active duty force.

Hypothesis 1E. The average emotional well-being scores for family members will be lower than that of the U.S population average. Rationale: Military family members endure stresses that are not typical of the average American family. Military families move frequently and often face family separation as well as separation from the social support networks of long time friends and extended family. The possibility of deployment of the active duty member into a hazardous area with little forewarning adds to the stress experienced by the military family member. These added life stresses are the

causal factors underlying the military family syndrome hypothesized by McCubbin and Dahl (1976).

HYPOTHESIS 1F. The average emotional well-being of individuals with less time on station will be more lower than those who have been on station longer. Rationale: Moving is a stressful event. Moreover, the adjustments to a new situation in the absence of a social network will result in decreased emotional well-being for beneficiaries of all categories.

2. Can evidence of a medical "offset" resulting from mental health access be detected in a military beneficiary population of active duty members and adult family members?

Hypothesis 2A. Utilization of outpatient physical health services made by beneficiaries in the lowest quartile of the mental health status scale will be significantly less than for those who had a mental health visit than for those who did not have a mental health visit in the prior twelve months. Rationale: This is central thesis of the "offset" phenomenon discussed in the literature. The model built to explore this phenomenon is introduced in Chapter II and discussed in Chapter III. According to the exponents of offset, people in need of mental health care who get appropriate specialty care will reduce their medical utilization in both inpatient and outpatient settings, since both they and their providers become aware of the true nature of their problem and cease to look for somatic explanations of mental health problems. Offset should be strongest in the lowest decile group of mental health status and decrease as need, measured by mental health status, abates.

Hypothesis 2B. Individuals who enjoy relatively high levels of mental health status will have similar physical health utilization experiences regardless of whether or not they see a mental health specialist. Rationale: This is the contrapositive counterpart to hypothesis 2A. In logical terms, it can be expressed as follows: $\sim A \Rightarrow \sim B$. People with no demonstrable mental health problems should not experience any offset in their medical utilization. This should be particularly true of individuals in the highest quartile of mental health status in the population under study (MCS score > 56). This conclusion is based on the presumption that mental health visits produce offset by eliminating unnecessary medical visits. If there are no mental health problems to be found, then a mental health visit cannot obviate the need for medical visits by identifying the true (psychological) source of the distress. Therefore, it is not logical for offset to be found in this case.

3. Among those individuals with a mental health status score in the lowest quartile of this sample (MCS ≤ 47), a score below the national average of 50 and one which suggests the need for some mental health treatment, do those who see a mental health provider differ from those who do not in terms of the number of medical visits for illness and injury? To what extent do differences in utilization, if they do exist, conform to the expectations of social psychological theory?

Hypothesis 3A. The magnitude of the offset will be stronger among active duty personnel than among family members, other things equal. Rationale: The health belief model predicts that where barriers to care are high and perceived susceptibility to problems of a given type is low, then access rates will be low. In this case, the barriers to mental health care and low perceived susceptibility to mental health problems are

culturally derived. This military subculture affects the active duty member more than the family member. As a result, active duty members under will search longer for somatic explanations for psychological distress than will family members. Therefore, the magnitude of offset should be stronger for this group than for family members.

Hypothesis 3B. The magnitude of offset for men will be higher than that for women.

Rationale: Women have more cultural permission than men to adopt the sick role in American society (Parsons, 1951). This seems particularly true in the case of use of mental health services. Therefore, they are more likely to seek appropriate mental health care sooner for their psychological problems, thus reducing the amount of time spent in a vain attempt to determine somatic origins for their distress.

Hypothesis 3C. The magnitude of offset will be higher for officers and their families than for enlisted personnel and their families.

Rationale: In America's all-volunteer force, officers have more at stake regarding their military profession. Because military members are fully accountable for their families, any stigma associated with a family member will automatically attach to the military member (Coates and Pellegrin, 1965). Any event which may be threatening to the career of the military officer will be strongly avoided because the stakes of losing their elevated status within the subculture are high.. Furthermore, their symbolic leadership role will push them away from an admission of mental health problems, which carry the stigma of personal weakness in American society. As a result, the search for somatic origins to their psychological distress will be lengthier for officers and their families than for enlisted personnel and their families.

This leads to a greater offset in this subpopulation than the one expected in the enlisted subpopulation.

Hypothesis 3D. The magnitude of offset will decrease as time on station increases.

Rationale. Individuals serving at a given military post longer will have had the chance to develop informal social support networks. These networks will have two relevant impacts on offset. First, they will provide a group to which an individual can turn to for assistance outside of the medical care system for emotional support. Second, these networks can provide the “permission” and encouragement to the individual to seek out mental health treatment in the health care sector when this type of care is needed.

Therefore, these individuals are less likely to use medical services overall and, if they do use them, more likely to seek out mental health treatment for their distress. Both of these factors should reduce offset.

Hypothesis 3E. The degree of offset will be the same across beneficiaries of the

three major branches of the Services. Rationale: While the stresses of military life, and consequently the likelihood of reduced emotional well-being, may differ between the services, there is no a priori theoretical basis for supposing that the cultural barriers imposed by any one service are higher than any other. Therefore, the magnitude of offset experienced by active duty members and family members may differ, but it should be the same within the beneficiary category across services. Due to the relatively small numbers of Marine Corps families included in the survey, all Department of the Navy beneficiaries (Navy and Marine Corps) will be analyzed as a single group with regard to the strength of the offset effect relative to the other Services.

4. *What is the difference in overall utilization (in terms of outpatient physical health visits) by the population experiencing greater than average levels of psychological distress and who visit a mental health provider versus those in the same distress category who do not see a mental health provider?*

Issue 4A. Rationale: DoD leaders are interested in a bottom line figure which they can understand easily. Coefficients resulting from a regression with a transformed dependent variable are often difficult for individuals without extensive statistical training to comprehend (Manning, 1996). A straightforward figure, such as the average amount of utilization reduced, is more likely to be understood and acted upon. Therefore, including such a figure as a research deliverable is of important practical significance.

5. *What is the estimated annual cost of the excess utilization associated with not treating DoD beneficiaries not making needed mental health visits in terms of excess utilization of non-mental health services?*

ISSUE 5A. Rationale. Determining an estimate of the maximum dollar savings potential to the military health care services system which may be possible through eliminating outpatient visit offset among DoD beneficiaries is done in order to make the results and implications of the research clear to the DoD leaders who are confronted with this information. Failing to address to interests of the primary audience for this research would be foolish. Few things are better at gaining the attention of DoD leaders than the opportunity to save money.

This section has identified the specific research hypotheses to be tested by this effort. Detailed discussions regarding relevant findings from the literature, which form the basis of the rationales offered in this section, will be discussed in Chapter II. The basic

methodological approach and the empirical model used to test these hypotheses will be presented in Chapter III. Prior to those discussions, however, a number of additional items of information must be presented in order to provide an adequate orientation for the reader. The first among these important preliminary items of information is an the operational definition of terms and concepts which will be used throughout the course of this dissertation.

G. Operational Definitions of Key Terms

The reader and the researcher must share a common understanding of key terms and concepts used in this thesis in order to minimize misinterpretation and confusion resulting from differences in semantics. In an effort to overcome this problem, list of critical terms used in this dissertation is presented below. The terms are listed in alphabetical order.

Catchment Area. The area of assigned responsibility for a military medical facility prior to the implementation of TRICARE, the universal triple option insurance program for DoD beneficiaries which is replacing several DoD health care programs, including CHAMPUS. It is approximately a forty mile radius of zipcode areas surrounding the military installation where the military medical treatment facility (MTF) is located. Clinics without associated military inpatient facilities use a quasi-catchment area of twenty miles radius from the facility. Non-active duty military beneficiaries living in the catchment area must receive approval from the MTF prior to obtaining inpatient services (if they want CHAMPUS to pay for these services). Active duty beneficiaries are assigned to the nearest MTF, regardless of distance, which must be consulted prior to the consumption of any health care services by the active duty member. Catchment areas for

both inpatient facilities and freestanding outpatient clinics have become increasingly important since the advent of capitation budgeting in FY94. Under capitation budgeting, military medical treatment facility commanders are held accountable for all expenditures made for health care by the beneficiaries in his or her catchment area, regardless of whether the services are performed by the military facility or by a civilian provider (Gooding, 1996).

CHAMPUS. An acronym which stands for "Civilian Health and Medical Program of the Uniformed Services. Historically, and for the period during which the survey used for this study was made, this plan covered virtually all active duty family members as well as retirees and their families. The only exception to this general rule were several small scale demonstration projects which sought to test various options for reforming CHAMPUS. Family members enjoy slightly favorable benefits over retirees in terms of copayments for services. The specific benefits of the CHAMPUS program are the same as those listed for TRICARE Standard in the table below that keyword. Active duty members are not covered by CHAMPUS or TRICARE, the costs of all health care for these individuals is borne fully by the government.

Community Hospitals. Small inpatient facilities with limited specialty care available. The number of inpatient operating beds varies widely for these facilities, but typically does not exceed 100. Many are similar to inpatient facilities serving relatively isolated and sparsely populated rural communities. Typically, the inpatient component of services available at these facilities is restricted to OB/GYN, Orthopedics, General Surgery and Internal Medicine. These facilities do not typically receive referrals but often

refer out complex patients to either DoD operated medical centers or civilian sources. These facilities typically have no inpatient mental health capability and relatively few mental health professionals assigned.

Facility in an Isolated Area. This is operationally defined as a military medical treatment facility located outside the confines of a Standard Metropolitan Statistical Areas established by the Bureau of the Census in 1990. As a result, overseas military facilities are included in this group of facilities. A variable included in the model, FACISOL, corresponds to this category, where FACISOL=1 indicates a facility in an isolated area. This category is established to distinguish sites where routine health care options in the civilian sector available to DoD beneficiaries are expected to be limited

Freestanding Outpatient Clinics. These facilities typically support smaller installations operated by the military services or bases which are located in close proximity to a larger military medical facility. These facilities are charged with the delivery of primary care and the arrangement of other necessary care. These facilities often have only a single mental health professional assigned.

Lead Agent Facility. Sophisticated medical facilities operated by the DoD and given broad responsibility for health care delivery in 12 geographic regions in the United States. See discussion under Military Medical Treatment Facilities, subheading Medical Centers.

Medical Centers. Tertiary care military medical treatment facility (MMTF) operated by the military Services. They have the largest number of inpatient beds and also support a number of medical and surgical subspecialties (mix varies) with sophisticated ancillary

service support. These facilities often receive referrals from military community hospitals and outpatient clinics. Most of these referrals are within a geographic region, but some referrals for specialized care are sometimes made nationwide and from overseas. Only one DoD Medical Center is operated outside the United States, the jointly staffed Medical Center located at Landstuhl, Germany, not far from Kaiserslautern. These facilities typically have extensive inpatient and outpatient mental health capabilities. Fourteen medical centers are designated lead agent sites. These DoD identified organizations are responsible for the coordination of care throughout 12 geographic regions. These lead agent medical centers are typically commanded by a General and represent the most sophisticated medical facilities operated by the DoD.

Mental Health Care. Professional services rendered by health care professionals in an outpatient setting which seek to identify and treat patient problems which are psychological, rather than physical, in origin. Mental health care in this study is narrowly defined and does not include substance abuse or alcohol abuse treatment. Although these problems of addiction may also have psychological origins, they are distinctive problems which are often measured and studied separately from other mental health problems. Mental health care is rendered by mental health professionals (see below) and by other health care professionals, particularly primary care practitioners (Regie, Goldberg and Taube, 1978).

Mental Health Professional. A psychiatrist, psychologist, or clinical social worker working in a mental health care capacity.

Military Health Services System. The health care system operated by the military for its beneficiaries. It encompasses both direct care rendered in military facilities, 75% of the total care delivered to the 8.5 million beneficiaries in 1994 (GAO, 1995), as well as care delivered to beneficiaries through the CHAMPUS and, more recently, TRICARE programs.

Military Medical Treatment Facility. (MMTF) Health care organizations operated by the Army, Navy and Air Force on or near military installations. Every active duty military installation has an MTF of some kind, although they vary widely in their level of capability and sophistication. They are staffed by active duty military members and civilian employees of the branch of the military which own the facility. These organizations range widely in staff size, specialty mix, and capabilities, but all are charged with the same responsibility of providing or arranging for the care of all active duty members in its catchment area and providing care at no charge to other beneficiaries of the military health services system, principally the families of active duty members and retirees and their families. There are three basic types of MMTFs: Medical Centers, Community Hospitals, and Freestanding Outpatient Clinics. See separate definitions for each of these facility types in this section.

Overseas Area. Any location outside of the boundaries of the 50 states which comprise the United States.

TRICARE. A triservice, triple-option, managed care plan which began to be implemented on a regional beginning in 1995. It was preceded by several small scale CHAMPUS Reform Initiative (CRI) demonstration projects of various types and of

various scales, several of which were in effect at the time when the data used for this research was collected. TRICARE's primary intent is to replace the indemnity style insurance represented by CHAMPUS, although it formally includes active duty members under its umbrella. Family members responding to the 1994-95 DoD Health Care Beneficiary Survey were not covered under TRICARE. However, since the program is currently planned to have been implemented nationwide by 1998, recommendations must be consistent with this new structure. TRICARE adds a Health Maintenance Organization (HMO) and a Preferred Provider Organization (PPO) as options for the military family. These are known as TRICARE Prime and TRICARE Extra, respectively. The CHAMPUS program which existed prior to TRICARE continues to exist as TRICARE Standard. Table 1 below provides specific information regarding each of the three coverage options which are of greatest salience to this research.

Table 1

TRICARE Health Benefit Comparison: Selected Items

BENEFIT	CATEGORY	===== TRICARE OPTIONS =====		
		Standard	Extra	Prime
Choice of Care	All CHAMPUS Eligibles	Unlimited	From Approved Network Chosen by Patient	From Approved Network by Primary Care Manager
Annual Enrollment Fee	Active Duty Families	None	None	None

Choice of Care	All CHAMPUS Eligibles	Unlimited	From Approved Network Chosen by Patient	From Approved Network by Primary Care Manager
	Retirees and their Families	None	None	\$230/Individual \$460/Family
Annual Outpatient Deductibles	E-4 and below	\$50 Individual \$100 Family	\$50 Individual \$100 Family	None
	E-5 and Above; Retirees and Their Families	\$150 Individual \$300 Family	\$150 Individual \$300 Family	None
Outpatient Civilian Care Copayments	E-4 and Below	20%	15%	\$6/visit
	E-5 and Above	20%	15%	\$12/visit
	Retirees	25%	20%	\$12/visit
Outpatient Mental Health	All Adult Beneficiaries (19 and over)	23 visits per calendar year without CHAMPUS approval; same deductible	23 visits per calendar year without approval; same outpatient deductible	No explicit limit

Rural Area. An area in the Continental US, Alaska and Hawaii not included in those counties which make up Standard Metropolitan Statistical Areas, as determined in the 1990 U.S. Census by the Census Bureau.

Usage (of Mental Health Care). Self-reported utilization of mental health services (at least one outpatient visit) in the previous 12 months.

Having operationally defined the key terms to be used in this dissertation, another important item of information to communicate early on is the scope of the study being presented. This discussion follows in the next section.

H. Scope

No single research effort can unilaterally answer every interesting question on a given subject area. Indeed, global and all-encompassing solutions are anathema to the scientific process, which relies on the slow accretion of knowledge over time made by a number of independent scientists. This effort is also limited in its scope and the extent of its inference. In particular, the scope of this research is limited by its operational definition of mental health care and by the problems inherent in including retirees among the beneficiary groups considered in the analysis.

This study excludes substance abuse or alcohol abuse as a component of mental health care. It might be reasonably argued that alcohol and substance abuse is a manifestation of poor mental health and should not be excluded from a study investigating the impact of such interventions on the reduction of medical visits. Three reasons are offered for the exclusive focus on the narrowly defined definition of mental health used in this study. First, alcohol and substance abuse services are organized separately from mental health services in the Department of Defense (Joint Healthcare Management Engineering Team, 1994; Air Force Management Engineering Agency, 1994; Houser, 1996). Therefore, administrative remedies would need to be considered by an audience wholly largely different from the one in the proposed study. Second, the complexities introduced by a single endogenous independent variable (mental health usage) would be increased greatly if multiple endogenous variables (e.g. mental health usage and alcohol/substance abuse usage) were introduced into the prediction equation for visits. Other instruments would need to be determined for these new endogenous

independent variables which would make this effort quite unwieldy. Third, the "offset" literature itself is divided between offset involving mental health, substance (drug) abuse, and alcohol abuse. In most cases, this differentiation is the result of the absence of data for utilization of the other types of services, a problem which does not exist here. However, the distinction between narrowly construed mental health usage and substance/alcohol abuse usage does reflect real administrative divisions which have often existed historically to separate these types of health services. It is likely that this separation is based on the belief that administrative remedies can only be achieved programmatically and incrementally along existing organizational structures. A study which simultaneously considered offset as the result of mental health, substance abuse and alcohol abuse programs would almost certainly need to offer among its recommendations an organizational unification of the clinical and financial responsibility of these programs, a step too large for most organizations, especially one as large as the military health services system, to consider seriously.

The scope of the research is also limited to active duty personnel and their family members over 17 years of age. In most cases, this means the spouse of the active duty member, but there are cases where indigent parents or the in-laws of an active duty member can be declared family members by DoD and afforded all of the rights and privileges regarding military health care which are enjoyed by a military spouse. The exclusion of children and teenagers from this study is necessary because the 1994-95 DoD Health Beneficiary Questionnaire only included beneficiaries aged 18 or older in its sampling frame. Therefore, the exclusion of this segment of the beneficiary population,

which consists of over 1 million beneficiaries, or roughly 13% of the total number of MHSS beneficiaries is excluded on pragmatic grounds of having no available data on these individuals (Graham, 1996).

Retirees of all ages are also excluded from this analysis. The survey data used by this study included retirees and their families in its sampling frame; therefore, the same simple explanation of no available data in order to justify the exclusion of this important segment of DoD health care beneficiaries does not suffice. Retirees consist of approximately 50% of the 8.3 million beneficiaries of the military health services system (MHSS) (GAO, 1995) and, therefore, constitute an important group to consider in a utilization study such as this. However, several factors made it necessary to exclude this group. First of all, approximately 30% of all military retirees and their families are also eligible for Medicare, a group which is not considered in the capitation financing mechanisms developed for military medical treatment facilities which keep medical facility commanders focused on the health care demands of beneficiary groups (Gooding, 1996). As a result, retirees 65 and over often are encouraged to seek care elsewhere and can often almost completely be unaffected by military medicine and culture. Second, many military retirees younger than age 65 and their spouses have second careers which provide them with many different types of alternative health insurance options. This makes a study of this inherently dissimilar group quite complex. Third, rank as a proxy for income and social status becomes more tenuous in the retired population, since financial success and status in a second career do not necessarily mirror the experiences in the military. Fourth, and most importantly from a methodological perspective, the

randomizing impact of the military assignment system which makes the instrumental variables approach feasible for active duty members and their families cannot be made for retirees and their families. Retirees and their families are not assigned based on the mission requirements of the military; they are free to settle where they wish. Therefore, the same arguments for the theoretical lack of correlation between the instruments and the error term for the number of physical health visits which will be made in Chapter III and which is critical for the principle empirical model which will be used in this study cannot be made for retirees. Finally, and most important from the organizational perspective, concern regarding mental health care utilization for retirees is exclusively a financial issue. The approach taken by this study is one where the potential of mental health care to reduce the number of medical visits is used as an attention getting leading argument which draws its strength by adding considerations of combat readiness to those of financial efficiency. The readiness argument is a trump card which is available for advocating recommended solutions which affect active duty members and their families but which is unavailable for retirees, who have neither direct nor indirect impact on force readiness. Therefore, for all of the reasons cited in this paragraph, this study will not consider the issue of offset for the retiree subpopulation.

Summarizing, the scope of this research effort is limited in two principle ways. First, it excludes from the definition of mental health the associated behavioral problems of alcohol and substance abuse. Second, it considers only the subpopulation of active duty members and their adult (18 and older) family members. The limited scope of the research is not a limitation of the research per se, but a consciously made choice based in

some cases on data limitations and in other cases on the preferences of the researcher. Genuine limitations of the research are discussed in the next section.

I. Limitations of the Research

Limitations of the proposed research include: (1) issues of the external validity of findings, (2) the inability of the current data set to measure the cost-effectiveness of mental health interventions, (3) the inability to positively identify what specific variables or causal mechanisms encourage and discourage the use of mental health services by the populations studied, and (4) limitations based on the nature of this survey instrument in particular and of self-reported data in general. Some of these limitations are related to the limited scope of the research effort, while other limitations are the result of deficiencies in the secondary data set which do not allow the researcher to analyze some aspects of the offset phenomenon under study.

By its very nature, the proposed study's external validity is quite limited. The bifurcated nature of the military health services system into military facilities which offer free outpatient care and supplementary health insurance which offers expanded care the active duty members and their families (with deductibles and copayments for family members but not for the active duty members), makes it a unique healthcare system in the United States. Neither is the design of the military health care system of the United States similar to other military health care systems throughout the world. The geopolitical superpower status of the United States requires it to maintain a medical force which must be capable of deploying worldwide necessitates a relatively large medical infrastructure which is not needed by other nations with more geographically limited vital

geopolitical interests. Instead, the military forces of these states include small medical components for battlefield medical assistance and relies on the civilian medical infrastructure for the provision of more complex services (Jancović et al, 1997). Since most other countries have few deployment commitments and rely on conscription to fill the ranks, a practice which eliminates the need for large programs for family members and retirees, a separate military medical infrastructure is unnecessary. As a result, these findings only apply to the non-retiree, adult portion of MHSS beneficiaries who are most directly tied to the MHSS for their health care needs.

Research focused on the MHSS may seem excessively narrow in its focus to some. However, it is an important issue for the 8.3 million beneficiaries of the system as well as to American taxpayers who spend over \$15 billion annually in order to operate this system (GAO, 1995). Moreover, few researchers devote their efforts toward examining in depth and detail issues which concern the military health services system. It is an esoteric area where few combine the knowledge of the system's idiosyncracies with sophisticated health services research analytical tools. Therefore, a research effort which results in findings that may be unique to this system should not be dismissed as unimportant.

A second limitation of the research is the fact that although offset can be examined, other interesting and related issues, such as cost-effectiveness of mental health services provided to DoD beneficiaries, cannot be fully explored with this particular data set. If an offset effect is detected, then issues regarding cost-effectiveness naturally follow. Questions for future researchers along this path would include whether mental health

interventions by specialists are effective in decreasing the emotional distress experienced by patients and the extent to which force readiness is enhanced through incremental increases in resources allocated by the Department of Defense to mental health treatment. The cross-sectional design of the available data do not permit these interesting analyses, which would require a different data collection design.

Another limitation is that the proposed research does not explicitly determine which particular aspect or aspects of the health belief model drive the utilization of mental health services in the military population. Knowledge of the cultural setting described in the literature review coupled with observed utilization behaviors can only suggest which groups might be studied in the future to explicitly determine why military beneficiaries choose to use mental health services and why they do not. Unfortunately, the available data do not provide any definitive information regarding motivations; instead, we are only able to speculate based on behavioral evidence as structured by the health belief model. A more definitive test of motivations and the factors which lead one beneficiary to use mental health services and another to avoid these services would certainly be interesting. The potential for follow-up research into this area which deepens our understanding regarding the basis of observed choices in usage of mental and physical health services is one of several interesting avenues of study which are not covered in this analysis.

Yet another limitation of this research is associated with its reliance on self-reported data from a survey instrument. Although the measurement scales for physical and mental health status which are used in the survey have been found to have strong validity and reliability for the general U.S. population (Ware, 1994), this does not necessarily mean

that they are reliable and valid for a military population. While this seems a reasonable assumption, since DoD beneficiaries are drawn from the general population and, therefore, likely to interpret questions in similar ways to the general population; it still remains an assumption. Second, since the survey instrument collected self-reported data, the respondents' answers are necessarily subjective. One might argue that military beneficiaries have such high expectations of their health that any limitation in functioning is reported by these individuals as more severe than would be reported by a member of the general population. Alternatively, one might speculate that a stoic and uncomplaining attitude exists among military members who, as a result, shade their responses more optimistically than a member of the general population. No studies have been performed which tests whether military beneficiaries differ from general population members regarding their perceptions of mental and physical health given the same objective infirmities. Therefore, this study must assume that they are comparable. The reliance of this research on these untested assumptions for the key health status variables constitutes an unavoidable limitation of this study.

A final limitation of this study arising from the survey instrument is its failure to collect data on variables, such as the construct of predilection to seek out health care, which would be important variables in the analysis. This leads to an omitted variables problem in the research. Fortunately, methodological techniques, such as two stage least squares, can be used to ensure that unbiased findings are made for the research questions. However, these methodological techniques are not capable of overcoming gaps in information and causal mechanisms which arise from the absence of data on some key

variables. While a limitation, it is one shared by every study, since it is not reasonable to expect that any study will be capable of collecting accurate data on every facet of information which may be relevant to an investigation of any particular dependent variable. Having set out what this research is not, it is important to underscore what this research is.

Fundamentally, this research is an opportunistic exploitation of existing data which serves to begin a discussion on the roles and missions of military mental health services. It is also an opportunistic use of the military system which assigns its personnel and mental health providers based on mission requirements without consideration of the mental health needs of beneficiaries assigned to a particular catchment area. While the data set does not have available the data which might enable one to definitively answer all potentially interesting questions in the area of military mental health utilization, it is capable of answering some important questions. These questions are the basis of the five overarching research questions presented earlier in this chapter.

Questions outside of the scope of this undertaking must be left for future research. However, the effort required to obtain data needed for more definitive studies capable of explicit findings regarding the motivations of the choice to use mental health services will never be conducted unless initial exploratory research such as this study can highlight the issues related to military mental health care and describe why it is a subject worthy of deliberate, rather than opportunistic, exploration and study. It is for this reason that this study must be undertaken in spite of the identified limitations. A pilot study such as this, marketed by articles and presentations at appropriate forums, seeks to convince enough

people of influence that additional investigation into the area of mental health from a macro-analytic population perspective is warranted. Therefore, the modest implicit aim of the research is to act as a gadfly to prod further study into this area. If this study is not conducted, the military mental health issues may not be addressed for many years to come, which would lead to policy decisions based on a dearth of empirically established insights. Therefore, while findings to specific hypotheses will be presented in Chapter IV, the evaluation of the success of this effort should not be dependent on a positive identification of an offset effect for the military population studied. While such a result is desirable from an organizational perspective, since it suggests that expanding access to mental health care may not only improve readiness and quality of care but also reduce overall costs, such a finding is a matter of scientific indifference. Indeed, one strength of this study lies in the fact that it is being conducted by an individual who is not a mental health professional and, therefore, does not have a professional stake in rendering a finding which places mental health care in a favorable light. From a scientific perspective, the success of this effort depends on the extent to which this undertaking acts as a catalyst for other carefully considered efforts to conduct scientifically sound health services research on the military health services system, particularly as it relates to the area of mental health research.

Science is a process; a single study cannot strive to cover every issue. However, if this study raises questions, introduces research methods, or covers issues heretofore unexplored, it will have accomplished its intent to pioneer empirically-based, health services research studies of mental health utilization among military beneficiaries.

J. Dissertation Structure

The remainder of this proposal is divided into four major chapters. Chapter II, Literature Review, presents relevant literature and findings from previous studies. The empirical and theoretical models used to test the core hypotheses of this dissertation are presented in this chapter after arguments drawn for the literature are made to justify the methodological approach suggested by the empirical model. Chapter III, Data and Methodology, covers these two important and related elements which are integral to the successful completion of this research effort. A major section on data describes the data set used in the research, addresses its shortcomings, and proposes solutions. Since this is research based on a secondary data set collected for a purpose which differs from that of this research effort, a thorough examination of the data is essential. Included in the discussion on data will be a discussion of the reliability and validity of key constructs and associated measurement scales which will be used in this research. Having familiarized the reader with the data used for the study, a subsequent major section in this chapter discusses the specific methods to be used to answer each research hypothesis or research issue. Chapter IV, Findings and Analysis, systematically and comprehensively answers the specific research hypotheses and issues using the methods described in Chapter III. Alternate methods or also presented to demonstrate that the findings are robust and not dependent on the selection of a particular method. An integrating analysis and discussion follows the presentation of findings for each of the five general research questions considered by this study. Finally, Chapter V, entitled Summary, Conclusions and Recommendations, begins by synthesizing and summarizing the findings of the study,

placing them in context with key findings reported elsewhere in the literature. Next, an overall conclusion regarding the policy and research implications of the study are presented. Finally, recommendations both for future research and other, more operationally oriented, actions are made. These recommendations are based on insights obtained in the course of the conduct of this study. A bibliography of citations used in the study and Appendices are included at the end of the document.

K. Chapter One Summary

This chapter has introduced the general issues surrounding the offset phenomenon and what makes it an interesting question to study in the military context. Specific research questions and dissertation deliverables have been identified. The operational definitions of key terms used in this research have been provided. The scope of the study was discussed and the limitations of the study acknowledged and presented in detail. Finally, a general outline for the structure of the remaining discussion was provided in order to give the reader a foreshadowing of the order of discussion which is to follow in the chapters ahead.

II. Literature Review

This chapter is divided into three major sections. First, prior studies which have investigated the "offset" phenomenon will be discussed. Second, other studies which suggest variables which should be included in a model of mental health utilization will be presented. Finally, insights on salient and unique aspects of military culture and how this may be related to mental health utilization will be outlined. The purpose of this literature review is to situate the present study into the appropriate scientific context and to present relevant information that has a bearing on the development of this study and its associated hypotheses. An additional and complementary objective of this chapter is to recognize the findings of previous researchers who, through their efforts, have laid a foundation of theoretical and empirical knowledge which makes the current study possible.

A. "Offset Studies"

The literature regarding the proposition that mental health visits could "offset" medical utilization for ostensibly somatic or ill-defined complaints has a relatively short history. Both Jones and Vischi (1979) and Mumford et al (1984) identify a West German study published in 1965 by Dühressen and Jorswieck as the first "offset study" in the literature. This study compared the number of inpatient days (unspecified as to specialty) of 125 neurotics in the period five years prior to completion of psychotherapy in 1958 and the number of inpatient days this group incurred in the five years following psychotherapy. Two comparison groups were developed by the researchers. The first group was a sample of patients from the general enrollment of the Berlin General Insurance Company. The second group was a sample of neurotic patients on a waiting

list for specialty treatment in 1958 and matched subjectively based on the subsequent psychological diagnosis. The authors found that the group which received treatment in 1958 significantly reduced hospital stays from an average of 26.09 days in the five year prior to treatment to an average of 5.9 days in the five years following treatment. The waiting list sample of 100 experienced slight reductions in inpatient utilization in the period of 1959-1963, down to 23.91 from a level of 25.55 inpatient days for the 1953-1957. In contrast, the general population group experienced an increase in the number of average inpatient days, from 10.04 to 11.70, in 1953-1957 versus 1959-1963, respectively. The authors offered their study as evidence that for this population, treatment by mental health specialists reduced the number of inpatient days. However, they were silent regarding alternative explanations for this downward shift in inpatient utilization. The interaction of treatment and history effects, whereby more sophisticated diagnostic methods or changes of practice patterns which have greater salience to those with mental health difficulties than for the general population, might be responsible for the downward shift of inpatient stays among users of psychiatric services in the five year period following 1958. This possibility is left unexplored by the researchers. The failure to consider alternative explanations for observed phenomenon in nonexperimental research designs is representative of a general pattern evident in much of the offset literature. This often cited study, identified as the first work of "offset literature" (Mumford et al, 1984; Fiedler and Wight, 1989), is performed by mental health professionals and draws conclusions which place mental health professionals and the utility of mental health care in a favorable light, even when those conclusions represent

only one of a number of possible explanations for the observations noted in the research which is presented.

The West German study was presented in some detail in order to give the reader a flavor for the general design of the research on "offset" issues. Typically, as in this pioneering study, a group which receives mental health treatment is compared either with its own pre-treatment history or with the other experience of one or more other groups which does not receive mental health treatment. These issues of quasi-experimental design arise because researchers in the field believe that a randomized controlled trial which would withhold treatment from a randomly selected group of individuals in mental distress while forcing it on others would be unethical (Fiedler and Wight, 1989). The West German study and many others may be criticized due to the uncertain comparability of the treatment group with the comparison group. Difficulties in establishing appropriate comparison groups has been particularly problematic in several studies of the offset phenomenon (Jones and Vischi, 1979; Mumford et al, 1984).

Another important seminal study in the offset literature is the one conducted by Follette and Cummings (1967) at the Kaiser Foundation Health Plan of Northern California. This study is particularly important because these researchers compared inpatient and outpatient physical health service utilization in four groups: (1) individuals in long term psychotherapy, defined to be individuals who had nine or more visits to the Department of Psychiatry in a period of one year; (2) individuals in "brief" psychotherapy, defined to be individuals with two to eight annual psychiatric visits; (3) individuals with a single psychiatric visit in the year of study; and (4) a comparison group

of historical high users of physical health services who did not have any psychiatric visits in the year of the study. The groups with at least one psychiatric visit were termed collectively the "experimental" group and numbered 152. The non-user, or comparison, group was selected using matching techniques on the basis of age, sex, socio-economic status, physical health utilization history, long term (three years or more) plan membership, and evidence of some psychological distress based on the medical records screen. Each experimental patient was matched with a control patient based on these variables alone. Since experimental patients were matched, the comparison group size was also 152. The outpatient utilization behavior of the subjects in this study was observed for five years after the experimental year, 1960. The authors found that utilization held more or less steady in the comparison group relative to the baseline year, 1959 throughout the five year period, but declined precipitously for the experimental patients in all categories (Follette and Cummings, 1967). Specifically, the decline was from an average of 13.5 annual somatic outpatient visits per patient for the experimental group in the baseline year to 5.7 in the fifth year of the study, with a steady annual decline. This represented a reduction in utilization of over 57 per cent. A disaggregation of the experimental group results is interesting. The realized reductions in somatic outpatient utilization for the single, brief, and long term experimental subgroups was 61.4%, 70%, and 50.1%, respectively. These results support Budman's (1982) theory of psychotherapeutic insight leading to reductions in somatic utilization, as mentioned in the first chapter. It is also important to note that reductions in utilization were detected for the experimental groups began in the first year following the experimental year,

suggesting that the impact of a mental health visit on outpatient utilization is both fast-acting and persistent. It represents the outpatient corollary to the West German study discussed earlier, suggesting that offset occurs both in inpatient and outpatient settings. The study's principle shortcoming is in the selection of the comparison group using a matching technique using only a limited number of variables and relying on investigator judgement to determine which individuals would be selected for the control group. Given the generally recognized poor ability of health services researchers to predict utilization, with the ceiling level of explained variance in prediction models for utilization estimated at between fourteen and twenty percent (McCall and Wei, 1983; Welch, 1985; Newhouse et al, 1989; Beebe, 1992), there is a strong likelihood that matching based on easily identified demographic variables will not result in an equivalent control group (Campbell and Stanley, 1963). Therefore, since the conclusions of this research is based on a comparison of experimental and control groups which are not likely to be equivalent, the findings are specious. Here again, flawed research design leads to conclusions which may not be warranted. The failure to consider the problem of omitted variables and their impact on the conclusions drawn in the study is a flaw shared by most of the "offset" studies, which exhibit a research design preference of creating control groups through a matching process rather than invoking econometric approaches in dealing with the problems introduced by omitted, and in many cases, unknown relevant predictors of utilization.

Goldberg, Krantz and Locke (1970) sought to overcome the comparison group selectivity issues noted in the German and Kaiser studies discussed above by taking a

more macro approach to the comparison group issue. These researchers used as their experimental group a sample of 256 individuals who received mental health treatment. The comparison group was the utilization experience of the total membership of the health plan (Group Health Association of Washington DC). This study is interesting to the current study because it also took the approach of comparing the physical health utilization behavior of users of mental health services with all other beneficiaries covered by a particular plan. In this way, the Goldberg et. al. study was able to overcome potential biases inherent in research design approaches which force the researcher to select a comparison group himself. However, even when the researcher uses careful matching criteria, the potential biasing effects of subjective selection and omitted variables from the matching algorithm cannot be understated. Goldberg et. al. (1970) found that users of mental health services, including those who only had a screening interview, realized a reduction of 31% of doctor visits relative to their baseline utilization in the period prior to the availability of a mental health benefit of up to ten mental health visits per year. In contrast, the average Group Health Association member who did not use mental health services had a negligible 1.6% reduction in service utilization in the one year period following the introduction of the mental health benefit. These results strongly suggest that individuals substitute physical health visits for mental health visits. This would seem to indicate a need to control for the availability of mental health providers to a group of beneficiaries. It also suggests that offset is a reasonable idea, since people seem to replace needed mental health visits with visits to other providers. A major shortcoming of this study was the limited number of independent variables. Most

notable was the absence of variables which controlled for mental and physical health status. The omission of these important covariates have potential biasing effects. If the users of mental health services happened to be afflicted with more short term maladies, such that their mental or physical health status was temporarily worse than the general membership of the health plan, a scenario which does not seem altogether implausible, then their utilization of physical health services would go down in a subsequent periods. This would represent a simple case of regression to the mean, a natural phenomenon arising from uncorrected selection bias when experimental groups differ systematically from control groups in quasi-experimental designs. The lesson learned from this study is the importance of including health status measures in the set of predictor variables in a health services utilization equation.

Small sample sizes is another problematic element in some offset studies. For example, the sample size of the treatment and comparison groups reaches to as low as $n=17$ in treatment and comparison groups (Longobardi 1981). Indeed, among the 29 studies reported in the Jones and Vischi (1979) meta-analysis of the offset literature, the average size of the experimental groups was 415. The median number of experimental subjects in the 58 studies examined in Mumford et al's (1984) meta-analysis of the offset literature was less than fifty. The small sample sizes used in many of the studies of the offset phenomenon has also long been recognized as a problem by reviewers of this literature (Jones and Vischi, 1979; Mumford et al, 1984).

Offset studies have used a number of dependent variables to measure offset. These include inpatient days (Dührssen and Jorswieck, 1965, Langer et al, 1975; Lucas, 1976)

and also outpatient and/or ancillary service visits (Goldberg et al, 1970; Kogan, 1975; Fink 1969; Kessler, 1978; Langobardi, 1981; Diehr, William and Shortell, 1979; Diehr et al, 1985). Studies which consider offsets in both inpatient and outpatient utilization or expenditures have also been conducted (Follette and Cummings, 1967; Jameson, 1976; Pallak et al, 1993). The trend in dependent variable selection has followed the general shift from inpatient to outpatient studies. While the earliest offset studies tended to emphasize the offset in inpatient utilization, more recent studies reflect an emphasis on outpatient or total utilization (Jones and Vischi, 1979; Fiedler and Wight, 1989). Research findings supporting the presence of offset have been noted for all three types of dependent variables, inpatient, outpatient and total (Mumford et al, 1984).

Comprehensive reviews of the literature have found evidence of offset in numerous settings. Frank and McGuire (1995) conclude that the preponderance of the evidence makes it likely that offset does indeed exist, but the wide variation in the estimates of the magnitude of offset is troubling. This variation may be indicative either of methodological problems which have not been solved, particularly the tendency of researchers to choose their own comparison groups based on matching for a very limited number of covariates, or of important differences in organizational contexts which might also represent the unmeasured basis of variation. Fiedler and Wight (1989) are exponents of the latter idea, contending that comparisons in offset across types of health plans, as in Diehr et al (1985) provide strong support for the argument that organizational setting is a variable of great consequence in offset studies. Therefore, Fiedler and Wight (1989) note, variability across studies is to be expected, inasfar as this variability is a function of

unmeasured differences in the study setting. Indeed, Jones and Vischi's (1979) meta-analysis of 21 "offset" studies conducted between 1962 and 1978 revealed a range of reported offset due to mental health visits from 85% in the West German study previously described to -82% (not an offset but an increase), in a study of poor Mexican-Americans (McHugh, 1977), which, as should be noted, was the only study in the Jones and Vischi review for which no medical offset was detected by the researchers. Jones and Vischi (1979) used these studies to estimate the average effect of the use of psychotherapy to result in a 20% reduction in the use of medical services. A subsequent meta-analysis by Mumford et al (1984) considered 119 different groups in 58 separate studies to estimate of the impact of the magnitude of the offset effect of mental health treatment. They found an average reduction (offset) of 73.4% in inpatient utilization and 22.6% in outpatient utilization across the studies using a difference of the differences approach. This approach compares the differences of pre and post service utilization between the treatment (T) and comparison (C) groups, whereby utilization over time period x from a time reference point of t was considered, as in $\{C_{t+x} - C_{t-x}\} - \{T_{t+x} - T_{t-x}\}$. The vast majority of the studies revealed some degree of offset, or a negative result in the foregoing expression. All but 11 of the 119 groups considered demonstrated some degree of offset. Mumford and her colleagues were pleased with the finding, since they considered offset studies in both the published and unpublished literature (e.g. unpublished Ph.D. dissertations), which refuted the potential argument that only interesting and atypical findings are published in the literature, thus giving a skewed representation of reality. In a later paper, Mumford and Schlesinger (1987) suggest that

offset will not be found in cases, like the Mexican-American study, where the population of interest has had poor access to all types of care in the past. In such cases, they argue, any offset phenomenon will be overwhelmed by the pent up demand for treatment of multiple health problems which had been previously neglected because of insufficient general health care coverage in the past. Therefore, these authors conclude that offset will only be found where the population has enjoyed a relatively stable benefit that does not unduly restrict access to needed care. If the organizational features influence the degree of offset, it seems reasonable that some variation in offset will be apparent across populations and settings. Therefore, the Frank and McGuire (1995) criticism of the variation in offset magnitude does not appear to be either unexpected or troublesome. It is simply a statement that the external validity of findings may be poor because of the idiosyncracies of the population or the health care system being studied. However, the variation present in the findings may have their origin in the more pernicious problem of the failure of researchers of the offset phenomenon to adequately address critical issues of selectivity bias arising for differences between experimental and control groups (users and nonusers of mental health services in this case) in their research design. Further discussion regarding this possibility is deferred until Chapter V.

The poor apparent external validity, or extendibility of findings across settings, in studies to date makes it all the more important not to assume a priori that offset will be found in a military setting. Unfortunately, this poor extendibility across settings also means that the findings of the present study may not hold for the civilian sector. Despite this limitation in external validity, a study of this nature for the DoD health care system is

important. Serving about 8.3 million beneficiaries and spending approximately \$15 billion annually (GAO, 1995), the DoD health services system is too large to be ignored by researchers. Moreover, unlike many civilian health care settings, the consequences of inefficient or ineffective health care delivery in this system are not simply born by an individual and his or her private employer and health insurance company. As taxpayers and citizens, all Americans are simultaneously employers and insurers of military beneficiaries. The potential fiscal and force readiness implications of poor health care delivered to the military population is an negative externality which hurts the entire U.S. population. Therefore, it is appropriate to focus some attention on this segment of the U.S. population and health services delivery system despite the fact that it is atypical of the experiences of most Americans.

The single offset study reported in the literature conducted by Longobardi (1981) for the military setting showed a difference in the difference between treatment and control groups of over 66% in terms of outpatient medical visits six months prior to and six months following mental health intervention. This large level of offset was determined in a study conducted by a single practitioner at a single overseas Army medical facility who studied 17 of his patients and compared them with 17 matched military beneficiaries. While such a finding is interesting, this fifteen year old finding with a very small sample size using data from a single practitioner with a personal stake in research findings hardly forms the basis of a general conclusion for offset in the present day military health services system as a whole. Therefore, the question of the existence of the offset phenomenon has yet to be considered for the general military

health services system. Pursuing that objective requires the selection of variables which might be appropriate for a model which might determine the degree of “offset” experienced in the military setting. Here again, a consideration of the literature should prove helpful in designing this particular study.

B. Appropriate Variables for a Model of the “Offset” Phenomenon in a Military Population

Although offset studies themselves provide some important insight regarding the variables appropriate in assessing the mental health offset, it is prudent to widen the search to determine appropriate variables in equations used for predicting access to mental health care and use of medical services. A broader search for an appropriate empirical model lessens the likelihood that the current research will simply repeat any research design flaws made in the past by researchers into the offset phenomenon. Usage of mental health care, defined as a binary variable of whether or not one obtains a mental health visit in the period of interest, is both a dependent and an independent variable in this research. It will be a key independent variable in the key predictions of the equation where the dependent variable is outpatient visits for physical health problems; this is the primary equation of interest in this study. This equation, which will be called the primary equation or the equation of interest in the remainder of the text, the following relationships hold:

$$\text{Non-Mental Health Utilization} = f(\text{Beneficiary Attributes, Mental Health Usage}) + \epsilon \quad (1)$$

The relevant and available beneficiary attributes are comprised of a number of predictor variables which will be identified later in this section. Many of the same beneficiary attributes which are included in the model for physical health utilization also predict mental health usage. Mental health usage, therefore, is endogenous to the model, since there are causal arrows internal to the empirical model which point toward it. This endogeneity, coupled with the strong likelihood that unobserved variables exist (e.g. threshold level for adopting a sick role and seeking assistance from the health care system) which affects both mental health usage and the amount of physical health usage, results in a potential for bias in the coefficients included in the model.

The endogeneity of mental health usage has confounded many researchers of the offset effect. Many have chosen to ignore the problem. Fortunately, the unique nature of the military system, which allocates active duty personnel and their families and mental health specialists to locations based on mission requirements which in virtually all circumstances is unrelated to mental health status, provides an opportunity to eliminate the endogeneity bias through the method of instrumental variables implemented through a two-stage least squares approach.

Mental health usage is a dependent variable in a related equation which shares many of the regressors of the physical health usage equation. This equation includes two exogenously determined variables, facility isolation (FACISOL) and mental health provider to beneficiary ratio (PROVRAT), which will be used as instruments in the first stage of a two stage least squares approach which first predicts the value of mental health

usage and inserts the predicted value into the physical health usage equation as a quasi-exogenous variable. The endogeneity of the mental health usage variable and the availability of instruments for its estimation require a secondary equation to be considered in this study. This equation, which will be called the secondary equation or the sample selection equation throughout the text, is:

$$\text{Mental Health Usage} = f(\text{Beneficiary Attributes, Instrumental Variables}) + \omega \quad (2)$$

As will be discussed later, the instrumental variables selected meet the required conditions of being theoretically uncorrelated with the error term of the equation of interest but strongly correlated with the dependent variable in the sample selection equation (Kmenta, 1986). The availability of instruments to estimate mental health usage in order to overcome the endogeneity problem confronted by other researchers of the offset phenomenon represents an important step forward taken by this research. Unfortunately, as will be discussed later, it is an opportunity which presents itself uniquely for this subpopulation of military beneficiaries because of an assignment process which serves as an unintended but efficient means of randomizing the distribution of individuals with mental health problems to locations with and without strong mental health treatment capacity. It is an approach which cannot be replicated for a study of offset in the civilian population.

This remainder of this section is organized to discuss the variables which appear in the empirical model in the following order: (1) the beneficiary attribute independent

variables, present in both the primary and secondary equations, known as “X” variables; (2) the dependent variable in the primary equation of interest, physical health care usage (TOTVIS), measured by the number of visits, known as the “Y” variable; (3) the binary mental health usage variable, called the MH variable (USAGE); (4) the omitted independent variables, shown as the “O” variables, and finally, (5) location attribute variables which are associated only with mental health which will be used only in the secondary equation in the role of instrumental variables which help to achieve unbiased estimates of the coefficients for the MH variable. These variables, termed “Z” variables, are correlated with the mental health usage variable but are theoretically uncorrelated with the error term of the equation of interest. Separate subsections will be devoted to each type of variable. Where applicable, a list of the variables of the type will be provided at the conclusion of the relevant subsection showing the variable names in that category. Appendix A lists all types of variables in alphabetical order and provides operational definitions and variable type for each of the variables included in the model. It should be noted that the empirical model being built in this section pertains to research questions 2 and 3, which constitutes the more scientific aspect of this study, the inquiry into the presence of an offset effect in the military population and several selected subpopulations. A slightly different, more expanded, set of variables is used in order to meet the objectives of the research question one and its more descriptive, less analytical objectives.

1. Beneficiary Attribute Independent Variables (The X Variables)

This subsection of the Chapter discusses the reasons for the inclusion of a group of variables related to the beneficiary which are thought to affect both mental health usage and the number of physical health visits. Unfortunately, these variables are unlikely to constitute the complete set of variables which explain the variation in mental health usage and the number of physical health visits. The impact of variables which are omitted from the model because they are either not known or not measured, which are termed "O" variables in the model presented later, causes problems in the model which will be addressed in a subsequent subsection. This subsection discusses the "X" variables in the model being built. These are variables which have been identified in both of the equations cited earlier and which will be included in the final model.

Certain independent variables are so frequently used in health services research that their omission, rather than inclusion in a theoretical model predicting utilization is conspicuous. These variables include a number of demographic variables, which will be discussed below.

Age has been found to be an important predictor of both physical and mental health service utilization. Most would agree that the use of medical services increases as people grow older as a function of the impact of the aging process on bodily systems. In addition, there is evidence that mental health problems are negatively correlated with age, where younger people more seem susceptible than older people to mental health problems (Kelly and Jones, 1995; Feinson, 1989). Since those with psychological distress are more likely to seek out mental health treatment than others (Ware et al, 1984)

and age is correlated with mental health status, age should be included as an independent variable in a prediction equation for mental health services utilization. A parallel argument holds for including age as a predictor for physical health utilization.

Health services researchers have also concluded that utilization is not a monotonically increasing function of age throughout its entire range. Aday and Eichorn (1972) showed that age and medical services use reflected a "U" shaped distribution, with the oldest and youngest members of society obtaining the greatest share of care in the general population. Curiously, mental health utilization shows an inverted "U" shape distribution, which Myers et al (1984) report rises monotonically until about age 45 and then decreases as individuals get older. Although the vast majority of the population of interest, active duty members and adult family members, fall in the range between the ages of 18 and 44, the likelihood of the importance of a quadratic age term is strong enough to merit its inclusion in the analytic model in addition to the age variable in the set of beneficiary attribute variables identified in equations (1) and (2) above. The inclusion of a quadratic age variable will accommodate the possible nonlinearity in the relationship between age and utilization.

Physical health status must be included among the beneficiary attribute variables for a number of reasons. It is a normative expectation that physical health status should be predictive of the number of physical health visits, with those sicker would be expected to demand more treatment for their physical infirmities. As a self-reported measure, it is likely that this variable is highly collinear with the self-reported mental health status variable, another of the predictors among the beneficiary attribute independent variables.

However, as will be discussed later in this chapter, the bidirectional and intertwined causal patterns which one might expect to be associated with physical and mental health status do not apply to the mental and physical health usage variables. The latter problem would undermine the recursive system that will be proposed in the model. In contrast, the correlation between their physical health status variable and other independent variables only results in multicollinearity. This problem exists to some degree in virtually all applied research; its result is estimates of regression coefficients which have a greater degree of variance than would be the case given complete independence of the variables (Kmenta, 1986). Physical health status will be measured by the physical component summary (PCS) score, a measure derived from the short form 36 (SF-36) questionnaire, a health measurement instrument developed by RAND researchers for use in the Medical Outcomes Study (MOS). Interestingly, it is the result of an orthogonal principal components factor analysis performed on the eight subscales of the SF-36, which yielded two summary factors, one for mental health and the other for physical health. As a result of this derivation, the multicollinearity of physical and mental health status should be coincidental and artifacts of the sample. Issues related to the reliability and validity of the health status measures will be deferred until Chapter III.

Gender also seems useful in the prediction of both medical and mental health visits. Although the underlying reasons are unclear, women tend to seek the assistance of health care providers more frequently than men (Aday and Eichhorn, 1972). In addition, women have been found to have a higher prevalence of psychiatric disorders than men, while men have a higher prevalence of alcohol and substance abuse problems (Shapiro et al,

1984; Jenkins, 1985; Yates, 1986). Since this study will narrowly define mental health usage to exclude alcohol and substance abuse, gender is particularly important as a control variable. Therefore, including gender in both prediction equations seems appropriate. In addition, given the high proportion of women in child-bearing years in the sample, an age*sex interaction variable will be included in the analytic model.

Eaton and Kessler (1981) reported that a national sample of rates of depression conducted by the National Institute of Mental Health (NIMH) showed that income, education, marital status, and race, in addition to age and gender, were all useful variables for predicting the likelihood of depression, the most common mental illness prevalent in the United States. Given the findings of Ware et al (1984) which record a positive correlation of utilization with need, it seems reasonable to include these variables in a prediction equation. In general, individuals in lower ranges of income and the divorced were found to have higher levels of depression by Eaton and Kessler (1981). Regarding race, only blacks and whites were reported in the Eaton and Kessler (1981) study. They found the distributions of scores on the CES-D scale to be different at the $p < .01$ level of significance, with blacks registering higher in both the most and least depressed categories. The findings on income, race, marital status and rank, as a proxy for socio-economic status, are based on disease prevalence rather than on utilization of services. Nevertheless, their inclusion in an initial model as beneficiary attribute variables seems appropriate considering Ware's (1984) finding that illness and utilization are correlated. With the exception of income, these variables are available in the data set.

Income is not measured in the data set, but rank can serve as a reasonable proxy for family income among active duty members and their families (Rogers, 1993). In addition, rank is an important attribute for DoD policymakers and must be included in order to satisfy that audiences demands. Indeed, rank may constitute a better variable for this study, since it confers both social status in the organizational subculture as well as financial means, both of which may be important components of the variation that income alone picks up in a general population.

Mental health status as measured by the mental component summary (MCS) is the mental health corollary to the PCS mentioned earlier. Like the PCS, it is the result of an orthogonal principal components factor analysis using the eight subscales derived from the SF-36. As with the PCS, a discussion of the reliability and validity of this instrument will be discussed in Chapter III. The MCS is included as one of the predictor variables in this study, but as a categorical variable rather than a continuous variable. The categories will be the quartiles of the distribution of MCS scores observed in the sample. This approach follows a similar approach followed by RAND investigators in the Health Insurance Experiment who examined the degree of association between mental health need and usage (Ware et al, 1984). Such an approach is taken in this study because the behavioral model used in this study posits that offset is only logically possible if a mental health problem exists for the mental health practitioner to detect. Therefore, offset is not logical, given the behavioral model, if individuals are mentally healthy. If offset is found to exist in the mentally healthy segment, it puts the behavioral model used in this and other research in question. This proof of concept by examining the contrapositive case is

not reported in any of the offset literature to date and constitutes one of the research deliverables of this dissertation.

Examining the experiences of the mentally healthy population in addition to those with mental health problems will provide an interesting consideration of the theoretical argument of the offset literature from a novel perspective. Other studies focusing on the offset issue have not examined beneficiaries who have no apparent need for mental health services. They have chosen this path because, theoretically, individuals without mental malaise would have no displaced mental health treatment needs. Therefore, any decision on the part of mentally healthy individuals to visit a mental health provider should uncover no unrecognized mental health problem which, in turn, would reduce demand for physical health services, thus creating an offset effect.

Since the existence of some level of mental health need rather than its magnitude which is critical in offset analysis, mental health status will also be used as a blocking variable, with the behavior of individuals falling below a cutoff score defined as being in need of mental health care considered separately from other groups. Since the focus of the research is determining the existence and magnitude of offset, rather than predicting mental health access, the data on mental health status must be used to segment the population into those whom theory predicts can be helped by mental health intervention and those who cannot. Then, within those blocking categories, mental health status can be used as a continuous variable to see the impact of declining mental health status on the degree of offset. In other words, within categories of mental health need, does a change

in mental health status result in a change in physical health use and in what direction (i.e. more or less physical health use).

Time on station is another variable that might seem to affect the use of medical services, particularly of mental health services. The passage of time allows newly arriving military members and their families to develop a social network which may provide support in times of emotional crisis. Indeed, a study conducted by the Naval Health Research Center showed outpatient mental health utilization patterns which were an exponentially decreasing function of months on station, with the largest number of patient visits occurring within the first months of arrival at a new duty station (Bailey, 1980). Knowledge of these strong findings suggests a need to incorporate this variable into the study. Fortunately, the data set captures this important variable.

Finally, professional affiliation with the military must be considered in greater detail. As has been mentioned earlier, rank conveys status and income within the military system. It is a variable which a DoD audience expects to be included in research and has been found to be of importance in other studies (Rogers, 1993). While it is different from the socio-economic status variable used in studies of civilian populations, it overlaps substantially with this important variable. Within the military system, higher rank confers both additional status as well as additional salary. Rank also confers status and economic means to family members as well as the active duty member in the military culture (Coates and Pellegrin, 1965). Therefore, consideration of rank need not be confined to the active duty subset of the sample. Another related variable, time in service in the military, which would reflect the degree of acculturation in the military subculture, cannot

be examined because the data set did not capture this variable. Rank is not a good proxy for time in the military environment and acculturation to military norms as one might initially believe. This is the case because many enlisted personnel transfer to the officer corps after a number of years of service. Therefore, a junior officer may have as many years in service as a senior officer or a senior enlisted person. Nevertheless, the inclusion of rank as a variable in the model is imperative, even if only its inclusion in the model is based largely to suit the preferences of DoD leaders, which is a major target audience for this research.

Additional variables are included which constitute important subpopulations for DoD policymakers and are unique to the military population being studied. First, the Service of the beneficiary will be included. This is typically a permanent distinction, since most individuals are only associated with a single Service as the result of commissioning, enlistment or marriage. The individual attribute is hoped to capture the unique culture of the Service, which constitutes a major environmental factor faced by active duty members and their beneficiaries. Consideration was given to adding variables to indicate the Service affiliation of the local hospital, but this was rejected. The vast majority of active duty members and their families of a given Service work at a location serviced by a military medical facility operated by their parent Service (Opsut, 1996). Moreover, preliminary exploratory studies of the data showed that the inclusion of these site specific, as opposed to individuals specific, Service affiliation variables provided virtually no additional information at the margin. As a result, the inclusion of a Service affiliation of the local military medical treatment facility was tantamount to including

three pairs of nearly perfectly collinear regressors into the equations of interest, a practice which leads to large variances for the estimated coefficients for these parameters (Weisberg, 1985). Since precise estimation of coefficients is important in this study and stepwise regression showed that the incremental information provided by adding Service affiliation of the servicing facility to the model was minimal, only the Service affiliation of the individual was included in the final model. These individual Service affiliation variables should be sufficient to capture the degree to which of the distinct cultures of the Services influence offset to a greater degree.

Regarding the inclusion of individual-specific Service variables, the mythology of the individual Services, each with its own cherished and separate traditions (Coates and Pellegrin, 1965), argues for the inclusion of these variables in the study. The consumers of military-related research expect that studies will include a Service-specific evaluation of issues wherever possible, since the Service constitutes the organizational structure within which changes in operations or the allocation of resources will take place (Graham, 1996). Therefore, Service affiliation dummy variables for the Army (SER4ARMY), Navy (SER4NAVY), and the Marine Corps (SER4USMC) is included in the empirical model for this study. The omitted category will be Air Force beneficiaries. Excluded from the analysis in their entirety are small DoD beneficiary groups, such as members of the Public Health Service, Coast Guard, and the National Oceanic and Atmospheric Administration, who are neither present in sufficient numbers nor who face the same cultural environment as military members and their families. These groups collectively represented less than five percent of the total sample. This study also fails to

consider the very real possibility that occupational groups (e.g. flight officers, medical personnel, engineers) exert strong normative influences on the use of different types of health services on their adherents. Unfortunately, lack of data on these topics in the primary data set and the inability to trace responses back to particular individuals in order to merge this information with the primary data set means that the relationship between occupational group and the use of mental and physical health services cannot be explored in this study. While this study cannot explore all possible influences on behavior of individuals by groups, the inclusion of Service affiliation constitutes a group which is thought to be of sufficient influence to warrant inclusion in the model. Moreover, inclusion is warranted because if excess utilization can be isolated to particular Services, then this information will aid in the development of a targeted remedy to the problem of offset.

Another variable of unique concern to military audiences is the impact that living overseas has on the health status and the health behavior of active duty members and their families. The special concern over personnel and their families overseas is partly motivated by concerns over force readiness, since the troops stationed overseas are more likely to be forced to deal with contingency operations than others. Moreover, since increased levels of stress are associated with living overseas and stress is believed to have an impact both on physical and mental health (Haour-Knipe, 1989), it seems to be an important variable to include among the set of "X" variables.

Summarizing, the following "X" type variables, meaning those thought to influence both the primary and secondary equations presented earlier, are as listed below.

The variable name for each variable follows each in parentheses. The "X" variables are: physical health status (PCS), mental health status (MCS), sex (MSEX), rank of sponsor (EGRADE), membership in a minority group (WRACE), individual association with a particular service (SER4ARMY, SER4NAVY, SER4USAF, SER4USMC), being stationed in an overseas area (INOVER), being on station less than six months (NEW), being married (MARRIED), an indicator as to whether one is an active duty member or a family member (ADBENCAT), age and associated variables (AGE, AGE2, AGESEX).

Having now put forward the group of independent variables associated with beneficiaries, attention can be turned to other variables in the estimation equations, beginning with the dependent variable of outpatient physical health visits

2. Physical Health Outpatient Visits (The Y Variable)

Offset studies have used a variety of measures to capture the outcomes of mental health utilization. In most cases, the selection appears to be linked to what data was available. In some cases, number of visits is used as the outcome variable and in other cases the dollar amount of expenditures was used. The meta-analysis of the literature conducted by Mumford et al (1984) suggests that either approach is effective in revealing "offset." Several researchers have noted that "offset" can be examined in inpatient and outpatient settings (Jones and Vischi, 1979; Mumford et al, 1984; Fiedler and Wight, 1989). The DoD 1994-95 Patient Satisfaction Survey has utilization information rather than cost information, therefore this form of the medical utilization variable will be used for this research effort. The data set also contains information on both inpatient and outpatient utilization, but the inpatient utilization information, which covers only twelve

months of utilization behavior, is inadequate for an offset study based on a general beneficiary population. Therefore, although it would be optimal to consider all aspects of offset in a single study, data limitations makes such an effort infeasible in this case. Therefore, the dependent variable to be used in this study will be confined to outpatient physical health utilization.

Outpatient physical health visits will be defined as visits reported for illness or injury (initial and follow-up) as well as visits for physical exams. The survey also includes the category of prenatal, dental, and other types of visits in the section on self-reported ambulatory visits which are not included in the dependent variable of this study. The identification and exclusion of some types of ambulatory visits, such as prenatal, which have no theoretical linkage to the offset issue, is important. Fortunately, the survey permits the exclusion of these types of visits from the study. Somatized mental health problems are most likely to manifest themselves in these primary care types of services as patients search for a somatic explanation of their maladies (Kirmayer and Robbins, 1991; Fisch, 1987). It is likely that this dependent variable will provide the most precise estimates of offset, since an outpatient visit is far more likely than an inpatient stay. This greater likelihood of a broader distribution of utilization across respondents may allow for a better discernment of patterns which may be attributed to the offset phenomenon.

Consideration was given to using inpatient utilization as a supplemental dependent variable in the analysis of the offset phenomenon. Some offset studies, such as the West German study discussed earlier, focused on offset from this perspective. Upon reflection, this option was rejected. Inpatient utilization is defined as any reported

hospitalization with an overnight stay in the previous year. Unlike the outpatient usage section of the survey, the inpatient utilization section did not request information regarding the reason precipitating the hospitalization (e.g. newborn delivery, bypass surgery). In spite of the relatively large sample size of nearly 26,000 beneficiaries, hospitalization is a relatively rare event. A preliminary exploration of the data set revealed that only 13.2% of all respondents in the sample were hospitalized in the previous year. It is for this reason that most population-based offset studies consider five years of data following a mental health encounter before rendering a judgement on inpatient offset (Mumford et al, 1984). The limited length of the observation period was the primary reason for ruling out inpatient days as a dependent variable in the offset analysis. A further complication arises in that previous studies have shown that hospitalization for normal birth is the most common reason for admission in this population (Opsut, 1994). Therefore, the low incidence of overall hospitalization coupled with a dominant main effect seemingly unrelated to mental health problems (giving birth) would have made detection of offset in inpatient utilization quite difficult, if not impossible.

A third dependent variable was also considered and rejected. This was a constructed composite of inpatient and outpatient utilization which weights an inpatient day at 13.5 times an outpatient visit (Optenberg and Moon, 1994). In this case, the raw inpatient day data rather than a categorical variable would have been used for inpatient utilization intensity. Weighted inpatient days would have been added to physical outpatient visits in order to get a composite utilization measure based crudely on relative

costs. Here again, data limitations render an accurate determination of appropriate weights difficult, since no data on the actual cost or type of visit or hospitalization exists. Furthermore, there would be a great deal of difficulty involved in interpreting the meaning of such a composite offset measure, since it would be unclear as to whether inpatient or outpatient care was being misused by somatizing patients. Finally, the inability of the data set to distinguish clearly between birth-related hospitalizations and other hospital stays added a final confounding factor which suggested that an analysis of a constructed proxy for total care costs to be a futile effort which would simply muddle the overall findings of the study.

Therefore, by elimination, the sole remaining candidate for a dependent variable for the primary equation of interest is total physical health visits, listed as TOTVIS or LNTOTVIS, if it is transformed by taking the natural logarithm of the number of visits. It will also be designated at the “Y” variable at times.

3. Mental Health Usage (the MH Variable) and Arguments Against A Nonhierarchical Model

Mental health usage, shown as USAGE in the statistical output shown in the appendices and MH in the graphical depiction of the empirical model to be shown later in this chapter, is the key variable for distinguishing between the two groups of interest, users and nonusers of mental health services. As noted earlier, “usage” is operationally defined in this study as a beneficiary having reported a mental health visit at least once in the preceding twelve month period. “Offset studies” are implicitly based on the impact on medical utilization which is caused by this “usage” variable (Fiedler and Wight, 1989).

Indeed, observing a statistically significant negative regression coefficient on this variable should be construed as evidence of offset, particularly for the segment of the population who is in need of mental health treatment. The individuals in need of care is defined here as the lowest quartile of mental health status, which includes all individuals with an MCS score less than or equal to 47. An explanation for the selection of this cutoff point as the definition of need is based on the distribution of MCS scores for individuals from the Medical Outcomes Study who were known to be suffering from clinical depression. Further details regarding this cutoff point will be provided in Chapter III. Because of the great importance of the mental health USAGE variable in offset studies, accurate estimation of this parameter's coefficient is of paramount importance in this study.

Some may contend that there is a problem with the mental health usage variable, suggesting that the effects of mental health usage cannot be accurately estimated in a cross sectional study because mental health usage is confounded with physical health usage, the dependent variable, in a simultaneous equation relationship which is not identified. This would constitute an endogeneity problem arising from a reciprocal and nonhierarchical relationship between the key independent variable of mental health usage and physical health visits for which complex methodological approaches would be required in order to pursue an investigation of this phenomenon. The current data set would be incapable of meeting the data requirements of exogenous variables unique to both of the simultaneous equations which would make complex methodological solutions like three stage least squares (3SLS) or full information maximum likelihood (FIML) approaches feasible.

A hierarchical approach is taken in this study, whereby the theoretical model holds that mental health usage affects the number of physical health visits but not vice versa. Critics of this hierarchical construction of the model would likely accept the premise of mental health usage affecting the magnitude of physical health utilization is true, but hold that a reverse causality arrow from physical health utilization to mental health utilization also exists. In other words, the more visits one makes to a primary care physician for purportedly physical ailments, the more (or less) likely it is that one will seek and obtain mental health treatment. This is the argument of proponents of reciprocal causality in a mental and physical health service utilization model. As a result, the advocates of this idea might conclude that an accurate estimation of the coefficient on the key mental health usage variable is impossible without engaging in methods which accommodate this type of endogeneity which introduced by nonhierarchical, or simultaneous equations, types of models. While such an argument may appear compelling initially, there are several points noted in the literature that strongly suggest that such a line of argumentation is specious. The discussion in the following paragraphs lends support to the alternative contention, held by the author, that the model for offset is appropriately specified as one which is hierarchical, with a unidirectional, rather than bidirectional, causality arrow going from mental health usage to physical health usage. In making this argument, the author follows Asher (1983) who notes that in order to support an argument for a hierarchical causal model it is not necessary to establish that absolutely no reverse causality whatsoever exists, but only to convincingly argue that reciprocal links are weak relative to the causal direction posited in the analytical model.

In order for the utilization of physical health services to meaningfully effect the usage of mental health services, three requirements must be met. First, the provider must recognize the presenting problems as a somatization of an underlying mental health problem and treat the patient for mental health problems, either personally or through a referral to a mental health specialist. Second, the patient must accept the physician's judgement that the problem is indeed mental rather than physical. Third, the primary care setting in which the patient and physician encounter each other must be structured in a way that incentives exist for both parties to identify the underlying problem as a mental health problem.

Primary care physicians face a difficult task in identifying mental health problems when these problems are not identified by the patient. Evidence from the National Medical Care Expenditure Study suggests that sixty percent of all mental health care is rendered in the primary care sector (Horgan, 1985). Other researchers have put this figure somewhat lower (54%), but still conclude that most mental health care takes place in a primary care setting (Regier et al, 1979). However, this same research notes that only about 5% of all individuals in the U.S. have any mental health treatment whatsoever. As Horgan (1985) notes, only 3% of the population receives mental health treatment in the primary care sector in any given year. However, the RAND Health Insurance Experiment showed that approximately 80% of the population will have some utilization of medical services (Duan et al, 1983). Since the first health care expenditures are most likely to arise in the primary care sector, the joint results of these studies suggests that only three primary care patients in 80, less than 4%, will receive mental health treatment from

primary care providers in any given year. In contrast, the vast majority of patients with mental health visits also have physical health visits, a fact which has motivated the interest of researchers in offset studies (Fiedler and Wight, 1989). The fact that so few patients get mental health treatment in the physical health sector but so many patients receiving mental health treatment receive physical health treatments suggests that causality goes overwhelmingly in the direction of mental health usage to physical health usage, rather than vice versa. The daunting task of the primary care provider is then to positively identify those few patients among the many he or she sees on a daily basis for whom mental rather than physical treatment is appropriate. It is not surprising to note that primary care physicians, in general, are not particularly good at making these identifications (Sturm and Wells, 1995). Indeed, the results of the Medical Outcomes Study showed that general medical clinicians failed to help the majority of patients with clinical levels of depression disorder (Rogers and others, 1993). Schulberg and his colleagues (1986) suggest that the detection (not the treatment) rate for mental health problems may be as low as eighteen per cent. Given that ambiguity of symptoms that many somatizing patients with mental health problems may display, it is not likely that a primary care physician will be able to identify a need for a mental health intervention even under the best of circumstances (Noyes and others, 1995). Furthermore, the literature suggests that the best of circumstances for identifying and treating mental health problems is rarely achieved in primary care practice. One reason for these suboptimal conditions is because patients themselves often deny the need for mental health treatment and will repel efforts of the primary care provider to pursue treatment in this direction.

Many patients simply refuse to accept that an explanation for their troubles is psychological and not physical (Olfson, 1991). In a study of 350 family practitioners, Orleans (1985) noted that patients constitute the largest obstacle to mental health treatment by family practitioners, with over 74% noting patient resistance to referrals to mental health specialists and over 66% resisting any diagnosis and treatment of mental health disorders. Mental health visits and psychotherapeutic insight do not occur when the patient refuses to acknowledge the possibility of a mental component to his or her problems. Fisch (1987) states that patients with masked depression will "vigorously push for a somatically oriented work-up and treatment." Mabe et al (1990) note that the majority of somatizing patients are managed in the primary care sector because "this is overwhelmingly their preferred locus of care." As a result, patients seeking treatment in the physical health sector choose this sector precisely because they do not want to accept their need for mental health treatment. Mabe et al (1990) discusses how this resistance on the part of patients can be broken under some circumstances; however, the circumstances described do not typically exist in the military health services system.

Mabe et al (1990) notes that treatment outcomes for somatizing patients with mental health disorders are greatly improved when the patient is in a long term therapeutic relationship with a single primary care physician. Where care is fragmented among multiple providers, then diagnosis and treatment of an underlying mental health problem becomes difficult. Mechanic (1992) notes that his study of British general practitioners revealed that the consequences of the free care of the National Health Service, most notably long queues and tightly packed appointments, markedly reduced

the ability of the physicians to deal with complaints that lacked clear and easily discernable diagnoses. Mechanic (1992) also noted such a result among prepaid group practices with busy primary care physicians. The military primary care system combines these two attributes, both of which have negative consequences for the identification of mental health needs in the physical health setting. First, it has the endemic strains of excess demand inherent in a government health care system which can be used free of charge by patient. Second, it operates on a model whereby patients are treated by providers on an as available basis, thus undermining the provider-patient continuity and relationship building which arises from such continuity (Griffith, 1995). In such a setting, one study found that even where patients themselves identified their primary cause of distress to be due to emotional and stress related disorders, only 13% of these patients were treated for their psychological maladies by military primary care doctors (Maoz et al, 1991). Maoz (1991) noted that inadequate training in psychiatry, frequent rotations of military providers and patients, and the lack of enduring patient-provider relationships all undermined the possibility of receiving definitive mental health care treatment as the result of a visit to a primary care setting. This poor performance was achieved when patients themselves believed their problems to be primarily psychological. Appropriate treatment would be even less possible if the primary care physician were confronted with a somatizing patient who actively resisted suggestions that mental health treatment should be considered.

This subsection has discussed in great detail the key independent variable of mental health usage. It has made the argument, based on findings from the literature, that

the overwhelming causal direction in the relationship of mental health usage and physical health usage is unidirectional, where mental health usage → physical health usage, and not vice versa. This argument has been made based on the difficulties faced by primary care physicians in identifying candidates for mental health treatment from among their patients, patient resistance to mental health treatment, and unique aspects of a military health care setting which lessens even further the chance that use of physical health services will significantly determine whether mental health services are used. Having made this case for a hierarchical model, attention is now turned to another aspect of the mental health usage variable which must be considered and taken into account by the final empirical model as well as the methods employed to conduct this research.

4. Omitted Variables (The O Variables), Mental Health Usage and the Endogeneity Issue

Dismissing the argument for a nonhierarchical, or reciprocal, model eliminates any need for a methodological solution involving simultaneous equations for the investigation of offset. However, the careful reader will still note that the key independent variable of mental health usage is predicted by some of the same set of independent variables, beneficiary characteristics, as the dependent variable of physical health usage. This might not be a problem if all or almost all of the variation in mental and physical health usage was explained by the included, exogenously determined variables (the set of “X” variables described earlier). If that were the case, mental health usage would be predicted without error and then could be included in the primary equation, where physical health visits is the dependent variable. Unfortunately, if the

“X” variables as a group do not have strong explanatory power, then it is likely that variables omitted from the model, such as family predisposition for seeking care, stress, and other unmeasured or unmeasurable factors also affect both mental and physical health usage. The presence of these omitted variables which affect both the dependent variable and the endogenously determined mental health usage variable would then lead to correlation between the error terms of the two key equations presented at the outset of this section (Kmenta, 1986). The impact of such omitted variables and the correlation of the error terms, ϵ and ω , from equations (1) and (2), respectively will bias the coefficients and confound the findings of the research (Kmenta, 1986). This is a particularly serious consequence in this study because offset is concerned mostly with the estimation of the magnitude, significance and direction of a particular parameter coefficient (of USAGE) in the model rather than a prediction of the value of dependent variable.

It is very likely that the “X” variables in the model will do a poor job in predicting mental health usage (MH) and physical health visits (Y). Visits and expenditures at the individual level are closely correlated, and various studies of the latter phenomenon have estimated the maximum obtainable R-squared value (explained variance) to be from fourteen to twenty percent (McCall and Wai, 1983; Welch, 1985; Newhouse et al, 1989, Beebe, 1992). Indeed, an initial regression of the X and MH variables on the logged value of Y for this study resulted in an adjusted R^2 value of .15. Such a result leaves open the possibility that there may exist one or several “O” variables which affect both the dependent variable in the primary equation, physical health visits (“Y”), as well as the endogenous independent variable of mental health usage (“MH”). The result of these

unmeasured and omitted, yet relevant, variables can be spurious correlations between the dependent variable and the set of predictors. These spurious correlations cause the error term of the equation for physical health usage to be correlated with the error term for the MH variable. The correlation between these two error terms introduces bias in the parameter coefficients predicted in the model.

One effective way to overcome this problem of correlated error terms is through a method of instrumental variables. This requires one to identify variables that are strongly correlated with the endogenous independent variable, mental health usage (MH) in this case, but are theoretically unrelated to the error term (ϵ) in the prediction equation for the dependent variable in the model, physical health visits (Greene, 1993). If one is successful in identifying such variables, they can be used to obtain predicted values for the endogenous MH variable which effectively eliminates the ω error term of the sample secondary equation. The results of this instrumental variables method are unbiased and consistent coefficients of model parameters (Dowd, 1997). The difficulty with this strategy often arises in identifying appropriate instruments which meet the requirements for instrumental variables (Kmenta, 1986). Fortunately, the quasi-random nature of the military assignment process with regard to mental health need and resources provides one with an excellent instrument which can be used to extricate this research project from the jaws of the dilemma created by the unknown and/or unmeasured, and therefore omitted, "O" variables.

5. Location Variables, Instruments for Mental Health Usage (The "Z" Variables)

Two variables are used as instruments for predicting mental health usage. They are strongly correlated with usage and have no theoretical or empirical relationship with the physical health usage variable. Therefore, they are proposed as instruments for the research model which will make the proposed model feasible and give the coefficients in the model the desired properties of unbiasedness and consistency. The instruments proposed for this study are: (1) the ratio of DoD mental health providers to the catchment area population of the DoD medical facility, and (2) the presence of the facility in a rural/overseas versus an urban CONUS site. Both of these variables represent an aspect of mental health provider supply, a variable which has been found to be positively correlated to the average number of mental health visits in a given location (Yates, 1986). They are only suitable for use as instruments for the MH variable due to the special circumstances of active duty personnel and their families.

The strong positive relationship between the ratio of physicians to population to the number of annual physician visits can be explained theoretically in three ways: as a rightward shift in the supply curve, an instance of physician induced demand (Folland, Goodman and Stano, 1993), or, alternatively, a case where those with relatively greater need of health services move disproportionately to areas where there is a high concentration of physicians. This latter possibility confounds the use of mental health provider ratios in a civilian setting, since both providers and patients theoretically could adjust their locations to bring about an equilibrium of access to care of a given specialty. In the military system, however, only primary care is staffed according to beneficiary

population levels (Houser, 1996). Assignments of personnel and their accompanying families is made to particular bases for reasons other than the mental health status of the member and his or her family. Similarly, the mission of the base will dictate the requirements for mental health staff. As a result, the provider to beneficiary ratios in the military display a wide degree of variation which is not theoretically linked to any form of need for mental health services. Frequent moves which are common in the military suggest that any attempt to manage the ratio of providers to those in need would be confounded by a process of reassignment which, from the perspective of the mental health services delivery system, is quite random.

Staffing of mental health clinics of DoD operated medical facilities is not done on a strict per capita basis, as is the case for the staffing of primary care facilities (Houser, 1996). This subtle difference in staffing approaches is important because it means that the ratio of demand for care relative to supply varies for mental health care but not for primary care and family practice. Yates (1986) notes that an NIMH conducted epidemiological study showed that "sites with a higher density of mental health providers had higher utilization of mental health professionals." Mental health professionals are assigned on the basis of authorized strength, special missions, and past utilization trends, (Joint Healthcare Management Engineering Team, 1994; Air Force Management Engineering Agency, 1994; Hart and Connors, 1996; Gooding, 1996). These factors do not predict the level of need for mental health services for a given base population. Indeed, if specialized mental health resources are not available, it is possible that individuals are forced into treatment in the primary care system and, as a result, do not

obtain mental health treatment for reasons described in the previous section. Therefore, the potential influence of this substitution effect requires at least an initial consideration of the density of military mental health professionals in a given catchment area.

The result of the assignment process of beneficiaries and mental health providers makes this ratio of mental health providers to beneficiary population one which is suitable as an instrument. There is no reason to believe that the ratio of mental health providers to the beneficiary population in the catchment area of a given base (PROVRAT) should have any effect on physical health usage. While the evidence is strong that many patients see primary care physicians for psychosocial problems, there is no evidence that people substitute a visit to the mental health professional for a visit to a family practice physician. This is particularly true because of the stigma associated with visiting a mental health specialist. However, assessing the ratio of military mental health specialists may not be sufficient since individuals may always see a physician, at their own expense, without clearance from the base medical facility. Therefore, a second instrument which accommodates this possibility is added.

The second instrument used is a dummy variable, FACISOL, which indicates whether or not the base is located in a non-SMSA area. Residence in an urban area, typically operationally defined in health services research to be residence in a standard metropolitan statistical area, has also been shown to be correlated with higher levels of utilization (Aday and Andersen, 1975; Aday, Andersen and Fleming, 1980; Ezzati, 1980; Freeman et al, 1976; Gentile, 1977; Salber et al, 1976; Wolinsky, 1976) after controlling for a number of covariates. Physician supply of all types is likely to be the underlying

reason for this empirically observed phenomenon as well. Physicians consistently have displayed a preference for practicing in urban areas (Eisenberg and Cantwell, 1976). This has led to a geographic maldistribution of physicians, with lower physician to population ratios in rural areas than in urban areas (Eisenberg and Cantwell, 1976). In terms of this study, a domestic urban environment may have an impact on utilization rates since there is a greater opportunity to obtain medical services in the community in order to supplement the resources of the on-base medical facility. These supplementary resources will be less available in rural areas and overseas area, where supply is reduced due to the difficulties in access associated with unfamiliar health care systems and language barriers. Therefore, individuals assigned to overseas and rural (non-SMSA) posts will have a decreased opportunity to utilize health care services relative to individuals assigned to posits in urban areas of the continental United States. This definition means that rural US facilities and overseas facilities are placed in a single category. This is appropriate because in either case, due to systemal barriers (the UK National Health Service), language barriers (Germany, Japan, Korea, etc.), or scarcity (rural US) creates a dearth of options in the civilian community for people seeking off base mental health care. This is a supply issue in another form. Supply does not affect family practice/primary care clinics because each is staffed according to a joint DoD manpower standard that provides uniform ratios of providers to beneficiaries worldwide (Joint Healthcare Management Engineering Team, 1994). The intent of DoD was to ensure that all active duty members and their families had equal access to free primary health care no matter where in the world they were stationed. This intention represented a effort on the part of DoD to use

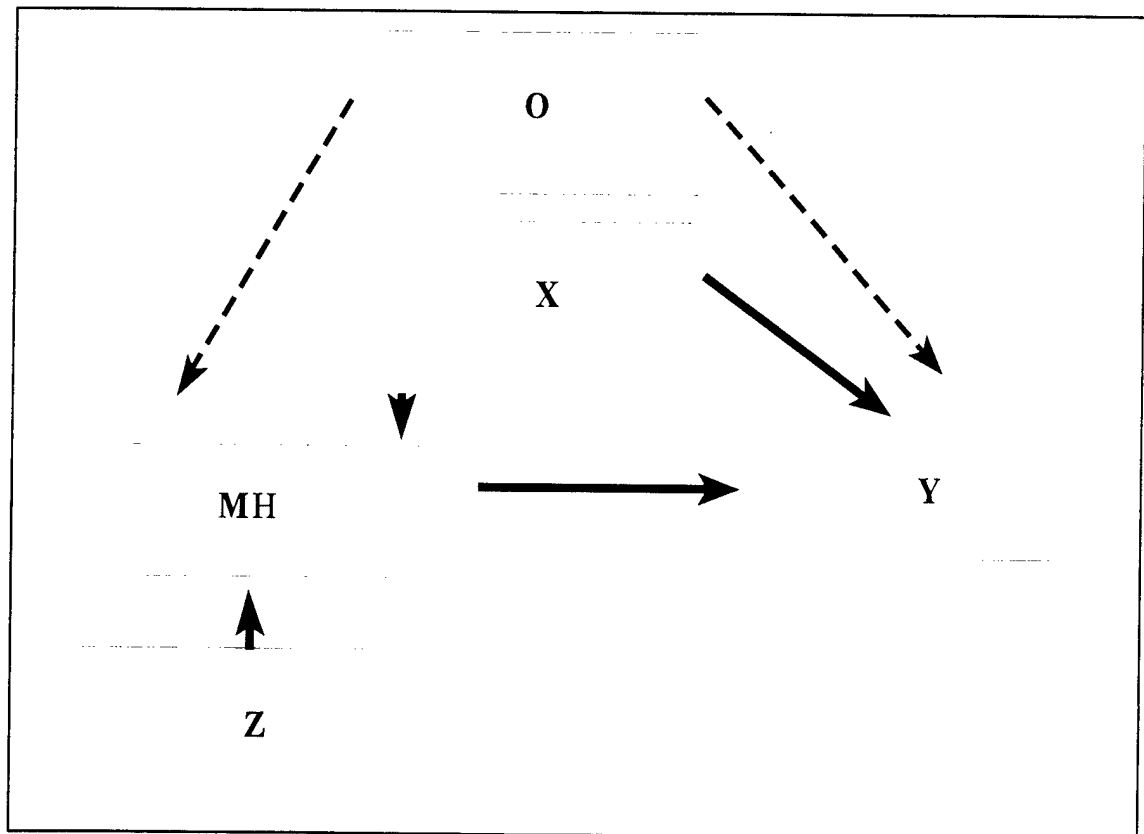
the availability of free medical care both as a retention tool as well as an instrument for maintaining a high level of readiness and morale (Houser, 1996). The relative constant ratio of DoD primary care providers across catchment areas coupled with the variability in the availability of mental health specialists makes an investigation of offset using two stage least squares possible, since it introduces the possibility of variables which are highly correlated with the endogenous variable of mental health usage which are theoretically uncorrelated with the error term of the primary equation of interest.

The quality of the instruments, PROV RAT and FACISOL, must still be tested. These results of these tests will be reported in Chapters III and IV. The first condition which must be met by potential instruments is evidence (typically furnished through a partial F test of the instruments' correlation with the endogenous independent variable) that the instruments are highly correlated with the MH variable. The other necessary condition of a good instrument, no correlation with the error term in the equation of interest, is not directly testable. This reliance on an untestable assumption has drawn criticism of two stage least squares and other sample selection models (Duan et al, 1984), however, they remain widely accepted as methodological approaches in the econometric literature (Kmenta, 1986; Greene, 1993). No less important than empirical testing is a basis of theory from which to argue the appropriateness of the use instruments in a particular instance (Kmenta, 1986). This task of this section was to present the theoretical arguments for the quasi-randomization process which is provided by the military. This was done in order to build the case that the selection of these particular instruments is reasonable from a theoretical perspective.

6. A Graphical Depiction of the Model for Investigating the Offset Phenomenon

Having introduced the individual variables deemed relevant to this study, it is appropriate to present in graphical form the general model for investigating the offset phenomenon. It should be noted that this model does not apply for the hypotheses listed under research question one. It does, however, apply directly to the hypotheses listed under research questions 2 and 3, which represent the core issues of scientific inquiry for this study. The model incorporates the variables discussed in this section and is presented in Figure 2 below.

Figure 2
A Graphical Depiction of the Empirical Model



The literature reviewed to this point has tended to be empirical in its content. This is the nature of offset studies. However, the reasons why some subpopulations may be more or less prone to using mental health services is an issue which is strongly rooted in sociological theory. Therefore, the following section marks a significant contrast to the literature reviewed heretofore by stepping back from the immediate research problem and considering important theoretical issues which lie beneath the surface of this research. A discussion of these issues of sociological theory is necessary in order to provide the rationale behind some of the specific research hypotheses which were articulated in the opening chapter.

C. The Military Environment: The Organizational and Cultural Mileau

The military health services system covers over eight million beneficiaries (GAO, 1995). These beneficiaries are divided into three separate groups, each of which are covered by different health insurance schemes (McNutt, 1994). Active duty beneficiaries, those individuals currently serving full time in the armed forces, are fully covered for all medical and mental health services, inpatient or outpatient. This group best resembles the free care group considered in the RAND health insurance experiment.

Active duty family members are the second distinct group of beneficiaries of the military healthcare system. This group consists of spouses and children (under age 18 or under 23 if the child is a full time student). These individuals are eligible for care at military medical facilities on a space available basis at no charge. In other words, if capacity not needed to care for military members exists, active duty family members may obtain care at a military medical facility at no charge. If capacity does not exist at the

local military healthcare facility, family members may obtain needed healthcare through CHAMPUS. Although available space varies depending on the characteristics of the catchment area in which the non-active duty beneficiary resides, it is interesting to note that over 70% of the more than 38 million outpatient visits made by non-active duty beneficiaries were made to military facilities in fiscal year 1994 (GAO, 1995). When using CHAMPUS, family members pay a nominal per diem rate of \$9.30 per day for inpatient stays and a 20% copayment (after a \$150 annual deductible) for outpatient care (OCHAMPUS, 1994). There is also a \$1000 cap on annual out-of-pocket costs to protect service members from the financial consequences of catastrophic illness. Since some care is obtained from the military facility free of charge and no coverage exists until the \$150 deductible is reached, family members in the aggregate can be considered well insured, but not fully insured, as is the case for active duty members.

Military retirees and their families are the third group covered by military healthcare benefits. Members of this group are also eligible for free direct care at military facilities on a space available basis. They are also eligible for care under CHAMPUS, but they face a higher cost share than that faced by active duty dependents. However, most military retirees pursue second careers and are covered by other health insurance; therefore, it is difficult to get accurate data of their overall utilization behavior (GAO, 1995). For this reason, this paper excludes this class of beneficiaries from the analysis. The behavior of the retiree population, while of interest to military planners, is not absolutely necessary in order to perform the analyses of interest in this research effort. Indeed, the heterogeneity of the retiree group makes inference with this subpopulation

quite difficult. Therefore, the retiree category of beneficiaries will not be discussed further in this study and henceforth DoD beneficiaries will be used to denote the active duty and family member portions of the beneficiary population only.

Active duty members and their families utilize outpatient health care services in the direct care system and CHAMPUS at rate that is 40% higher than the general civilian population with the same age/sex characteristics (Rogers, 1993). The economic model and evidence from the RAND experiment would predict this behavior, since the depth and breadth of coverage afforded military beneficiaries and their families is considered to be better than the coverage of this age/sex population mix in the civilian sector (U.S. GAO, 1995). No military beneficiaries are uninsured, and much of the care they receive is free. This sets them quite apart from other Americans, particularly among the young and healthy segments of the population from which the active duty force and their spouses are drawn. For purposes of comparison, it is interesting to note that one in six Americans under age 65 are without insurance in any given year (Starr, 1994) and even those who have coverage are often faced with higher deductibles and copayments than is the military family. Therefore, it is reasonable to believe that research results applicable to the civilian sector may not apply in the unique environment of the military health services system.

In the case of outpatient mental health utilization, the predictions of a simple economic model of supply and demand where lower price implies higher demand for services is partially contradicted by empirical evidence among military beneficiaries. The RAND studies showed the demand for *mental health services* is more sensitive to

difference in price than is the demand for outpatient medical care services. Therefore, after correcting for age and sex differences in populations being compared, the economic model predicts that the more fully insured group would utilize more outpatient mental health services. This increased utilization is not observed for active duty members, however. In contrast to their utilization of medical, dental and surgical services, which is approximately 40% greater than the utilization of these services by appropriate reference groups in civilian society, active duty military members use the available, easily accessible, and free military mental health resources far less than a demographically similar comparison group in civilian society, even though civilians typically have far thinner mental health coverage. In fact, for those civilians who have any mental health coverage whatsoever, the coinsurance share born by patients for outpatient mental health services for those whose health insurance includes such coverage is typically 50% (Opsut, 1994). The behavior of active duty members contradicts the predictions of the economic model. It is a mystery as to whether this depressed utilization of mental health services is due to favorable selection (individuals without mental health needs) or due to culturally imposed barriers to usage of mental health services (i.e. stigma). This research will be able to determine if low active duty utilization of mental health services are indeed due to lower levels of need (as measured by the mean MCS) or if some other reason must be considered.

Interestingly, active duty family members have not displayed this same reticence toward using outpatient mental health services provided by the military health services system in the past. Their utilization behavior for mental health services exceeds that

displayed by demographically matched comparison groups in the civilian population, even when uninsured individuals are screened from the comparison grouping in the civilian population (Opsut, 1994). This behavior is consistent with the economics model, since military family members enjoy richer coverage for mental health than is typically available to civilians of similar age/sex distribution.

Indeed, the economics model provides no explanation as to why military mental health services, as distinct from other services and despite full coverage, seems to be avoided by active duty military members. The answer is unlikely to be found in quality, since if this were the case family members would avoid treatment in the direct care system. Family members seem just as unhindered in seeking free outpatient mental health care through military channels as they are in seeking other types of free medical interventions in the direct care system (Opsut, 1994). Assuming that active duty military members are rational decision makers, the utilization (or lack thereof) of available military mental health services is inexplicable under economic models. The remainder of this paper applies sociological theory to explain what would be construed by economists as aberrant or paradoxical behavior on the part of military members regarding their utilization of available and free outpatient mental health services. In order to delve into the reasons underlying this mysterious behavior, the health beliefs model is used as a diagnostic tool.

1. The Health Belief Model

The health belief model (HBM) was developed as an analytical tool by investigators doing work for the U.S. Public Health Service and was used to explain the empirical

findings of their research (Rosenstock, 1974). During the time of its development, the Public Health Service was emphasizing preventive medicine and the health beliefs model was used to show what factors might effect an individual's predilection to behave in a manner consistent with maintaining good health. (Rosenstock, 1974). The model has since been applied by other researchers to help explain illness and sick role behaviors as well (Becker, 1979). Kirscht found that the model was a useful tool in analyzing the response to symptoms of illness by patients (Kirscht, 1974) and patient actions following diagnosis (Becker, 1974). The extension of the model to these situations is critical for investigating the outpatient mental health utilization behavior of military beneficiaries, since the issue of central interest in this paper is not centered on a question of preventive care.

Janz and Becker (1984) note that the health beliefs model consists of four dimensions. They identify and define these four dimensions as follows:

Perceived susceptibility- Individuals vary widely in their feelings of personal vulnerability to a condition. Thus, this dimension refers to one's subjective perception of the risk of contracting a condition.

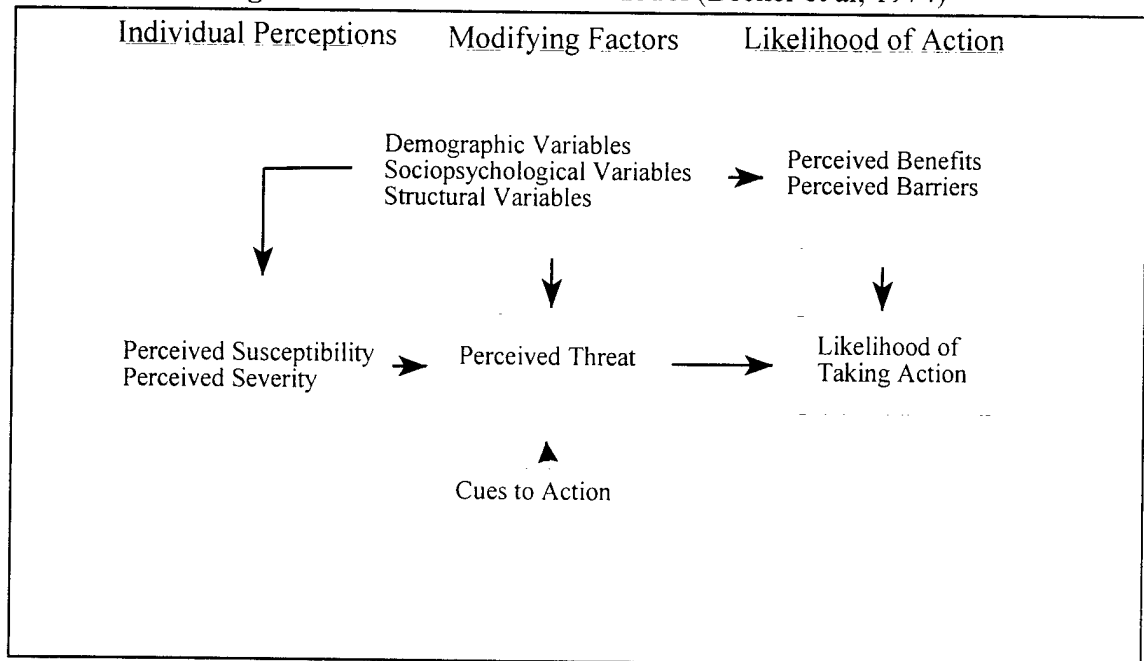
Perceived severity- Feelings concerning the seriousness of contracting an illness also vary from person to person. This dimension includes evaluations of both medical/clinical consequences and possible social consequences.

Perceived benefits- While acceptance of personal susceptibility to a condition believed to be serious was held to produce a force leading to behavior, it did not define the particular course of action likely to be taken; this was hypothesized to depend upon beliefs regarding the effectiveness of the various actions available in reducing the disease threat. Thus, a "sufficiently-threatened" individual would not be expected to accept the recommended health action unless it was perceived as feasible and efficacious.

Perceived barriers- The potential negative aspects of a particular health action may act as impediments to undertaking the recommended behavior. A kind of cost-benefit analysis is thought to occur wherein the individual weighs the action's effectiveness against perceptions that it may be expensive, dangerous, unpleasant, inconvenient, time-consuming, and so forth. (Janz and Becker, 1984)

Organized into graphical form by Becker and colleagues, the health beliefs model shows how these elements of the model interact with one another. Figure 3, shown below, depicts this model graphically.

Figure 3: The Health Belief Model (Becker et al, 1974)



A key insight provided by the health belief model is that both beliefs and attitudes are affected by sociopsychological variables. Therefore, if actions defy the expectations of economic models, then the social psychological variables which affect perceived susceptibility and the barriers to care for medical ailments in the military setting must be different from the social psychological variables which affect the utilization of mental health care by active duty members. These variables must uniquely affect active duty members and not their family members or members of a civilian control group.

The potential of culture to influence behavior in profound ways has been noted by many social theorists. Lewin observed that valences for different activities were affected profoundly by the cultural beliefs of the society in which the individual was immersed (Lewin, 1952). From a health perspective, several researchers have noted that ethnic origin and cultural background played a significant role in influencing along all the dimensions of the model (Becker, 1979; Kasl and Cobb, 1966)). Cultures seem to shape the behavior of its members by establishing subjective norms which constrain the freedom to act in a manner which may better reflect their personal beliefs or attitudes (Schuman, 1995). This finding is consistent with the health beliefs model. Therefore, culture would seem to be a fruitful area of investigation to determine the reasons underlying the unexpected behavior observed by active duty beneficiaries regarding mental health services.

2. The Subculture of the American Military

Western culture, particularly in the form manifested in the United States, is based firmly on a view of the self which is independent and autonomous (Markus and

Kitayama, 1991). This culturally derived identification of desirable characteristics celebrates the entrepreneur and scorns the welfare recipient. Similarly, those who are poor in spirit, the mentally ill, are identified as having failed to live up to the cultural ideal of strength and self-reliance. The culture of the American military bears the imprimatur from Western and American culture; however, it also has important nuances that make the cultural environment of the American military a distinctive subcultural group within American society as a whole. Understanding the military subculture is critical to an understanding of how it influences the individuals who live in the military milieu.

3. The Military Subculture and Its Impact on the Self-Concept of Military Members.

The military subculture represents a distinct subculture in American society which strongly influences the behavior of both military members and their immediate families. Its influence is felt in American military communities located in this country and overseas and should not be underestimated. Very often, these communities are located in remote areas, largely isolated from the rest of American society. The military subculture places a strong emphasis on teamwork and group loyalty which extends beyond the workplace to the family. Military communities and organizations are closely knit, resembling a small town environment. Like a small town, there are few secrets on a military post. Teamwork is the basis for organizational performance; social loafing is neither tolerated by the chain of command nor by the work group (McCubbin and Dahl, 1976).

Military members are indoctrinated from the first day of training that the strength of the group rests on each of its components being strong and self-reliant individuals pooling their abilities to accomplish the mission. One's duty is to perform one's very best so as not to let the group down. This theme resonates well with the structural-functional strain of sociological theory. Even the language of the military, where individuals are called "members," hearkens toward a corporate identity wherein each individual has a role to play for the advancement of the collective. Those who fail to meet their obligations to their "unit" are punished for dereliction of duty and are treated as deviants.

In spite of the emphasis on teamwork, the American military remains fully American in its cultural values of independence and self-reliance. Indeed, individual strength and fortitude is particularly prized, given the potential for encountering combat situations filled with stress and difficult decisions. Individual behavior is expected to reflect this inner strength. As will be shown later, this expectation of individual strength is a "social norm" in the fullest sense of the use of that term by Axelrod (1986), who states that a norm exists in a given social setting when "individuals usually act in a certain way and are often punished when seen not acting in this way." Individuals who fail to reflect this strength are punished for their nonconformist behavior (Yamagishi, 1995). In as far as mental illness is perceived as a weakness in military society, avoidance of punishment is one explanation for the lack of utilization of mental health services by military members. However, the belief that seeking help will lead to punishment and, therefore, the action of seeking help is avoided is only a partial explanation. Social psychological theory also gives us reason to believe that many military members do not even consider the possibility

of needing mental health care because needing this type of help is incongruous with a strongly held self-image.

Career military members develop a self-schema early in their careers which internalizes the subjective subcultural norms for behavior (Segal, 1986). Gecas would consider the resulting self-presentation of the military member to be a genuine reflection of self-concept (Gecas and Burke, 1995), since the pervasiveness of community life would make long term sustenance of false personas extremely difficult. Therefore, a successful career military member's phenomenal self is difficult to distinguish from the external projection of self, since his self-schema has already internalized the subculture's exogenous ideas of what sort of person he should be (Gecas and Burke, 1995). Those who make the military a career do so precisely because the military subculture represents an environment in which they find a high degree of congruence between their social and work milieu and their self-concept. The result is what Beckman describes as a stable self-conception which has the attribute of being resistant to challenge and change (Gecas and Burke, 1995).

This stable self-conception of the typical military member can also be explained well from sociological theory derived from the symbolic interactionist school. Sociologists of this school would note that the military subculture is replete with opportunities for social interaction which are almost ritualistic, wherein pre-established roles of the parties of the interaction are established through unmistakable cues from clothing (Mortimer, 1995) which reflect irrefutable (within the context of the military subculture) identity claims (e.g. rank insignia). These obvious cues virtually insure that the interacting parties will

act "appropriately," thereby providing consistent feedback to the interactants that the other's perception of the self is consistent with one's self-concept. The result is that in the typical military context, there would seem to be little difference between the self-concept from the Chicago School perspective of symbolic interactionism, which is the "looking glass self" (Cooley, 1981), the individual perceives as the result of interactions with others, and the a priori core self, postulated by Stryker and other symbolic interactionists of the Indiana School (Mortimer, 1995), which postulates an existential identity presented in different ways depending on the salience and commitment to a given role in a particular context (Mortimer, 1995). The enveloping nature of the military subculture galvanizes the self-concept of the military member into a role and image of self which is consistently presented and reinforced.

The military is a 24 hour a day, 7 day a week profession (McCubbin and Dahl, 1976). This mandatory total commitment of individuals to the organization is one of the aspects of a military career that identifies it as a greedy institution (Segal, 1986). The greediness of the military can also be attributed to the pervasiveness of its demands on the individual, spanning issues from dress, behavior, grooming, and attitude. In order to be successful in the profession of arms, the military member must internalize this normative and expansive schema into a self-schema which reflects these requirements (Howard, 1995). Once accomplished, impression management is actively pursued in interactions with others to convey this military image to others and maximize public esteem (Howard, 1995). Stryker would characterize the military member's role of soldier, sailor, or airman as having a high degree of salience, since it is exercised with such great frequency

(Mortimer, 1995). Furthermore, since important others, both family members and colleagues, use the military member's role as a military member as a primary social reference point (McCubbin and Dahl, 1995), Stryker would also characterize the role of having a high degree of commitment (Mortimer, 1995). The high levels of role commitment and salience has the result of guaranteeing the high stakes involved for the military member to maintain the appropriate military image.

The military expects its members to be strong individuals who are able to function effectively under stressful circumstances. Those who do not live up to the subculture's social norm face early separation from active service, either through discharge or failure to be promoted. Early separation means premature loss of the role which forms the foundation for his self-image. The military member will expend considerable effort to maintain the image of strength consistent with the idealized image of the military member in order to avoid the serious negative consequences of nonconformity with governing cultural schemas.

4. The Influence of the Military Subculture on Active Duty Families.

Families of active duty military members are highly integrated into the military community as well. Another unusual aspect of the military subculture that makes it a greedy institution (Segal, 1986) is that it demands certain behaviors from the families of its members. These demands are often stress-inducing and include the following: frequent geographical moves (occasionally to foreign countries), lengthy periods of separation of the military member from the family, elevated risk of injury or death to the military member, and the development of social responsibilities and behaviors on the part

of family members, particularly spouses, which are appropriate to the rank of the military member. Inappropriate behavior on the part of the family members will result in negative career repercussions for the military members (Segal, 1986). Manifesting reactions to the potentially stressful life of military living is not among the cultural taboos for military family members, however. In a spirit of enlightened organizational self-interest, the military subculture's paternalistic and team-oriented approach attempts to mitigate the impact of stress on military families through a variety of formal and informal support services. When these preventive measures prove inadequate, the institution delivers resources to the afflicted family through formal and informal support channels.

The military leadership recognizes that family problems will affect the performance of the military member. Therefore, it is interested as an institution in keeping the member's family happy so the member can focus his or her energy on military duties (Ginn, 1986). Military family members are often considered to be an extension of the military member, so problems in the family are a matter of interest to the military command structure. This interest includes concern for the mental health of family members. As a result, in contrast to the active duty member's perception of mental health care as a threat to self-image and career, the family member is socialized by the culture into accepting a portrayal of mental healthcare as another component of the military's vast array of support services designed by the military to keep families happy so the active duty member will be motivated to make the military a career and put forth his/her best efforts on duty, unhampered by concerns over the well-being of his/her family (Ginn, 1986).

5. Sociological Theory's Explanation of Utilization Behavior of Mental Health Care by Active Duty Members.

As was mentioned earlier, active duty military members use the available, easily accessible and free mental health resources of the base far less than would be expected given their demographic characteristics (Opsut, 1994). In contrast, their utilization of medical, dental and surgical services is generally in line with utilization patterns of appropriate reference groups in the civilian community (Opsut, 1994). The health beliefs model gives us several insights on why this behavior might be occurring.

Social psychological factors affect both beliefs and actions in illness behavior, according to the extended version of the health beliefs model. The discussion of the military subculture in the previous section points toward several sociological explanations of why service members might use their mental health benefits less than one might expect. First, the military's beliefs and attitudes regarding personal strength might act as a check on the behavior of servicemen (Schuman, 1995). Americans seem to view mental health as an absence of psychic distress experienced by the individual (Smith-Lovin, 1995). It follows that mental health care would be necessary when individuals cannot cope adequately with the stresses and pressures of life without assistance. An admission of inability to cope with life's circumstances conflicts strongly with the self-schema of a military member. Therefore, any action reflecting this maladjustment to circumstances would naturally be avoided. Second, seeing a military mental health provider might be avoided because it would be viewed as risky because, as Blumer notes, interaction results are not predictable (Mortimer, 1995).

A visit to the mental health clinic by the military member sets off a round of identity bargaining consistent with Goffman's dramaturgical model (Gecas and Burke, 1995). Moreover, in the encounter between psychologist and military member, a tug of war between the two participants in the interaction ensues over the root cause of the problem and the identity of the person seeking assistance (Gecas and Burke, 1995). While a military member may seek care for what he portrays as a transient problem, he may be diagnosed with a chronic disorder, which will irreparably damage his career. Although he will try to present himself favorably, the act of going to a mental health professional places him at considerable disadvantage in this interaction. First, the practitioner occupies a role that gives him considerable power relative to his patients (Lofland, 1995). American society has conferred upon the health care provider the role as the competent authority to diagnose medical and mental health problems (Wolinsky, 1988) and military mental health professionals, as officers, typically outrank their patients. Therefore, the outcome of the interaction is strongly weighted in favor of the judgement of the provider, who enjoys to advantages of the situational authority of the practitioner over the patient and the situational dependency of the patient on the provider's assistance, the likely advantage of rank over the patient, and the culturally conferred advantage of professional prestige (Wolinsky, 1988). Therefore, the mental health evaluation visit is a situation in which the patient is extremely vulnerable vis-a-vis the provider. This position of helplessness, weakness, and lack of control over one's own destiny resonates poorly with the military person's culturally imbued self-concept.

Emerson's exchange theory holds that in imbalanced relations (e.g. doctor-patient), outcomes tend to favor the more powerful party (Molm and Cook, 1995). This asymmetric relationship may be necessary to give providers leverage in getting patients to comply with treatment regimens (West, 1984), but to a military member it means that he/she is entering a dangerous situation in which he/she can exercise little control. Therefore the mental health professional's viewpoint regarding the service member's identity is likely to prevail. As Cooley notes, individuals are more likely to accept the "looking glass" version of the self when one is feeling extremely insecure and vulnerable (Gecas and Burke, 1995). Since it is under these circumstances that the military professional sees a mental health provider, he/she is likely to acquiesce to the labeling diagnosis of mental disorder and suffer the consequences resulting from this interaction if he/she takes the first step and seeks assistance at the military mental health clinic at the place of assignment.

In keeping with the symbolic interactionist credo of meaning discovered through interaction, Scheff suggests that mental illness is not an intrinsic condition but a reaction formulated by the individual in response to what his behavior elicits in others (Scheff, 1963). Once one is identified as being mentally ill, he is placed into a culturally appropriate schema of a mentally ill individual by others and is perceived to act in a manner consistent with the other's preconceived schema of a mentally ill individual (Scheff, 1963). This label results in consequences for the active duty member which threaten a self-image which is likely to be extremely high in salience and commitment levels for him/her. Seeing a psychiatrist risks an interaction which may result in a label

being affixed to him/her which would undermine this core self-concept. Thoits argues that "events that threaten highly valued identities will result in greater stress and potential for psychological distress" (Wiley, 1995). Since the unpredictable consequences of getting mental health treatment may place the military member's highly valued self-identity as a serviceman at risk, the military mental health clinic cannot possibly function effectively in its therapeutic role for the military member. Seeking mental health care exacerbates any distress already experienced by the member. Therefore, it is understandable why a military member would avoid the military mental health professional as much as possible. Avoidance of the mental health professional by active duty members despite need for these services is, therefore, the likely outcome of the socio-cultural infrastructure of the military mental health system. This situation increases the likelihood that active duty members will conduct lengthy searches for somatic explanations for their discomfort, since physical ailments are not associated with the stigma which accompanies mental or emotional problems. These factors create the conditions under which offset is likely to be observed.

Once the label of mental illness is pinned on the individual, future interactions with others within the military are cast in a different light. Others no longer see the military member as a dependable member of the team. He/she is confronted with this unfavorable perception of others regarding his capabilities in repeated interactions with co-workers, who assign him non-critical tasks. As a result, the labeled individual comes away from these encounters with the impression that there is something wrong with him, particularly after this impression is repeatedly reinforced in his social interactions. If he/she submits

to further mental health treatment, he/she simply corroborates the view that he/she is mentally ill and in need of treatment. As a mental health patient, he/she is rewarded by care providers when he shows "insight" into his condition. This "insight" is the acceptance of the view that he/she is mentally ill and in need of help. This "insight" is supported by an assisted reconstruction of his past which is consistent with the diagnosis for a particular form of mental illness (Scheff, 1963). After treatment, the military community, like other communities, interacts with his label as mental ill and does not permit him to reintegrate into social life as a normal individual. Link and Cullen (1990) report that although people in the community state that the ideal member of the community would not behave prejudicially toward an individual labeled as mentally ill, they describe themselves and others as falling short of this behavioral goal. Experimental evidence also supports the theory that people behave differently toward mentally sound individuals described by researchers as suffering from mental illness. These studies have shown that people are less sincere, open, sensitive, and secure when interacting with those labeled as being mentally ill (Link and Cullen, 1990). The result of these interactions in the community, coupled with his therapist's positive reinforcement and encouragement of a mentally ill self-concept, leads to the eventual acquiescence to a self-image of mental illness and acceptance of that role and its consequences. These consequences are markedly negative in terms of self-esteem, potential for employment, and social acceptance (Link and Cullen, 1990) for all members of society. Due the nature of military cultural norms, these negative consequences are even more pronounced for military members.

Diagnosis of chronic mental health problems risks the loss of social role and financial well-being for the active duty military member. The pervasiveness of the self-schema means its loss can be devastating. Suicide is a leading cause of death among active duty military members. Military mental health professionals have noted with remorse that suicides often occur during the discharge process, and that this process is sometimes triggered by a mental illness diagnosis by a military mental health professional. (Fragala, 1991). Indeed, even when imminent discharge is not faced, there is evidence that military members feel personally or socially disgraced by a public episode of mental health problems to such a degree that they voluntarily withdraw from the service. Pullen and Labatte's study of 101 individuals hospitalized temporarily for minor psychiatric diagnoses, showed only 20% still on active duty two years after the hospitalization (Pullen and Labatte, 1992). The psychiatric hospitalization of a military member is evidence of weakness which lies beyond the range of normal behaviors tolerated in the military subculture. Psychiatric illness of active duty members is often viewed in the military subculture as a manifestation of a character flaw which results in the abandonment of personal responsibilities to the unit which is not tolerated.

The psychiatrically hospitalized soldier is not allowed to take on the sick role; instead, his dereliction of duty to the collective resulting from mental breakdown seems to be regarded as deviant and unacceptable within the salient cultural milieu (Twaddle, 1973). Therefore, the possibility of acquiring the mental illness label coupled with the strong desire to avoid it prevents members from seeking care from the military system. As a result, military members prefer using anonymous civilian counseling services (McCubbin

and Dahl, 1976) over those proffered by the military because of the fear of negative career impact. The mental illness label has severe consequences. The costs associated with the consequences of acquiring the label far outweigh any conceivable benefits which might be derived from it, which might include time off from work or relief from stressful tasks. Since actors have goals and interests in interaction which include the protection of core aspects of self (Mortimer, 1995), beliefs about the negative consequences of seeking treatment in a military mental health care system act as a significant behavioral check against utilization.

6. Active Duty Utilization Behavior and the Health Belief Model

The above discussion illuminates the large role played by sociopsychological variables which effect mental health utilization behavior to such a degree that they completely overwhelm the effect of free care predicted by the economic model. In terms of the health beliefs model, the military subculture erects high barriers to mental health care for active duty members, since mental illness often results in expulsion from the subculture. The health beliefs model states that individuals make a cost-benefit calculus of weighing benefits against barriers prior to taking health care related actions. Given that psychiatry is an inexact science where even practitioners are uncertain in the efficacy of certain treatment regimens (Light, 1979), it seems likely that the result of this cost-benefit process will almost always reveal that the costs of a visit to the mental health clinic by an active duty military member far outweigh any possible benefits that might accrue from this visit.

These social psychological factors may even affect the military member's beliefs about himself to such a degree that he does not consider himself to be vulnerable to mental illness. Indeed, Mechanic notes that patients in cultures where the expression of emotional distress is inhibited will often use physical language to express psychological problems (Mechanic, 1972). Therefore, sociopsychological intervening variables will not simply directly inhibit the utilization of mental health services, they may also indirectly inhibit the utilization of these services because the subconscious (other internalized other of the military subculture) does not consider the experienced distress as a psychological problem.

Active duty family members face different costs and benefits and are not culturally barred from identifying psychological distress in themselves. The next subsection demonstrates why active duty family members may exhibit utilization behavior that deviates radically from that observed by active duty members.

7. Sociological Theory's Predictions of Utilization of Mental Health Care by Active Duty Family Members

Family members of active duty have different incentives regarding the sick role. The military wants military family members to be happy because the positive impact of good health in the family on the member's morale (Hart and Conners, 1996). There is no requirement for a family member to be strong and independent. In fact, the military openly acknowledges the stress placed on family members resulting from its own demands on the member and the sacrifices it expects from families. The family member's self-image may not be threatened by making a mental health visit, since the occupational

role and income, is not typically threatened by this behavior, as it seems to be for active duty members. Moreover, since the military provides the culturally acceptable explanation of the difficulty of military life for families, the stigma of utilizing mental health services is not borne by the individual family member. In sociological terms, Wolinsky (1988) would say that, in contrast to active duty servicemen, the military subculture grants family members "permission" to assume the sick role when experiencing mental health problems. Individual manifestations of mental illness are blamed on the rigors of military life. The term, "military family syndrome" has emerged in the psychological literature as a classification for the maladjustment problems of children and spouses of military members who suffer from a variety of mental health problems (Jensen, 1991; Werkman, 1992). The transfer of the label from the individual to the circumstances facilitates the use of mental health care by military family members.

When economic disincentives for reducing utilization are removed, utilization of mental health services by military family members skyrockets. Evidence of this behavior was noted in an experiment in Fort Bragg, NC, which made available mental health treatment by civilian providers without copayment rather than with a 20% copayment. The resulting threefold increase in the utilization rate above the anticipated utilization increase is at least anecdotal evidence that the major disincentive for family members for using psychiatric care is economic (Kunkel, 1992). Labeling seems to be far less of a concern to military family members than it is to active duty members, and rightfully so, since the cost benefit ratio is heavily tilted in favor of benefits for the military family member.

Not only is the stigma of mental illness lessened by its attribution to military circumstances rather than to the individual, some benefits also accrue to the mentally ill family member. By embracing the patient role and manifesting appropriate deviance, the individual identified as being mentally ill patient draws attention to himself and receives professional care and treatment in reasonably comfortable surroundings. According to Talcott Parsons, acceptance of the sick role means that one was exempted from normal social role responsibilities and needed to be taken care of by others (Parsons, 1951). Moreover, the "privileges and exemptions of the sick role may become objects of 'secondary gain' for which the patient is positively motivated, usually unconsciously, to secure or retain" (Parsons, 1951). Like an addictive drug, the longer the individual maintains the sick role in order to receive the benefits derived from the sick role, the firmer the label of mentally ill is affixed and the less likely he is to return to the community in a role or status that is not associated with the stigma of the mentally ill label.

These benefits and costs from the mentally ill label will vary according to the specific circumstances of the individual. The costs of the mentally ill label are reduced for the family member in two ways. First, the partial transference of the label to its ascription to "military family syndrome" or other situational circumstances lessens the cost by of this label since most, if not all or the burden is accepted by the military as an institution. Second, the frequent moves which are normal in military life allow the family member to move to a new community where he does not bear the label of having mental health problems. Third, since diagnosis of mental illness by a family member does not place the

military member's status or career at risk, no economic threat militates against seeing the mental health professional.

While costs of acquiring the mentally ill label are low, the potential benefits can be high for the military family member. The afflicted military family member is the recipient of quasi-official nurturing by groups such as the Officers' Wive's Club, Base Chaplain's Office, and other base support agencies. Unlike active duty members, who face barriers to care which are primarily cultural and have a secondary economic impact, copayments and other economic disincentives seem to constitute the only barrier to seeking of mental health treatment by family members. Therefore, since barriers to care are relatively low, we would expect the amount of excess medical utilization to be low and offset levels small compared with active duty members, since family members are encouraged to see mental health specialists in case of emotional problems and experience relatively few obstacles in seeking this appropriate care for the emotional and mental difficulties.

D. Chapter Two Summary

This chapter presented literature from three distinct domains which relate to this research topic. First, background information regarding offset studies was presented. This was done to familiarize the reader with the motivation and methods used for offset studies in the past. Next, portions of the general utilization literature were presented as a way to build support for the inclusion of particular variables in the model used in this research. The argument for the appropriateness of a recursive model was made based on the evidence in the literature regarding patients, providers and systemic influences which

strongly reduce the possibility that physical health visits will result in a change in the usage of mental health services for an individual patient. However, establishing the correctness of a recursive model did not entirely eliminate the endogeneity problem arising from the affect of omitted relevant variables, which were then discussed. The unique solution to this problem was identified as instrumental variables. This approach was available as a result of a military assignment process which randomly distributes individuals with varying degrees of mental health need (potential demand) to locations with different levels of mental health provider supply. An empirical model for analysis of the offset phenomenon was presented as the synthesis of the discussion presented in the first two sections of this chapter. This model reflected the sum of decisions regarding variables to be included in the empirical, or analytic, model.

A theoretical piece discussing utilization of services from the perspective of the health belief model formed the third major section of this Chapter. Specific aspects of military culture were discussed and linked back to the health belief model. This model, which draws heavily on core sociological theories, provides valuable insights suggesting why the offset effect might be particularly strong in some subgroups of the population being studied. This theoretical section of the literature review provided the basis for the direction imputed in the working hypotheses presented in the first chapter.

This chapter has drawn on the existing literature to place the current study into an appropriate context. Drawing on three major and distinct domains of literature, it has sought to justify the basis of the hypotheses presented in Chapter I and to build an empirical model suitable for the available data to test the research hypotheses under

consideration. Careful attention must now turned to questions of how this research will be conducted. The following chapter will introduce the data and methods to be used in order to make appropriate determinations of the correctness of the specific hypotheses.

III. Data and Methods

A. Origin of the Primary Data Set

The primary data set was acquired from the 1994-95 Health Care Survey of DoD Beneficiaries (see Appendix AF for a copy of the Survey document). The population of interest in the survey was all of the adult (age 18 and older) beneficiaries of the military health services system. The sampling frame used was the Defense Enrollment Eligibility System (DEERS) as of August 10, 1994. The DEERS system is an automated database which contains basic eligibility information on all persons eligible for care under the military health services system. It is used as the primary screening tool for the determination of eligibility for military healthcare benefits at the point of service in military hospitals and by the CHAMPUS fiscal intermediaries. Because of the financial importance of maintaining accuracy, it is believed to be the most up to date and accurate compilation of beneficiaries of the MHSS. The population of interest using this sampling frame numbered 6,592,033 (Graham, 1996). The survey was conducted by the DoD in order to comply with Section 724 of the National Defense Authorization Act for Fiscal Year 1993, which required the DoD to conduct an annual survey of its beneficiaries regarding their health care benefit (US Congress, 1993). Appendix B provides the reader with Section 724 of this Act in its entirety. Although the survey was mandated, the DoD had considerable latitude regarding the content of the survey, and decided to mount a major effort to mount a survey effort capable of drawing conclusions regarding access, utilization, and satisfaction down to the individual catchment area level (Opsut, 1996), ultimately spending over \$2 million for the contract, which does not

include the contract monitoring responsibilities and analysis performed by DoD employees.

The final survey instrument was mailed to 165,952 beneficiaries who were selected systematically from the sampling frame (Graham, 1996). There is no periodicity in the DEERS database, therefore systematic sampling should yield a sample not substantially different from a simple random sample (Kalton, 1983). The survey included 97 questions, many of which had subparts. Six major areas were addressed: demographics (including military unique questions such as rank and Service adherence), health status (measured by the SF-36 instrument), familiarity with the breadth of services offered, self-reported utilization of services, satisfaction and access of services (measured by the Group Health Association of America's Patient Satisfaction Survey) (Graham, 1996). The portions of the survey used in this research effort are limited to questions regarding demographics, utilization, and health status. The specific items used will be identified in the next subsection.

The overall response rate to the survey was approximately fifty-four percent (Latta and others, 1996; Graham, 1996). This was achieved after a notification letter and a reminder letter with a second copy of the survey (Latta and others, 1996). Cost considerations and the volume and dispersion of the beneficiaries precluded more aggressive efforts to boost the response rate further (Graham, 1996). An extensive telephone follow-up with mail survey nonrespondents was made in order to assess the degree of response bias present in the sample. The salient findings from this effort was that nonrespondents differed little from survey respondents in general (Chu et al, 1995).

In terms of the issues of greatest concern in this study, similar conclusions were reached regarding the similarity between mail survey respondents and nonrespondents.

Specifically, the number of outpatient visits was slightly higher for nonrespondents and the mental health component of the SF-36 health status instrument was slightly lower for nonrespondents, although in virtually all cases the differences between mail survey respondents and nonrespondents was not statistically significant (Chu et al, 1995).

Therefore, the mail survey respondents can be considered to be representative of the general population of interest with respect to the issues relevant in this study.

The DoD's 1994-95 Health Care Survey contains a little over 89,000 usable observations (individual responses to the survey) (Graham, 1996). The data has been "cleaned up" by Westat, Inc., the primary contractor for the project, which had the responsibility of transforming the raw survey responses into usable data for analysis (Graham, 1996). The data set was made available for analysis in August 1996. Missing responses were not imputed by DoD or the contractor (Graham, 1996). The data is in the form of a SAS data set which resides on an IBM MVS mainframe computer located at Fort Detrick, an army installation outside of Frederick, Maryland. This research effort will use the subset of 25,933 usable survey responses which were submitted by active duty members and active duty family members, the groups of interest for this study.

B. Supplemental Data

Supplemental data was gathered from the military services and the Defense Medical Information Service (DMIS) from August to October 1996. The military services provided the number of authorized mental health providers (psychiatrists, psychologists,

and clinical social workers) for the mental health clinic function by facility (Houser, 1996). Authorized rather than assigned strength was used because the latter fluctuates on a monthly basis; in contrast, the latter is a stable figure around which the average assigned strength fluctuates throughout the year as individuals are reassigned and are temporarily posted elsewhere.

DMIS provided the number of beneficiaries assigned to the catchment area (or 20 mile clinic circle) for each military facility (Humphries, 1996). The catchment area is nominally defined as 40 mile radius around an inpatient military facility. DoD beneficiaries are expected to seek care first at the military facility in their zip code assigned catchment area if they reside in a catchment area, as do more than 75% of all DoD beneficiaries worldwide (GAO, 1995). Failure to formally check for service availability from the catchment area MMTF can result in the patient being responsible for 100% of the cost of care. Individual beneficiaries residing within 20 miles of a stand alone outpatient clinic operated by DoD are also expected to seek care at the military MTF first. This is required for all active duty members, all inpatient services and some outpatient procedures (OCHAMPUS, 1994), and strongly encouraged for other outpatient services. The link between the beneficiary and the responsible MMTF has been strengthened since the advent of capitation budgeting in FY94. Under capitation budgeting, MMTF commanders are responsible for all government health care expenditures in their assigned area of responsibility (40 miles radius for inpatient facilities, 20 mile radius for outpatient facilities), regardless of where these expenditures take place. The link of active duty members to the military facility is virtually absolute,

since only a small percentage of this group enjoys private (non-military) health care coverage, usually through a spouse's employee health package (Graham, 1996).

Surprisingly, the link to the military health services system is nearly as strong for family members, since the results of the 1994-95 DoD Beneficiary Survey showed that only 11% of active duty family members enjoyed private coverage unrelated to the military (Graham, 1996). Given the great financial disincentives to bypass the military system and seek care off-base, the ratio of mental health providers to the population, in particular, would seem to represent an important element of information which might be useful in predicting the likelihood of an individual to seek out mental health services.

The variable, PROV RAT, was constructed by dividing the Service-provided number of authorized military mental health professionals by the DMIS-provided number of beneficiaries in the catchment area. The other instrument, FACISOL, was constructed by comparing the geographic location of the facility's catchment area with a Bureau of the Census map of standard metropolitan statistical areas (SMSAs). Bases for which a more than half of the land area comprising catchment area was in an SMSA were designated as being in an urban area (FACISOL=1).

Three variables were added for use in the descriptive analysis involved with research question number one. These were the additional location specific variables of ARMY, NAVY and LASITE, which identified facilities operated by the Army, Navy, and DoD lead agent facilities, respectively. These were included in deference to the interest of the military audience for this research. They are dropped from the model for analyzing the presence of offset in the two stage least squares model because their inclusion

significantly weakens the ability of the instrument to eliminate bias from the two stage estimation.

The final data set used for the analysis merged the facility specific attributes of the secondary data set to the beneficiary specific attributes of the primary data set.

C. Presentation of the Basic Set of Variables

The basic set of variables to be included in the analyses, with a description and their corresponding survey number (if applicable) and their intended use is shown in the table below.

Table 2
Origin of the Basic Set of Model Variables

VARIABLE NAME	VARIABLE DESCRIPTION	SOURCE	USE
TOTVIS (LNTOTVIS)	Total number of visits for illness or injury (The natural log of this variable)	Survey: 7a+7b+7c	Dependent Variable
PCS	SF-36 Physical Composite Scale Score (Normalized)	Derived from Survey: 72-82	Independent Variable
MCS	SF-36 Mental Composite Scale Score (Normalized)	Derived from Survey: 72-82	Independent Variable
USAGE	Usage of Mental Health Services (Binary: $x > 0 = 1$ else 0)	Survey: 7h	Key Blocking and Independent Variable
FACISOL	1=Urban 0=Rural/Overseas Original Variable Name was Urban.	Derived from 97	Instrument for Endogenous Variable
PROVRAT	Ratio of Authorized Mental Health Providers to Catchment Area	Services and DMIS	Instrument for Endogenous Variable

VARIABLE NAME	VARIABLE DESCRIPTION	SOURCE	USE
ADBENCAT	Active Duty,Active Duty Family Member. 1=Active Duty, 0=Family Member	Survey: 88a,89a	Independent Variable
SER4XXXX	Service Affiliation of Sponsor XXXX= ARMY. NAVY, USMC. USAF is omitted category	Survey: 88b,89b	Independent Variable
MSEX	Gender of Beneficiary 1=Male 0=Female	Survey: 84	Independent Variable
EGRADE	Rank of Sponsor 1=Enlisted 0=Officer	Survey:88c, 89c	Independent Variable
AGE	Beneficiary Age	Survey: 87	Independent Variable
AGE2	(Beneficiary Age) ²	Calculated	Independent Variable
AGESEX	Beneficiary Age*Sex	Calculated	Independent Variable
MARRIED	Marital Status of Beneficiary 1=Married 0=Other	Survey: 91	Independent Variable
WRACE	Self-Reported Race 1=White 0=Other	Survey: 94	Independent Variable
INOVER	Does the Beneficiary Live Overseas? 1=Yes 0=No	Survey: 96	Independent Variable
NEW	Time Lived in Current Area is less than six months =1; otherwise NEW=0	Survey: 95	Independent Variable
ARMY	A location attribute indicating that the individual lives in an Army catchment area.	DMIS	Independent Variable but not used in the Two Stage Least Squares Approach
NAVY	A location attribute indicating that the individual lives in an Navy catchment area.	DMIS	Independent Variable but not used in the Two Stage Least Squares Approach

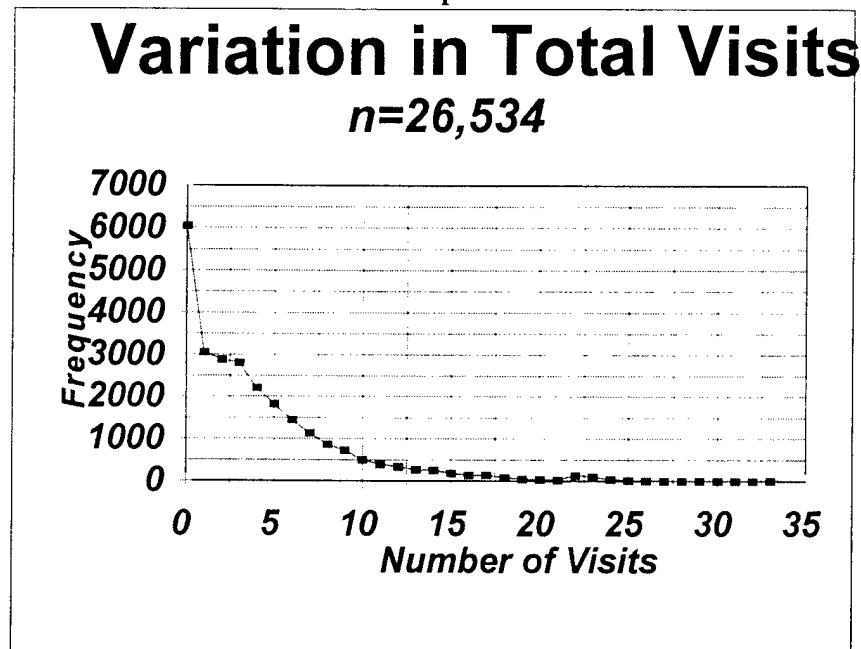
VARIABLE NAME	VARIABLE DESCRIPTION	SOURCE	USE
LASITE	A location attribute indicating that the individual lives in the catchment area of a DoD "Lead Agent" Site	DMIS	Independent Variable but not used in the Two Stage Least Squares Approach

The above presentation minimizes differences in the importance of the variables included in the empirical model. Not all variables are created equally. Some issues regarding the variables are critically important if a study is to be judged as feasible. Among these issues is sufficient dispersion in key variables in order to allow an examination of the inferences and hypotheses posed. Without variation in key variables, a research effort cannot detect phenomena it hopes to examine. Another of these important issues is detectable differences between groups that a study can muster. This is particularly true in a study such as this, which is trying to detect differences in total somatic visits between two groups of beneficiaries, one group which has received a mental health visit and another which has not. These issues of variable dispersion and detectable differences will be examined in the remainder of this section.

Arguably the most important variable in this or any other study is the dependent variable, since the degree of variation explained in this variable by one or more of a host of independent variables is the key element of the study. Fortunately, the data on the number of somatic visits is broadly dispersed. There is a clustering at zero visits within the twelve month time frame; however, this is typical of studies of medical utilization and occurs even when care is free, as was demonstrated in the RAND Health Insurance

Experiment (Manning et al. 1987). Figure 4 below, shows the dispersion of the dependent variable across the 26,534 individuals examined in the data set.

Figure 4
Distribution of Dependent Variable



The table below with categories compressed for ease of presentation tells a similar story:

Table 3
Dispersion of the Outpatient Visit Dependent Variable

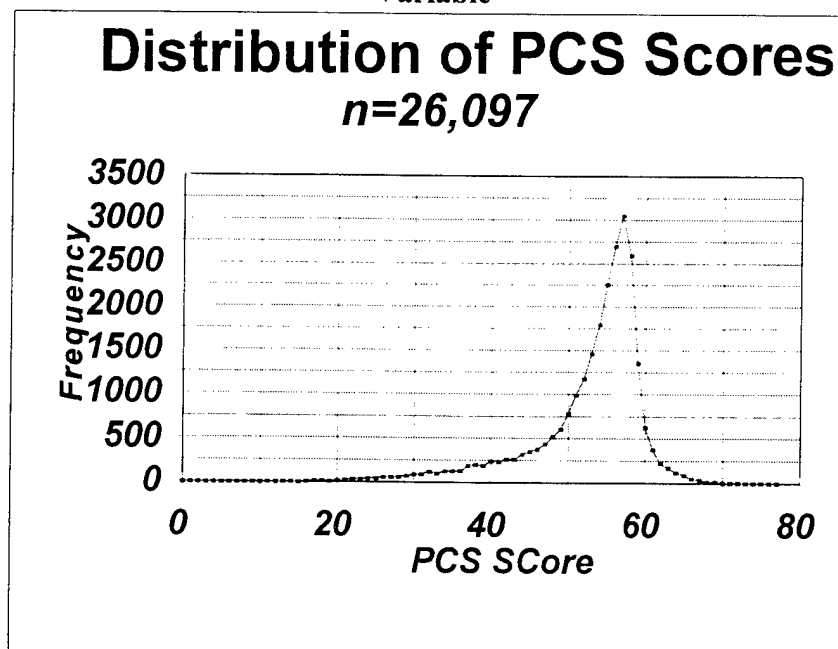
Total Visits	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	6169	23.2	6169	23.2
1-4	11246	42.4	17415	65.6
5-9	6190	23.4	23605	89.0
10-19	2475	9.3	26080	98.3
20-33	454	1.7	26534	100.0

Two other variables which play a major role in the proposed research are the two composite scale variables from the SF-36, the mental component summary (MCS) and the physical component summary (PCS) scores. These scales have been described in Chapter II and their demonstrated levels of validity and reliability will be discussed in detail in a later section in this Chapter. In their natural form, they are both continuous variables. For purposes of simplification, this paper has converted the continuous scores to integers and then grouped these integers in four distinct groups relevant to the hypotheses which will be tested in this research.

The PCS score is an important variable because it serves as the principle control for the natural and logical expectation that those with greater physical infirmities will seek out the care of physicians at a greater rate than those who do not. Its distribution in the sample population is shown below in Figure 5. The total number of observations is

less than that reported for total visits due to this section of the survey not being completely filled out by some respondents.

Figure 5
Distribution of the Physical Component Summary Score
Variable



As was pointed out in Chapter II, the Physical Component Summary (PCS) of the Short Form 36 (SF-36) is a score normalized on general U.S. population scores for this scale, with mean of 50 and differences in 10 points indicating a shift of one standard deviation. It is important to note that the PCS score has a relatively long left hand tail, with greater dispersion among scores below the normative mean of 50 than above it. The actual range of PCS scores rounded off to the nearest integer in this sample was 7 - 75. The mean of the sample was calculated to be slightly above that of the U.S. norm at 53.06, as might be expected in a group of younger adults, the active duty element of which would be presumed to be quite physically fit. The standard deviation of the sample was 7.7, which indicates a tighter dispersion in this relatively homogenous group relative to the general U.S. population upon which the normative scores were based.

For expository purposes, the data set is broken into four discrete categories based on the rounded PCS score. Actual PCS scores, weighted for their representativeness of the population from which the sample is drawn, will be used in the analysis of data. Issues of weighting will be discussed at length in a separate subsection later in this chapter. The first PCS group shown is for individuals scoring two standard deviations or below the national average score, or at a PCS score of 30 or below. The second PCS Group is for those individuals who scored below the national average but were within two standard deviation of the average score, or from 31-49. PCS group three was for individuals scoring at or above the U.S. national mean within a single standard deviation of that level, or PCS 50-59. Finally, the most health group, PCS group four, was for those individuals

scoring above a single standard deviation from the mean, or PCS score of 60 or higher.

Table 4 shows the distribution of these groups in the sample.

Table 4
Distribution of PCS Scores

PCS Scores	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0-30	613	2.3	613	2.3
31-49	4810	18.5	5423	20.8
50-59	18934	70.2	23744	91.0
60+	2353	9.0	26097	100.0

The mental component summary also plays a key role in the analysis. Although this variable does not enter into the equations per se; it does play a role in determining which individuals will be examined, since the behavioral model for offset used in this survey implies that offset should only be found in groups where there is some level of mental health morbidity which can be identified. As a result, one would expect offset in to be strongest in the population group with the lowest mental component summary, particularly those who fall below two standard deviations below the U.S. national average. Individuals with mental health scores well above the average are less likely to have a mental health condition. Therefore, the presence of offset is only expected in individuals whose mental component summaries are lower than the U.S. national average. The sensitivity of the test will be measured by considering ever sicker groups. For example, if the initial set of respondents with MCS of 59 or lower do not display offset,

perhaps the group with MCS of 49 or lower will. Offset will be examined for the MCS group for which it will theoretically be strongest in, namely, those with the lowest relative MCS scores who do not report any mental health treatment. Based on studies conducted by John Ware and his colleagues (1994) in the Medical Outcomes Study, 93.4% of individuals with diagnosed clinical depression will score at or below 32 on the MCS and 70.5% of individuals with clinically diagnosed depression will score at or below 47 on the MCS. The median MCS score for those scoring positive on a depression screener administered separately by Ware was 45.24 (Ware, 1994). Given that those with clinically morbid levels of depression represent only a subset of those who could be helped by professional mental health intervention, the groups used to consider the hypotheses in this study seem reasonable. Considering the a priori expectation that the active duty force and their adult family members would be drawn from among the more mentally fit segments of the U.S. population, the actual distribution of the MCS scores is somewhat surprising. The mean score for active duty members and adult active duty family members in the sample was 50.8 and the standard deviation was 9.26. This result suggests that the military subpopulation of active duty members and their families is not much different in terms of mental health status than is the general U.S. population, whose standardized MCS scores have a mean of 50 and a standard deviation of 10. The actual distribution of the MCS in the sample is shown in Figure 6 below. Immediately following the figure is a tabular display of the frequency of observed MCS scores. In contrast to the PCS groupings, these groupings will actually be used as the cut points for examining offset in the military beneficiary populations, as was mentioned earlier.

Figure 6
Distribution of the Mental component summary

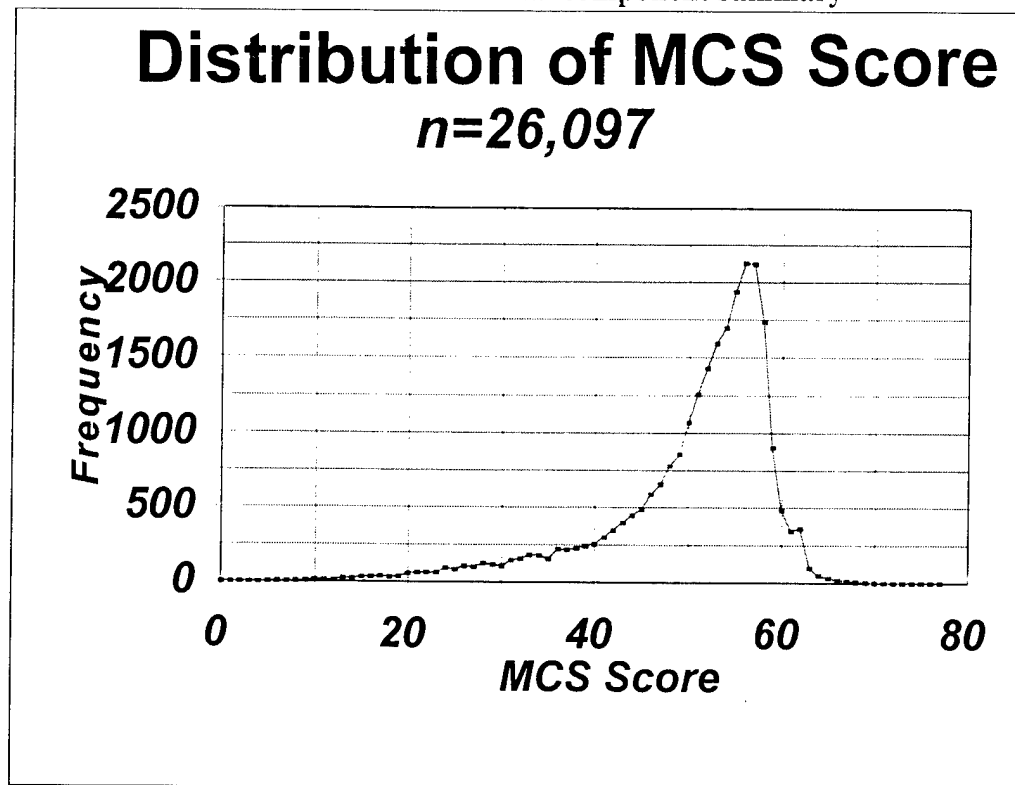


Table 5
Distribution of MCS Scores by Category

MCS Scores	Frequency	Percent	Cumulative Frequency	Cumulative Percent	Tertile
0-30	1417	4.9	1417	4.9	Lowest
31-49	6036	25.6	7453	30.5	Lowest
50-55	8947	32.3	16400	62.8	Middle
56-59	7793	29.9	24193	92.7	Highest
60+	1893	7.3	26086	100.0	Highest

Another critical variable in the study is the binary access variable. Only 1283 of the 26,534 individuals reporting this information in the sample indicated their having had a mental health visit in the preceding twelve month period. This translates into a outpatient utilization rate of mental health services by individuals in this sample of 4.81%. The level of outpatient mental health utilization by these DoD beneficiary groups is considerably less than that reported by Wells and others (1986) for 1975 data from the Rand health insurance experiment. That study reported an outpatient mental health usage rate (defined as any use in a year) of about 7%. The DoD usage rate is also considerably less than the 9% outpatient usage rate for adults aged 19-64 found in the more recent 1987 National Medical Expenditure Survey (NMES-2), as reported by Freiman, Cunningham and Cornelius (1994). A cross tabulation of MCS category and access shows interesting results, with some individuals in the higher mental fitness categories experiencing some utilization while others in MCS determined low mental fitness categories not seeing the mental health practitioner. However, the results generally show

the expected relationship of greater mental health utilization as MCS scores decrease, as has been demonstrated by several papers in the validation efforts of the mental health scales of the SF-36 (Ware and others, 1984; Ware and others, 1994). These results are shown in Table 6 below:

Table 6
Mental Health Access (Use or No Use) by Mental Health Category
($\chi^2=890$; $p < .001$)

		MENTAL HEALTH CATEGORY				
		(MCS Score)				
Frequency						
Percent						
Row Pct						
Col Pct						
		0-30	31-49	50-59	60+	Total
No Mental Health		1019	6152	15811	1859	24841
		3.90	23.57	60.59	7.12	95.19
Usage		4.10	24.77	63.65	7.48	
		78.99	92.33	97.36	97.64	
Mental Health		271	511	429	45	1256
		1.04	1.96	1.64	0.17	4.81
Usage		21.58	40.68	34.16	3.58	
		21.01	7.67	2.64	2.36	
Total		1290	6663	16240	1904	26097
		4.94	25.53	62.23	7.30	100.00

Similarly, one would expect to see the number of visits to a medical practitioner increase as the PCS score declined, indicating lower levels of patient health. This relationship has been demonstrated (Ware and others, 1994) and is apparent from a review of these data as well. Table 7 shows the negative correlation between the number of visits and physical health status, as measured by the physical composite scale, for these data. A similar relationship between mental health status and the number of medical visits also exists and is shown in Table 8. The fact that declining mental health status

leads to increased medical visits is an encouraging sign that offset may be observed. Offset could still be observed even if this relationship did not hold, since offset depends on a comparison of the visit behavior for those who see mental health practitioners and those who do not. However, given the behavioral model of somatized mental health problems and the relatively modest percentage of people who see a mental health specialist, the expectation would be for the negative correlation between mental health status and total somatic visits, as is demonstrated in Table 8.

Table 7

Physical Health Score by Number of Medical Visits
($\chi^2=2716$; $p < .001$)

PCS Score		Number of Somatic Visits					
 V	Frequency						
	Percent						
	Row Pct						
	Col Pct						
		0	1-4	5-9	10-19	20-33	Total
0-30	233	469	355	176	57	1290	
	0.89	1.80	1.36	0.67	0.22	4.94	
	18.06	36.36	27.52	13.64	4.42		
	3.84	4.24	5.83	7.24	12.75		
31-49	1383	2686	1659	779	156	6663	
	5.30	10.29	6.36	2.99	0.60	25.53	
	20.76	40.31	24.90	11.69	2.34		
	22.80	24.26	27.27	32.06	34.90		
50-59	3978	7230	3598	1245	189	16240	
	15.24	27.70	13.79	4.77	0.72	62.23	
	24.50	44.52	22.16	7.67	1.16		
	65.59	65.31	59.14	51.23	42.28		
60+	471	686	472	230	45	1904	
	1.80	2.63	1.81	0.88	0.17	7.30	
	24.74	36.03	24.79	12.08	2.36		
	7.77	6.20	7.76	9.47	10.07		
Total	6065	11071	6084	2430	447	26097	
	23.24	42.42	23.31	9.31	1.71	100.00	

Table 8

Mental Health Score by Number of Medical Visits
 $(\chi^2=335; p < .001)$

MCS SCORE		NUMBER OF SOMATIC VISITS					
 v	Frequency						
	Percent						
	Row Pct						
	Col Pct	0	1-4	5-9	10-19	20-33	Total
0-30		233	469	355	176	57	1290
		0.89	1.80	1.36	0.67	0.22	4.94
		18.06	36.36	27.52	13.64	4.42	
		3.84	4.24	5.83	7.24	12.75	
31-49		1383	2686	1659	779	156	6663
		5.30	10.29	6.36	2.99	0.60	25.53
		20.76	40.31	24.90	11.69	2.34	
		22.80	24.26	27.27	32.06	34.90	
50-59		3978	7230	3598	1245	189	16240
		15.24	27.70	13.79	4.77	0.72	62.23
		24.50	44.52	22.16	7.67	1.16	
		65.59	65.31	59.14	51.23	42.28	
60+		471	686	472	230	45	1904
		1.80	2.63	1.81	0.88	0.17	7.30
		24.74	36.03	24.79	12.08	2.36	
		7.77	6.20	7.76	9.47	10.07	
Total		6065	11071	6084	2430	447	26097
		23.24	42.42	23.31	9.31	1.71	100.00

This section has focused on presenting the reader with distributions of some of the key variables to be used in the study. Its modest intent was to demonstrate that these key variables do indeed vary over a broad range, a necessary prerequisite for a study of this type. The next section deals with the more critical issue of statistical power and minimum detectable differences in the total number of visits between users and nonusers of mental health services.

D. Minimal Detectable Differences Between Groups

The ability to discern the differences in two groups when differences exist is crucial for a research project such as this. Several pieces of information are necessary in determining the power of a given sample to distinguish between . They are: (1) the level of acceptable type 1 error, known as alpha [α]; (2) the level of acceptable type 2 error, known as beta [β]; (3) the magnitude of difference one desires to be able to detect with the study, (4) the number of individuals in each group in the study; and, (5) the variance of each of the groups. Type 1 error is determining that the alternative hypothesis (e.g. that the mean number of visits do differ between Groups A and B) is true when it is, in fact, false (McClave and Benson, 1988). Traditionally, this level is fixed at .05 in health services research, meaning that conclusions asserting differences in groups will be incorrect in five percent of all analyses (Manning, 1996). Type 2 error is a conclusion that the null hypothesis is true (e.g. no difference in medical visits between the groups using a mental health specialist and the group not using a mental health specialist) when in fact it is false (McClave and Benson, 1988). Beta is traditionally fixed at .2 for health services research (Manning, 1996). Since power is defined to be equal to $[1-\beta]$, the commonly accepted level of power in health services research is .8 (Manning, 1996). This research does not deviate from the normative standards for alpha and beta of .05 and .2, respectively. Adhering to these standards allows for comparability of findings across studies, a desirable result, against which no argument is raised on substantive grounds for this research. Therefore, since sample size and variance are fixed in studies using

secondary data, the only unknown is the detectable difference, which can be calculated as shown in equation (3) below:

$$[Z_{\alpha/2} * \sigma_{DIFF}] + [Z_{\beta/2} * \sigma_{DIFF}] = \text{Detectable Difference} \quad (3)$$

Given the known values for alpha and beta, the Z terms of the above equation are 1.96 and .84, respectively (McClave and Benson, 1988; Manning, 1996). Furthermore, the standard deviation of the difference is given by the Equation 4 (below), where N is the harmonic mean of groups of different sizes. According to Cohen (1988), the use of the harmonic mean produces results which are exact, provided neither group's size is small (<10), which it is not in this research. The formula for the harmonic mean, N' is given in equation 5.

$$\sqrt{\frac{\sigma_1^2}{N} + \frac{\sigma_2^2}{N}} = \sigma_{Diff} \quad (4)$$

$$N' = \frac{2 * N_1 * N_2}{N_1 + N_2} \quad (5)$$

Given the known alphas and betas, equation (3) can be expressed as in equation (6) below:

$$[1.96 * \sigma_{DIFF}] + [.84 * \sigma_{DIFF}] = \text{Detectable Difference} \quad (6)$$

For the entire sample, there are 1283 observations where a visit was made to a mental health specialist and 25,251 cases where no visit to such a provider was made. Using equation (5), the harmonic mean, N' , is 2,566. Using the harmonic mean as N in equation (5), and recalling that the sample variance in medical visits for those who used a mental health specialist and those who did not in the preceding twelve months was 37.28 and 19.84, respectively, it is possible to determine that σ_{Diff} is .1492. Then using this value in the formula for equation (6), it is easily determined that the minimum detectable difference is .418. In other words, the mean number of total visits for the users of mental health services must be at least .418 less than nonusers of mental health services for us to detect any offset whatsoever, given the parameters for alpha and beta which will be used in this study. Considering that the means for users and nonusers of mental health services were 7.42 and 3.94, respectively, the detectable difference of under .5 days should be considered quite adequate for this study. Statistically significant differences will result only when this degree of minimal detectable difference is exceeded positively or negatively in any comparisons performed between groups. The purpose of the presentation in this section has been to describe the method for determining differences between groups to show that the size of the sample is sufficient to detect very small differences in means between groups. This method will be applied in the analysis and results of statistical significance or absence thereof will be reported, as appropriate, in Chapter IV.

E. Reliability and Validity

The 1994-95 Health Beneficiary Survey includes two well known measurements instruments in widespread use in health services research. In addition to straightforward demographic and utilization questions, it includes the Group Health Association of America's Patient Satisfaction Survey Instrument and the Short Form 36 (SF-36), a measurement instrument for health status originally developed for use in the Medical Outcomes Study of the 1980s (Graham, 1996). This research does not use the patient satisfaction portion of the survey; therefore, these comments on reliability and validity will be confined to the measurement instrument used for the critical health status variables, the SF-36, and scales derived from that questionnaire.

The SF-36 consists of 36 questions from which eight subscales are derived. These subscales are for the following focus area: (1) physical functioning; (2) role limitations due to physical problems; (3) pain; (4) social functioning; (5) mental health; (6) role limitations due to emotional problems; (7) vitality; and, (8) general health perceptions. The reliability for each of these subscales is reasonably strong and generally exceed the .8 level of Cronbach's coefficient alpha measurement of reliability which Nunnally and Bernstein (1994) suggest as adequate for studies which are concerned, as is this one, with the size of correlations and the mean differences among experimental treatments. Table 9, below, taken from McDowell and Newell (1996), shows that the reliability of the SF-36 subscales has been strong across multiple studies.

Table 9
Cronbach Alpha Coefficients for SF-36 Scales from Several Studies

Scale	Kantz et al (1992)	McHorney et al (1994)	Brazier et al (1992)	Jenkinson et al (1994)	Ware et al (1993)
Physical Functioning	.88	.93	.93	.90	.93
Role Limits (physical)	.90	.84	.96	.88	.89
Pain	.80	.82	.85	.82	.90
Social Functioning	.77	.85	.73	.76	.68
Mental Health	.82	.90	.95	.83	.84
Role Limits (emotional)	.80	.83	.96	.80	.82
Vitality	.88	.87	.96	.85	.86
General Health	.83	.78	.95	Not examined	.81

As might be expected, the PCS and MCS measures, as scores derived through factor analysis of the eight component subscales, have similar reliability levels. Ware et al (1994) reports a Cronbach's alpha of .93 for the PCS and .88 for the MCS in a study of the general U.S. population consisting of nearly 2,500 observations. Similar reliability scores were noted for studies conducted in Germany, Sweden and the United Kingdom (Ware et al, 1994). Using data from the medical outcomes study, the reliability of the composite measures was estimated for the PCS and MCS to be .92 and .90, respectively. These levels of reliability were robust across 23 different subgroups of patients sorted on

the basis of sociodemographic characteristics, diagnosis and disease severity (Ware et al, 1994). The reliabilities of the composite measures are equal to or better than those of the eight subscales of the SF-36, attesting to the validity of the factor analytic approach used to derive the summary measures. Also noteworthy is the fact that test-retest correlations for subjects after six months, with the exception of the pain subscale, range from .6 to .9 (Brazier et al, 1992). The relatively strong stability of the scale scores over a moderately long interval of time is a factor which will be used to assuage concerns over postdiction which will be discussed in a later section of this chapter.

The validity of the SF-36 and its component subscales has been examined extensively by researchers. Direct examination of the SF-36 questions, which appear in Section V (items 72-82) of the 1994-95 DoD Health Beneficiaries Survey at Appendix AF, suggests good content validity. These health related questions and the eight categories of subscales do appear to reasonably capture important aspects of health; however, while content validity can be asserted it cannot be proven against a quantitative criteria (Carmines and Zeller, 1979). Fortunately, other aspects of validity have also been considered by researchers eager to measure the construct of health and some of its component dimensions using the SF-36 as a measurement instrument.

McHorney and others (1993) used both psychometric and clinical criteria to examine the validity of the SF-36 subscales. Administering the instrument to patients with clinically diagnosed physical or mental health problems of known relative severity and judged the ability of the scales to vary appropriately with clinical diagnoses to be excellent in the group of over 1000 participants. This example of criterion-based

validation of the instrument was repeated by Ware (1994) and found to be equally good for the PCS and MCS values, with physical and mental component summaries varying in predicted directions based on the type of impairment and its severity which clinicians had determined in other settings. Indeed, the composite scores perform better than any of the individual subscales. Performance of the PCS and MCS has also been compared with other measures of well-being used in the medical outcomes study and found to be quite good compared to these criteria. For example, the MCS scores were correlated at $r=.88$ with a specific depression measure used in the Medical Outcomes Study (Ware, 1993).

Examinations of the reliability and validity of the SF-36 subscales and its derivative mental and physical component summary scores have been discussed in this section. In general, findings have indicated that this instrument in general and these scale scores in particular perform well regarding their reliability and validity. Their extensive and repeated use in numerous studies since its development in the Medical Outcomes Study is yet another indicator of the reliability and validity of these scales. Certainly, if questions in this regard had existed regarding the validity and reliability of the SF-36, it would not have been selected from among numerous candidates to measure health outcomes in many high profile and extensively scrutinized research undertakings of recent years. While reliability and validity do not appear to be problematic in the data to be studied, there are some issues related to the data and its intended purposes which might be interpreted as problematic. The next two sections address some of these concerns and proposes solutions and workarounds, beginning with the issue of the clinical interpretation of the MCS score.

F. Interpretation of Differences in the MCS Score: The Issue of Clinical versus Statistical Significance

The distinction of the issue clinical significance from statistical significance which arises in any study which considers differences between groups is an important one. Jacobson et. al. (1984) note that establishing statistically significant differences does not establish that such a difference is meaning in any clinical sense. Defining the clinical meaning of scale differences, therefore, is an important role of research. The concept of clinical significance is most meaningful in studies which consider the effectiveness of selected treatment regimens or when comparing modalities of care (e.g. fee-for-service versus prepaid care) and their impact on the health status of a population (Lindgren et al, 1993). While the current study does not fall into these two categories, some consideration of the clinical meaning of a given magnitude of a difference in the mean MCS scores found for various populations considered in this study is useful.

Two approaches are offered to readers who seek to assess the clinical significance of differences in mean MCS scores of various population groups reported in this study. These approaches are the criterion-based approach and the effect size approach. Each will be described, in turn, in the following paragraphs.

The first approach involves a description of the how a given change in score on an interval scale, such as the MCS, changes the likelihood of various salient events. This approach is described as a criterion-based approach (Ware et al, 1994). The advantage of this first approach is that it provides concrete, clinically meaningful, anchor points which the reader can use to assess the meaningful ness of the differences reported. Such an

approach was used by the experimenters in the RAND Health Insurance Experiment, who noted that a three point difference in the Mental Health Index (the interval scale used in their study and a precursor to the SF-36's MCS score) was the equivalent impact of being fired or laid off from a job (Brook et al, 1983; Wells, Manning and Valdez, 1990). The use of a concrete operational definition of changes in scores on a given scale provides the reader with a means of judging the clinical meaningfulness of reported differences in scale values. For the MCS, Ware et al (1994) reports that an increase of three to four points for an individual in the 40-50 point range of the scale, while appearing numerically small, would imply approximately a 21 percent reduction in the likelihood of clinical depression, a twenty percent reduction in the likelihood of mental health treatment, and a twelve percent, and a 28 percent reduction in the percentage of individuals that accomplish less at work due to emotional problems. The linkage of clinical impact with a change in scale score, therefore, provides the reader with a criterion-based benchmark with which to judge reported differences.

An alternative, more general approach, uses the concept of effect size as the method for categorizing the clinical importance of a given change in a scale score. This approach, recommended by Kazis et al (1989), is suggested because many of the newly developed health status scales, like the Mental Component Summary, have not been interpreted from a clinical perspective throughout the range of the scale. As a result, interpretations of clinical meaningfulness may be difficult. This is particularly the case because these psychometric interval scales are only nominally interval scales. In other words, the units appear to be equal in size as an artifact of development rather than

because of some intrinsic reason. In reality, these psychometric scales which are represented as interval scales may in fact be nonlinear or discontinuous. For example, a three point difference may be the equivalent to the loss of a job for a median person in a study but mean much less (or more) to a subject who is an outlier in one respect or another. This danger means that exclusive reliance on criterion-based approaches may result in poor assessments of clinical meaningfulness by the reader. Therefore, Kazis et al (1989) recommends the more objective effect size approach of interpreting the clinical meaningfulness of results. This approach defines effect size to be the mean difference in scores (either between groups or in a pre- and post-test situation) divided by the standard deviation of scores from the instrument. Using benchmarks suggested by Cohen (1988), an effect size of .2 is considered small, one of .5 as moderate, and an effect size greater than or equal to .8 as large. For the MCS scale, which has been standardized with a standard deviation of ten, interpretation is quite easy, since differences in scale scores need merely to be divided by ten in order to determine effect size. Therefore, a difference of two points on the MCS (effect size of $2/10$ or .2) would represent a small difference. Unlike the first approach, the approach recommended by Kazis et al (1989) is not subject to implicit and untestable assumptions regarding the linearity of the scale throughout its range.

The purpose of this discussion is to prepare the reader to interpret the descriptive research findings arising from research question number one from a clinical perspective. However, caution is suggested in relying on clinical interpretations to judge the meaningfulness of differences in mental health status. The current research is not a

clinical study which seeks to test the effectiveness of one method of care over another. Neither is it intended to be an evaluation of the effectiveness military health services system versus the civilian health care system, although it could be interpreted to be such. Instead, differences between groups are reported simply as a means to determine whether or not members of one group have systematically lower (or higher) mental health status scores than members of another group. For such an analysis, statistical significance is the primary test to determine the meaningfulness of results. As the primary purpose of this analysis is to consider the potential for managerial, rather than clinical, intervention, no discussion regarding the clinical significance of the findings will be offered in Chapter IV. However, for the reader interested in extending the interpretation of these results beyond the objectives of the current study, it is hoped that the information provided in this section provides some guidance.

G. Data Problems and Solutions

In addition to the issue of clinical significance discussed in the foregoing section, three basic problems have been identified with the data set available for this research. First, the data regarding utilization is collected at one point in time. Typically, a study such as this would follow a panel design where a cohort of beneficiaries was evaluated periodically, regarding health status and utilization behavior (Jones and Vischi, 1979; Mumford et al, 1984). The available data set does not permit a study designed in this way; therefore, an alternative approach was taken. The data available for this study do not indicate when in the preceding 12 month period the first mental health visit occurred. Theoretically, offset should occur only after usage of mental health services. Therefore, if

the first and only mental health visit came on the day the survey arrived, there would be no real opportunity for offset but the observation would be included in the group with mental health usage. Similarly, if the last mental health visit occurred thirteen months prior to receipt of the questionnaire, the effects of psychotherapeutic insights might have been experienced in the measurement period, but the observation would be placed in the no mental health usage category. The result of this situation is a fuzzing of categories which biases the study toward a null finding. Fortunately, the relatively large sample size of the data set is likely to be able to overcome this bias toward zero, since new episodes of mental health care consisting of one or more mental health visits are likely to be uniformly distributed across the twelve month period of study. As a result, half of the mental health visits will have occurred in the first six months of the study. Given Longobardi's (1981) finding of a 66% reduction of outpatient visits in the six months following a mental health intervention as compared to the six months prior to an intervention, this researcher is hopeful that large numbers will overcome the problems associated with the cross sectional nature of this study. As things are, a positive finding of reduced medical utilization given usage of mental health services will understate, rather than overstate, the true degree of offset.

The second problem with the data is the issue of "postdiction," an issue which arises in most cross sectional utilization studies (Manning, Newhouse and Ware, 1982). Mental health status is captured at the conclusion of the period rather than at the beginning and the end of the period. This means that no valid conclusions can be drawn regarding the effectiveness or the appropriateness of mental health treatment for individuals based on

their emotional well being scale scores. Neither can this emotional scale score be used as a valid dependent variable in the analysis. However, this is not the aim of the analysis. Instead, the emotional scale score is one of several predictors for prior year utilization. It is planned to be used as a 0/1 dummy variable, with those with scores falling below the cutoff score used as an indicator of mental health need included in the equations for mental health "access" and medical visits. Since the MCS is based on scales which are constructed with the language of "in the past 4 weeks...", it is impossible to avoid this problem entirely if the time span for which visits are considered is in excess of the month prior to the survey. a study by Nerentz et al (1992) is encouraging, however, as it showed that the mental health component of the SF-36, to have a test-retest reliability of .795 after six months, thus suggesting that mental health status, while not fixed, changes rather slowly over time. Such a result suggests that using a post-hoc measurement for mental health status may be reasonable, given the lack of alternatives available in the analysis of a secondary data set. Even in other types of analyses, in which mental health status is evaluated at the beginning and the end of the study period, one still has the problem that mental health status in the middle months of the study will not necessarily be the same as in the first or last months, when it is measured. No studies were encountered in the literature reviewed for this project which measured mental health status monthly and calibrated that scale value with the prior month's utilization, which would be the technically correct solution to this dilemma. Issues of practicality must be considered in empirical research which necessitates a less than pristine approach to measurement. Given that the mental health variable will be used largely as a categorical measure of

mental health problems which identifies quartiles of mental health status, and that only the extreme quartiles will be scrutinized carefully to answer the research hypotheses, the post-hoc measurement, while not ideal, would seem to be usable for its limited purpose of identifying subsets of individuals with more (or less) need than the average individual in the sample.

The final problem in the data is associated with the endogeneity of the mental health usage variable. This problem is distinct from a simultaneous equations bias problem, which was ruled out on the basis of theory, in favor of the current, and hierarchical, research model which was presented in Chapter II. The strong likelihood of omitted variables affecting both this variable and the dependent variable of physical health visits gives rise to a potential for bias in the coefficients. This issue was discussed in some detail in the previous chapter. The proposed remedy to this situation involves the use of instrumental variables in order to accomplish the methodological technique of two stage least squares (2SLS). This effective method will be discussed in greater detail in the sections which follow.

H. Data, Models and Methods: An Integrating Overview

The research questions were developed with consideration for their value from both the scientific and policy perspectives. The first, fourth and fifth research questions address key areas of interest to DoD policymakers; the findings for these questions will be of greater interest to policy makers in DoD. The second and third research questions address issues of a more scientific nature, the identification of the offset phenomenon in a military population. The answers to these questions will be of greater interest to the

health services research community. While the answers to the latter group of questions constitutes the core of this research effort, the importance of the former group should not be underestimated. These audience-sensitive research objectives are equal in importance to the scientific questions because it is the DoD policymaker audience alone which has the authority to permit more definitive analyses and effect systemic change in the future.

The less sophisticated research questions of interest to policymakers which involve no complex modeling or methodological issues, are important issues because they address information demands that DoD policymakers will require before considering the scientific issues involved. Essentially, these research questions are intended as the bait which will pique interest in the scientific conclusions made in this and future studies in the area of mental health utilization in the MHSS and will use the responses of both health care users and nonusers. Research question number one involves a series of presentations of descriptive statistics which serve to orient the reader and are important perspectives required based on the organizational structure of the U.S. military. It requires no sophisticated models, and all presentations will use available descriptive statistics available in SAS and compares different subgroups to each other based on utilization and mental health morbidity. In spite of efforts to reduce interservice rivalry, the culture of interservice competition remains strong in the military, even in the medical service (GAO, 1995). Presenting comparisons of means showing utilization and mental health morbidity may seem scientifically mundane, but they are often seem to be riveting for leading DoD decision makers (Graham, 1996), the people expected to be the principle

consumers of this research. Research question number four estimates the average overall offset effect in terms of excess physical health visits by nonusers of mental health services. Finally, research question number five makes a rough quantified estimate of the gross benefit of offset based on average cost per outpatient visit, the amount of offset per patient determined in the model, and the impact that a shift in the proportion of individuals getting mental health care might make. The use of multiple assumptions and averages in determining this figure makes the offset figure very imprecise. Nevertheless, question five provides an empirically-based estimate of the impact of offset on excess utilization, a number which the DoD audience will demand in order to determine the relative importance of this issue and further research into this area.

The research questions of greater scientific interest (two and three) involve considerably more complex modeling and methodological issues. The model presented earlier collects into a single diagram the key variables identified in the literature which are available in the data set and said to be predictive of utilization. Essentially, positive evidence of an offset effect will occur if the mental health usage variable in the two stage least squares prediction model is negative and significant. Theoretically, offset should only be present in the subpopulation which falls below a threshold level of mental health need, which has been defined as an MCS score less than or equal to 47 in this study. Readers are reminded that (mental health) USAGE is a binary variable, where 1=some usage and 0=none. If evidence of offset is found, the degree of offset will be determined by comparing the mean number of ambulatory physical health visits made by individuals who received mental health treatment with those who did not receive such treatment. The

extent of the offset can be measured by the magnitude of the difference in the predicted value of the dependent variable, retransformed to original units using the smearing estimator, for users and nonusers. If these are significant in the hypothesized direction, with nonusers receiving more physical health visits than users with the similar levels of mental health need, then this is evidence of offset in the group under study.

In contrast to the approach taken for research question one, which considers aspects of mental health status and usage for active duty members and their families, and draws on the full population of active duty and family member respondents, the remaining research questions consider a subset of responses which are relevant to an investigation of offset. The findings presented for these questions will only consider the subset of active duty and family member beneficiaries individuals who are users of physical health services and who live within a catchment area of a military medical treatment facility.

The restriction of the sample to users of physical health services amounts to an exclusive consideration of observations represented the two cells in the right hand column in the table shown below. This conditional analysis is justified on two grounds, one empirical and one theoretical. The empirical basis of considering beneficiaries conditional on their usage of physical health services is illustrated by Table 10 below. As can be seen in that table, only 68 individuals out of over 26,000 (.25% of the total) in the sample are users of mental health care but nonusers of physical health care. Given that there are 17 independent variables in the basic set of model variables for the equation of interest, the tiny operational cell size of this subgroup makes reasonable estimation for

this group statistically meaningless. This empirical argument eliminates the lower left hand cell from the analysis on the grounds of statistical feasibility..

Table 10
Cross Tabular Display of Mental and Physical Health Users

		Physical Health Use		
Frequency				
Percent				
Row Pct				
Col Pct		None	Some	Total
-----+				
No Mental Health		6101	19150	25251
Usage		22.99	72.17	95.16
		24.16	75.84	
		98.90	94.03	
-----+				
Some Mental		68	1215	1283
Health Usage		0.26	4.58	4.84
		5.30	94.70	
		1.10	5.97	
-----+				
Total		6169	20365	26534
		23.25	76.75	100.00

Consideration of only physical health users also makes sense on a theoretical basis. The upper left hand cell is eliminated because offset cannot be determined considered for people who do not access the health care system at all. There is nothing to be offset if people do not access the health care system. This empirical fact notwithstanding, it is theoretically possible that changes made to the system could shift nonusers of the system into the user category and thus have an impact on utilization and offset. However, measurement of offset using this cross-sectional data set which observes the situation at a single point of time renders this theoretical possibility incapable of measurement. Given this situation, it is only practical to consider current

users of the system (the “some” column) in answering research questions two through five. Therefore, this study will confine itself to the subsample of beneficiaries who report some physical health visits. These arguments of for a consideration of data conditional on physical health usage obviates the need for either a Tobit or a Rand two-part model for this research effort.

The exclusion from consideration of individuals in the sample who do not live within the bounds of a catchment area is done for reasons of methodological necessity. Overcoming the endogeneity of the mental health usage variable is a key concern in this study. The instruments used which overcome the endogeneity problem are only relevant for individuals who live within a DoD catchment area. Therefore, the methodological approach taken forces one to consider only this subset of the population, which is a total of approximately 15,400 observations. Fortunately, this group represents a sample of the most important population subset. DoD actively seeks to manage health care of its beneficiaries who reside in catchment areas. Most active duty members and their families live within catchment areas; moreover, DoD has significantly greater options in areas where it provides both direct care through its own facilities and supplemental care through civilian sources. Therefore, this necessary restriction is not terribly onerous with regard to the impact on policy recommendations.

The discussion of methodological issues which affect the approach taken in this study continues in the following section.

I. The Transformation of the Dependent Variable and Related Methodology Issues

The possibility that the dependent variable in the principal model, total physical health visits, might have to be transformed was recognized and considered. This is likely because an examination of the distribution of this variable reveals a high degree of skewness, even when only nonzero observations of this variable are considered. The need for a variance stabilizing transformation was assessed using the method proposed by Box and Cox (1964), as recommended by Weisberg (1985). The Box and Cox method represents a systematic approach in the selection of an appropriate transformation of the dependent variable in the model. This analysis was performed using the SAS macro, ADXTRANS, a utility available under the SAS/QC family of software (SAS Institute, 1989). Essentially, this procedure uses maximum likelihood methods to determine a parameter, lambda (λ), which simultaneously determines the value of parameter coefficients, standard deviation and an inserted λ parameter. An optimal lambda of 1 means no transformation is required for the data; a zero indicates a logarithmic transformation is appropriate for the data and other values, typically in increments of .5, indicate the power transformation suggested for the dependent variable (Weisberg, 1985). In simplified terms, the following model is examined with the Box Cox procedure, with the objective of the procedure to identify a lambda which minimizes heteroskedasticity of the variance.

$$Y^\lambda = X\beta + \epsilon \quad (7)$$

Appendix C shows the results of this Box-Cox analysis procedure produced by the SAS software for these data, which found that the optimal lambda was zero for the full range of the data used ($\lambda=0$), which is applicable for the second research question. Additional runs of the Box-Cox analysis for subsets of the data required for analysis under research question three (e.g. men only, active duty only) returned a lambda of zero in all cases without exception. Therefore, a natural logarithmic transformation of the dependent variable will be used in both of the research questions which seek to determine the presence of offset (questions two and three).

Specification tests are employed to ensure that the transformations suggested by the Box-Cox procedures are indeed appropriate. The specification test used in this dissertation is the Pregibon link test. This test is available in the statistical and econometric software package called Stata, which is capable of reading in SAS datasets, like the one used for this analysis, quite easily. The Stata manual captures the essence of that test quite well and is quoted below:

The link test is based on the idea that if a regression or regression-like equation is properly specified, one should not be able to find any additional variables that are significant except by chance. One kind of specification error is called a link error. In regression, this means that the dependent variable needs a transformation or "link" function to properly relate to the independent variables. The idea of a link test is to add an independent variable to the equation that is especially likely to be significant if there is a link error. (Stata, 1993)

The added independent variables are the residuals of the regression equation for the proposed model and the square of the residuals of the regression equation. The residuals, of course, are expected to be highly correlated with the regression model. The

key issue is after taking this relationship into account, the square of the model residuals, which should be uncorrelated with a correctly specified model, are significant (Stata, 1993). If they are uncorrelated, it suggests that the model is correctly specified; in particular, the test provides excellent evidence to support the appropriateness of the dependent variable transformation suggested by the Box Cox method described above. This utility in assessing the appropriateness of the specified model in general and the transformation of the dependent variable, in particular, is the reason for its selection as a key diagnostic method for this analysis. The results of the Pregibon linktest will be presented in Chapter IV.

The goodness of fit of the theoretical model will also be tested in a more general sense. The theoretical model derived from the analysis of the literature includes one quadratic term, the square of age (AGE2). Also included are interaction terms of AGE*MSEX and MCS*USAGE. Without goodness of fit testing, one is uncertain as to whether the literature has considered all of the quadratic or interaction terms relevant to the model. One approach to goodness of fit testing has been suggested by Hosmer and Lemeshow. These researchers suggest analyzing the suitability of a proposed model by breaking the regression of interest into deciles and determining whether the defined model seems to fit the data appropriately throughout all portions of the range of the dependent variable (Lemeshow and Hosmer, 1982; Hosmer, Lemeshow and Klar, 1988; Hosmer, Tabor and Lemeshow, 1991). While Hosmer and Lemeshow developed their procedure in order to test the goodness of fit for logistic regression models, the basic approach of piecewise testing of the suitability of a model is appropriate for all types of

models. It is the same approach that motivates other, possibly more well-known, approaches for assessing model specification and goodness of model. These include Ramsey's regression specification errors test (aka RESET test) (Ramsey, 1969) or Utts' rainbow test (Utts, 1982). The software package, STATA, uses the Hosmer-Lemeshow variant of this general approach to model specification and goodness of fit testing computes the goodness of fit for the proposed model using a procedure called the Hosmer- Lemeshow linearity test (Stata, 1993). T-statistics are computed for the suitability for each of the ten deciles of the distribution of the dependent variable. Significant t-statistics for any decile is indicative of inadequate specification of the model, often suggesting the omission of a quadratic or interaction term in the model being tested. The results of the Hosmer-Lemeshow linearity test will be reported in Chapter IV.

A transformation of the dependent variable, while useful in normalizing the distribution of the dependent variable and permitting analysis of the data using parametric methods which require the assumption of a normal distribution for the data, also exacts a price. Interpretation of results is no longer straightforward. For questions where the magnitude of the dependent variable is of interest, the data must be retransformed back to their original units. Specifically in the case of this study, the retransformation is necessary in order to appropriately respond to research question number four, where the magnitude of the excess physical health visits must be estimated in actual visits rather than log transformed visits, a figure which is meaningless to decision makers.

The retransformation problem has been recognized in the health services research literature. The retransformation of a dependent variable from a logarithmic transformation back to its original units was developed by Duan (1983) as part of his work with the RAND health insurance experiment. This method is known as the Smearing estimator; it is a nonparametric retransformation technique which corrects for the inconsistent mean and variance which occurs when the transformed dependent variable is retransformed back to visits from log-visits. The procedure is performed using the following three step process. First, run the regression with the transformed dependent variable and save the residuals and the coefficients of the independent variables from this regression. Second, exponentiate the saved residuals and calculate their mean, this results in the smearing estimator, which is called S. Expressed mathematically, the second step is as follows:

$$S = \frac{\sum e^{U_{hat_i}}}{n} \quad (8)$$

Third, multiply the predicted coefficients from the original regression by the value of each of the independent variables in the regression. Fourth, exponentiate this product. Finally, multiply this product by the smearing estimator. These last three steps can be summarized with the following expression:

$$E(Z_i) = e^{X_i * Bhat} * S \quad (9)$$

The result will be the prediction of total physical health visits, the dependent variable prior to the transformation. The smearing retransformation will be used in order to convert log transformed total visits back into the original units for purposes of presentation of estimates of magnitudes of change resulting from offset which are more easily interpretable by the intended audience for this research.

J. Survey Design and Its Methodological Implications

The DoD Health Beneficiary Survey for 1994-95 was designed to satisfy a large number of stakeholders. Among these stakeholders are individual military medical treatment facilities which are eager to learn more about the characteristics of the patients they serve in their catchment area and the satisfaction of various segments of their beneficiary population with the services rendered. The military Services operate over 150 stand alone facilities throughout the world. Many of these facilities are small and serve small base populations. The designers of the study at the Department of Defense wanted these facilities to be able to use the survey results to inform local decision-making and analysis by the medical facility commanders. A simple random sample, while effective in capturing the characteristics of the beneficiary population as a whole, would not be capable of providing sufficient cell sizes by beneficiary group to reliably inform commanders of smaller medical facilities serving relatively small populations.

Because of these various concerns, the DoD directed the prime contractor of the survey, Westat, to design a stratified sample with the military medical facility as the primary sampling unit and beneficiary categories as the strata within the primary sampling unit. Individuals were selected systematically from eligibility rosters arrayed by social security number from within the stratum of interest for each primary sampling unit. This approach, while ensuring adequate cell size for each beneficiary category for each facility, also creates a design effect which must be addressed when determining appropriate means and variances when the unit of analysis differs from a single beneficiary stratum (e.g. active duty members) within a single primary sampling unit (e.g. Eisenhower Army Medical Center) (Chu and Flores-Cervantes, 1994).

The solution to estimating means and variance from complex survey designs involves two procedures, weighting and replication. Weighting is required for the estimation of both means and variances of parameters. Replication techniques are required to get accurate estimates of variances in complex samples (Latta et al, 1996; McCarthy, 1966;Graham, 1996). Specialized software is required in order to determine accurate means and variances for parameters, such as mental health status, since the unit of analysis is the group and the representativeness of the sample of the group of interest is affected by the stratified sampling design and differential nonresponse among groups.

The use of specialized software is not necessary when testing behavioral models, such as offset, because the unit of analysis is no longer the group, but the individual (Opsut, 1996). In other words, an individual's physical health utilization habits can be considered without regard to design effects on variance estimates because the issue of

interest is not an estimate of a parameter average but of whether a certain, theory-based behavioral phenomenon occurs or not. As a result, the offset portion of the study, which is considered in research questions two through five, can use the survey results without concern for the design effects on variances for discrete groups. When investigating offset, where the unit of analysis is the individual, rather than the group, design effects are no longer relevant. Moreover, the model itself deals with relevant differences in terms of facility and individual characteristics. For these reasons, SAS or other similar packages, such as Stata, can be used without adding replication weights to the empirical model in order to determine research findings related to the central issue of offset. Nevertheless, a brief discussion of replication techniques and weighting is required because it is relevant in making an accurate finding for the group of research questions under research question number one.

Weighting is accomplished in order to ensure that the sample of respondents can be used to estimate the population characteristics. A key step in this procedure is to compare the demographic attributes of sample respondents with the known characteristics for the population and apply poststratification weights. This procedure was used with the DoD survey used in this study as the primary data source. The weighting variable, RWT, is used to ensure estimates of the mean for parameters are not skewed by a nonrepresentative sample due to sampling design or nonresponse patterns. Weighting must be used to obtain accurate point estimates of the mean for parameters using standard commercial software packages, such as SAS or SPSS (Latta et al, 1996). The procedure in SAS simply involves adding a weight statement to the model and identifying the RWT

parameter as the weight (or `aweight=rwt` in Stata). These weights are used throughout the analyses. However, estimating variances of these mean estimates is somewhat more complicated. These require the inclusion of replicate weights in order to return variances of the estimated parameter means for various subgroups which are consistent with the sampling design of the survey.

Variance estimates of parameter means for groups require the use of specially designed software. Commercial products such as SAS and SPSS assume a simple random sample and typically underestimate the variance of parameters from complex survey designs (Opsut, 1996; Latta et al, 1996). The actual variance of parameters from the sample may only be determined using replication techniques (McCarthy, 1966; Graham, 1996). Fortunately, several software products which are capable of handling complex survey designs effectively are available. These products include Sudaan, Stata, and Wesvar PC. One of these products, Wesvar PC, was used in order to make estimates of the variance of some parameters of interest. Accurate variance estimates is particularly important in order to deliver accurate findings for research question number one, where the focus is comparing means of groups in order to determine whether means of two groups are different vis-a-vis their mental health status and mental health usage rates. Accurate estimation of variance is a critical component of this research question and use of specialized variance estimation software products cannot be avoided.

Replication is one general approach used for generating accurate variances which are representative of the population of interest (Brick et al, 1996). The main idea is to take subsamples of the sample and use the distribution of the subsample estimates in

order to estimate the variance of the entire sample. The specific approach used in this research is the jackknife replication method for estimating variances. For the health beneficiary survey, forty subsamples, or replicates are used and each observation is assigned forty replicate weights which are used along with the final refined weight to produce accurate estimates of variance for the parameters which are appropriate for the entire population. The jackknife procedure is accomplished as described in this excerpt from the Technical Manual for the 1994-95 Survey (Latta et al, 1996):

The standard errors of estimates from the survey can be calculated by the following jackknife replication approach. Let $\hat{r}$ denote a weighted survey estimate (e.g. the average number of visits to an MTF by active duty personnel or the average satisfaction score for a catchment area). Further, let $\hat{r}(j)$ denote the corresponding estimate derived from the jackknife replicate, using replicate-specific weights. The estimated variance of $\hat{r}$ will be computed from the formula:

$$VAR(\hat{R}) = \frac{(K-1)}{K} \sum (\hat{r}_j - \hat{r})^2$$

Where the summation in the above formula extends from $j=1$ to $K=40$ jackknife replicates. The standard error of the estimate, $se(\hat{r})$, is the square root of the estimated jackknife variance given in the above formula and the corresponding 95 per cent confidence limits around the estimate are given by $\hat{r} \pm 1.96 se(\hat{r})$.

The jackknife procedure described above (Jackknife Type 1) has been validated for use by researchers using the DoD data set by Adam Chu, lead Westat statistician for the 1994-95 DoD Health Beneficiary Survey project (Graham, 1996).

K. Justification of the Instrumental Variables Approach

Research questions two and three focus on the central issue of the presence of offset. Since, for reasons described earlier in this chapter, only the conditional case of users of physical health services is being considered in this study, methods dealing with issues of sample selection into users and nonuser of physical health services are not directly relevant. As a result, sample selectivity models used to determine the attributes of physical health users and nonusers or, alternatively, Tobit or RAND two-part models which seek to adjust for the characteristics of observations below a given threshold are not applicable to this study. However, the possibility of real and unobserved differences in the behavioral characteristics of mental health users and nonusers makes some method of selectivity correction necessary.

The decision to use mental health services should be considered as a threshold problem in which some of the variables, such as mental health status, are known, but many other variables, such as beliefs regarding one's susceptibility to mental health problems (as suggested by the health belief model), remain unknown to the researcher. As a result, the usage of mental health services serves as a proxy which includes the sum of the influences exerted by omitted variables on mental health usage and physical health usage. The likelihood of underlying and unobserved differences in the characteristics of mental health users and mental health nonusers makes some form of selectivity correction model necessary.

The method chosen to deal with these self-selection problems is two stage least squares, implemented using an instrumental variables approach. This method solves the

problem of an included endogenous variable, mental health usage, in the equation of interest by eliminating the error term of the secondary equation through the use of an instrument. An instrumental variables approach uses the instrument (Z), the vector of independent variables (X), and the dependent variable (Y) in order to calculate parameter coefficients. Using the instrumental variables approach to parameter coefficient estimation, $\beta_{\text{usage}} = (Z'X)^{-1} (Z'Y)$, rather than $\beta_{\text{usage}} = (X'X)^{-1} (X'Y)$, the formulation which would apply without the use of an instrumental variables approach.

A recent, and widely known, application of instrumental variables in health services research was an article which appeared relatively recently in the *Journal of the American Medical Association* and written by McClellan, McNeil and Newhouse (1994). That objective of that article was to see if more intensive treatment of myocardial infarction patients reduced mortality. The estimation difficulty in that study resulted from the fact that patients were not assigned randomly to treatments. The lack of random assignment introduced the possibility of omitted variables (e.g. case mix) that affected both the choice of treatment and subsequent outcomes, controlling for other observed variables in the outcome equation. The problem is similar to the one found in this study. McClellan and his co-authors used distance from the nearest specialty hospital as an instrument. Distance to a specialty hospital was correlated with the type of treatment (more intensive) received but theoretically not correlated with other unobserved differences which affected both the selection of treatment and the outcome. In this way, these researchers were able to obtain unbiased and consistent estimators for the coefficients of the endogenously determined treatment variable. This study takes a

parallel approach in achieving consistent and unbiased estimators for mental health usage coefficient by using site specific instruments which are strongly correlated with the endogenous independent variable of usage but theoretically uncorrelated with the omitted variables affecting the equation of interest.

One of the important criteria of a good instrument is a strong correlation with the endogenous independent variable for which it is intended to be an instrument.

Instruments which are only weakly correlated with endogenous explanatory variables can lead to significant levels of bias in the instrumental variable estimator which cannot be remedied by increasing the number of observations in the data set (Staiger and Stock, 1994). Bound, Jaeger, and Baker (1995) provide a benchmark for determining the level of bias remaining in the coefficient of the endogenously determined independent variable when instruments of various degrees of strength are chosen. The comparison is the level of bias in the instrumental variable estimator relative to an ordinary least squares estimator without the confounding aspect of endogenous predictors embedded in the model. The vertical axis of the table below shows the number of instruments in the model; the horizontal access reflects the results of a partial F test for the instrument from the regression of all of the predictors of the included endogenous variable.

Table 11

**Bias of IV Estimates Relative to OLS Estimates
(Bound, Jaeger, and Baker, 1995)**

Partial F Statistic for Instruments						
<i>No. Of Instruments</i>	.5	1.0	2.0	4.0	10.0	100.0
2	.61	.37	.14	.02	.00	.00
3	.62	.411	.21	.09	.03	.00
10	.65	.47	.30	.17	.08	.01
20	.66	.49	.32	.19	.08	.01
100	.67	.50	.33	.20	.09	.01
200	.67	.50	.33	.20	.09	.01

Appendix D gives the results of the regression of the X and Z variables on the endogenously determined MH variable. The partial F statistic for these two instruments, FACISOL and PROV RAT, for the entire sample of over 15,000 observations used in the analysis of offset analyses is shown at the bottom of the regression output. It is 8.06. This corresponds most closely to the highlighted cell in the above table, which shows that two instruments with this strong a level of correlation with the endogenous independent variable are excellent instruments because they produce estimates of coefficients with almost no bias. As a result, the first necessary condition for an instrumental variable approach, instruments which are strongly correlated with the endogenous independent variable, is met in the case of the current research. It should be noted that the strength of the instrument presented here is for theoretical purposes only. The strength of the instruments for subsets of data set considered to evaluate specific research questions is an

empirical issue which must be analyzed on a case-by-case basis for each subset. The strength of the proposed instruments will be discussed in Chapter IV and supporting appendices, where appropriate. However, the fact that the instruments meet the important criteria of strong correlation with the endogenous independent variable for the entire sample should be construed as favorable initial evidence regarding the utility of the proposed instrument.

The second necessary condition for an instrumental variables approach is the assumption that the proposed instruments are not correlated with the “O” variables in the model (McClellan, McNeil and Newhouse, 1995). These assumptions are not directly testable, but it is possible to provide supporting evidence that makes such an assumption more plausible. The theoretical arguments for the lack of association between the instruments and unobserved factors affecting the physical health usage were put forth in Chapter II. Essentially, they were based on the fact that the military’s method of assigning active duty members and mental health providers is essentially random with respect to the mental health needs of the base population. An empirical method which supports, but does not prove, this claim can be found by considering the distribution of key model variables such as mental health status and physical health status across categories of the instruments. If there is little difference in the distribution of illness across these categories, this is evidence, but not proof, of the quasi-random results of the military assignment process with respect to mental and physical health need among active duty members and their families. The two tables below show the cross tabulation of the

instruments, FACISOL and PROV RAT (broken into approximate quartiles) with the distributions of mental health status (MCS), broken into quartiles.

Table 12

Cross Tabulation and Chi Square Test for Independence of Mental Health Provider Ratio and Mental Health Status

TABLE OF RATLEV (PROVRAT QUARTILE) BY MCSLEV (MCS QUARTILE)

RATLEV		MCSLEV			
Frequency					
Expected	M C S		L E V E L		
Percent					
Row Pct					
Col Pct	LOWEST	LOWMID	HIMID	HIGHEST	Total
LOWEST	1390	1439	1386	1346	5561
	1417.2	1404.7	1349.2	1389.9	
	6.83	7.07	6.81	6.61	27.31
	25.00	25.88	24.92	24.20	
	26.78	27.97	28.05	26.44	
LOWMID	1211	1095	1081	1161	4548
	1159.1	1148.8	1103.4	1136.7	
	5.95	5.38	5.31	5.70	22.33
	26.63	24.08	23.77	25.53	
	23.33	21.29	21.88	22.81	
HIMID	1171	1175	1124	1216	4686
	1194.2	1183.6	1136.9	1171.2	
	5.75	5.77	5.52	5.97	23.01
	24.99	25.07	23.99	25.95	
	22.56	22.84	22.75	23.89	
HIGHEST	1418	1435	1350	1367	5570
	1419.5	1406.9	1351.4	1392.2	
	6.96	7.05	6.63	6.71	27.35
	25.46	25.76	24.24	24.54	
	27.32	27.90	27.32	26.86	
Total	5190	5144	4941	5090	20365
	25.48	25.26	24.26	24.99	100.00

STATISTICS FOR TABLE OF RATLEV BY MCSLEV

Statistic	DF	Value	Prob
Chi-Square	9	12.965	0.164
Likelihood Ratio Chi-Square	9	12.955	0.165
Mantel-Haenszel Chi-Square	1	0.016	0.900
Phi Coefficient		0.025	
Contingency Coefficient		0.025	
Cramer's V		0.015	

Sample Size = 20365

Table 13

Cross Tabulation and Chi Square Test for Independence of Mental Health Provider Ratio and Mental Health Status

TABLE OF FACISOL BY MCSLEV (MCS QUARTILE)

TABLE OF FACISOL BY MCSLEV

FACISOL(Facility Isolation Indicator)		MCSLEV			
Frequency					
Expected					
Percent					
Row Pct					
Col Pct		1	2	3	4
-----+-----+-----+-----+-----+					
Rural/Overseas		1334	1269	1228	1254
		1299.9	1279.9	1223.5	1281.7
		8.22	7.82	7.57	7.73
		26.23	24.96	24.15	24.66
		32.15	31.06	31.45	30.65
-----+-----+-----+-----+-----+					
US SMSA Location		2815	2816	2677	2837
		2849.1	2805.1	2681.5	2809.3
		17.34	17.35	16.49	17.48
		25.26	25.27	24.02	25.46
		67.85	68.94	68.55	69.35
-----+-----+-----+-----+-----+					
Total		4149	4085	3905	4091
		25.56	25.17	24.06	25.21
					100.00

STATISTICS FOR TABLE OF FACISOL BY MCSLEV

Statistic	DF	Value	Prob
-----+-----+-----+-----			
Chi-Square	3	2.335	0.506
Likelihood Ratio Chi-Square	3	2.332	0.506
Mantel-Haenszel Chi-Square	1	1.637	0.201
Phi Coefficient		0.012	
Contingency Coefficient		0.012	
Cramer's V		0.012	

The key item to note from the above tables is that the Chi-Square statistic shown at the bottom of the table unequivocally reflect results which make it inappropriate to reject a null hypothesis of independence of the two variables. This is an amazing result

given the relatively large sample size involved. The result lends strong credence to the argument that the supply of mental health providers, both on base and in the civilian community, is uncorrelated with the mental health needs of the assigned active duty population and their families. In other words, from a perspective of mental health care, the military assignment process approximates a randomized assignment process. While this finding may not be welcome by those in need of mental health care or DoD health care leaders, it does provide an excellent foundation for research, since this result, coupled with the earlier result of strong correlation of the proposed instruments with the endogenous mental health usage variable, makes the use of instrumental variables approach reasonable in this research effort.

L. Justification of Two Stage Least Squares as an Estimation Technique

The two stage least squares methodological approach is a single equation instrumental variable method (Greene, 1990). A single equation method is appropriate for this investigation of offset because the hierarchical nature of the model means that only one equation, the one in which physical health visits is the dependent variable, is relevant in determining offset. The secondary equation for predicting usage is required only because mental health usage is an endogenously determined independent variable in the primary equation. Since unmeasured, "O", variables are suspected of affecting both mental health usage and physical health visits, the problem of bias-producing, correlated error terms in the two equations is the result. The solution to this dilemma is to eliminate the error term in the secondary equation for mental health usage by using instruments which are correlated with mental health usage but theoretically uncorrelated with any

omitted variables relevant to the model in order to estimate the endogenous independent variable of mental health usage. Substituting the predicted, or instrumented, value of mental health usage for its actual value eliminates the bias problem by eliminating the measurement error for this term in the primary equation.

Two stage least squares basically involves running two regressions sequentially. The first stage, using instrumental variables, fixes the value of the endogenous independent variable by substituting the true parameter with a predicted value for the parameter. The second stage uses the results of the first regression stage as the value for the endogenous independent variable which is then included in the second stage, wherein physical health visits will be estimated. The coefficient for the included endogenous independent variable for mental health usage is determined using the matrix algebra equation below, where Z is the instrument, X is the vector of independent variables, and Y is the dependent variable, and β represents the coefficient on the subscripted variable .

$$\beta_{usage} = (Z^T X)^{-1} (Z^T Y) \quad (8)$$

The final equation used to predict physical health visits makes use of the results of this first stage and results in the following prediction equation, where MH_hat is the predicted value of the endogenous mental health usage determined in stage one of the two-stage method and ϵ is the error term in the prediction of the dependent variable:

$$Y = \beta_0 + \beta_{usage} MH\_hat + \beta_x X + \epsilon \quad (9)$$

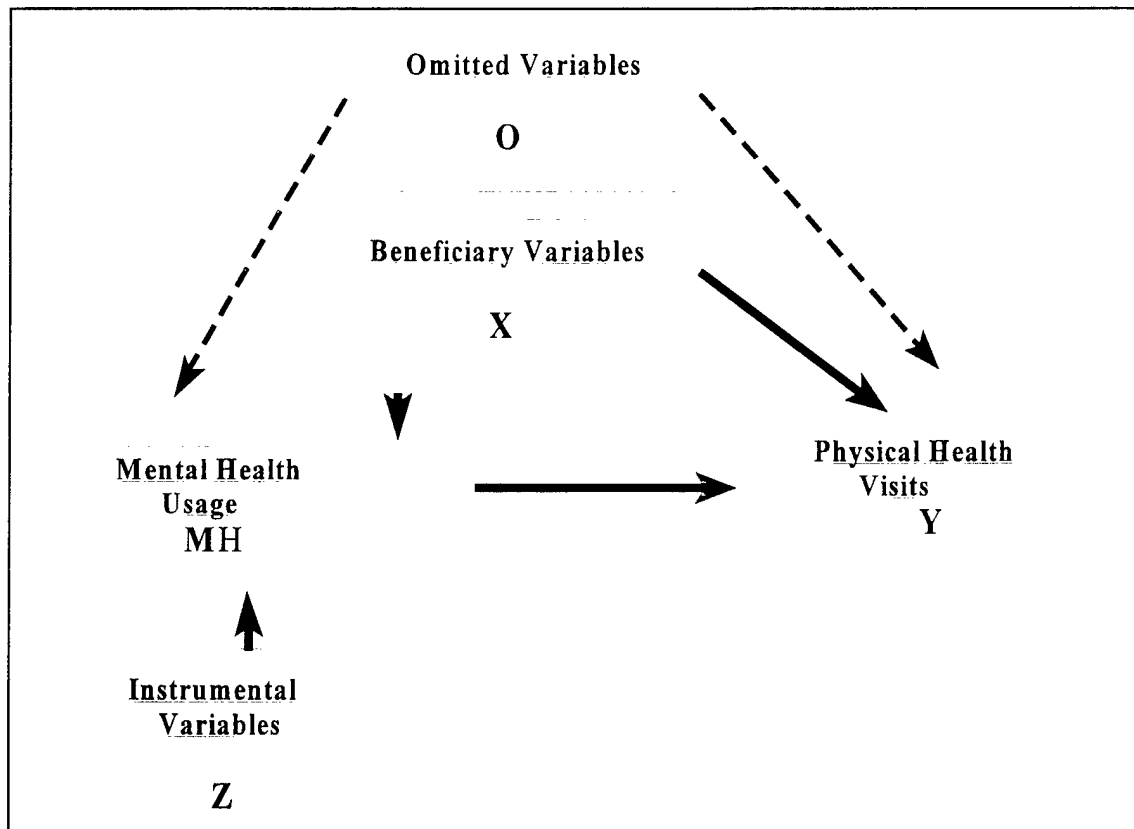
If the instruments used in the first stage are of good quality, which the previous section has demonstrated to be likely, the two stage least squares technique produces estimates for model coefficients which are unbiased and consistent (Kmenta, 1986; Staiger and Stock, 1994). The two stage least squares method described herein will be the principal method used in order to answer research question two and three.

M. Research Methods: Specific Approaches to Hypotheses and Issues

The section summarizes the models and methods discussed in this section. It begins by presenting the model which applies to the more complex research questions (2 and 3). Following the model, it continues by presenting research deliverables for this study which were first introduced in the first chapter. However, rather than providing the rationale for the specific deliverable as was done in the first chapter, the methods used to obtain the desired findings will be identified in this section. Alternative methods, including stepwise regression and ordinary least squares regression (which eliminates the instruments from the model and regresses the X variables and the MH variable directly on the Y variable of the empirical model) will also be presented in order to demonstrate any sensitivity to methodological choice of the analytical findings.

The final theoretical model for the research is reprinted below for the convenience of the reader.

Figure 7
A Graphical Depiction of the Empirical Model



The main purpose of this section is to integrate the methods described in this Chapter into the framework of individual research hypotheses which were introduced in Chapter I. Hypotheses are organized under their associated research question in the same manner of presentation as was made in the first chapter.

Research Question 1. To what extent do active duty members and active duty family members of the four principal Armed Services (Army, Air Force, Marines, Navy) differ regarding their emotional well being and their utilization of professional mental health services?

Hypothesis 1A: Active duty members have higher emotional well-being than family members. Method: This is a large sample, one tailed test of differences between population means (McClave and Benson, 1988), where the means of interest are the MCS scores of the two groups of interest, active duty (AD) members and active duty family members (FM). Remembering that higher MCS scores are indicative of better emotional well-being, the hypotheses to be tested are:

$$H_0: (\mu_{AD} - \mu_{FM}) = 0$$

$$H_A: (\mu_{AD} - \mu_{FM}) > 0$$

The test statistic is :

$$Z = \frac{\bar{x}_{AD} - \bar{x}_{FM}}{\sigma_{(\bar{x}_{AD} - \bar{x}_{FM})}} \quad (10)$$

Using the standard significance level of $\alpha = .05$, the corresponding Z score will be 1.645 for this one sided test. Finally, the denominator value in equation (7) is given by equation (8) below:

$$\sqrt{\frac{\sigma_{AD}^2}{N} + \frac{\sigma_{FM}^2}{N}} = \sigma_{(Z_{AD} - Z_{FM})} \quad (11)$$

Hypothesis 1B: Active duty men and women utilize mental health services less than male and female family members. Method: Chi-square test of a two by two contingency table, where:

Table 14

Contingency Table for Hypothesis 1B Analysis

	Mental Health Usage	No MH Usage	TOTAL
Active Duty Members	N_{11}	N_{12}	$N_{1.}$
AD Family Members	N_{21}	N_{22}	$N_{2.}$
TOTAL	$N_{.1}$	$N_{.2}$	N

The chi- square test is performed by multiplying the marginal probabilities of each of the two rows and columns together and then dividing by the total number in the sample, such that the expected value of a given cell, $\hat{E}(N_{11}) = N_{1.} * N_{.1} / N$. The test statistic is χ^2 , which is calculated by summing for all four cells in the above table the observed cell value minus the expected value of the cell, squaring the difference and dividing the result by the expected cell value. Mathematically, this equation is given as follows (McClave and Benson, 1988):

$$\chi^2_{(.05)} = \sum \frac{(OBS - EXP)^2}{EXP} \quad (12)$$

The degrees of freedom for this test is one, and is determined using the formula $[r-1]^*$ $[c-1]$ = chi-square degrees of freedom. If the calculated statistic exceeds the chi-square table value for $\chi^2(1)$ with $\alpha = .05$, or 3.8, then this is an indication that the null hypothesis of no differences in the utilization rates for mental health services must be rejected.

Hypothesis 1C: Mental health morbidity and mental health utilization will be least for Air Force families and active duty members and greatest for Navy beneficiaries of corresponding groups (e.g. active duty and family member). Utilization and morbidity experienced by Army beneficiaries will be between the experiences of the other services for the corresponding beneficiary groups. Method. Run large sample comparison of means between dyads of Services (Air Force versus Navy, Air Force Versus Army, Army Versus Navy, etc.) and test for a significance in the differences between means for both mental health status and utilization rates.

Hypothesis 1D. The level of emotional well-being scores for active duty members will be higher than that of the U.S population average. Method: Method: Use the same method as that proposed under Hypothesis 1A but use the U.S. population norm of 50 with standard deviation of 10 determined by Ware (1994) using a general population (GP) sample of 2474 persons. The other group is family members from the sample. The hypotheses in this case are:

$$H_0: (\mu_{AD} - \mu_{GP}) = 0$$

$$H_A: (\mu_{AD} - \mu_{GP}) > 0$$

Hypothesis 1E. The average emotional well-being scores for family members will be lower than that of the U.S population average. Method: Use the same method as that proposed under Hypothesis 1A but use the US population norm of 50 with standard deviation of 10 determined by Ware (1994) using a general population (GP) sample of 2474 persons. The other group is family members from the sample. The hypotheses in this case are:

$$H_0: (\mu_{GP} - \mu_{FM}) = 0$$

$$H_A: (\mu_{GP} - \mu_{FM}) > 0$$

HYPOTHESIS 1F. The average emotional well-being if individuals with less time on station will be lower than those who have been on station longer. Method: Use ordinary least squares with mental health status (as measured by MCS) as the dependent variable and using all of the beneficiary and location characteristics identified in the research model as independent variables. Time on station variable is a categorical variable with four mutually exclusive and exhaustive categories. Combine the highest three categories into a single category and create a dummy variables called NEW. NEW will be 1 if time on station is less than 6 months and 0 otherwise. The null hypothesis is no difference in MCS based on time on station. The alternative hypothesis is that there is a difference and MCS is lower for individuals who have been on base briefly. Reject the null hypothesis if the coefficient on NEW is significant at the $p = .05$ level and negative.

2. Can evidence of a medical “offset” resulting from mental health access be detected in a military beneficiary population of active duty members and adult family members?

Hypothesis 2A. Utilization of outpatient physical health services made by beneficiaries in the lowest quartile of emotional well-being scale ($MCS \leq 47$) will be significantly less than for those who had a mental health visit than for those who did not have a mental health visit in the prior twelve months. Method: The total number of outpatient visits for physical health is the desired dependent variable. Normalize this distribution with a logarithmic transformation and run a two stage least squares regression. Evaluate the mental health usage variable for the lowest quartile ($MCS < 47$) of mental health status in the population. If the coefficient on this variable is significant and negative, this is evidence of offset in the group of lowest mental health status patients.

Hypothesis 2B. Individuals in the uppermost quartile ($MCS > 56$) of emotional well-being will have similar physical health utilization experiences regardless of whether or not they see a mental health specialist. Normalize the distribution of the dependent variable with an appropriate transformation and run a the two-stage least squares model for this subgroup. An insignificant or positive coefficient on the mental health usage variable for beneficiaries in the top quartile of mental health status indicates support for this hypothesis.

3. Among those individuals with an emotional well-being score in the lowest MCS quartile of the sample (which is below the national average), how do those who see a mental health provider differ from those who do not in terms of the number of medical visits for illness and injury? To what extent do differences in utilization, if they do exist, conform to the expectations of social psychological theory?

Hypothesis 3A. The magnitude of the offset (the significance of the mental health usage variable in the negative direction in the two stage least squares equation) will be stronger among active duty personnel than among family members, other things equal. Method: Using those observations of MCS scores for individuals in the lowest quartile of the sample, run two separate two stage least squares regressions and compare the results. Evaluate and compare the coefficient on the mental health usage variable for each group. The hypothesis is supported if and only if the coefficients on mental health usage are both negative (offset is present) and the magnitude of this coefficient on usage is significantly more negative for active duty than for family members using the large sample comparison of differences between means approach which was described in detail under research question #1.

Hypothesis 3B. The magnitude of offset for men will be higher than that for women. Method: Same approach as under hypothesis 3A, except the groups for comparison will be men versus women rather than active duty versus family member.

Hypothesis 3C. The magnitude of offset will be higher for officers and their families than for enlisted personnel and their families. Method: Same approach as under hypothesis 3A, except the groups for comparison will be officers and their families versus enlisted personnel and their families.

Hypothesis 3D. The magnitude of offset will decrease as time on station increases. Method: Same approach as under hypothesis 3A, except the groups will be those on station less than six months versus all others.

Hypothesis 3E. The degree of offset will be the same across beneficiaries of all four branches of the Services. Method: Same approach as under hypothesis 3A, except the groups will be the individual Services. Department of the Navy personnel (Navy and Marine Corps) will be grouped together as a single group.

4. What is the difference in the number of overall utilization by the population experiencing greater than average levels of psychological distress and who visit a mental health provider versus those in the same distress category who do not see a mental health provider?

Issue 4A. Method: Determine the mean overall physical health utilization for those who had a mental health visit and those who did not in the lowest quartile of MCS status. Take the difference between the predicted mean physical health visits for users and nonusers and evaluate. If necessary, perform the smearing retransformation prior to determining these differences in order to discuss the findings in terms of the original units (number of visits) rather than the transformed units (log-transformed number of visits), in order to provide a more comprehensible result. Offset is an estimate of per beneficiary savings resulting from shifting a nonuser of mental health services to the user category. If users have more visits than nonusers of mental health services, this figure will be negative, indicating that there is a per unit cost involved in shifting mental health nonusers to users even before considering the cost of mental health visits incurred at the margin.

5. What is the estimated annual cost associated with not treating those active duty family members and active duty personnel in terms of dollars?

ISSUE 5A. The solution is the method and is based on the following information:

- 1. [Use the conservative estimate for the offset in total utilization determined in research question 4 as] = OFFSET per patient.**
- 2. [(Total number of active duty and active duty family member beneficiaries) * (proportion of beneficiaries in these categories with psychological distress, i.e. MCS $\leq$ 47)] = total POTENTIAL CASES applicable for offset.**
- 3. PROPORTION of psychologically distressed individuals getting mental health treatment by category, i.e [MCS $\leq$ 47 | USAGE=1].**
- 4. \$/PRIMARY CARE VISIT.** Average CHAMPUS payment for an outpatient primary care visit.
- 5. \$/MENTAL HEALTH VISIT.** Average CHAMPUS payment for an outpatient mental health visit.
- 6. AVERAGE NUMBER OF MENTAL HEALTH VISITS FOR MENTAL HEALTH USERS.**
- 7. ESTIMATED PER CAPITA COST SAVINGS resulting from shifting psychologically distressed mental health nonusers to user category.** Determine using the formula below:

(OFFSET * \$/PRIMARY CARE VISIT) - (\$/MENTAL HEALTH VISIT * AVERAGE NUMBER OF MENTAL HEALTH VISITS FOR USERS)

8. Determine the estimated maximum savings potential for offset using the information above placed in the formula below.

**\$ OFFSET POTENTIAL= (1-PROPORTION)*(OFFSET*POTENTIAL CASES)*
(ESTIMATED PER CAPITA COST SAVINGS)**

N. Chapter Three Summary

This chapter has discussed the data and methods used in this chapter. Issues regarding the survey and sample process conducted in order to acquire the data set used for this research were discussed extensively. The distributions of some key variables were presented in order to give the reader some familiarity with the data set. The instruments and scales used to measure health were shown to be reliable and valid. The methods proposed to answer the specific research questions and issues was described in general and then specified for each research deliverable. In addition, methods for dealing with particular aspects of the study were discussed. The Box Cox method for determining an appropriate transformation of the dependent variable was discussed. The transformation requires a retransformation back to original units in order to make the findings of the study comprehensible. The retransformation approach which will be used in this study for the logarithmic transformation of the dependent variable in the offset studies is Duan's smearing estimator (1983), which was introduced and discussed.

Sample design issues and their impact on the findings for research question number one were discussed. Accurate estimation of group variances will be achieved using jackknife replication methods. Wesvar PC, a specialized software package capable

of estimating variances from complex survey designs will be used to ensure accuracy for the analyses pertinent to research question number one, where it will be applied.

The necessity of the use of the technique of instrumental variables and two stage least squares (applicable to research questions two and three) was also discussed in detail. Tests of the data and theoretical arguments support the use of the instrumental variable approach and the validity of the two stage least squares method. Most of the methods and analysis will rely a various types of statistical significance tests. However, some context and information was provided for readers interested in evaluating the clinical significance of differences in average MCS scores found in various groups examined in this study.

The chapter concluded with a section which identified which methods applied to which specific research hypotheses. Having described in detail the methods employed to analyze the data, the following chapter goes forward and conducts the analysis.

IV. Findings and Analysis

A. Introduction

This chapter presents and analyzes findings pursuant to the investigation of the specific research hypotheses stated in previous chapters. Excluding this introduction and a closing chapter summary, it is organized into five major sections. Each of these major sections addresses one of the five overarching research questions to be investigated in this effort. The analysis of results are presented and findings relevant to each of the research hypotheses are discussed. A final section which synthesizes the results across research questions and summarizes and highlights the more interesting findings from each of the major sections of the chapter will also be presented. Some modifications to this general structure are made in the discussion regarding the first research question. These are necessary in order to satisfy the interests of particular constituencies among the intended audience of this research and to provide a more in depth view of the data than might be possible under a single, summarizing multivariate analysis.

In the case of the first research question, subsections will first present preliminary analysis, by specific hypothesis, to give the reader a feel for the data and the critical covariates and their relationships to one another. The preliminary analysis is analytically naive; however, it is straightforward and technically correct. These analyses will consider only the independent variable of interest (or a limited subset of variables) and its (their) relationship with the dependent variable. Of course, the omission of known important covariates which are correlated with the independent variable which is observed results in a bias of the coefficient of the included independent variable in unpredictable directions.

Therefore, this preliminary exploration of the relationship will be unsatisfactory to a sophisticated and experienced researcher. However, such an exploration of the data does provide the reader who has limited statistical knowledge but strong interest in the unique relationship between the independent variable of interest (e.g. the Air Force) and the dependent variable and is therefore included. Leaders responsible for particular subsets of beneficiaries find it useful to know the status of the group for which they bear primary accountability, without respect to causal covariates which might influence results. For example, the Chief of Naval Operations will be concerned about a low average mental health status for his sailors even if this status is attributable to the fact that active duty Navy personnel are younger than active duty personnel of other Services and age is negatively correlated with mental health status. For this reason, the preliminary studies are presented in this Chapter. Patience is requested from sophisticated investigators eager to see multivariate findings regarding the identification of significant factors predictive of mental health status and usage of various groups. These will be presented in Section B6 on this chapter. Individuals who have no interest in the analysis from an organizational perspective might avoid possible confusion by not reading sections B1, B2 and B3 of this chapter.

Comparisons of the mean scores for groups can be considered from a clinical or statistical perspective. The discussion in this chapter focuses on statistically significant differences, since the objective is to discern general tendencies in usage or mental health status for entire population subgroups. However, those who wish to assess the clinical meaningfulness of differences between subgroup mental health status scores are referred

back to Section F in Chapter III. As a rule of thumb, a difference of two points in MCS score could be considered a small difference and eight points a large difference from a clinical perspective.

A multivariate analysis is also accomplished as a means for answering the final research hypothesis under research question number one. These results provide the basis for the final analysis and conclusions regarding the entire first set of research hypotheses as well as an analytical bridge to the methodologically more complex research questions which follow. The final analysis and final findings for all of the questions under research question number one are found in a final summarizing subsection.

B. Findings and Analysis for Research Question One

The hypotheses to be answered under the first research question is descriptive in nature. It is: "To what extent do active duty members and active duty family members of the three Services differ regarding their emotional well being and their use of mental health services?" The purpose of the hypotheses considered under this research question was descriptive in nature. Reasonable a priori expectations are put to the test using these data to see if empirical evidence supports expectations. The desired result will be increased knowledge of the true state of the world which is based on empirical evidence rather than assumption. These facts can then be used as building blocks upon which well-informed strategic plans and policy decisions can be made. The methods to answer each specific hypothesis were presented in the previous chapter. This section will consider each of the six hypotheses in order.

1. Preliminary Findings and Analysis of Hypothesis 1A

The first specific hypothesis under the first research question was: "Active duty members have higher emotional well-being than family members." This seemingly straightforward investigation revealed some interesting findings after some consideration. While one could simply answer the question and be technically accurate, a deeper consideration of the question revealed some surprising evidence which contradicted the findings of a hasty and naive analysis. The following discussion presents these initial findings and then continues with a stream of logic which final results in a reversal of the the initial conclusion.

Active duty members have a higher average mental health scores than do family members, with a Z-score of $|2.95|$, a difference which is statistically significant at a $p < .002$ level. This finding is consistent with the expectation stated in Chapter 1, which held that screening of active duty personnel and efforts to keep their morale high in order to maintain force readiness would result in an active duty force with emotional well-being levels which are higher than the general population and for family members. Family members may benefit from the same morale and welfare programs designed to keep active duty personnel happy, but they are not subject to the institutional screening process at entry into the military subculture and throughout a military career.

The large sample, two-tailed test of no difference between the mean MCS scores of active duty and the active duty family member population samples revealed results which are shown in Table 15 below:

Table 15

Difference in Average MCS Scores By Beneficiary Category

(Z Score 2.95; p-level < .002)

Category	N	Mean Score	Std Error of Mean
Active Duty	14519	50.42	.151
AD Family	11578	49.74	.174

The impact of initial mental health screening on the mental health status of the active duty force, both upon entry and throughout the military career, may be overstated. The current mental health screening method only identifies less than one half of one percent of all recruits on the basis of mental health problems (Crawford and Fiedler, 1991). It is an approach which identifies and eliminates only the extreme low end outliers in mental health fitness and does not necessarily ensure a military force which is above average in mental fitness. Similarly, it is only the extreme outliers in mental health status which are identified and nonvoluntarily discharged, because there is a strong preference within the military to return individuals to duty after medical or mental health treatment in order to conserve valuable and trained human resource investments (Pullen and Labatte, 1992). Indeed, return to duty rates is an outcome measure which is sometimes used to evaluate the effectiveness of military mental health care (Pullen and Labatte, 1992).

A simple comparison of means ignores a number of important covariates, however. For example, extensive testing of the measurement instrument for mental health status consistently revealed gender to be an important predictor of mental health

status, with women generally having a lower mental health status than men (Ware, 1994). Furthermore, since the sample reflects a skewed beneficiary population where 91% of active duty adult family members are women and only about 17% of the active duty sample consists of women, there is a strong potential for the active duty result to be specious and simply a reflection of the disproportionate share of women in each group. Indeed, female beneficiaries of the military health services system, reflect the same pattern of lower mental health status relative to male beneficiaries, as depicted in Table 16.

Table 16
Difference in Average MCS Scores By Gender
(Both active duty and adult family member beneficiary categories)
(Z-score 6.16; p-level <.001)

Category	N	Mean Score	Std Error of Mean
Male	13116	50.82	.159
Female	12981	49.36	.125

This difference is also statistically significant at the $p < .001$ level of significance, with a $|Z|$ score of 6.16. Therefore, since the active duty force consists primarily of men and active duty family members consist primarily of women, it is reasonable to expect that a conclusion that active duty members are more mentally fit than adult family members of active duty personnel. Such a conclusion, while technically correct, is specious, since it is a conclusion driven in a large part by differences in the proportions of the gender represented in the two groups of beneficiary types being examined, active duty members and active duty family members, rather than on type of connection to the

military system, which is ostensibly the purpose of this comparison. Table 17, below, shows the percentage breakdown of the two groups to drive home this point of differential representation by gender among the two groups.

Table 17
Gender Distribution in Beneficiary Categories

	Male (Percent)	Female (Percent)	Total
Active Duty	11984 (46)	2644 (10)	15155 (56)
Family Members	997 (4)	10581 (40)	12194 (44)
Total	12981 (50)	13,116 (50)	26,097 (100)

Another key covariate which is omitted in a simple comparison of means between beneficiary category and mental health status is the different utilization patterns across ranks. The distinction between officers and enlisted in the military culture is unambiguous (Coates and Pellegrin, 1965); moreover, this important distinction in military culture extends to family members as well (McCubbin and Dahl, 1976). Although many exceptions exist, officers and their spouses tend to be better educated and come from a higher socio-economic background than enlisted members and their spouses. Therefore, just as it may not be appropriate to make an aggregate comparison of military beneficiaries to active duty members without considering the effect of gender, it may be similarly inappropriate not to consider the sponsor's rank when comparing groups, since this may have a strong effect on mental health status. Indeed, empirical analysis supports such a concern. As shown in Tables 18 and 19 below, officers and officer family

members have mental component summaries which are significantly higher than their enlisted counterparts.

Table 18

Difference in Average MCS Scores By Rank for Active Duty

(Z=10.35; p-value <.001)

Category	N	Mean Score	Std Error of Mean
Officer	3550	53.18	.27
Enlisted	10861	49.86	.173

Table 19

Difference in Average MCS Scores By Sponsor's Rank for Family Members

(Z-Score = 10.25; p-value < .001)

Category	N	Mean Score	Std Error of Mean
Officer	3258	52.31	.231
Enlisted	8286	49.08	.215

The differences between officer and enlisted are significant for both active duty members and family members. The $|Z|$ scores are 10.35 and 10.29 for active duty and family member differences, respectively. This constitutes strong evidence ($p < .001$) against a null hypothesis of no difference between the mean mental component summary between officer versus enlisted categories for comparisons between both active duty members and family members. Given the apparent influence of rank on mental health status, it seems reasonable to consider this important covariate as well when assessing

whether or not active duty members have higher mental health status than family members.

Tables 20 through 23 (below) show the final results of a breakdown of active duty versus family member mental health status when these comparisons are made within gender and rank categories. The results partially contradict the naive comparison which was displayed in Table 15 above. While among men, the average mental health status for active duty personnel is higher than that of family members of the same gender, the opposite is true among women. Female family members have marginally higher mental health scores than their active duty counterparts for both the enlisted and officer categories. In none of the cases are the differences statistically significant. Apparently, the disproportionate share of women in the family member group leads to a specious conclusion that active duty members are more mentally fit than family members. Apparently, this is not the case when other key covariates are taken into account. When the covariates of gender and rank are taken into account, the alternate hypothesis of active duty members having a higher mental health status than family members cannot be supported by the data. Instead, there appears to be virtually no difference between active duty and family members of active duty within gender/rank categories. Therefore, one is led to conclude that in spite of the military's efforts to exclude individuals with poor mental health profiles from active duty, these efforts do not result in any significant differences in average mental health status vis-a-vis active duty family members who are not subject to such scrutiny. It is outside the scope of this study to consider why this

result is observed; nonetheless, it represents an interesting finding which contradicts the a priori expectations of this study for this relationship.

Table 20

Difference in Average MCS Scores For Males in Officer Families

(Z= -.03; p-value=.51)

Category	N	Mean Score	Std Error of Mean
Active Duty	2971	53.48	.316
Family Member	326	51.72	.607

Table 21

Difference in Average MCS Scores For Females in Officer Families

(Z= -.62; p-value=.73)

Category	N	Mean Score	Std Error of Mean
Active Duty	579	51.72	.607
Family Member	2932	52.13	.256

Table 22

Difference in Average MCS Scores For Males in Enlisted Families

(Z= -1.31; p-value=.90)

Category	N	Mean Score	Std Error of Mean
Active Duty	8918	50.20	.203
Family Member	669	51.12	.672

Table 23

Difference in Average MCS Scores For Females in Enlisted Families

(Z= -1.02; p-value=.84)

Category	N	Mean Score	Std Error of Mean
Active Duty	1943	48.35	.454
Family Member	7617	48.87	.230

The reader is reminded that this subsection presented preliminary analysis of the data relevant to answering research question 1A. The treatment of the problem began with a simplistic view and moved to one slightly increased complexity to show the reader the importance of covariates in the data and the impact that the lack of independence, between beneficiary category type and gender for example, has on the results of the analysis. As noted in the introduction to this chapter, a rendering of a definitive finding regarding the hypothesis posed in this section is deferred until after a multivariate analysis is conducted later in this chapter.

2. Preliminary Findings and Analysis of Hypothesis 1B

The second specific hypothesis under the first research question was: "Active duty men and women utilize mental health services less than male and female family members of active duty." This is the service utilization correlate of the analysis of mental health status conducted for the investigation of research question 1A. A simple statistical test of this hypothesis can be performed using a chi-square test for independence using a two by two contingency table that can be constructed from the two dichotomous variables under consideration, mental health usage and beneficiary category. Table 24 depicts the

contingency table, wherein the values in parentheses represent the expected value for the cell if mental health usage and beneficiary category were independent.

Table 24
Test for the Independence of Mental Health Usage and Beneficiary Category

$$[\chi^2(1) = 53.01; p < .001]$$

	No Mental Health Use	Mental Health Use	Total
Active Duty	14169 (14042.6)	587 (713.4)	14756
Family Members	11086 (11212.4)	696 (569.6)	11782
Total	25255	1283	26538

The test statistic for this distribution is a chi-square with one degree of freedom. The chi-square value for the above distribution is 53.01, which yields $p < .001$ for the null hypothesis of the independence of the two categories. A cursory inspection of Table 24 makes it apparent that family members have higher utilization than expected based on their representation in the overall sample and active duty members have lower utilization than would be expected had the categories of interest been independent. This seems to provide support for Hypothesis 1B.

Alternatively, an analysis of the data pursuant to reaching a conclusion on this hypothesis could be made using the same approach as for hypothesis 1A, which was an example of a large sample comparison of the difference between two means. This approach is standard fare in epidemiology, which has among its focal interests comparisons of disease rates between groups (Dever, 1984). Table 25 shows this result,

which is essentially a replication of Table 15 with the comparison of interest being mental health usage, a binary yes/no variable, rather than the continuous variable of mental component summary, as was presented in Table 15 earlier. Specifically, the usage rate displayed in the table below and other tables is the percentage of individuals in the group being considered who reported at least one mental health visit in the foregoing twelve month period. Therefore, if three individuals in 100 reported at least one mental health visit, the usage rate would be shown as .03.

Table 25
Difference in Mental Health Usage Rates By Beneficiary Category
(Z score= 3.93; p-value < .001)

Category	N	Usage Rate	Std Error of Mean
Active Duty	14756	.0381	.0039
Family Member	11778	.0575	.0030

Once again, there is apparently strong support for the hypothesis. The resulting $|Z|$ score is 3.93, which yields $p < .001$ for the two-sided test of the hypothesis. On the surface, it seems as if active duty personnel do utilize mental health services less than their family members. However, this naive assessment ignores the lesson learned in the previous section, whereby it was shown that the uneven distribution of gender across the beneficiary categories coupled with profound differences in mental health status between men and women resulted in specious conclusions drawn from a hasty and naive analysis which ignored the impact of gender on the distribution.

Therefore, following the same logic as pursued in the analysis of the previous hypothesis, I compare mental health usage rates between active duty and active duty family members within sponsor rank and gender categories, as was done for mental health status scores in Tables 15 through 18 above. Several studies have shown gender to be a strong predictor of mental health utilization, with females being the higher utilizers of this service (Shapiro et al, 1984; Jenkins, 1985; Yates, 1986; Fiedler and Wight, 1989). The coincidence of sponsor rank and mental health utilization has not been reported in the literature; however, in as far as rank is used as a proxy for socio-economic status (SES) in this study and lower SES is associated with lower overall utilization rates of health services (Wan and Soifer, 1974; Salber et al, 1978), it seems prudent to limit comparisons to those between groups with similar rank and gender attributes. Therefore, the same breakdown of the comparison within like gender and rank categories are shown in Tables 26 through 29 for mental health usage rates as were presented earlier for mental health status.

Table 26

Difference in Mental Health Usage Rates For Males in Officer Families

($z=1.03$; $p\text{-value}=.15$)

Category	N	Mean Score	Std Error of Mean
Active Duty	3013	.0121	.0022
Family Member	332	.0214	.0088

Table 27

Difference in Mental Health Usage Rates For Females in Officer Families

(Z=.99;p-value=.34)

Category	N	Mean Score	Std Error of Mean
Active Duty	590	.0411	.0141
Family Member	2981	.0564	.0063

Table 28

Difference in Mental Health Usage Rates For Males in Enlisted Families

(Z=1.28;p-value=.10)

Category	N	Mean Score	Std Error of Mean
Active Duty	9065	.0366	.0040
Family Member	678	.0587	.0167

Table 29

Difference in Mental Health Usage Rates For Females in Enlisted Families

(Z=-1.12;p-value=.87)

Category	N	Mean Score	Std Error of Mean
Active Duty	1978	.0692	.0076
Family Member	7753	.0591	.0049

In the case of mental health usage rates, active duty personnel generally had lower utilization rates of mental health services than their family member counterparts. The single exception to this rule of thumb arose in the case of the enlisted female comparison

group, where active duty enlisted women used mental health services at a rate which was 17.1% higher than adult family members (wives in virtually all cases) in enlisted member households. None of these results are statistically significant at the $\alpha = .05$ level. However, there seems to be a general tendency for family members to use mental health services more than active duty members.

Summarizing these results, in none of the four comparisons of like subgroups can the null hypothesis of no difference in usage rates between active duty and family members be rejected in favor of the alternative of lower usage for active duty at a .05 level of significance. The .05 level of significance for the two tailed test of active duty having lower utilization rates than family members is 1.96. In other words, the Z-score would have to exceed 1.96 to provide evidence to reject a null hypothesis of greater than or equal levels of utilization by active duty members at the $p = .05$ level of significance. The calculated Z scores shown in Tables 26-29 above never exceed this threshold score and are in three of the four cases negative, reflecting the fact that, contrary to expectations, family members seem to have a higher mental component summary than active duty members. Therefore, there is insufficient evidence to reject the null hypothesis of no difference in favor of the alternative of less usage for active duty only in the case of females in officer households. These results overturn the naive, aggregate comparison presented at the outset of this section.

One striking thing about this finding arises when comparing it with the results concerning mental health status scores in officer families. Active duty personnel in each of the four rank/gender comparison groups score lower on mental health status than their

family member counterparts. Although the differences are not statistically significant at the .05 level, the unanticipated direction of difference is interesting. Paradoxically, however, active duty members use services less than their family member counterparts on three of four of the comparison groups. Again, the differences in usage are not significant at the $\alpha = .05$ level, but the findings lead one to question the conventional wisdom. Together, these findings show that the groups with lower levels of mental health status obtain less mental health treatment. Given that active duty members receive their care free of charge provided they obtain it through official channels and family members must in many cases pay a deductible in order to access these services through their CHAMPUS coverage, the situation is perplexing. Why individuals with lower levels of mental health status would avoid treatment is a mystery; although conjectures can be made regarding the underlying cause for these findings, the answer extends beyond the scope of this study. It certainly constitutes a paradox which contradicts the findings of Ware et al (1984) examining mental health status and utilization in a general population and found that those with poorer mental health status (as measured by the appropriate SF-36 subscales) were more likely to obtain mental health care. A positive correlation between need and use of services seems appropriate given a normative expectation of need driving demand for services in the realm of health care. Perhaps the cultural barriers unique to active duty personnel, a possibility suggested by the health belief model, exist which serve to inhibit many active duty personnel from availing themselves of mental health services commensurate with their level of need. However, while an interesting issue for

speculation, ascertaining the reason underlying this observed aggregate behavior goes beyond the scope of this research.

In summary, the preliminary findings for hypothesis 1B are as follows. The null hypothesis of no difference in usage between family members and active duty members , while rejected in a naive comparison, cannot be rejected if like gender/rank subgroups of active duty and family member individuals are compared with one another. Indeed, in all but one subgroup comparison, average mental health usage rates are lower for active duty individuals than for family members. While these differences are not statistically significant, the difference between mean utilization rates on a percentage basis is astounding, reaching as high as a 76 per cent greater utilization rate of mental health services for male family members vis-a-vis male officers in officer households. Similar results were obtained for men in enlisted households, with male family member utilization registering at 60 per cent higher than active duty men in enlisted households. A similar trend of greater mental health usage rates by family members was observed for females in officer households, where the active duty group's usage was 37 per cent less than the family member group. Only females in enlisted member households showed an opposite trend. In this comparison category, active duty individuals had seventeen percent higher usage rates for mental health care. This group directly contradicted the prior expectations of military having lower mental health usage rates than family members. Therefore, if the military culture does have a dampening effect on active duty mental health utilization, this effect is not uniform across all gender/rank categories. Why this influence might be strongest for male officers remains unexplored in this study.

What seems clear is that the relationship between active duty status and utilization rates seems to be more complicated than a model which considers only two covariates, in this case gender and rank of the active duty member of the household. It is also clear that gender plays an important role in predicting usage rates, with male usage substantially lower than female usage; however, this issue is not the focus of this particular research hypothesis. A more complex approach to modeling the relationship between beneficiary type and mental health usage rates will be presented and discussed in the subsection covering hypothesis 1F, where regression models are introduced. These multivariate models will be able to overcome the shortcomings of multiple bivariate correlations of variables which have been presented here.

3. Preliminary Findings and Analysis of Hypothesis 1C

The third specific hypothesis under research question number one involved a comparison of mental health status and mental health usage levels among the Services. For the purpose of this analysis, Department of the Navy personnel in the Marine Corps are considered as a separate category. Although the Marine Corps uses Navy medical facilities and personnel, it represents an important and large subgroup within the Navy department with its own distinct training camps, traditions, and operational bases, which sets it apart from other subpopulations within the Services. The distinctive uniqueness of the Marine Corps as an entity, while not administratively correct, reflects the de facto situation, particularly regarding culture. The 1994-95 DoD Beneficiary Survey implicitly recognized this situation by allowing respondents to identify themselves as affiliated with

the Marine Corps. Given its importance and the availability of the data, the Marine Corps will be considered as a separate Service entity here and throughout this analysis.

The purpose of this research question is to determine if all of the Services are relatively similar regarding mental health status and utilization or if differences are apparent between Services. If mental health status or utilization rates are unexpectedly low (or high) for a particular Service, this would be an interesting finding that could be pursued in follow-on research. Specifically, the hypothesis is: Mental health morbidity (as evidenced by low mental health status scores) and utilization will be least for Air Force families and active duty members and greatest for Navy and Marine Corps beneficiaries of corresponding groups. The Army's mental health utilization and morbidity levels will be between those of the Navy and the Army.

Once again, a straightforward, technically correct, approach is initially taken in the manner of the analysis done for the first hypothesis under the first research question. Grouping on beneficiary adherence to Service, direct in the case of active duty members and indirect (through the active duty sponsor) in the case of family members, the results for mental health status by Service are shown in Tables 30 and 31, with individual tables for active duty personnel and their family members.

Table 30

Mental Health Status by Service- Active Duty

Category	N	Mean Score	Std Error of Mean
Air Force	7282	50.93	.272
Army	4132	50.34	.217
Navy	2383	50.49	.359
Marine Corps	722	49.21	.819

Table 31

Mental Health Status by Service- Family Members

Category	N	Mean Score	Std Error of Mean
Air Force	5473	50.33	.165
Army	3421	49.69	.272
Navy	2004	49.61	.371
Marine Corps	680	48.53	.866

These data, examined using the previously described preliminary approach with a single independent variable, branch of Service in this case, reveal only meager support for the hypothesis that the Air Force's mental health status is highest among the Services. An ordinal examination of the data for mental health scores as follows (arrayed from highest to lowest): Air Force, Navy, Army, Marine Corps, which supports the hypothesis. However, the only statistically significant difference among all possible pairs is the difference between Air Force active duty members and Marine Corps active duty members. The Air Force's better mental health status relative to the Navy is not

significant at the .05 level, thus making it impossible to rule out the possibility that these scores are the same. Similarly, the average active duty Air Force MCS score is higher, but not significantly so, than that of the Army, with a Z-score of 1.70, which falls below the 1.96 threshold level for significance at the $\alpha = .05$ in the two sided hypothesis test. The active duty Air Force versus Marine Corps does show a significant difference in favor of the Air Force with a Z-score of 1.99 ($p=.047$). The remaining two-way comparisons among the Services(Army vs Navy, Army vs. Marine Corps, Navy vs. Marine Corps) are statistically insignificant, despite the appearance of a trailing score registered by the active duty Marine Corps respondents to the survey.

The mental health scores for family members were arrayed in the expected order, with Air Force having the highest scores, followed by the Army, which was followed by the Navy and Marine Corps family members. For family members, the only head to head Service comparison which had a difference significant at the .05 level was the comparison between the Air Force and the Marine Corps. The Z-score for this difference was 2.042 and had a p-value of .042. Table 32, below, summarizes the significant differences in mental health status among the Services.

Table 32

**Summary Table of Preliminary Findings for Mental Health Status Differences
Between Services
(only differences significant at p less than or equal to .05 are shown)**

Comparison Group	Raw Difference	Z-score of Difference	p-value
Air Force vs. Marines- Active Duty	1.72	1.99	.047
Air Force vs Marines - Family Members	1.8	2.04	.042

The same general approach described above which compared mental health status across the four Services was used to compare reported mental health usage rates across the four Services. Tables 33 and 34, shown below, reflect the usage rates among the Services and Table 35, which follows, reports all differences between Service pairs which were found to be statistically significant at the .05 level.

Table 33

Mental Health Usage Rates by Service- Active Duty

Category	N	Mean Score	Std Error of Mean
Air Force	7389	.0549	.00859
Army	4204	.0427	.00528
Navy	2426	.0193	.00363
Marine Corps	737	.0289	.01091

Table 34

Mental Health Usage Rates by Service- Family Members

Category	N	Mean Score	Std Error of Mean
Air Force	5560	.0583	.00371
Army	3474	.0587	.00723
Navy	2052	.0631	.01058
Marine Corps	692	.0334	.00665

Table 35

**Summary Table of Preliminary Findings for Usage Differences Between Services
(only differences significant at p less than or equal to .05 are shown)**

Comparison Group	Percent Difference	Z-score of Difference	p-value
Air Force vs. Navy- Active Duty	Air Force has 184% higher usage rate than Navy	3.90	<.001
Army vs. Navy- Active Duty	Army has 121% higher usage rate than Navy	3.65	<.001
Air Force vs. Marines - Active Duty	Air Force has 90% higher usage rate than Marines	1.85	.032
Air Force vs. Marines- Family Members	Air Force has 75% higher usage rate than Marines	3.27	< .001
Army vs. Marines- Family Members	Army has 76% higher usage rate than Marines	2.58	.005
Navy vs. Marines- Family Members	Navy has 89% higher usage rate than Marines	2.38	.01

Summarizing the preliminary findings displayed in the above tables, it seems that for active duty members, the Navy and Marines have usage rates far below that of those found for the Air Force and the Army. With the exception of the Air Force active duty group, all active duty groups have utilization rates which are lower than the general population mental health usage estimate of five percent of the total population presented by Regier et al (1979). Furthermore, these rates of usage are significantly lower than the empirical estimates of Wells et al (1986) from the RAND Health Insurance Experiment of 1975 (7 %) and of Freiman, Cunningham and Cornelius (1994) from the 1987 National Medical Expenditure Survey (9%). The situation is different for family members. In this case, the usage rates for the Army and the Air Force are similar to the national mental health usage rate of approximately five percent reported by Regier et al (1979) for the general U.S. population. The usage rate figure for Navy personnel is somewhat higher than this benchmark rate and the Marine's corresponding figure markedly lower.

Taken as a whole, the preliminary findings for hypothesis 1C yield puzzling and somewhat paradoxical results. Air Force beneficiaries of both types, active duty and family member, have the highest mental health status scores or, in other words, lower levels of mental health morbidity, than their counterparts in the other Services. However, the utilization rates for mental health services by Air Force beneficiaries of both categories is also relatively high. In contrast, Marine Corps family members are the sickest group regarding mental health status and are among the lowest utilizers of mental health care among Service beneficiaries. The paradox in these findings is that mental health utilization rates do not track consistently with need, as defined by low mental

health status scores, for the DoD population examined. This contradicts the general findings of Ware et al (1984), who found that mental health need and usage rates were positively related. Such an outcome is preferable, since one would hope a health system will devote a higher relative share of resources to those groups who have the most apparent need for these services. The finding of an inconsistency between need for and use of mental health services will be more fully examined later in this chapter through the use of multiple regression techniques as a means of analysis.

In summary, preliminary findings based on the preliminary analysis presented thus far show hypothesis 1C are only partially supported. For active duty, the Air Force does have lower mental health morbidity than the other Services, and these differences are statistically significant in the predicted direction for the contrast of the Air Force with the Army as well as that of the Air Force with the Marine Corps. In the case of family members, the Air Force still evinces the highest mental health status (lowest mental health morbidity), but the difference is only statistically significant at the .05 level in the comparison of Air Force versus Marines. Regarding usage rates, the prediction that Air Force utilization rates would be lower than that of other Services is roundly refuted. Indeed, Air Force utilization rates are the highest and second highest among the Services for active duty and family members, respectively. Indeed, significant tests revealed that Air Force utilization differed from that of the other Services significantly and in a direction opposite from that hypothesized in several cases. These results are preliminary; further discussion regarding the issue of Service impact on utilization will follow the multivariate analysis to be presented later in this chapter.

4. Findings and Analysis of Hypotheses 1D and 1E

The fourth and fifth hypotheses among the group of descriptive hypotheses involved a comparison of mental health status of the beneficiary groups in the military health services system to that of the general U.S. population. Specifically, hypothesis 1D stated: "The level of emotional well-being scores for active duty members will be higher than that of the U.S. population average." Hypothesis 1E stated: "The level of emotional well-being scores for active duty family members will be lower than that of the U.S. population average." Once again, in order to make the comparison fair, one must adjust somehow for the very different mix of the genders in the general population and the active duty population. The approach used in this section is to compare gender specific subpopulations with each other rather than the aggregate population. Unfortunately, since the general population benchmarks were obtained from the literature, this modest level of sophistication is all that is possible. Without the raw data which Ware (1994) used to make his estimates, only this level of analysis is possible. This is sufficient, however, since the purpose of these two research hypotheses was simply to place the mean mental health status scores into a context and to determine if they were in line with general population mental health status or not. Given the limited objectives and data for these research hypotheses, no subsequent analysis of these questions following the discussion in this subsection will be attempted.

Ware (1994) reports that his sample of a general population resulted in a mean MCS score for males of 50.73, with a standard deviation of 9.57. 1,055 men were included in his sample. The women in Ware's sample numbered 1,412. The mean MCS

score for women was 49.33 and the standard deviation was 10.32. These figures are included in Table 36 below.

The sample data for the military health services system beneficiary population in the sample provided the results which are also displayed in Table 31 below:

Table 36

Mental Health Status by Beneficiary Category and Gender

Category	N	Mean Score	Std Error of Mean
Active Duty - Male	11984	50.76	.17450
Active Duty - Female	2535	48.89	.35033
Family Member - Male	997	51.68	.54583
Family Member - Female	10581	49.52	.18778
General Population - Male	1055	50.73	.295
General Population - Female	1412	49.33	.275

The method used to test hypotheses 1D and 1E is the basic, large sample test of differences between population means (McClave and Benson, 1988), where the means of interest are the MCS scores of the two groups of interest, in this case the relevant military health services system beneficiary category (active duty members for Hypothesis 1D and active duty family members for hypothesis 1E) and the general population results. Remembering that higher MCS scores are indicative of better emotional well-being, the

hypotheses to be tested are shown as follows, where MIL indicates the military population of interest and GP indicates the relevant general population figure:

$$H_0: (\mu_{MIL} - \mu_{GP}) = 0 \text{ (both)} \quad H_A: (\mu_{MIL} - \mu_{GP}) > 0 \text{ (1D)} \quad H_A: (\mu_{MIL} - \mu_{GP}) < 0 \text{ (1E)}$$

The test statistic is :

$$Z = \frac{\bar{x}_{MIL} - \bar{x}_{GP}}{\sigma_{(\bar{x}_{MIL} - \bar{x}_{GP})}} \quad (12)$$

Using the standard significance level of $\alpha = .05$, the corresponding Z score will be 1.96 for this hypothesis test. Finally, according to McClave and Benson (1988) the denominator value in equation (11) is given by equation (12) below:

$$\sqrt{\frac{\sigma_{MIL}^2}{N_1} + \frac{\sigma_{GP}^2}{N_2}} = \sigma_{(\bar{x}_{MIL} - \bar{x}_{GP})} \quad (13)$$

Applying these formulae to the hypotheses yields the following results, which are summarized in Table 37 below:

Table 37

Summary Table of Mental Health Status by Beneficiary Category and Gender

Comparison Category	Z Score	P-Value	Evidence Against Null Hypothesis
Active Duty versus General Pop (Male)	0.09	.49	Insufficient
Active Duty versus General Pop (Female)	-0.99	.84	Insufficient
Family Member versus General Pop (Male)	-1.53	.94	Insufficient
Family Member versus General Pop (Female)	-0.57	.72	Insufficient

A Z-Score greater than $|1.96|$ in the appropriate direction had to be obtained in the calculated test statistic, depicted above, in order to provide evidence to reject the null hypothesis of no difference between the means of the two groups in favor of an alternative hypothesis consistent with sociologically-based prior expectations. In each of the cases examined, there was insufficient evidence to reject the null hypothesis of no difference in the mean utilization score for the compared groups. Particularly curious, however, was a result that showed that the mean scores for DoD personnel were in a direction contrary to the predicted direction for three of the four comparisons. Although the difference was not statistically significant, it is interesting to note that the mean mental health score was higher than that of the general population for family members of both sexes and lower than that of the general female population for active duty members. Only in the case of active duty males was the DoD sample mean in its expected place

relative to the general U.S. population mean. A preliminary conclusion of this result would be that the DoD population is reasonable reflective of general U.S. society regarding mental health status. Moreover, any belief suggesting an unusual mental toughness on the part of the active duty force or, alternatively, of the mental frailty of military family members is exposed by this sample to have a basis of myth rather than of fact. Hypothesis 1D, which suggested that a higher mental health status would be found among active duty personnel relative to the general population (within gender categories), cannot be supported. Similarly, hypothesis 1E, contending that the stresses of military life might result in mental health status lower for active duty family members than the general population, cannot be supported.

Having presented the findings of the demographic analyses, attention is now turned to the final hypothesis under research question number one. Unlike the other hypotheses in this group, it uses multivariate regression as its method of statistical analysis. The model used to analyze this final research hypothesis under research question one will also be used to analyze in a scientifically more appropriate way the hypotheses presented thus far. The multivariate model which will be used in the next subsection provides a good methodological bridge between the simple methods of comparison used thus far in the analysis and the more complex methods which will be used to analyze research questions 2 and 3.

5. Findings and Analysis of Hypothesis 1F

The final hypothesis under research question is intended to consider the reasonable possibility that individuals who have recently arrived at a duty station are

more likely to be in need of mental health services, as evinced by a lower mental component summary, than other individuals. By using the method of regression, variables which are thought to influence mental health status can be included as explanatory variables so as to leave the variable, "new", which denotes individuals with six months or less time on station, to reflect only the variance not explained by the other variables. The selection of variables was based on theory and a review of findings reported in the literature and discussed in Chapter Two. The result of the multivariate technique is the elimination of any need to run multiple analyses on subgroups, as was done in the preliminary presentations of the first three research hypotheses, which focused on the impact of active duty beneficiary category, gender and rank, and Service affiliation, respectively. As a result, there is no need to run separate regressions for men and women or other categories. The purpose of this analysis is to re-explore the findings of Bailey's (1980) study of Navy mental health utilization. In that study, Bailey used a simple correlation approach not very different from the preliminary analyses presented earlier in this chapter to show that Navy personnel were more than two times more likely to use outpatient mental health services within their first six months of assignment. Based on these findings, one might expect that the mental health need might be greater for this group. If this is the case, then an extra effort to provide support to newly arriving families might be considered as a way to reduce the elevated levels of mental health morbidity and mental health utilization among the group within the population.

In the case of the test of whether "newness" significantly and negatively affects mental health status, multiple linear regression is used as the approach. In making this

assessment, the generally accepted approach of running a regression based on a theoretical model was used. It is acknowledged that such an approach assumes the independence of the independent variables in the model, as assertion which cannot be proven. Despite this shortcoming, the conventional method of using a theoretical model as the basis of regression-based analysis is used. Weights are used in order to accommodate the increased variances resulting from the stratification in the design and the nonresponse bias in the sample. Fortunately, the data included replicate weights and the final refined weight, thus making estimation of coefficients adjusted for their relative proportions in the sampling frame a relatively easy task. The software program Wesvar PC version 2.02 was used to derive the coefficient estimates for the models of interest. The model for this statistical test is a linear regression where:

$$\text{Mental Health Status} = f(\text{Beneficiary Attributes, Location Attributes, Mental Health Usage, Newness}) \quad (14)$$

There is insufficient evidence to support the conclusion that newness results either in lower mental health status or lower utilization. The results of the statistical analyses for the hypothesis that newness has a negative association with mental health status is shown in Appendix E. The labels for the variables in the statistical output are described in Appendix A. The variable entitled “new,” an indicator variable for someone who has been on station for six months or less at the time of the survey, is the variable of interest for this hypothesis. For mental health status, the coefficient on “new” is negative, as anticipated, but the associated t-score is only -0.36, which translates to a p-value of .7184,

a result which is not statistically significant. Therefore, we cannot reject the null hypothesis that newness makes no difference in the mental health status of individuals.

An argument parallel to the one made for decreased mental health status for newcomers could be made for the utilization of mental health services as well. Indeed, this is more precisely the approach taken by Bailey (1980) in his study. It seems reasonable that newcomers to a location not only suffer from the stresses inherent to adjusting to a new location and situation, but may also lack a strong social network in the area which might provide an alternative to mental health care should a mental health crisis arise. This relationship between the independent variable, "new," and the binary dependent variable of usage would be positive, based on the foregoing logic. A small methodological adjustment is necessary to handle the binary dependent variable; ordinary least squares is not appropriate in this case (Kmenta, 1985). Instead, logistic regression is chosen as an effective technique for analyzing situations with a binary dependent variable such as "usage." As was the case in the linear regression on mental health status, appropriate weights are used in order to adjust for the sampling design and variable nonresponse error. Again, Wesvar PC is employed in order to correct the variances for the errors resulting from the deviation from a simple random sample. As before, the independent variable of interest is "new." This model is:

$$\text{Mental Health Usage} = f(\text{Beneficiary Attributes, Location Attributes, Mental Health Status, Newness}) \quad (15)$$

The results of this statistical analysis are shown at Appendix F. Here again, the results do not provide any evidence which would argue against the null hypothesis of no

difference in the likelihood of a mental health visit resulting from an observed individual being new to the area, since the p-value of the estimate is well above the .05 cutoff for significance.

In summary, statistical analyses of the data set for the DoD population contradict the findings of Bailey (1980). The data analyzed here provide no evidence either of increased need, in the form of lower mental health status, or increased usage of mental health services by newcomers to a duty station. Two conclusions are offered as the most likely reasons why Bailey's findings and those discussed here contradict one another. First, it is possible that Bailey's sample of Navy enlisted personnel does not reflect the more general behavioral patterns of other DoD beneficiaries or that Bailey's sample, while reflective of DoD health care beneficiaries of 1972, does not reflect the behavioral and utilization habits of the present DoD beneficiary population. In either case, the problem is that of different populations on which the analyses were performed. A second explanation is based on the analytical approach. Like the naive preliminary findings discussed for research questions 1A, 1B and 1C, earlier in this chapter, Bailey failed to use multivariate techniques which would control for correlation among relevant independent variables predictive of usage. As will be shown in the following section, analysis using multivariate techniques often result in conclusions which are at odds from more naive approaches because they are able to consider multiple effects simultaneously, apportioning to the responsible variable that proportion of the variance for which it seems uniquely responsible. A naive approach which omits important variables can bias the magnitude and even the sign of a coefficient because some of the variance attributable to

other covariates is inappropriately transmitted to the variable included in the estimation equation (Kmenta, 1989). Therefore, the preliminary analyses presented earlier are all re-examined in the following subsection.

6. Final Analysis and Conclusions for Research Hypotheses 1A, 1B and 1C

The multivariate analysis performed for hypothesis 1F can be used to analyze research hypotheses 1A, 1B and 1C as well. The multivariate findings are the basis for the final analysis and conclusions for these three research hypotheses.

As the reader may recall, the purpose of research hypothesis 1A was to determine whether active duty personnel had higher emotional well-being scores than family members. Based on the multivariate regression presented in Appendix E, the conclusion must be that there are no differences in mental health scores between active duty and family members once all included covariates for the model are considered. Differences are found in some naive comparisons between the groups because of different proportions of the genders and other important covariates. Not unsurprisingly, none of the facility-related predictors are significant. The strongest predictors of MCS score were age, rank, being married and association with the Army. These variables had coefficients with p-values of .02, < .01, < .01 and .002, respectively. Once these covariates are controlled for in a multivariate regression, the t-score coefficient for the dichotomous variable distinguishing active duty from family members is only -.08, which implies a p-value of .9356. Contrary to the basic naive correlation study presented first in the preliminary findings, after controlling for other covariates, beneficiary category has virtually no impact on mental health status.

Hypothesis 1B also involved a comparison of active duty and family member subpopulations. In this case, however, the dependent variable of interest was the utilization rate. An initial, naive analysis showed there to be a significant difference in utilization rates between the two groups. However, after dividing the sample into four rank/gender homogenous subgroups, the analysis revealed no difference in mean usage that was statistically significant. The subdivision of the sample was a crude method of controlling for two covariates, gender and rank, which were thought to have a strong influence on utilization. The logistic regression results shown in Appendix F shows the strength of other covariates in the full model on the prediction equation for usage. This multivariate approach sustained the conclusion of no difference in usage rates attributable solely to beneficiary types after accounting for the impact of covariates. Therefore, the null hypothesis of no difference between active duty and active duty family members in their mental health usage patterns cannot be rejected.

Further analysis of the usage equation yields some interesting findings. Unlike the prediction equation for mental health status, where facility factors did not play a meaningful role, some facility factors play an important role in predicting usage. As expected, a higher ratio of military mental health providers per DoD beneficiary in a catchment area was positively related to utilization ($p=.04$), and the location of a facility in a rural or overseas area, with reduced access to community sources of mental health care, was a factor which dampened usage rates in a statistically significant way ($p=.04$).

Several individual factors also proved significant in predicting usage. These were age, where increased age was found to be positively correlated with usage ($p=.03$), rank,

where enlisted status was positively correlated with usage ($p=.01$), race, where whites were found to have higher usage rates ($p=.004$), living overseas, where living overseas was negatively correlated with likelihood of usage ($p=.02$), and mental health status, which was negatively correlated with usage ($p < .001$). Other variables did not prove to be significant.

The last research hypothesis for which a more detailed analysis is possible related to whether individual Service culture seems to have an impact on mental health status or utilization. The preliminary analysis showed that Air Force mental health status levels were higher than the Army and the Marines for active duty and higher than the Marines for family members. Other differences were not found to be statistically significant at the .05 level. The multivariate analysis results shown in Appendix E show that only an affiliation with the Army yields significantly different, and lower, mental health status, relative to the Air Force when other covariates are considered in the fuller model. The coefficient for Army mental health status has a p-level of .002. Subsequent regressions were run on the active duty and family member subpopulations. The variable indicating an individuals's affiliation with the Army, "SER4ARMY", remained statistically significant at the .05 level in both regressions; it was found to be stronger in the regression for the active duty subpopulation group. It is beyond the scope of this research to determine why the mental health status of individuals affiliated with the Army seems to be lower than Air Force members, but the result should raise some concern among Army officials. Summarizing, the mixed result for research hypothesis 1C related to mental health status stands. The mental health status of Air Force beneficiaries is higher

than that of Army beneficiaries; however, the mean mental health status for Air Force beneficiaries relative to Navy and Marine Corps beneficiaries is not statistically significant, even though the mean Air Force mental health status level is higher overall.

The second component of research question 1C involved a comparison among the Services of mental health usage rates. Usage for the purposes of this study was defined as one or more mental health visits. The preliminary analysis of this aspect of research question 1C was presented earlier and tentative findings were presented in Tables 33-35 . The tentative findings provided evidence to reject the null hypothesis of no difference between the Services in usage rates in several two Service head to head comparisons. The multivariate approach using logistic regression presented in Appendix F revealed that Service affiliation of the beneficiary had no impact on the likelihood to use mental health services once other covariates were considered. Separate logit regressions run for active duty and family member subpopulations confirmed this general conclusion. Therefore, the final finding for the issue of differences in usage is unequivocal. Service affiliation does not have a statistically significant impact on the mental health utilization behavior of DoD beneficiaries.

The final analysis and findings for research hypotheses 1A, 1B and 1C have been presented in this subsection. In some cases, the final findings based on multivariate techniques agreed with the tentative findings based on less sophisticated methods, in other cases, the tentative conclusions were overturned following the multivariate-based analysis. However, this should not be interpreted as a repudiation of more basic analytic techniques. A Marine official is concerned about Marine Corps personnel and is very

much interested in a straightforward and uncomplicated presentation of how the troops under his or her charge and their families fare. From his or her organizational perspective, it matters little that other covariates, such as age, are the real culprits underlying lower mental health status scores of Marine Corps members and their families and not affiliation with the Marine Corps per se. The Commandant of the Marine Corps may not be able to or may not wish to change the relatively youthful profile of the average Marine Corps member. However, he can use the knowledge that Marine mental health status is lower under current conditions in order to effect changes will change the status quo in an effort to improve mental health status in spite of the youthful profile of his Service. While change in the dependent variable is most likely to be made by altering factors found to be significant in a multivariate analysis, such change might not always be feasible or desirable. Fifty year old Marines, while emotionally better adjusted, are unlikely to be effective in the difficult physical challenges with which Marines are expected to contend. Therefore, the scientific perspective cannot be heralded as the only one with merit; instead, organizational considerations must be considered. This organizational perspective is served by the more naive approaches presented in the sections on preliminary analysis.

Consideration of how a group stands relative to others is also an important issue because organizational structure is the means by which systemic changes are delivered. The fact that the skewed gender composition of DoD family members toward females results in a lower mean mental health status score for family members is less important to the Director of Family Support Services at a military post because it is his or her

responsibility to improve the circumstances of military families, regardless of the origins of their distress. Changing the gender of military spouses is not a practical solution; instead, he or she will seek out administrative or policy initiatives which support the mostly female adult family members so as to improve their mental health status. Stakeholders, not statistics, take actions which change the status quo and stakeholders in the DoD are structured in terms of Services and beneficiary category groups. The basic analysis fulfills the information needs of these organizational stakeholders. The more sophisticated, multivariate analysis gives these stakeholders a sense of pressure points where focused intervention on their part may do the most good. Therefore, the presentation of both preliminary and final analyses was considered to be complementary, rather than redundant, since each type of analysis provides an important perspective which is useful information for decision makers within the DoD.

7. Summary of Findings for Research Question Number One

Research question number one involved basic analysis of issues related to mental health status and utilization. For three of the six specific research hypotheses, analysis was conducted in two phases. An initial phase, denoted as preliminary analysis and findings, took the perspective of a DoD decision maker responsible for a particular DoD group. These groups of interest were active duty, active duty family members and each of the four military Services. A subsequent phase using multiple regression techniques and called final analysis and findings, rendered final conclusions regarding research hypotheses with the full model with all covariates included. In many cases, the findings from these two approaches differed. Both the univariate and multivariate analyses had a

place, since each satisfied the needs of different audiences. Readers with an organizational perspective will be interested in a univariate analysis, identified above as the “preliminary analysis,” since their area of responsibility is often confined to a single group (e.g. women, family members, the Navy). Readers with a more traditional scientific perspective will focus more on the multivariate findings which were identified as the final analysis. The result may be confusing, particularly to readers who are unfamiliar with the information needs of the other audience. Therefore, in order to overcome any possible confusion which may arise from presenting findings from both perspectives in responding to research hypotheses 1A, 1B and 1C, this section was developed to summarize these potentially confusing, related findings based on different perspectives. Both preliminary (for hypotheses 1A, 1B and 1C) and final findings are summarized in Table 38 below.

Table 38
Research Question One Findings Summary Table

Hypothesis Number	Research Hypothesis	Preliminary Analysis Finding	Final Analysis Finding
1A	Active duty members have higher emotional well-being than family members	Supported in naive approach; not supported when gender and rank covariates are added	Not supported.

Hypothesis Number	Research Hypothesis	Preliminary Analysis Finding	Final Analysis Finding
1B	Active duty men and women utilize mental health services less than male and female family members	Supported under naive approach; not supported when gender/rank covariates are added, although the differences usage rates between active duty and family members are large on a percentage basis for all categories except females in enlisted households.	Not supported
1C(1)	Mental health morbidity will be least for Air Force families and active duty members and greatest for Navy beneficiaries.	Not supported	Not supported
1C(2)	Mental health utilization will be least for Air Force families and active duty members and greatest for Navy beneficiaries.	Supported for active duty; not supported for family members	Not supported for either active duty or family member groups.

Hypothesis Number	Research Hypothesis	Preliminary Analysis Finding	Final Analysis Finding
1D	The level of emotional well-being scores for active duty members will be higher than that of the U.S. population average	Not applicable	Not supported. Active duty and general population mental well-being scores are indistinguishable within gender categories
1E	The average emotional well-being scores for family members will be lower than that of the U.S. population average	Not applicable	Not supported. Active duty and general population mental well-being scores are indistinguishable within gender categories
1F	The average emotional well-being of individuals with less time on station will be lower than those who have been on station longer	Not applicable	Not supported.

Research hypothesis 1A sought to determine whether family members had lower mental health status than active duty members, as was anticipated. The simple answer to this question was that family members indeed had lower mental health status; however, when other covariates were added to the prediction equation for mental health status, the effect of beneficiary status was rendered statistically insignificant. Therefore, while DoD officials should be concerned about the mental health status of family members, it is not family member status per se which reduced mental health status but variables such as

living in an enlisted member household and female gender which have the greatest negative impact on mental health status. Therefore, family member advocates for DoD should work to boost morale and support programs for enlisted member's wives, particular those in the Army, since this is the group which seems to have the greatest problems regarding mental health status.

Research hypothesis 1B also sought to compare active duty members with active family members. In this case, however, the focus was on usage of mental health services. The hypothesis predicted that family member utilization of mental health services would be higher than that of active duty members. Here again, the straightforward comparison of the mean usage rates between groups revealed a distinctly higher rate of utilization among family members relative to active duty members. The inclusion of covariates, however, eliminated this effect. The null hypothesis of no difference in utilization due to beneficiary category group affiliation could not be rejected in the sophisticated multivariate methodological approach to the question.

A similar pattern of findings resulted for hypothesis 1C, where the central concern was focused on whether an individual's Service affiliation had any impact on either mental health status or mental health usage. The initial findings were mixed, with Air Force active duty members showing higher mental health scores than their Army and Marine Corps counterparts and Air Force family members showing statistically significant higher scores than their Marine Corps counterparts. No other significant differences between Services were evident in the twelve (six of active duty and six for family members) head to head comparisons made regarding mean mental health status of

the four Services. The multivariate analysis sustained the conclusion that Army active duty beneficiaries indeed had lower mental health status than Air Force active duty beneficiaries at a statistically significant level of $p < .05$. Furthermore, Army family member beneficiaries evinced statistically significant (and lower) mental health scores than their Air Force counterparts. No other differences between the Services on mental health status were found to be statistically significant using the multiple regression technique.

The usage element of research hypothesis 1C provided interesting results. The initial assumption was that Air Force usage rates would be lower since it was assumed that Air Force mental health morbidity would be lower than that of the other Services. Lower morbidity meant higher mental health status and lower levels of need. Assuming that usage follows need, the a priori expectation was that a low need group would have low utilization relative to other groups. The data suggested that this positive correlation between need and use did not hold in all cases. While Air Force affiliated beneficiaries had among the lowest levels of mental health morbidity, they displayed among the highest rates of utilization. Contrary to normative expectations, in five of the six cases where significant differences between Service pairs were found, the Service with the higher mental health status score also had the higher usage rates. This perplexing and unexpected result led to a sound rejection of the hypothesis that Air Force usage rates would be lowest among the Services. Instead, Navy and Marine Corps active duty usage rates were the lowest among the Services, despite the fact that their mental health status levels tended to be lower than those of the Army and the Air Force. The only predicted

result supported by the data was found in the case of Navy family members, where usage rates did lead the Services, however, even this result was statistically significant only for the comparison of Navy family members with Marine family members. The results discussed in this paragraph were drawn from the preliminary analysis. The apparent inconsistency between need and use of mental health services among the Services constitutes an interesting result from a scientific perspective and a vexing issue of concern from an organizational perspective. The multivariate result which shows no statistically significant influence of Service category on utilization rates, constitutes a refutation of the hypothesis that the Air Force would have the lowest usage rates and the Navy and Marines the highest. However, this finding is anticlimactic. The truly interesting result is the apparent inconsistency between need and use of mental health services, particularly among active duty personnel. That result was obtained using the methodologically simple dyadic comparison of means between groups.

Research hypotheses 1D and 1E sought to compare mental health status of active duty and family members of active duty, respectively, to the general U.S. population. The purpose of this analysis was to determine the extent to which military populations differed in terms of baseline mental health status from the general population. The a priori hypotheses were that active duty personnel would have higher mental health status than the general population as a result of entry level screening and efforts to maintain high morale in order to maintain peak force readiness. Family members were expected to have mental health status which was lower than that of the general population due to the stresses of the military lifestyle. In order to adjust for differences in gender mix between

the military and general populations, both active duty and family member subpopulations of the DoD beneficiary population were compared to their gender specific counterpart in the general U.S. population. The result of these comparisons was across the board concurrence with a null finding. The data showed that active duty members and family members are indistinguishable from the general population in terms of their mental health status once the unusual gender mix of active duty and family member subpopulations is taken into account.

The final hypothesis was an effort to determine if mental health levels were lower and mental health usage rates were higher for military beneficiaries. The expectation was that the severing of friendship networks at a previous post coupled with the stresses of adjusting to a new location would lead to this result. A multivariate approach was used to determine the finding for this research hypothesis. For mental health status, a continuous dependent variable, linear regression was chosen. For usage, a dichotomous variable, logistic regression was employed. In both cases, WESVAR PC was used to perform the desired regressions in order to account for the idiosyncracies of the sampling methodology. The results of these regressions were reported in Appendices three and four. "Newness" was found to have neither an impact on mental health status nor on usage rates. The results from this multivariate analysis stood in contrast to results on the same issue published by Bailey (1980).

Research question number one dealt with a number of issues related to mental health status and usage which are of interest to organizational stakeholders in the Department of Defense. The findings related to this research question were presented in

order to boost the general knowledge level within the Department of Defense regarding the mental health status and mental health usage patterns of two key segments of its beneficiary population. Moreover, familiarity with the data resulting from the discussion of the key variables presented in this section provides the reader with a strong background with which he or she may consider the matter of offset in the military beneficiary population. The issue of offset is dealt with in various ways in the remaining four research questions, the first of which is presented in the following major section of this chapter.

C. Findings and Analysis for Research Question Two

The analytical heart of this dissertation lies with the answering of this research question. For convenience, it is restated here: Can evidence of a medical “offset” resulting from mental health access be detected in a military beneficiary population of active duty members and adult family members?

The definition of offset used in this paper is a statistically significant and higher level of physical health visits among nonusers of mental health services than among users of mental health services, other things equal. The offset literature focuses on individuals with poor mental health status; researchers in this area have been concerned about poor access to mental health treatment and the impact it might have on utilization. Mumford and Schlesinger (1987) noted that cost offset is often considered by researchers because it represents an opportunity for mental health researchers to couch their legitimate clinical concerns over the undertreatment of mental health morbidity in the population into a cost-benefit perspective which might gain attention and support from the payors for health

services. If increasing access to mental health care can be proven to achieve long run savings, then payors would strive to restructure incentives for utilization in order to enable more people who need mental health care to access the mental health services system. This underlying motivation has led to an exclusive consideration of offset as a phenomenon which is relevant only to current users of mental health services or individuals with a relatively low mental health status.

The underlying, usually unspoken, motivation of researchers in the offset literature seems to have been the provision of a financial argument for expanding mental health access (Mumford and Schlesinger, 1987). The current research has no such hidden agenda; therefore, two separate hypotheses are tested. The first research hypothesis tested in this section follows the pattern of offset studies found in the literature, focusing on the segment of users where undertreatment of mental health problems might lead to unnecessary suffering on the part of beneficiaries. In this case, a finding of offset shows that, other things being equal, users of mental health services do indeed have fewer physical health visits than individuals who do not use mental health services. A finding of offset here is an argument for increasing access to mental health services for active duty members and their families.

The second research hypothesis to be explored in this section follows the reasoning of previous researchers of the offset phenomenon to its logical conclusion for beneficiaries who have no apparent need for mental health services. In the absence of mental health need, a mental health visit should have no impact on the number of physical health visits. In contrast to low mental health status nonusers of mental health

care, who have an undiscovered and untreated mental health problem that leads them to seek for explanations for their discomfort in the physical health sector, individuals with average or above average mental health status have no undetected and untreated mental malady which should differentially motivate these beneficiaries to see a physician, other things equal. Therefore, there should be no systematic detectable difference between the number of physical health visits experienced by users and nonusers of mental health services, other things equal. This is the converse of the argument for offset. Where offset argues that undetected mental illness must be identified by patients and providers among mental health nonusers whose mental health status indicates the need for mental health status, the same logic, applied in a converse sense, holds that in cases where no underlying mental health morbidity is there to be found, users of mental health services should derive no benefit from any "insight" which convinces them that the root of their discomfort is psychological, since there is no underlying psychopathology to be found.

Additional methodological steps were taken prior to making the analysis in order to ensure the validity and accuracy of the analysis. First, the dependent variable of total physical health visits (TOTVIS) was transformed by taking its natural logarithm and using the transformed variable as the dependent variable. The logarithmic transformation was suggested as the result of the Box-Cox analysis previously described in Chapter III. The suitability of the transformed model was then analyzed by the Pregibon linktest. This test revealed no problems with the specification of the theoretical model presented earlier. Similar results reflecting an appropriately specified model were obtained using the Hosmer-Lemeshow linearity test. Information on both of these model specification tests

were discussed in Chapter III. The computer output for these tests is included in the Appendices for the research hypotheses to which they pertain.

It is interesting to note that the self-reported mental health usage rate for the DoD beneficiaries in this sample is well below that of the self-reported mental health usage rate of 9.6 percent reported by Wells et al (1984) from the RAND health insurance experiment is striking. Disaggregated by gender, the RAND results based on self-reported patient data on mental health visits revealed a mental health usage rate of 6.91 percent for men and 12.05 percent for women (Wells et al, 1986). In contrast, mental health usage rates by gender for the DoD sample were found to be 3.33 percent for men and 6.02 percent for women, overall. Considering the fact that the findings from the first research question 1D revealed DoD beneficiaries in this sample have mental health status which is indistinguishable from that of the general U.S. population, the relatively low DoD mental health usage rates suggests the possibility of considerable undertreatment of mental health problems may exist within the military. This explanation is more likely than the alternative explanation of overtreatment of mental health problems in the general population because of the widely held belief that mental illness is chronically undertreated in the general U.S. population. Indeed, researchers have estimated that as much as twenty percent of the U.S. population needing mental health treatment are not receiving it from any source (Regier, Goldberg and Taube, 1978). Using self-reported data for assessing mental health usage is likely to provide a liberal estimate of mental health usage. Wells et. al. (1984) compared mental health usage rates reported by patients with usage rates which were derived based on provider-reported diagnoses or the

use of psychotropic drugs in the absence of accepted medical indications and found the self-reported usage rate to be the highest of the three measures for the 4,524 enrollees in the subsample used in their analysis. Relative to mental health diagnoses found in claims reports which reflected a 7.1% mental health usage rate for the population, patient reports of mental health usage reflected a 9.5% rate, a 35% higher usage rate. The RAND researchers speculated that patient reports might overstate the true number of mental health encounters. Therefore, even the low usage rates reported by the military may be generous estimates of the true rate of mental health encounters in the military population studied. Therefore, since poor performance of any health care system in the identification and treatment of the mental health needs of its beneficiaries increases the likelihood that afflicted individuals will seek succor in the physical health arena, a phenomenon identified in the literature as offset, the low usage rates reported by military members and their families relative to the general population makes it likely that offset will be found in this population if it is detectable in any population.

1. Findings and Analysis of Research Hypothesis 2A

The first of the two research hypotheses to be investigated under research question two focused on individuals in the sample with relatively low mental health status. This research hypothesis was articulated in the first chapter and is repeated here for the convenience of the reader. It is: Utilization of outpatient mental health services made by beneficiaries in the lower deciles of emotional well-being scale will be significantly less than for those who had a mental health visit than for those who did not have a mental

health visit in the prior twelve months. This research hypothesis tests whether or not offset can be detected in the overall population.

The first approach presented is a comparison of the regression coefficients of separate regressions for users and nonusers of mental health services of the set of independent variables in the model on the dependent variable of total physical health visits. In this comparison, the items of interest are the coefficient on the independent variable of mental health status and the predicted value of the dependent variable for the two groups. In this first approach, with separate regression lines and coefficients run to model the physical health utilization behavior of mental users and nonusers separately independently, the coefficient on the MCS score in each regression equation has a special meaning. By separating the regression equations for users and nonusers, we can directly test the behavioral model presented in Chapter I, which contends that mental health users will not seek additional somatic health services in the face of declining mental health status but nonusers will. However, a significant difference between the coefficients on MCS score for users and nonusers is a necessary, but not sufficient condition for a finding of offset in a population. The second required criterion under this approach is a higher predicted value of the retransformed dependent variable for nonusers relative to users. Nonusers must get more care than users, regardless of their response to changes in mental health status relative to users for offset to hold. This is the second necessary condition for a finding offset using this method. Fulfilling the criteria for both of these necessary conditions constitute sufficient evidence for a finding of offset under this method.

The lowest quartile of the data set was selected as the low subgroup considered under research hypothesis 2A because it resulted in a cutoff mental health score which had some clinical relevance. The cutoff score for the lowest quartile of mental health status, as measured by MCS score, was 47. This figure is close to the median score of 45.24 for patients registering positive on a clinical depression screener used by John Ware in the sample of the general U.S. population used in the Medical Outcomes Study which he used in the development of the physical and mental component summaries (Ware, 1994). Alternative cutoff scores for the low mental health status group were tried which examined the lowest third ($MCS \leq 50$) and the lowest fifth ($MCS \leq 45$) of the data. The results relevant to the evaluation of this research hypothesis for the two critical criteria for a finding of offset were the same for all three threshold points for the lowest mental health segment of beneficiaries.

Specific results of the regressions for users and nonusers in the lowest quartile of the data ($MCS \leq 47$) are shown in Appendices G and H, respectively. The results of the separate regressions shown in Appendices G and H are summarized in the table below. As has been noted earlier, a key issue in offset studies is not the significance of the mental health status coefficient in any single equation consisting solely of users or nonusers but of the relative differences in coefficients for users and nonusers of mental health services. If the negative correlation between mental health status and physical health visits were equally strong for users and nonusers, this finding would provide evidence which refuted the first necessary criterion for a finding of offset. Table 38 summarizes the differences between coefficients for the user and nonuser regression

equations and then shows the associated p-level of the differences between the estimates of the regression coefficients where the z-score is determined by subtracting the coefficient estimate for users from the coefficient estimate for nonusers and dividing this difference by the square root of the sum of the squared standard error terms for the user and nonuser coefficients, as in the equation shown below:

$$\frac{\beta_{xUSER} - \beta_{xNONUSER}}{s.e.(\beta_{xUSER} - \beta_{xNONUSER})} = Zscore \quad (16)$$

Table 39

Differences in Coefficients for Users and Nonusers of Mental Health Services

(Lowest MCS Quartile: MCS ≤ 47)

VARIABLE	USER COEFF	NONUSER COEFF	ZSCORE	P-value
INTERCEPT	1.905944	3.447637	-77.0847	< .02
PCS	-0.029039	-0.030516	0.02954	> .05
MCS	-0.000938	-0.011522	1.0584	< .01
MSEX	0.572505	0.169818	8.05374	> .05
EGRADE	-0.001514	0.057191	-1.1741	> .05
INOVER	0.250035	-0.0499416	5.999532	> .05
WRACE	0.164437	-0.060266	11.23515	< .02
SER4ARMY	0.084678	-0.028369	2.26094	> .05
SER4NAVY	-0.40743	0.093196	-50.0626	< .01
SER4USMC	-0.254242	0.024383	-5.5725	> .05
MARRIED	-0.171464	-0.058628	-2.25672	> .05
NEW	0.197123	0.011519	3.71208	> .05
ADBENCAT	0.305499	0.185397	2.40204	> .05
AGE	0.060025	0.006759	1.06532	> .05
AGESEX	-0.026084	-0.006581	-0.39006	> .05
AGE2	-0.000592	0.000010582	-0.0121	> .05
ARMY	-0.115677	0.070278	-3.7191	> .05
NAVY	0.2058	0.058889	2.93822	> .05
LASITE	-0.056468	-0.008533	-0.9587	> .05
FACISOL	0.122907	-0.03547	3.16754	> .05
PROVRAT	115.913225	-71.276642	3743.797	> .05

The critical finding from the above table is that the coefficient for mental health status is significantly more negative for nonusers than for users. This finding satisfies the first necessary condition for the identification of an offset effect. What this result means is that for individuals with relatively low mental health status, nonusers of mental health services will make increasingly more visits to physical health providers as their mental health status decreases. The insignificant coefficient on the mental health status for users in this quartile (see Appendix G) supports the theory that people in the low range of mental health status who obtain mental health services may have identified their cause of discomfort and do not seek out additional care in the physical health sector in order to address their discomfort. In contrast, the significant coefficient for nonusers on mental health status for this quartile (shown in Appendix H) suggests that as mental health status decreases and no mental health care is obtained, the number of physical health visits rises significantly. While these results are not the only possible explanation for why the MH (mental health usage) variable in the regression equation is insignificant for mental health users and significant for nonusers, they are consistent with Budman's (1982) theory of therapeutic insight on the part of a mental health patient.

Offset is a relative phenomenon. Therefore, the MCS coefficient for either mental health users or nonusers will not, by itself, fulfill the first criterion necessary in proving offset. Instead, evidence of offset is proven only in the contrast between users and nonusers which was portrayed earlier. It is because physical health visits for nonusers increases at a rate significantly higher than the rate of users of mental health services as mental health status declines that a finding supporting offset may be determined for this

quartile of beneficiaries. However, this finding of significant differences between users and nonusers in the coefficient for mental health status only fulfills the first necessary condition for offset. Thus far, no evidence has been provided to address the second necessary condition for offset.

In order to complete the evaluation of the presence of offset in this lowest quartile (in terms of mental health status) group of beneficiaries using this approach, it is necessary to evaluate the predicted value of the number of physical health visits for both groups. The regressions portrayed in Appendices G and H do not show the predicted value for the number of visits for users and nonusers. These predicted values, retransformed using the nonparametric smearing estimator discussed in Chapter III, are shown in the table below.

Table 40

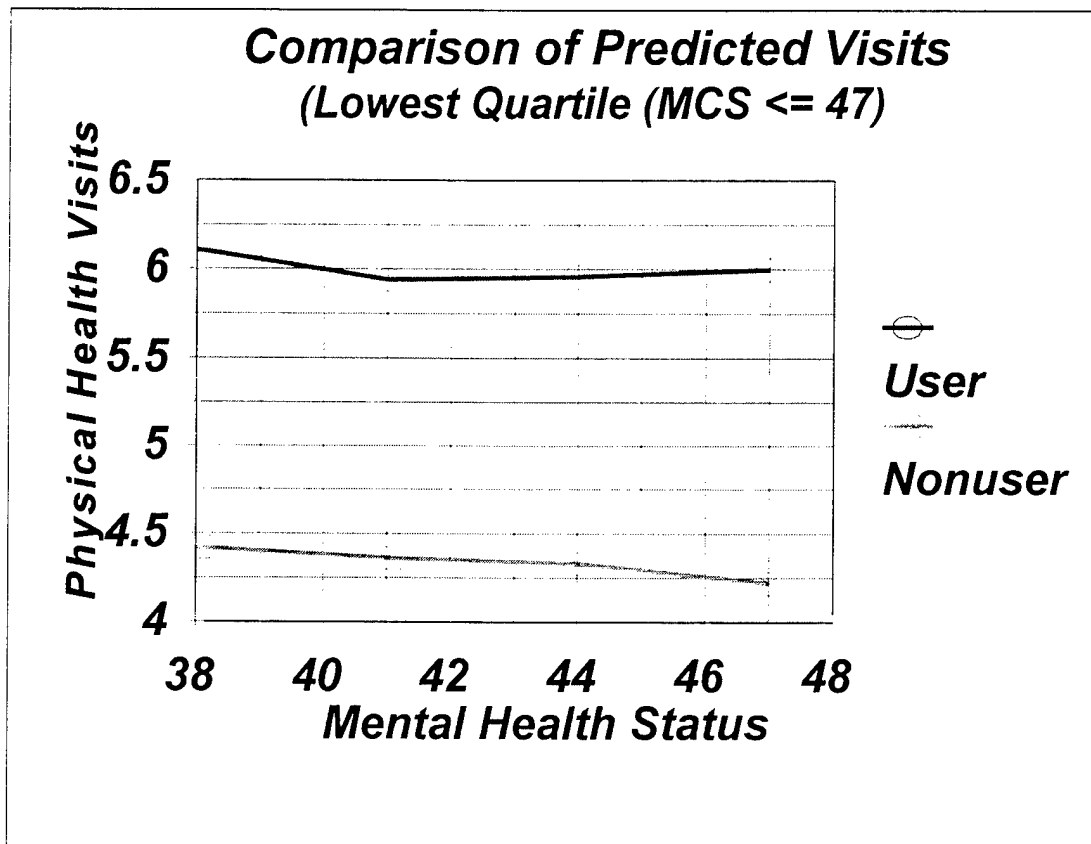
Predicted Number of Outpatient Physical Health Visits (Lowest Quartile)

Population Subset	Mental Health Users	Mental Health Nonusers
MCS < 38	6.11	4.42
MCS < 41	5.94	4.36
MCS < 44	5.96	4.33
MCS < 47	6.00	4.22

The results presented in the above table unequivocally refute the argument for the presence of offset. The differences between means of users and nonusers for each population subset are significant at the $p < .01$ level. Across the range of mental health status, nonusers have fewer visits than users. Therefore, the second necessary condition

for a finding of offset is not fulfilled. Offset cannot occur if nonusers have fewer physical health visits than users. Graphically, the situation is one as pictured below, where the user line is flat, but consistently higher than the negatively sloped nonuser regression line.

Figure 8: Graphical Representation of Offset in Lowest Quartile of MCS Scores



An alternative, and arguably more straightforward, approach to test for the presence of offset is to run the two stage least squares model presented in Chapter III and consider the coefficient on the variable for mental health usage. This approach permits the inclusion of users and nonusers in a single equation. A finding of offset would be a statistically significant negative coefficient on the usage variable. This would indicate that, other things equal, mental health users have fewer physical health visits than nonusers. This model was run for the lowest quartile of beneficiaries in terms of mental health status with the results shown in Appendix I. The positive coefficient on the usage variable provides sufficient evidence to corroborate the finding of no offset effect made previously. In order to give evidence of an offset effect, the coefficient on usage would have to be negative and significant. It is neither. Therefore, there is no offset effect which can be detected in these data. This is the major finding of this research. Essentially, mental health users tend to have higher physical health usage rates than nonusers, other covariates equal, although this pattern is not statistically distinguishable from zero. This is precisely the finding which is illustrated in Figure 8 above.

Other elements in the output in Appendix I are worthy of note. First, the partial F value for the instrument for this lowest mental health quartile is over 9.7, suggesting an almost complete absence of bias in the coefficients in the model. PROV RAT and FACISOL are excellent predictors of USAGE. Second, the results of the Pregibon linktest and the Hosmer-Lemeshaw linearity test show that the model is well specified for this group of observations. The results of these tests support the use of the two stage least squares model as a method to investigate offset in these data.

Two additional methodological approaches were taken in order to add credibility to the two approaches considered in the response to research thus far. A first approach involved an investigation of the presence of an offset effect using ordinary least squares. Two stage least squares is a method preferred by econometricians for problems such as this and is the approach dictated by current methodological thinking in the circles of health economists, particularly since the publication of the previously cited McClellan piece in *JAMA* in 1994 (Manning, 1997). However, the arguments of health economists for the two stage least squares are not always persuasive to members of other disciplines. Therefore, two additional methods were used in order to test for offset among those individuals in the lowest quartile of mental health status in the sample ($MCS \leq 47$).

The first alternative method is that of ordinary least squares. The preference for this method over two stage least squares is the argument that mental health usage, as an observed variable, should not be eviscerated by estimating it in a preliminary first stage and using that preliminary estimate as an instrument for the second stage of the regression of the equation of interest. This argument notes, correctly, that two stage least squares discounts some of the information contained in the data set based on an empirical model which portrays mental health usage as endogenous. This argument is not without a reasonable basis. However, as shown by an examination of the coefficient on usage in Appendix J, this approach yields no difference in the result of no offset effect. A modification of the OLS approach, which includes an interaction term of $MCS \times USE$ ($MCS \times USAGE$) is shown at Appendix K. It yields a similar result of a coefficient

indistinguishable from zero for the USAGE parameter. Therefore, the finding of no offset effect remains the same under this method.

A second alternative method which was explored is stepwise regression. In this technique, potential independent variables are added to the model until further additions to the set of independent variables leads to negligible improvements to the predictive power of the model. Stepwise regression has the advantage of not presuming that a theoretically derived empirical model is correct and letting the data determine for themselves what the appropriate model ought to be. The results of the stepwise regression is shown in Appendix L. All of the variables included in the empirical model were made available to the stepwise procedure. The resulting model did not include the USAGE variable, which is evidence that this variable is not a strong predictor of the dependent variable, the natural logarithm of physical health visits. Here again, an alternative method, in this case stepwise regression, provides no support for a finding of offset.

The basic finding for research hypothesis 2A is that the offset effect cannot be detected in this sample of active duty members and their adult family members. This finding is supported by four distinct methodological approaches: a comparison of users versus nonusers, two-stage least squares, ordinary least squares (with and without an MCS*USE interaction, and stepwise regression. Each of these approaches yield the same finding: Among beneficiaries whose mental health status score on the MCS scale is below 47, and therefore are likely to need mental health care, nonusers of mental health services tend to have more physical health visits, other things equal, than nonusers of

mental health services. This conclusion is also unchanged regardless of where the cut point for low mental health status is set, based on a multitude of separate tests conducted by this researcher (but not presented here) indicated. Therefore, while it is true that mental health nonusers reflect a strong tendency to increase their number of physical health visits significantly as their mental health status decreases, these nonusers, in the aggregate, access the health care system at a lower rate than mental health users, other model covariates equal. Mental health users appear to have been stabilized with regard to physical health use, since their usage of physical health services does not appear to change at all in response to worsening mental health status. However, as a group, mental health users simply tend to use more physical health services than nonusers, other model covariates equal. Explaining why this may be the case goes beyond the scope of this research hypothesis and is a matter of conjecture, but it may be that mental health users have a lower threshold level for seeking the assistance from medical personnel for both their physical or psychic discomfort. The implications of this possibility will be discussed further in Chapter V. It is not speculation, however, to conclude from the evidence that there is no general offset effect which might be exploited by the Department of Defense through a guided policy of increasing access to mental health services in an effort to decrease overall costs. However, this conclusion does not preclude the possibility of the presence of offset among subpopulations of beneficiaries. These possibilities will be explored in the analysis of research question number three. Prior to a consideration of that topic, another issue must be considered with respect to the portion of the study population with no apparent need for mental health services.

Typically unexplored in the offset literature, is the question of whether the offset phenomenon dissipates with increasing mental health status. Theoretically, in the absence of mental health need there is no reason to expect the presence of an offset effect. Indeed, mental health usage by individuals with high mental health status suggests utilization of mental health services for purposes of personal growth or insight which constitutes a luxury which lies outside of the scope of the mission of the DoD mental health services system or military mental health professional (Kutz, 1996). However, it is the organizational circumstances of the military that make the analysis of the non-needy, from a mental health perspective, segments of the population important. While it is doubtful that offset-like effects will be found in other mental health status quartiles of the distribution, the possibility should not be rejected out of hand. If offset is found in these unlikely places, then one might be forced to reassess the validity of the theory underlying the offset effect. Moreover, implications for action which may arise from such an observation which may affect the substance of recommendations for action which will be presented later. This investigation of the behavior of individuals with higher mental health status than those investigated in this section is the topic of the next research hypothesis.

2. Findings and Analysis of Research Hypothesis 2B

The second and final research hypothesis under research question two involved a consideration of individuals with normal and above normal levels of psychological well-being. Again, for the convenience of the reader, this research hypothesis is repeated here. It is: Individuals with above average levels of emotional well-being will have similar

physical health utilization experiences regardless of whether or not they see a mental health specialist.

The rationale for this hypothesis is that seeing a mental health practitioner when no mental malaise appears to be present should not have any effect on the number of physical health visits because there does not appear to be any problem of a psychological nature that a mental health visit would detect and treat. Therefore, based on the implications of the behavioral model for offset presented in Chapter I, there is no reason for nonusers of mental health services to have higher physical health visits resulting from a futile search for the origins of their psychic discomfort since they have no discomfort, or at least none detected by the mental component summary (MCS) measurement instrument used in this study to assess mental health status. Therefore, there should be no offset effect in these quartile groups.

In order to test this hypothesis, the highest three quartiles of MCS status were investigated. As in the analysis of research hypothesis 2A, the variable of interest is the MCS score in its interaction with usage in the two stage least squares model. A significant and negative coefficient on this variable would reflect the presence of offset and contradict this theoretically based expectation. As was done in the prior section, an alternative approach of comparing the predicted value of the dependent variable and the mean coefficient on the MCS parameter as measured for users and nonusers will also be presented. Once again, in this alternative approach of disaggregating users and nonusers of mental health services, a determination of offset is contingent on the fulfillment of two necessary conditions: higher predicted physical health usage by nonusers of mental health

and a significant difference between the user and nonuser coefficient for the MCS parameter in parallel regression equations, with the nonuser coefficient being more negative than that of the user. In addition, the results from the methodologically more elegant two stage least squares approach are also presented. The other alternative methods presented in the previous section, ordinary least squares regression and stepwise regression, will not be presented again. The results from these alternative methods yielded the same findings as the two stage least squares model which is the primary method of choice for this study. Including redundant statistical output was believed to provide little additional value added and is, therefore, not shown.

The evidence from the middle two quartiles of beneficiaries showed no evidence of offset. The results of from the two stage least squares model are presented in Appendix M for the middle two quartiles of MCS status, respectively. The coefficient on the parameter of interest (USAGE) for the middle two quartiles is positive and insignificant. This indicates that mental health have more visits than nonusers, which is a contradiction of offset.

The results from the alternative methodological approach of comparing the predicted values of users and nonusers and the coefficients on the MCS parameter from separate regression runs for users and nonusers in the middle two quartiles reflects similar findings of no offset effect. As was the case for the lowest quartile of users, the predicted mean value of physical health visits for users is consistently higher than registered for nonusers across the range of mental health status in this middle range of mental health status. The table below reflects this consistent pattern of predicted physical health visits,

whereby the predicted values presented are the result of the use of the smearing retransformation described in Chapter III.

Table 41

Predicted Number of Outpatient Physical Health Visits (Middle Quartiles)

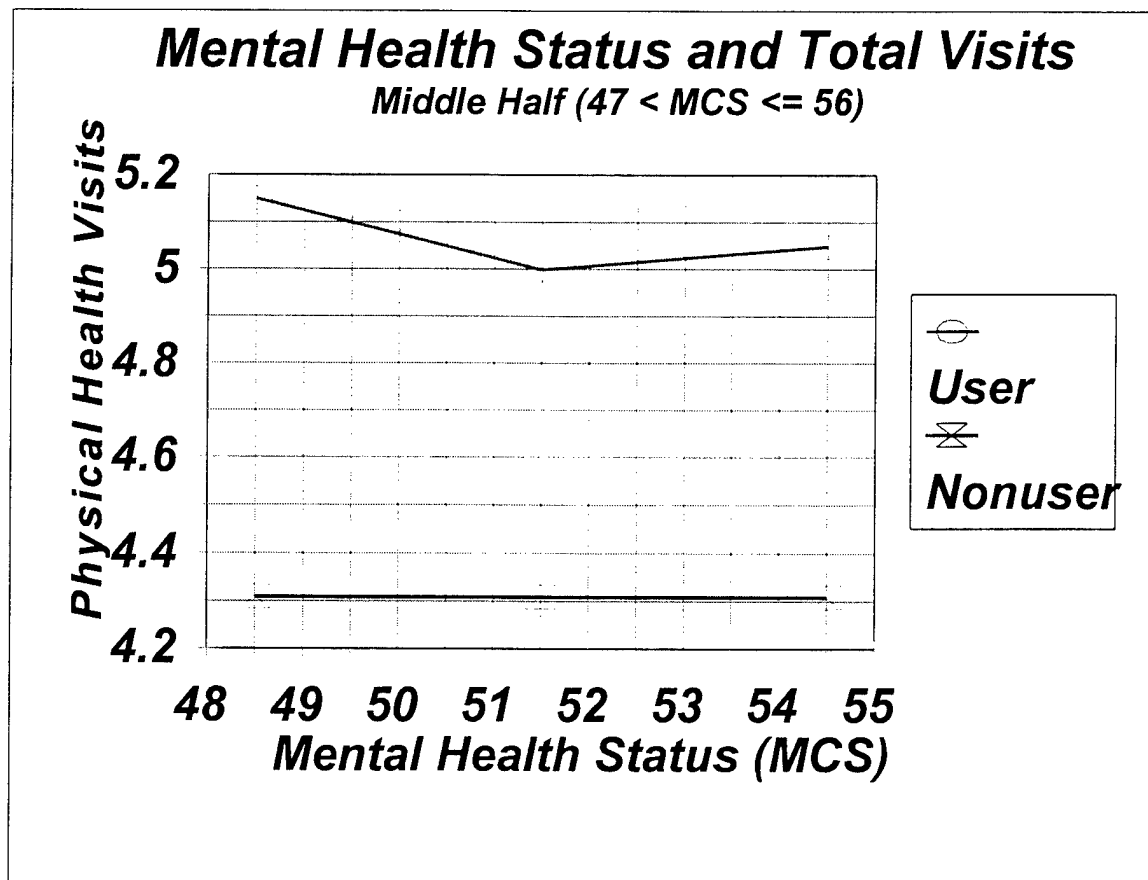
Population Subset	Mental Health Users	Mental Health Nonusers
47 > MCS ≤ 50 (Second Lowest Quartile)	5.15	4.31
50 > MCS ≤ 53 (Second Lowest Quartile)	5.00	4.31
53 > MCS ≤ 56 (Second Highest Quartile)	5.05	4.31

As can be seen from the above table, one of the necessary conditions for a finding of offset is not met for the middle two quartiles of mental health status. This is the same result as was found in the analysis of the first quartile under research hypothesis 2A. Although this constitutes sufficient evidence to reject offset in these quartiles, the second necessary criterion for offset, a statistically significant difference between the coefficient of the mental health status parameter for users and nonusers will also be considered.

Results from the regressions for the second lowest quartile (in terms of mental health status) of beneficiaries, with MCS scores ranging from 47-53, are shown in Appendices N (users) and O (nonusers). The second highest quartile, with MCS scores from 53-56, are shown in Appendices P (users) and Q (nonusers). As a review of the

regression results presented in the appendices reveals, all four of these groups had coefficients on the key MCS variable which was statistically indistinguishable from zero. In other words, changing mental health status had no statistically significant effect whatsoever on the number of physical health visits incurred by the beneficiary for either users or nonusers in this middle range of mental health status. In this sense, they were similar to the mental health users in the lowest MCS quartile, shown previously in Appendix G, where differences in mental health status led to no statistically significant change in the dependent variable of physical health visits when other covariates were considered in the multivariate regression. A graphical representation of the relationship between mental health status and physical health visits for users and nonusers in both of these middle quartiles of MCS status is shown in the Figure 9 below.

Figure 9
Graphical Representation of Absence of Offset in the Middle Half of MCS Scores



Essentially, as depicted in Figure 9, the simplified regression lines for users and nonusers with respect to the MCS parameter reflect essentially parallel slopes which are not significantly different from zero. This figure suggests that neither of the necessary conditions for offset are met for this subset of the sample. This intuitive conclusion is supported by the data presented in the tables below, where it is shown that the differences in the coefficients for MCS for the two middle quartiles is statistically

indistinguishable from zero. Table 42 shows the differences in the coefficients for users and nonusers for beneficiaries with the second lowest quartile of MCS scores and Table 43 does the same for beneficiaries with the second highest quartile of MCS scores.

Table 42
Differences in Coefficients for Users and Nonusers of Mental Health Services
(Second Lowest Quartile: 47 > MCS >= 53)

SECOND QUARTILE GROUP MCS > 47 AND MCS <= 53

VARIABLE	BETA_USER	BETA_NONUSER	ZSCORE	P-value'
INTERCEPT	3.937258	2.139476	0.8742508	>.05
PCS	-0.035252	-0.034936	-0.051597	>.05
MCS	0.026549	0.009231	0.5158442	>.05
MSEX	-0.081599	0.189212	-0.463378	>.05
EGRADE	0.267895	0.189968	0.4913912	>.05
INOVER	0.083569	-0.045807	0.4498021	>.05
WRACE	0.104411	0.041215	0.3840945	>.05
SER4ARMY	0.181427	0.004494	0.6893175	>.05
SER4NAVY	0.293089	0.164062	0.5403548	>.05
SER4USMC	0.229245	-0.085013	0.8744483	>.05
MARRIED	0.044812	-0.122573	1.0918481	>.05
NEW	0.19	-0.123208	1.5647714	>.05
ADBENCAT	0.284172	0.292279	-0.054362	>.05
AGE	-0.137399	0.01769	-2.27069	<.02
AGESEX	-0.007923	-0.016128	0.4189299	>.05
AGE2	0.002304	-5.7127E-05	2.3035011	<.02
ARMY	-0.100792	0.103943	-0.830691	>.05
NAVY	-0.151619	0.02534	-0.702605	>.05
LASITE	-0.030164	0.042466	-0.530825	>.05
FACISOL	-0.0280199	-0.144616	0.5368913	>.05
PROVRAT	-648.089148	4.983249	-1.375724	>.05

Table 43
Differences in Coefficients for Users and Nonusers of Mental Health Services
(Second Highest Quartile: MCS > 53 and MCS ≤ 56)

THIRD QUARTILE GROUP MCS > 53 AND MCS ≤ 56				
VARIABLE	BETA_USER	BETA_NONUSER	ZSCORE	P-value'
INTERCEPT	6.259073	2.460584	0.7137549	>.05
PCS	-0.017643	-0.031692	1.9121864	>.05
MCS	-0.088404	-0.003821	-0.888529	>.05
MSEX	0.031365	-0.134978	0.2699223	>.05
EGRADE	0.050548	0.176516	-0.539269	>.05
INOVER	0.165094	0.065025	0.2590916	>.05
WRACE	0.213846	-0.015544	1.2101316	>.05
SER4ARMY	0.369852	0.124622	0.7709509	>.05
SER4NAVY	-0.32183	0.16359	-1.377561	>.05
SER4USMC	-0.516809	0.414773	-1.946352	<.03
MARRIED	-0.402994	-0.178594	-0.925046	>.05
NEW	0.16654	0.02814	0.676948	>.05
ADBENCAT	0.459898	0.16879	1.1674594	>.05
AGE	0.056491	0.02814	0.3408657	>.05
AGESEX	-0.013306	0.001571	-0.68296	>.05
AGE2	-0.000844	-0.00027	-0.441004	>.05
ARMY	0.164833	-0.009176	0.5453594	>.05
NAVY	0.424726	-0.165883	1.9677451	<.03
LASITE	-0.243422	-0.049641	-0.983344	>.05
FACISOL	0.112628	0.043778	0.1995649	>.05
PROVRAT	6.116395	52.869478	-0.074275	>.05

The finding of no offset among beneficiaries with MCS scores in the middle half of the distribution of users (MCS from 47 to 56) was encouraging. In order to complete the analysis, the possibility of the presence of offset needed to be investigated for beneficiaries who were in the highest quartile of MCS status.

The analysis of beneficiaries in the top quartile of mental health status again revealed no evidence of offset. Once again, the results of the two stage least squares regression (Appendix R) showed the coefficient on the key parameter of USAGE to be statistically insignificant, but tending positive, a result which contradicts a finding of

offset. Furthermore, as has been the case in the other quartiles, users of mental health services seek physical health care in greater quantity than do nonusers throughout the range of this quartile. However, the table below shows that while the differences between users and nonusers narrow to their narrowest level for the lowest two thirds of this highest quartile ($56 > \text{MCS} \geq 58$) before ballooning out to their largest difference of all for individuals with MCS scores greater than 58.

Table 44

Predicted Number of Outpatient Physical Health Visits (Highest Quartile)

Population Subset	Mental Health Users	Mental Health Nonusers
$56 > \text{MCS} \leq 58$	4.75	4.33
$\text{MCS} > 58$	6.63	4.33
$\text{MCS} > 56$ (Entire Highest Quartile)	5.62	4.33

The spike in physical health usage for mental health users in the highest segment of mental health status is mirrored in the simple regression results shown in Appendix S. Those results show a coefficient on the MCS parameter for users which is positive and significant for the first time in this analysis. In contrast, nonusers of mental health services in this quartile (Appendix T) have a coefficient on the key MCS variable which is not significantly different from zero. As shown in the table below, the difference in the coefficients for the MCS parameter is highly significant.

Table 45
Differences in Coefficients for Users and Nonusers of Mental Health
(Highest Quartile: MCS > 56)

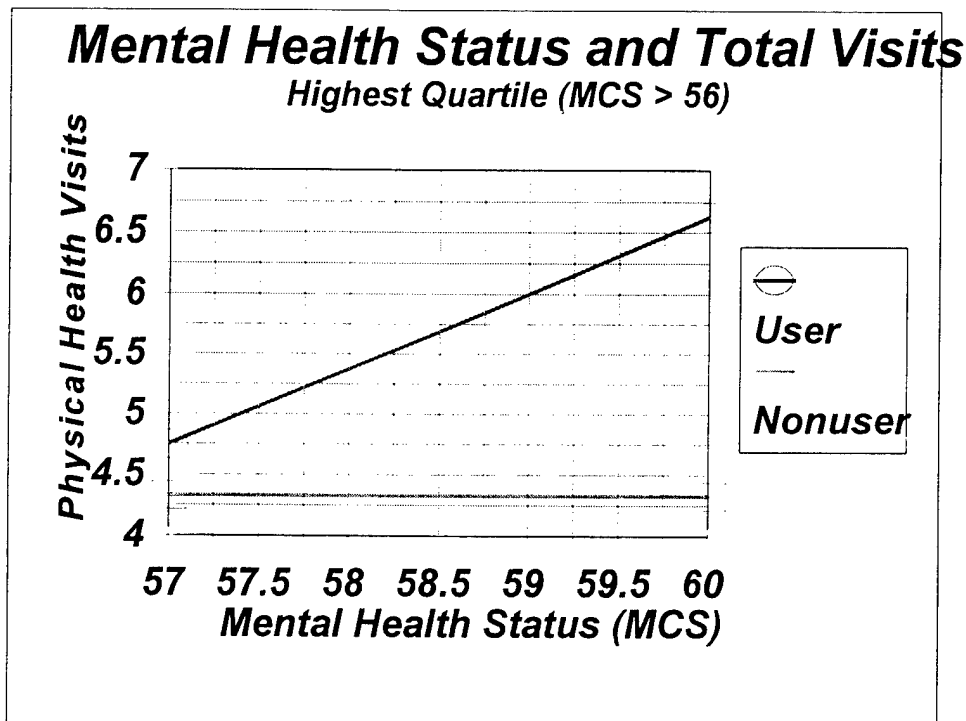
TOP QUARTILE GROUP MCS > 56				
VARIABLE	BETA_USER	BETA_NONUSER	ZSCORE	P-value'
INTERCEPT	-2.162834	2.644819	-2.18732	<.03
PCS	-0.02988	-0.037184	1.3429674	>.05
MCS	0.089673	0.000925	2.7763592	<.01
MSEX	0.737946	0.127584	1.1117035	>.05
EGRADE	0.358823	0.061811	1.8436378	<.05
INOVER	-0.875627	-0.025148	-2.955473	<.01
WRACE	-0.213992	0.013389	-1.699816	<.05
SER4ARMY	-0.412555	-0.018731	-1.744748	<.05
SER4NAVY	-0.14795	-0.077557	-0.146682	>.05
SER4USMC	-0.280643	-0.025377	-0.390535	>.05
MARRIED	0.242599	-0.069824	1.8008657	<.05
NEW	0.019579	0.01658	0.0167694	>.05
ADBENCAT	0.149781	0.159597	-0.075279	>.05
AGE	-0.023001	0.021854	-0.925034	>.05
AGESEX	-0.02342	-0.005371	-1.02571	>.05
AGE2	0.000435	-0.00023	0.9016216	>.05
ARMY	0.540144	0.046213	2.1413034	<.02
NAVY	0.202705	0.086847	0.238788	>.05
LASITE	-0.132607	0.031744	-1.102106	>.05
FACISOL	-0.037273	-0.040701	0.0155259	>.05
PROVRAT	401.359124	41.232251	0.62361	>.05

What seems to be occurring in this category of beneficiaries in the uppermost quartile of mental health status, defined empirically as those with an MCS score greater than 56, is what could be termed a negative offset effect. Whereas the offset effect is said to be present when nonusers have higher rates of physical health utilization relative to users and mental health status declines, other covariates equal, and when physical health usage rates for nonusers is higher than that for users. In this highest quartile of mental health status, especially at its extreme upper end, the exact opposite is occurring. Mental health users have higher physical health usage rates than nonusers. Moreover, the rate of

physical health use increases as their mental health status increases! In the analysis conducted for research hypothesis 2A (among beneficiaries in the lowest quartile of mental health status), mental health users had stable demands with regard to physical health visits as mental health status changed, but nonuser utilization of physical health services was negatively correlated with changes in mental health status. The situation found in the highest quartile of MCS scores constitutes a mirror image of the offset situation found in the lowest MCS quartile. In this uppermost quartile of mental health status, it is the mental health nonusers whose physical health visits are unaffected by differences in mental health status and the mental health users whose physical health visits are significantly impacted by changes in mental health status. Therefore, although the a prior expectation of no offset in this segment is supported, there is evidence of an altogether unexpected and paradoxical finding of a negative offset effect at the upper end of the mental health status range. An important caveat to these statements must be added, however. Given the limitations of the data regarding the timing of visits relative to the end of the period (when health status is measured), one cannot be certain as to the causality direction for this relationship. In other words, it may be that visiting a physician brings peace of mind which improves mental health status. Such an interpretation of the relationships of the data in the figure which follows would not constitute a paradox. Unfortunately, the cross-sectional nature of the data does not permit one to establish whether physical health visits bring peace of mind or whether worried well individuals overuse health care services. Determining which of these explanations is correct lies beyond the scope of this study but remains an interesting question for future research.

Figure 10 depicts the situation described in this paragraph graphically.

Figure 10
Graphical Representation of Negative Offset in the Highest Quartile of MCS Scores
(MCS > 56)



The implications of this unexpected finding are important. If researchers focus only on the segment of the population with the greatest mental health need and evidence of offset is found, one might be tempted to recommend measures to encourage mental health usage by beneficiaries without restraint. However, the presence of what I have termed as a negative offset effect in the highest quartile mental health status beneficiaries makes the simple fix of increasing mental health access inappropriate. If mental health access is increased across the board, any positive offset achieved in turning lowest quartile nonusers into users might be wholly negated by the negative offset which results

in turning nonusers into users in the uppermost mental health status quartile. Instead, more precise interventions would be required in order to encourage those in need of mental health care, who will in turn use fewer physical health resources upon receiving mental health care, and to identify and discourage use of mental health services by those who have no demonstrable need for this care, since it also seems to result in excess utilization of physical health services.

The results of the empirical analysis of research hypothesis 2B support the working hypothesis that no offset effect would be found in the elements of the beneficiary populations which enjoy higher mental health status. The presence of a negative offset effect is an interesting anomaly which merits further consideration in the future. The implications of this discovery will be discussed further in Chapter V.

3. Summary of Findings For Research Question Number Two

The purpose of research question number two was to determine if the offset effect described in the literature could be detected in a military population. In addition, it sought to determine whether or not this offset effect dissipated with improving mental health status of a population. The former issue has been the focus of the offset literature presented in Chapter II. The latter issue has not been considered by researchers in the area, possibly because the hidden agenda of researchers in this area has been to provide a justification for increasing access to mental health services. Increasing access to mental health services for individuals who have no serious mental health afflictions is tantamount to encouraging waste of resources. While the issue of unnecessary use of services may be a matter of indifference (or even an objective if one considers the

incentives underlying the issue of provider induced demand) to mental health providers operating in a fee-for-service structure, it is of great concern to an organization such as the Department of Defense which is simultaneously provider and payor of health care services. Meeting legitimate need for mental health services is important to the DoD from a readiness perspective alone; if an offset effect exists, it provides additional motivation to increase access of mental health services to those who need such care. This was the motivation for research hypothesis 2A. However, limiting unnecessary use of mental health services is also a matter of concern for the DoD. Therefore, the possibility of unanticipated consequences of increasing access to mental health services, such as a negative offset effect, had to be considered as well. This was the motivation underlying research hypothesis 2B. The result of this investigation across the full spectrum of mental health status in the population investigated yielded some interesting findings.

The major finding of this section are there is no offset effect which can be detected in the study population. In addition, it appears that a negative offset effect exists in the upper ranges of mental health status, whereby mental health users paradoxically tend to use greater amounts of physical health services as their mental health status increases.

No evidence supporting the presence of an offset effect was found in the lowest quartile of mental health status. In this lowest quartile, in which need for mental health care is strongest, individuals who obtained a mental health visit had higher numbers of physical health visits as their mental health status declined. This is a fundamental contradiction of the offset principle. However, it was also found that one of the two

necessary conditions for offset could be supported. Nonusers of mental health services did use significantly more physical health services as their mental health status declined as did users of mental health services, whose physical health usage was substantially unaffected by changes in mental health status. The finding of no offset effect was supported by the methodologically sounder two stage least squares approach.

The middle two quartiles of the mental health status distribution, covering a range of MCS scores from 47 to 56, revealed neither an offset effect nor a negative offset effect. The coefficients on the mental health status parameter for both users and nonusers in these quartiles was neither significantly different from zero nor significantly different from each other. Here again, however, mental health users used physical health services more than nonusers.

The uppermost quartile of mental health status revealed a negative offset effect. In this group, users of mental health care demonstrated higher usage of physical health services as their mental health status increased. The positive correlation of mental health status and volume of physical health usage coupled with higher predicted visits for users than nonusers of mental health services was termed the negative offset effect. In contrast, nonuser physical health visits were unaffected by changes in mental health status. Therefore, moving nonusers into the user category would increase physical health usage rates unnecessarily. The military health care system cannot afford to apply its tight resources on the worried well or on people who derive benefits from the usage of health care which does not appear to be related to their health status or need for services. The presence of this negative offset effect should temper any urge to increase access to mental

health care in the DoD beneficiary population. This simple and straightforward approach has negative utilization consequences arising from the presence of a negative offset effect which must be considered in any recommendations for action.

This research question has achieved the principle scientific objective of this research. In spite (or perhaps because) of the presence of a large sample size with data which controlled for the physical health status of patients observed in the data, this study has detected no evidence of an offset effect in this population. While the limitations of the data used for this study have been recognized earlier, the inability of this study to find even weak support for the offset phenomenon suggests that the methodological shortcomings of studies reported in the offset literature might have vastly overstated the strength of the phenomenon. Alternatively, it may be that the military represents such a unique environment that offset, while present in other populations, simply is not present in the military population of active duty members and their families. The historically poor record of the findings of offset studies to be generalized beyond their unique organizational circumstances makes either explanation reasonable. An unexpected bonus of this analysis has been the discovery of a new phenomenon which has been termed the negative offset effect, which under any circumstances tempers calls to broaden mental health access by noting the consequences of overutilization of health services by the worried well. Implications of these findings will be discussed further in Chapter V.

These general findings, while of scientific interest, lack practical utility because of their general nature. While the absence of offset in the aggregate is important to know, this knowledge is not of sufficient specificity to warrant giving up on the possibility of

offset in some subpopulations where the promise of offset to increase quality and decrease costs while through improved mental health access cannot be fulfilled.

Therefore, further investigations are necessary to determine whether or not an offset effect can be detected in readily identifiable subgroups of the DoD beneficiary population under study. If so, then appropriate interventions might be tailored to these groups. This is the purpose of research question number three, which is analyzed and discussed in the following section.

D. Findings and Analysis for Research Question Number Three

The foregoing analysis has established that no overall offset effect is detectable in the population under study. This finding diminished the prospects for proposing a sweeping, general policy change resulting from this research effort. However, the overall finding of no offset effect does not necessarily preclude the possibility of detecting offset in important subpopulations of the DoD beneficiary population. Indeed, a finding of offset in a subpopulation is likely to be of greater practical import, since it could allow for more precise targeting of groups for which boosting access to mental health services will result in a reduction of utilization of physical health services. However, the magnitude and direction of the differences in the quantity of physical health care used by mental health users and nonusers makes a finding of offset in any subpopulation unlikely. Nevertheless, an investigation is conducted in order to rule out the presence of offset in any of several important subpopulations identified in the research hypotheses.

In addition, regardless of the findings on offset, the research hypotheses investigated under research question three are of interest because they test expectations of

user behavior based on the sociological theories presented in Chapter II. The basic methodological approach taken in this section is to compare the coefficients of the USAGE variable in the two stage least squares regression equation between two groups. The first group named in the paired comparisons is expected to have greater aversion to obtaining mental health care, and therefore would be more likely to get more physical health visits in order to avoid a mental health visit than the comparison group. Support for these hypotheses would be in evidence if the negative number (signifying offset) was larger for the group expected to be more averse to mental health care relative to its counterpart (e.g. men versus women). The result of paired difference test of coefficients would then be a statistically significant t-statistic, since a large negative would be subtracted by a smaller negative and then divided by the standard deviation of the difference.

However, given that offset was not detected in the general population under study, it is not possible that all subsets of the population will show evidence of offset, whether statistically significant or not. At best, since all of the group comparisons consider different splits of the entire population, at least one of the subgroups will have a positive coefficient on the USAGE parameter. If one of the subgroups has a negative coefficient and this coefficient is sufficiently different to result in a significantly negative t-score on a paired t-test of the coefficients, then a finding of greater offset in subgroup A relative to subgroup B could be made. Such an outcome will be meaningful because it shows that offset does play a role in one of the groups being compared. If, however, all subgroups being compared have positive coefficients on the USAGE parameter, any comparison

between groups regarding the degree of offset is meaningless, since offset as a phenomenon would be present in neither group.

This section, following the pattern of the other sections in this chapter, systematically addresses each of the specific research hypotheses in turn. Only those individuals with some evidence of need ($MCS \leq 47$) are examined, consistent with the traditional behavioral model for offset, which views offset as a phenomenon conditional on mental health care need. Box-Cox analyses were performed for each of the subgroups analyzed under this research question (e.g. males). In every case, the recommended variance stabilizing transformation was a logarithmic transformation of the dependent variable. Therefore, the dependent variable in each of the analyses in this section is the natural logarithm of the total visit count.

1. Findings and Analysis for Research Hypothesis 3A

The objective of research hypothesis 3A was to compare the strength of the offset effect between active duty members and their families. A hypothesis was derived from a review of sociological theory and key aspects of the military subculture which suggested that active duty personnel would be more averse to seeking mental health care than family members, presumably due to the real and imagined consequences that a mental health visit would have on the active duty member's career. As a result, it was presumed that active duty personnel would tend to seek relief from mental health problems in the physical health arena longer than family members, other things equal. This stronger aversion to mental health care was expected to lead to an offset effect which was more pronounced for active duty members than for family members.

The empirical results regarding offset for active duty members and family members are presented in Appendices U and V, respectively. The empirical model was adjusted slightly for family members, in that the instrument used was comprised solely of PROVRAT rather than of PROVRAT and FACISOL, as shown in the empirical model. The partial correlation of the instrument with USAGE in the single instrument version of the model was better than the two instrument version and was, therefore, substituted. Active duty members used the original two instrument model, as reflected in the empirical model presented in Chapter III.

As a review of the key parameter from the two stage least squares estimation clearly shows, there is no evidence of offset in either family members or active duty members. In both cases, users of mental health care access the physical health care system more than nonusers. Therefore, since neither group experiences offset, this research question is no longer applicable.

2. Findings and Analysis for Research Hypothesis 3B

This research hypothesis sought to compare men and women. Based on a review of the literature presented in Chapter II, it was believed that men would be more averse to seeking mental health care and thus have higher offsets than women. The empirical results regarding offset are shown in Appendices W and X for men and women, respectively. Once again, an adjustment in the model was made for women by dropping the FACISOL variable from the instrument and retaining only PROVRAT as the instrument. For women, FACISOL was a poor predictor of mental health usage;

therefore, the single item instrument performed better. The instrument from males is unchanged from the empirical model of Chapter III.

There is some evidence of an offset effect for men, since the key parameter of USAGE is negative. However, the magnitude of this effect is not statistically significant. In other words, although the negative coefficient is in the direction required for offset, it is not of sufficient magnitude to be statistically distinguishable from zero. In contrast, women do not show any hint of evidence of an offset effect, since the coefficient on the key parameter of the equation is positive. However, a comparison of the differences in these coefficients reveals a weakly statistically significant difference (for a two-sided significance test at the $\alpha = .10$ level) of -1.77. Therefore, although a finding of offset cannot be supported for men because the coefficient of the key parameter is not statistically significant, the fact that it is negative coupled with the fact that the difference in utilization between men and women mental health users is statistically significant constitutes sufficient evidence to support the hypothesis that the magnitude of offset is higher for men than for women. This finding is consistent with the expectation derived from sociological theory and presented in Chapter II.

3. Findings and Analysis for Research Hypotheses 3C and 3D

There is no evidence of an offset effect in either officer or enlisted families, the pair of concern in research hypothesis 3C, nor in newly arrived individuals (arrival within six months) and personnel who have lived on station for longer periods of time. The results of the two stage least squares estimations for these groups are shown in

Appendices Y, Z, AA and AB. Since no offset effect is detected in any of these groups, comparison of the groups based on the magnitude of their offset effect is no longer valid.

4. Findings and Analysis for Research Hypothesis 3E

Appendices AC, AD and AE show the regression results for separate runs for the Army, Air Force, and Navy, respectively. In no case is there evidence of offset for any of the services. The coefficient for the key parameter in the Air Force equation is negative, but only slightly so, and in any case not statistically distinguishable from zero. The coefficient on the key USAGE parameter in the two stage least squares estimation for the other services is positive for the Navy. However, the difference between the coefficients for the Air Force and the Navy yields a Z-score of $-.042$, for a p-level of $.48$, which is statistically indistinguishable from zero. Therefore, no finding of offset can be made for the Air Force or the Navy subgroups. Marine Corps personnel were combined with other Department of the Navy personnel due to their relatively small numbers. Their small number would make a statistically significant finding very difficult to justify due to expected wide swings in standard error arising from the small sample size.

The Army findings represent a special case. For the Army subgroup, the instrument for the endogenous independent variable of usage is extremely poor, rendering estimation of coefficients from the two stage least squares subject to excessive bias. Since two stage least squares has been identified as the methodologically correct way of estimating this problem and alternative instruments for mental health usage are not available, a finding for offset cannot be properly rendered for the Army subgroup. However, examination of the OLS run of the regression of the independent variables and

USAGE on the logged value of total physical health visits revealed a strongly positive coefficient on the USAGE parameter. This evidence, coupled with the admittedly biased, yet insignificant, coefficient on the USAGE parameter from the two stage least squares method rendered in Appendix AC, makes it unlikely that an offset effect is present in the Army subpopulation.

5. Summary of Findings for Research Question Number Three

The original purpose of this research question was to identify subgroups within the DoD population with a particularly strong offset effect. It was written with the expectation that an offset effect would be found in the overall sample. Therefore, since no overall offset effect was found, the issues surrounding this set of research questions became less interesting. None of the subgroups examined had any evidence of offset; that is to say, the coefficient on the USAGE parameter was either positive or indistinguishable from zero in all cases. Males and individuals associated with the Air Force showed small negative coefficients on the USAGE parameter, although these were not significant. The difference between the USAGE coefficient for males and females was statistically significant. The difference between the USAGE coefficients between the Air Force and the Navy were not statistically significant. Therefore, one might say that the offset effect, to the extent it may be present, is stronger among males than among females. This is consistent with prior expectation derived from sociological theory. However, such a finding is nearly meaningless since the presence of an offset effect cannot be validated for any of the subpopulations considered under research question number three.

E. Findings and Analysis for Research Question Four

The objective of research question four was to estimate the magnitude of the offset effect in terms of the difference in the number of physical health visits attributable to the usage of mental health services. Here again, the failure to find an offset effect changes the nature of this question. Rather than estimating the number of physical health visits saved per person from a mental health visit, one estimates the number of additional physical health visits used as the result of providing mental health access. Nevertheless, the magnitude estimation issue remains important. Despite an absence of offset, there is still evidence from research question number one that military beneficiaries do not receive the amount of mental health care appropriate to their aggregate need. Therefore, expanded access may still be a worthwhile goal from the perspectives of quality of care and force readiness, despite its cost. The first step in identifying the cost of expanded access is to determine the empirical difference in physical health usage between mental health users and mental health nonusers.

There are several ways that one could accomplish this goal of quantifying excess physical health use on the part of mental health users and nonusers: however, the method chosen here was to use the estimates of the predicted mean value of the dependent variable for mental health users and nonusers, retransformed into the original units of visits with the smearing estimator, and subtracting these two figures from each other. Table 46 shown below, itself an adaptation of an earlier table, shows the difference in the number of physical health visits for individuals in the lowest quartile of mental health status at various cut points in the mental health status distribution.

Table 46

Differences in Physical Health Usage for Mental Health Users and Nonusers

Population Subset	Mental Health Users	Mental Health Nonusers	Difference (Users-Nonusers)
MCS < 38	6.11	4.42	1.69
MCS < 41	5.94	4.36	1.58
MCS < 44	5.96	4.33	1.63
MCS < 47	6.00	4.22	1.78

The difference varies between 1.58 and 1.78 visits, with mental health users always obtaining more physical health visits than mental health nonusers. However, the difference in terms of offset is more appropriately shown as negative, since the affect of mental health usage is not a decrease in the number of physical health visits, as would be the case if an offset effect had been detected in this population, but an increase in physical health visits which is experienced by mental health users. This is a sort of negative offset effect, which holds, contrary to theoretical expectations, that mental health usage does not lead to a decrease in the number of physical health visits, but to an increase. Therefore, choosing MCS $\leq$ 47 as the cut point, the per beneficiary impact of changing mental health nonuser into a user is an increase in expected increase of 1.78 physical health visits. Alternative cut points will yield somewhat lower incremental increases in physical health visits. This finding eliminates any possibility of decreasing total costs by increasing access to mental health care. Such a conclusion is only strengthened when supplemented by the fact that the average mental health user in the population studied receives 4.8 mental health visits in a twelve month period.

Having estimated the magnitude of the impact of changing a mental health nonuser into a mental health user in terms of physical health visits, it remains to estimate the cost per individual and maximum cost to the system of a policy which encourages nonusers of mental health services into using these services. This is the objective of research question number five.

F. Findings and Analysis For Research Question Number Five

Research question number five asked: "What is the estimated annual cost associated with not treating those active duty family members and active duty personnel in terms of dollars?" Of course, the response of "it depends" is correct since the incremental difference in physical health visits for mental health users and nonusers changes as one changes the cut point for requiring mental health usage for those who fall below a certain mental health status score. This consideration having been noted, an eight step algorithm used to answer research question five was identified in Chapter III. This algorithm, now joined with its required elements of information, is repeated in this section for the convenience of the reader. Given the findings reported heretofore in this Chapter, it should be clear that not treating active duty members and their families in need of mental health care ($MCS \leq 47$) is not associated with a cost, since there is no offset effect. Instead, rather the opposite is true. Treating individuals who require mental health care is likely to be an expensive undertaking. The purpose of this section is to provide an estimate of how much additional cost might be incurred through more aggressive efforts of providing mental health treatment to those in need of care.

Following the algorithm provides a step-by-step means of achieving a solution to this question.

*Step 1. [Use the conservative estimate for the offset in total utilization determined in research question 4 as] = **OFFSET** per patient.* This figure was established as -1.78 visits. The figure is shown as a negative because “offset” implies that mental health nonusers use more physical health services than users, which empirical testing has established is the opposite of the true situation.

*Step 2. [(Total number of active duty and active duty family member beneficiaries) * (proportion of beneficiaries in these categories with some level of psychological distress, i.e. $MCS \leq 47$)] = total **POTENTIAL CASES** applicable for offset.*

There were a total of 1,803,381 active duty members and 1,090,431 active duty family members above the age of 17 and included in the sampling frame for this study (Chu and Flores-Cervantes, 1994). The proportion of beneficiaries defined to be in some level of mental distress ($MCS \leq 47$) was 25.5 percent of the total sample. Therefore, the total number of active duty members and their adult family members estimated to be in some level of mental distress is 737,922. This is the number of potential cases.

*Step 3. **PROPORTION** of psychologically distressed individuals getting mental health treatment by category, e.g. [$MCS \leq 47 \mid USAGE=1$].* Only 12.19 percent of the individuals in the sample with MCS scores less than or equal to 47 reported a mental health visit in the prior year.

Step 4. \$/PRIMARY CARE VISIT. Average CHAMPUS payment for an outpatient primary care visit. The average cost of a primary care visit provided in a military facility is \$103.66. The average governmental cost for a CHAMPUS visit to a primary care clinic is \$158.84 (Vector Research, 1996). These figures include associated ancillary and overhead costs (Pascoe, 1997). In order to make the overall estimate conservative, the lower of the two figures, \$103.66, will be used in estimating overall costs.

Step 5. \$/MENTAL HEALTH VISIT. Average CHAMPUS payment for an outpatient mental health visit. The average cost of a mental health clinic visit provided in a military facility is \$124.73. The average governmental cost for a CHAMPUS visit to a mental health clinic is \$115.40 (Vector Research, 1996). These figures include associated ancillary and overhead costs (Pascoe, 1997). In order to make the overall estimate conservative, the lower of the two figures, \$115.40, will be used in estimating overall costs.

Step 6. AVERAGE NUMBER OF MENTAL HEALTH VISITS FOR MENTAL HEALTH USERS. The empirically determined conditional mean of the number of mental health visits given any mental health use is 4.8.

Step 7. ESTIMATED PER CAPITA COST SAVINGS resulting from shifting psychologically distressed mental health nonusers to user category. Determine using the formula below:

*(OFFSET * \$/PRIMARY CARE VISIT) - (\$/MENTAL HEALTH VISIT * AVERAGE NUMBER OF MENTAL HEALTH VISITS FOR USERS)*

There is no savings for offset, so the OFFSET figure will be negative, thus representing an additional marginal cost resulting from shifting nonusers to users. The appropriate figures for the above equation are included below:

$(-1.78 * \$103.66) - (\$115.40 * 4.8) = -\$738.43$ Estimated per capita loss associated with providing mental health treatment to an individual with MCS ≤ 47 . This is an estimate of direct health care costs only, however, and is not adjusted for likely savings resulting from the individual's increased productivity, if the individual is employed by the government.

Step 8. Determine the estimated maximum savings potential for offset using the information above placed in the formula below.

$\$ \text{ OFFSET POTENTIAL} = (1 - \text{PROPORTION}) * (\text{POTENTIAL CASES}) * (\text{ESTIMATED PER CAPITA COST SAVINGS})$

The above formula gives the maximum incremental cost of treatment every active duty member and adult active duty family member with a predefined level of mental distress (MCS ≤ 47). $1 - .1219 (= .8781)$ is the proportion of those in need who do not already receive services and is the value of the first expression in the equation. The second expression is given by 737.922, as established in Step 2 of this algorithm. The per capita cost savings (actually a loss since there is no offset) for shifting each mental health nonuser into a mental health user is $-\$748.33$, as established in Step 7 above. Multiplying these figures together yields the result of

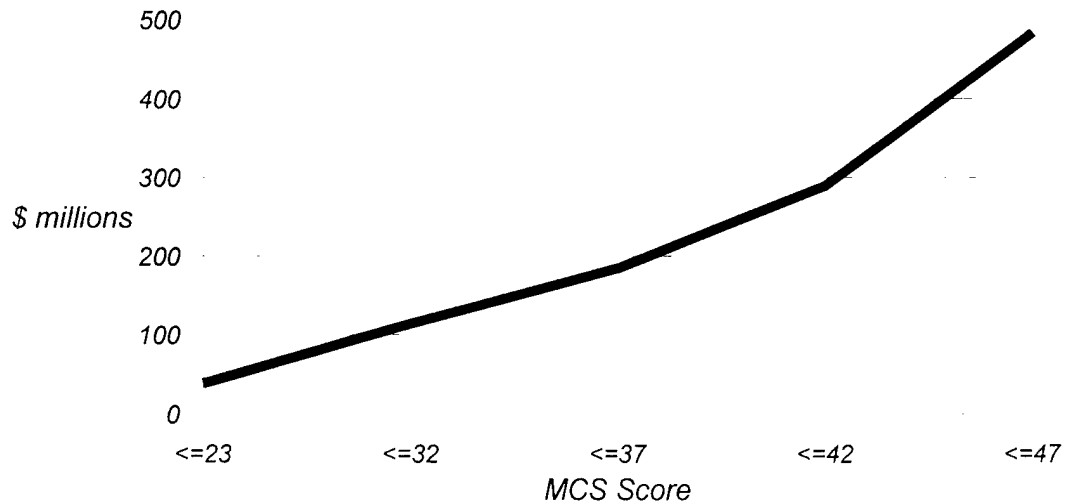
-\$ 484,894,872 for the cutoff score of 47 on the MCS. This represents a rough estimate of the maximum cost to the government for ensuring that all active duty members and their families who might need mental health care receive treatment. Selecting a different cut point for required mental health care would yield lower projected annual costs, since the number of individuals to be induced to become mental health users would be reduced. Using the same algorithm for a variety of MCS score cut points, the incremental cost for a universal mental health access for active duty and active duty family member beneficiaries falling below a given MCS threshold would be as shown in the leftmost column of the table and the figure shown below. As the table and associated figure below shows, the lower the cutoff score used the lower the program costs. However, lowering the cutoff score reduces the effectiveness of the program, since more individuals with mental health problems will not be treated appropriately. In addition, the figures shown in the table below neglects other costs, such as the cost of screening beneficiaries, as well as other savings, such as productivity gains, which are not included in this rough estimate. A precise estimation, however, is not required to come to the conclusion that universal and mandatory (for active duty) access to mental health care for those falling below a certain mental health score will be an extremely expensive undertaking because of the large number of beneficiaries involved.

Table 47

**Projected Program Cost of Universal Mental Health Access for Individuals Below
Various MCS Score Threshold Points (Total beneficiaries= 2,893,812)**

MCS Threshold Score	Percent of Total Beneficiary Population	Percent of Those Under Threshold not receiving mental health care now	Estimated Program Cost (\$)
MCS <= 23	2.2	19.84	38,189,490
MCS <= 32	6.5	19.16	113,789,747
MCS <= 37	10.4	17.80	185,126,515
MCS <= 42	15.9	15.66	290,398,389
MCS <= 47	25.5	12.19	484,894,872

Figure 11
Graphical Depiction of Cost of Expanded Mental Health Access
Universal Mental Health Access Program Costs



Several additional caveats are necessary regarding these estimates. First, although active duty members could be ordered to obtain a mental health visit, family members could not; therefore, it is unlikely that everyone defined to need mental health care will receive treatment. Second, it is not clear that individuals who would not have obtained a mental health visit prior to a screening system being implemented would require the same average number of mental health visits that current users now receive. Third, it is not certain that current nonusers would change their physical health utilization behavior if forced to see a mental health specialist. Fourth, implementation of widespread testing regimens may lead individuals to lie on the screening tests to avoid unwanted mental health treatment. All of these factors would reduce the estimated cost to the system for instituting a screening procedure which sought to give access to mental health care to all who seemed to need it.

Nevertheless, these caveats and others notwithstanding, the unambiguous message of these estimates remains this: in the absence of offset, expanding mental health access to the population in need is an extremely expensive undertaking which is likely to cost hundreds of millions of dollars annually. Therefore, rather than determining a cost of not treating those with mental distress appropriately, this research has founds that treatment of those currently untreated for their mental distress is hugely expensive. It turns out that there is no free lunch after all. Expanding mental health access to people in need of such care may be the right thing to do from a force readiness and quality of care perspective, but it seems incapable of being justified on the basis of direct cost savings to the government. It seems as if the iron triangle of cost, quality and access cannot be overcome though the magical power of the offset effect, at least not in a military population, after all.

G. Chapter Four Summary

The results of the empirical analysis of the research hypotheses were reported in this chapter. This section summarizes the findings resulting from the analyses conducted and reported in this Chapter.

Research question number one involved basic analysis of issues related to mental health status and utilization. For three of the six specific research hypotheses, analysis was conducted in two phases. An initial phase, denoted as preliminary analysis and findings, took the perspective of a DoD decision maker responsible for a particular DoD group. These groups of interest were active duty, active duty family members and each of the four military Services. A subsequent phase using multiple regression techniques and

called final analysis and findings, rendered final conclusions regarding research hypotheses with the full model with all covariates included. In many cases, the findings from these two approaches differed.

Research hypothesis 1A sought to determine whether family members had lower mental health status than active duty members, as was anticipated. The simple answer to this question was that family members indeed had lower mental health status; however, when other covariates were added to the prediction equation for mental health status, the effect of beneficiary status was rendered statistically insignificant. Therefore, while DoD officials should be concerned about the mental health status of family members, it is not family member status per se which reduced mental health status but variables such as living in an enlisted member household and female gender which have the greatest negative impact on mental health status. Therefore, family member advocates for DoD should work to boost morale and support programs for enlisted member's wives, particular those in the Army, since this is the group which seems to have the greatest problems regarding mental health status.

Research hypothesis 1B also sought to compare active duty members with active family members. In this case, however, the focus was on usage of mental health services. The hypothesis predicted that family member utilization of mental health services would be higher than that of active duty members. Here again, the straightforward comparison of the mean usage rates between groups revealed a distinctly higher rate of utilization among family members relative to active duty members. The inclusion of covariates, however, eliminated this effect. The null hypothesis of no difference in utilization due to

beneficiary category group affiliation could not be rejected in the sophisticated multivariate methodological approach to the question.

A similar pattern of findings resulted for hypothesis 1C, where the central concern was focused on whether an individual's Service affiliation had any impact on either mental health status or mental health usage. The initial findings were mixed, with Air Force active duty members showing higher mental health scores than their Army and Marine Corps counterparts and Air Force family members showing statistically significant higher scores than their Marine Corps counterparts. No other significant differences between Services were evident in the twelve (six of active duty and six for family members) head to head comparisons made regarding mean mental health status of the four Services. The multivariate analysis sustained the conclusion that Army active duty beneficiaries indeed had lower mental health status than Air Force active duty beneficiaries at a statistically significant level of $p < .05$. Furthermore, Army family member beneficiaries evinced statistically significant (and lower) mental health scores than their Air Force counterparts. No other differences between the Services on mental health status were found to be statistically significant using the multiple regression technique.

The usage element of research hypothesis 1C provided interesting results. The initial assumption was that Air Force usage rates would be lower since it was assumed that Air Force mental health morbidity would be lower than that of the other Services. Lower morbidity meant higher mental health status and lower levels of need. Assuming that usage follows need, the a priori expectation was that the low need group would

evince lower utilization. The data suggested that this positive correlation between need and use did not hold in all cases. While Air Force affiliated beneficiaries had among the lowest levels of mental health morbidity, they displayed among the highest rates of utilization. Contrary to normative expectations, in five of the six cases where significant differences between Service pairs were found, the Service with the higher mental health status score also had the higher usage rates. This perplexing and unexpected result led to a sound rejection of the hypothesis that Air Force usage rates would be lowest among the Services. Instead, Navy and Marine Corps active duty usage rates were the lowest among the Services, despite the fact that their mental health status levels tended to be lower than those of the Army and the Air Force. The only predicted result supported by the data was found in the case of Navy family members, where usage rates did lead the Services, however, even this result was statistically significant only for the comparison of Navy family members with Marine family members. The results discussed in this paragraph were drawn from the preliminary analysis. The apparent inconsistency between need and use of mental health services among the Services constitutes an interesting result from a scientific perspective and a vexing issue of concern from an organizational perspective. The multivariate result which shows no statistically significant influence of Service category on utilization rates, constitutes a refutation of the hypothesis that the Air Force would have the lowest usage rates and the Navy and Marines the highest. However, this finding is anticlimactic. The truly interesting result is the apparent inconsistency between need and use of mental health services, particularly among active duty personnel. That result was obtained using the methodologically simple dyadic comparison of means between groups.

Research hypotheses 1D and 1E sought to compare mental health status of active duty and family members of active duty, respectively, to the general U.S. population. The purpose of this analysis was to determine the extent to which military populations differed in terms of baseline mental health status from the general population. The a priori hypotheses were that active duty personnel would have higher mental health status than the general population as a result of entry level screening and efforts to maintain high morale in order to maintain peak force readiness. Family members were expected to have mental health status which was lower than that of the general population due to the stresses of the military lifestyle. In order to adjust for differences in gender mix between the military and general populations, both active duty and family member subpopulations of the DoD beneficiary population were compared to their gender specific counterpart in the general U.S. population. The result of these comparisons was across the board concurrence with a null finding. The data showed that active duty members and family members are indistinguishable from the general population in terms of their mental health status once the unusual gender mix of active duty and family member subpopulations is taken into account.

It is also interesting to note that usage rates for the active duty population are significantly lower than those of civilian populations. Although this is not a research deliverable, this analysis, combined with the findings for research questions 1D and 1E are particularly troubling.

Tables 48 and 49 show the calculated DoD outpatient mental health usage rates compared with gender specific baseline rates from the RAND Health Insurance Experiment and the 1987 National Medical Expenditure Study (NMES-2). These studies are good benchmark comparison because they exclude both institutionalized individuals and military beneficiaries from their sampling frames. By including subjects from across

the nation in their sampling frames, these studies have excellent claims of being representative of the health behavior of the general U.S. population. Since most of participants in both the RAND and the NMES-2 studies had insurance coverage which was less generous than the benefits enjoyed by active duty members and their families, it cannot be argued that the general comparison baseline reflects a group with greater financial access to care.

Table 48
Mental Health Usage Rates for Various DoD Population Groups - Males
(Percentage difference shown is for DoD group versus baselines)^a

Group	Usage Rate	Percentage Difference	
		Baseline A	Baseline B
Active Duty - Army	3.60	-47.90	-36.84
Active Duty - Air Force	4.96	-28.22	-12.98
Active Duty - Navy	1.28	-81.48	-77.54
Active Duty - Marines	2.66	-61.51	-53.33
Family Member- Army	6.67	-3.47	17.01
Family Member- Air Force	4.45	-35.60	-21.93
Family Member- Navy	3.22	-53.40	-43.50
Family Member- Marines	1.49	-78.44	-73.86
General Population Baseline A [RAND Health Insurance Experiment - Ages 18-62] (1975 Data)	6.91	N/A	
General Population Baseline B [National Medical Expenditure Survey - Ages 19-54] (1987 Data)	5.70	N/A	

^a Percentage Difference calculated as follows: (Group rate-Baseline rate)/Baseline rate.
 Rand Data from Wells et al, 1986. NMES-2 data from Freiman and Cornelius, 1994.

Table 49

Mental Health Usage Rates for Various DoD Population Groups - Females
(Percentage difference shown is for DoD group versus baseline)^a

Group	Usage Rate	Percentage Difference	
		<i>Baseline A</i>	<i>Baseline B</i>
Active Duty - Army	7.29	-39.50	-27.17
Active Duty - Air Force	7.56	-37.26	-24.48
Active Duty - Navy	4.59	-61.90	-54.14
Active Duty - Marines	5.83	-51.62	-41.76
Family Member- Army	5.78	-52.03	-42.26
Family Member- Air Force	6.03	-49.96	-39.76
Family Member- Navy	6.59	-45.31	-34.17
Family Member- Marines	3.46	-71.29	-65.43
<i>General Population Baseline A</i> <i>[RAND Health Insurance</i> <i>Experiment - Ages 18-62] (1975</i> <i>Data)</i>	<i>12.05</i>	NA	
General Population Baseline B [National Medical Expenditure Survey - Ages 19-54] (1987 Data)	10.01	NA	

^a Percentage Difference calculated as follows: (Group rate-Baseline rate)/Baseline rate.
 Rand Data from Wells et al, 1986. NMES-2 data from Freiman and Cornelius, 1994.

Since the population studied exhibits similar mental health status, or need for mental health services as the general population, but uses mental health services at substantially lower rates, it is apparent that the underutilization of outpatient mental health services by active duty members and their families is real. What is uncertain is whether underutilization of outpatient mental health services is substituted for

overutilization of inpatient psychiatric services. What has been ruled out by this research is the possibility that underutilization of outpatient services is resulting in higher usage of physical health services. This is the offset effect; it has not been detected in the military population under study. In any case, the underutilization of ambulatory mental health services in the military is troubling, because it means either that expensive inpatient psychiatric services are being used or that people are not getting needed mental health treatment. Furthermore, underuse of needed mental health services might be result in other negative behaviors, such as inappropriate violence or chemical/alcohol abuse. These explanation are worrisome from cost, quality of care and/or force readiness standpoints. The implications of these findings and what might be done in light of them are items which will be discussed in Chapter V.

The final hypothesis under the first research question was an effort to determine if mental health levels were lower and mental health usage rates were higher for military beneficiaries who had recently arrived at their duty station. The expectation was that the severing of friendship networks at a previous post coupled with the stresses of adjusting to a new location would lead to this result. A multivariate approach was used to determine the finding for this research hypothesis. For mental health status, a continuous dependent variable, linear regression was chosen. For usage, a dichotomous variable, logistic regression was employed. In both cases, WESVAR PC was used to perform the desired regressions in order to account for the idiosyncracies of the sampling methodology. The results of these regressions were reported in Appendices E and F. "Newness" was found to have neither an impact on mental health status nor on usage

rates. The results from this multivariate analysis stood in contrast to results on the same issue published by Bailey (1980).

In contrast to research question number one, which dealt with a number of issues related to mental health status and usage which are of interest to organizational stakeholders in the Department of Defense, the remaining research questions focused on the presence of an offset effect in the military population under study..

Research question number two considered users and nonusers of mental health services across the entire spectrum of mental health status. In all cases, mental health users had more physical health visits than nonusers. This result ensured that no offset effect would be found, since a necessary condition for a finding of the offset effect is lower utilization of somatic health services for mental health users versus nonusers. However, this overall finding notwithstanding, some interesting findings were made. First of all, mental health usage did seem to control the amount of physical health utilization among individuals with the poorest mental health status. The physical health usage rates for mental health users were stable in the face of declining mental health status, whereas it increased significantly with declining mental health status for nonusers of mental health services. The differences between user and nonuser behavior in this respect were significant. This finding fulfilled the second necessary condition for a finding of offset and lent support to the behavioral model of futile help-seeking behavior for those in poor mental health status who do not obtain a mental health visit for whatever reason they might have. In addition, evidence of what was termed a negative offset effect was found to exist in the upper ranges of mental health status. In this case, mental health

users had higher numbers of physical health visits which increased as their mental health improved. This stood in stark contrast to the physical utilization behavior of mental health nonusers in the highest levels of mental health status whose physical health utilization behavior was unaffected by changes in their mental health status. The paradoxical behavior of high mental health status mental health users with respect to their physical health utilization behavior was discussed. These individuals are overusers of health services relative to their apparent need; they constitute a group not discussed in the offset literature which would threaten the benefits of any widening of mental health care access by consuming these expanded resources unnecessarily. This is a group which must be considered whenever an attempt is made to quantify the benefits of expanded access in cases where offset is detected. However, given the finding of no overall offset effect, the presence of such a group simply makes the financial case for expanded access even worse than stated. The finding of no offset was consistent across four methodological approaches used: two stage least squares, OLS regression, stepwise regression, and user versus nonuser (bifurcated) analysis.

The task of research question number three was to consider various subgroups with regard to offset. Not surprisingly, given the finding of no overall offset effect from the analysis of research question two, no subgroup showed evidence of an offset effect. In fact, among the subgroups considered, only males and members of the Air Force had the sign corresponding to the parameter considered for the analysis of offset in the correct (negative) direction for the USAGE variable in the two stage least squares equation which would support a finding of offset. However, in both of these cases the coefficient was

statistically indistinguishable from zero. None of the eleven subgroups examined showed evidence of the use of mental health services results in a reduction of physical health services. There is no localized offset effect that could be exploited in a targeted effort at increasing mental health access while reducing costs. This was the major finding of research question number three.

Research questions four and five were developed for the purpose of quantifying the offset effect. They were originally intended to show the per capita saved visit rate and a maximum possible savings for the system resulting from expanding access. However, because the data revealed what could be termed a negative offset effect, with mental health users demanding more physical health visits than nonusers (other things equal), the answers to these questions showed the magnitude of increased marginal cost attributable from increasing access to mental health services. Mental health users in the lowest quartile of mental health status had between 1.58 and 1.78 more physical health visits than nonusers, depending on the cut point of MCS score selected. This was the finding for research question four. The presence of a negative offset effect meant that rather than offering the potential for saving the DoD money from its health care budget, expanding mental health access could be expected to cost in excess of four hundred millions dollars annually. Therefore, in the absence of an offset effect, a panacea solution which permitted an expansion of mental health access which would simultaneously reduce costs and improving quality proved to be illusory. The general implications of these findings will be discussed further in the final Chapter, which follows.

Chapter V. Summary, Conclusions and Recommendations

This chapter summarizes key aspects of this study, from design through analytical conclusions. It concludes with a number of recommendations for future action which are based on the insights gleaned from this research.

A. Summary of Research Design and Methods

This section reviews the major aspects of the research design used in this study. The research design and methods selected play a significant role in establishing the perspective from which data is analyzed.

1. Purpose and Objective of the Study

This study had a twofold purpose. The first purpose was to use in a constructive manner the data obtained from the 1994-95 DoD Survey of Healthcare Beneficiaries in order to highlight issues related to mental health status and utilization by active duty military members and their families. The second purpose of the study was to use these data to investigate the presence of the offset phenomenon. This phenomenon, the existence of which continues to be debated in health services research literature (Fiedler and Wight, 1984), was selected as the scientific focus of the research for several reasons. First, since the magnitude of the offset effect seemed to vary substantially from study to study according to organizational characteristics and no broad-based study of the military population regarding offset had been reported in the literature, determining the presence and/or magnitude of offset in the DoD health services system would fill an important gap in the literature. Second, the implications of the presence of an offset effect, which included an improvement in quality of care, higher force readiness and reduced overall

costs, which all could be achieved simultaneously through increasing mental health access for those in need. represented a potential opportunity for system improvement at no additional cost. It was a chance with possibilities too good to leave unexamined. Third, aspects of the DoD dataset and the DoD system afforded the opportunity to measure offset using a better research design than was possible in other studies reported in the literature. In particular, the large sample size and information on the key covariate of physical health status made this data set particularly attractive for the proposed research. Furthermore, unique aspects of the DoD assignment system allowed this research to overcome the endogeneity problem of the key mental health usage parameter through a two stage least squares design. The endogeneity issue, unaddressed in other studies, was recognized to have biasing effects on the results reported in other studies. The availability of good quality instruments in this study allowed for an estimation of the phenomenon without this biasing affect.

Research questions were developed to address these twin objectives of the study. Research question number one dealt exclusively with the first objective of highlighting the data set and the subject area to DoD personnel. The remaining research questions, for which the analytical models and literature review was conducted, dealt mostly with the second objective of investigating the offset phenomenon. Of course, findings for these, more scientific, research questions also were of direct interest to DoD decision makers and, therefore, simultaneously contributed to the first research objective of informing the DoD community. A total of five research questions were developed, most of which had several subelements known as research hypotheses.

2. Theoretical and Conceptual Framework of the Study

The offset phenomenon is based on a behavioral model which contends that individuals in mental distress who do not obtain mental health treatment will seek remedies for their distress in the physical health arena. Misinterpretation regarding the origins of distress on the part of patients and providers will then lead to unnecessary and ineffective physical health visits obtained by nonusers of mental health services. As a result, nonusers of mental health services with mental health problems will have more physical health visits than individuals who correctly identify the psychological origins of their distress and obtain a mental health visit, other things equal.

An analytical model was developed in order to capture the key determinants of outpatient visit utilization. This model selected variables based on a thorough review of the offset literature and the general utilization literature. Ultimately, a hierarchical model was presented. However, the strong possibility of omitted independent variables which influenced both the decision to use mental health services and the number of physical health visits used necessitated the use of instrumental variables in a two stage least squares approach which would enable the precise and unbiased estimation of the coefficient for the endogenous mental health usage variable. Fortunately, the characteristics of the military assignment system meant that mental health need and care was distributed in a way which approximated a random process. This random distribution of mental health demand and supply provided the basis for strong instruments which were capable of parsing out the exogenous part of the overall variance in the mental health usage parameter, thus allowing for accurate estimation of this key

coefficient. The mental health usage coefficient, alone or in interaction with a main effect mental health status variable, was identified as the key element in a study of offset. Holding other variables constant in a regression, the coefficient for mental health usage would need to be negative and significant in order to provide evidence of offset.

Strong theoretical arguments based on the health belief model were identified to suggest that offset would be very prominent in a military setting. Offset was expected to be strongest in situations where individuals have a strong aversion toward using mental health services. This is the case because individuals with a strong aversion to using mental health services would be expected to seek remedies for their distress in the physical health arena, particularly if the barriers to seeking care in this area were low relative to the barriers involved in using mental health care. Analysis of the relevant social psychological literature and the military subculture provided insights on what subgroups might have higher barriers to using mental health care. This study of the literature provided the basis of the a priori expectations detailed in the specific hypotheses offered in Chapter I.

3. Data and Methods Used in the Study

The data used in this study were drawn from three sources. The primary source of data was the 1994-95 DoD health beneficiary survey, a copy of which appears as the final appendix in this document. This document provided data on the key demographic variables, including the mental and physical health status of individuals, as well as the number of mental and physical health visits. Supplementary data used for the instruments in this study was obtained from the Services and the Defense Medical Information

System. The total study population included over 60,000 beneficiaries. However, the analysis was limited to active duty members and their families, a group of approximately 26,000 total observations. This limitation was imposed because of the inappropriateness of using the assumption of random assignment which was critical to the proposed analysis proposed to retired members and their families. Unlike active duty members and their families, retirees have free reign over where they choose to live, thus making the instruments selected poor predictors of mental health usage. Furthermore, military retirees as a group are likely to be less strongly affected by the normative expectations of the military subculture than active duty members and their families. For these reasons, the scope of the study was restricted to active duty members and adult family members of active duty.

Two principal analytic approaches were used. The first method compared the results of separate regressions for users and nonusers of mental health services. A finding of offset required that two necessary conditions be fulfilled. First, the coefficient of the mental health status variable had to be significantly more negative for nonusers than users. This finding would support the expectation of the behavioral model that mentally distressed persons would seek increasing amounts of somatic care as their mental health worsened, thus creating the possibility of offset. Second, the predicted value of physical health visits for nonusers in mental health distress had to be higher than that for users. If mental health users had more visits than nonusers, then offset was not a possibility, since there were no relative savings from usage which were in evidence. However, the primary

and methodologically more defensible approach involved the two stage least squares approach and the examination of the mental health usage variable.

The principal method for determining the presence of offset was the examination of the coefficient on the usage parameter (or, alternatively, the interaction of usage and mental health status parameter) in the regression equation derived from the conceptual model. A two stage least squares approach was made possible through the availability of strong instruments for mental health usage. The two stage least squares approach significantly reduced the biasing effect of omitted, yet relevant, independent variables believed to be present in the full model of the phenomenon. Alternative methods were used and presented to underscore the correctness of the findings of no offset effect and to illustrate subtleties in the behavior of users and nonusers that the primary technique of two stage least squares was not particularly adept at highlighting.

B. Overarching Study Findings

The specific findings for each research hypothesis have been presented in Chapter IV. To summarize, the ultimate findings for each of the research hypotheses are shown in the table below.

Table 50

Summary Table of Research Findings

Hypothesis Number	Research Hypothesis	Preliminary Analysis Finding	Final Analysis Finding
1A	Active duty members have higher emotional well-being than family members	Supported in naive approach; not supported when gender and rank covariates are added	Not supported.
1B	Active duty men and women utilize mental health services less than male and female family members	Supported under naive approach; not supported when gender/rank covariates are added	Not supported
1C(1)	Mental health morbidity will be least for Air Force families and active duty members and greatest for Navy beneficiaries.	Not supported	Not supported
1C(2)	Mental health utilization will be least for Air Force families and active duty members and greatest for Navy beneficiaries.	Supported for active duty; not supported for family members	Not supported for either active duty or family member groups.

Hypothesis Number	Research Hypothesis	Preliminary Analysis Finding	Final Analysis Finding
1D	The level of emotional well-being scores for active duty members will be higher than that of the U.S. population average	Not applicable	Not supported. Active duty and general population mental well-being scores are indistinguishable within gender categories
1E	The average emotional well-being scores for family members will be lower than that of the U.S. population average	Not applicable	Not supported. Active duty and general population mental well-being scores are indistinguishable within gender categories
1F	The average emotional well-being of individuals with less time on station will be lower than those who have been on station longer	Not applicable	Not supported.

Hypothesis Number	Research Hypothesis	Preliminary Analysis Finding	Final Analysis Finding
2A	Utilization of outpatient physical health services made by beneficiaries in the lowest quartile of the mental health status scale will be significantly less than for those who had a mental health visit than for those who did not have a mental health visit in the prior twelve months	Not applicable	Not supported. No evidence of an offset effect. No statistically significant difference between mental health users and nonusers, but the direction of difference is in the opposite direction of that predicted (i.e. mental health users consume more physical health visits than do nonusers).
2B	Individuals who enjoy relatively high levels of mental health status will have similar physical health utilization experiences regardless of whether or not they see a mental health specialist	Not applicable	Supported. Differences between users and nonusers is not statistically significant. Paradoxically, for the highest quartile of mental health status, physical health usage rises and mental health status improves.
3A	The magnitude of the offset will be stronger among active duty personnel than among family members	Not applicable	Not supported. No offset effect found in either group.
3B	The magnitude of offset for men will be higher than that for women	Not applicable	Not supported. No offset effect found in either group.

Hypothesis Number	Research Hypothesis	Preliminary Analysis Finding	Final Analysis Finding
3C	The magnitude of offset will be higher for officers and their families than for enlisted personnel and their families	Not applicable	Not supported. No offset effect found in either group.
3D	The magnitude of offset will decrease as time on station increases	Not applicable	Not supported. No offset effect found in either group.
3E	The degree of offset will be the same across beneficiaries of the three major branches of the Service	Not applicable	Not supported. No offset effect found in either group.
4	What is the difference in overall utilization (in terms of outpatient visits) by the population experiencing greater than average levels of psychiatric distress (MCS ≤ 47) and who visit a mental health provider versus those in the same distress category who do not see a mental health provider	Not applicable	Mental health users use more services than nonusers. The difference changes according to mental health status, but ranges between 1.58 and 1.78 additional physical health visits for mental health users. The a priori expectation (to support offset) was that nonusers would have more visits than users, a hypothesis not supported by these data.

Hypothesis Number	Research Hypothesis	Preliminary Analysis Finding	Final Analysis Finding
5	What is the estimated annual cost of the excess utilization associated with not treating DoD beneficiaries not making needed mental health visits in terms of excess utilization of non-mental health services	Not applicable	Program cost estimates vary from between \$38 and \$484 million, depending on the cutoff MCS score selected for mandatory mental health treatment.

This section will not repeat those findings. Instead, this section seeks to integrate those specific findings into four overarching major findings which synthesize interesting and thought provoking things which may be gleaned from this research.

The first major finding relates to the mental health status of the DoD beneficiary population investigated. Contrary to expectations, active duty members and family members exhibited no differences in their mental health status once differences in the proportion of the genders between the groups was considered. Neither were the DoD beneficiaries different from the general population in terms of mental health status. Within traditional age/gender group demographic cohorts (e.g. males 18-24), DoD beneficiaries are mentally healthier than their counterparts general population. However, since mental health improves with age and the military has a disproportionate share of individuals in the younger age cohorts, the within age group advantage enjoyed by DoD beneficiaries in terms of mental health status is counterbalanced by the fact that military members and their families are younger than the general population. As a result of these

countervailing differences in population attributes. the mental health needs of the general and military beneficiary populations could be considered to be more or less equivalent.

The second major finding is the disjunction between need and use of outpatient mental health services in the DoD population. There is a tendency for DoD groups with less relative need (e.g. Air Force beneficiaries) to get relatively more mental health care. This is a paradox. More worrisome is the comparison of DoD outpatient mental health rates relative to observed general population utilization rates for mental health treatment. As was noted earlier, these usage rates for mental health services in the general population have themselves have been characterized as inadequate relative to general population needs (Regier, Goldberg and Taube, 1978). Military utilization rates are as much as 81 percent lower than these "inadequate" general population utilization rates in spite of the fact the mental health status of the military population and the general population are indistinguishable. The inconsistency between need and use of outpatient mental health services for the DoD as a whole is a disquieting major finding resulting from this study.

The third major finding relates to the issue of offset and its absence in the military population. The absence of offset means that any program to expand access to outpatient mental health services is likely to be quite costly. Investigating offset in the context of the major finding of underutilization relative to need discussed above is important because the deficit in outpatient mental health usage has three most likely explanations. First, DoD treatment patterns may tend to hospitalize individuals for psychiatric ailments who would be treated in an outpatient setting in the civilian setting. This possibility is

unlikely, since the high cost of inpatient psychiatric care would be contrary to the cost conscious dictates of military health care; however, data limitations make it impossible for this possibility to be investigated analytically. Second, mental health outpatient needs may show up, inappropriately, in a strong offset effect for the DoD. This is the result suggested by the behavioral model presented in Chapter I. The study findings suggest that this is not the case. The characteristics of the data set used in this study, which had a tendency toward biasing the results toward zero, are unlikely to have resulted in a false negative finding. Offset was ruled out due to a decidedly *positive* coefficient on the USAGE variable rather than a negative coefficient on this key parameter which was simply not of sufficient magnitude to show up as being statistically significant. The bias toward zero of the data set simply means that it is likely that mental health users actually use even more physical health services than nonusers, other things equal, which is a direct contradiction of offset. The third, and in the view of this researcher, mostlikely, possibility is that mental health services are simply undertreated among DoD beneficiaries. However, undertreatment may not be an access problem. Instead, it could very well be a patient or a culture problem. If, as suggested by health belief model and other sociological theory, health care usage is dependent on an assessment of the severity of a given type of illness and one's susceptibility to it, it may be the case that DoD beneficiaries as a group have a smaller proportion of people who seek relief from distress in the formal health care system. An alternative, though related, explanation which is also consistent with the health belief model, is that the military subculture erects barriers to access to the mental health care system. The relationship between these two

explanations and its implications are considered further explored in the following paragraph.

The fourth and final major finding of this study is that mental health users are very different from nonusers in their health care utilization habits. The absence of an offset effect and the unlikeliness of the substitution of inpatient psychiatric stays for outpatient mental health visits suggests the possibility of unmeasured differences in how mental health users and nonusers approach the health care system. A normative military culture of self-reliance or fear of the social and economic consequences of using health care (e.g. vision problems can eliminate a pilot from flying status permanently) may result in an aversion of military personnel to help-seeking behavior, at least in as far as the health care setting. The absence (or weaker presence) of such cultural norms and fear of dire socio-economic consequences in the civilian sector may lead to higher usage rates for all health services in the general population. Furthermore, it is possible that mental health use achieves one of its aims and gets users to seek to change the status quo rather than stoically accepting it. As a result, mental health users might seek to effect changes to physical health impairments as well and actively seek treatment to improve physical health or prevent physical illness rather than passively accepting the status quo of their physical health status. Such an explanation is consistent with these research findings and the theory of offset; however, in this argument, mental health use catalyzes physical health use rather than depressing it, as it purports to do under the "offset effect". Further research is required to determine whether or not a change in attitude from an exocentric attitude of stoic acceptance of circumstances toward an egocentric attitude regarding the

possibility of changing life circumstances is generally attendant to mental health usage. Such a phenomenon would constitute a type of negative offset effect which affirmed the positive role mental health treatment can play in the lives of individuals. Using this reasoning, mental health users differ not only from nonusers, but the act of usage makes them even more different and aggressive regarding their attitudes toward the use of health care services in general as their world view changes from an exocentric perspective in which they are helpless and an egocentric view in which they feel in command of their own destinies regarding health status. This explanation extends the basic argument of a threshold type of explanation for the observed behavior.

If one thinks of the act of using health services as a threshold problem, with each individual having a different, and perhaps multiple (depending on the type of service- one for dental problems, another for mental problems, another for physical ailments) thresholds which trigger usage of services, yet another explanation of the findings arises. Consider the possibility that mental health users in this study represent a group of people who simply have lower relative pain thresholds across all ailment categories than mental health nonusers. This would mean that these individuals will seek both physical health care more than mental health nonusers with the same characteristics. This hypothesis can be tested by estimating the coefficients for mental health users and multiplying them by the parameter values of the mental health nonusers and comparing the actual prediction for the average number of physical health visits registered by nonusers with the predicted number of physical health visits for nonusers if they behaved in the way mental health

users behaved with regard to the model parameters. The equation for the predicted model is as follows:

$$Y_{\text{hat}}_{\text{NonusersAsUsers}} = \beta_{\text{Users}} * X_{\text{Nonusers}} \quad (17)$$

This analysis was done for the individuals with MCS ≤ 47. The average value of actual logged physical health visits for this group was 1.458. Using equation 17 to predict average physical health usage for nonusers acting like users resulted in a prediction of 1.724 logged physical health visits per person. The difference in the means was statistically significant at the $p < .01$ level in the expected direction- with nonusers acting like users registered physical health visits far in excess of their actual usage. It appears as if many active duty members and their families either have a higher tolerance threshold relative to mental health problems or seek care for mental distress outside the health care system. Rather than offset, a negative offset effect was detected, with users of mental health care generally showing a propensity to use more physical health services than nonusers, other covariates equal. The clear tendency of mental health users to use more physical health services than nonusers eliminated any possibility that increased access to mental health care might lead to reduced overall costs to the DoD health care system. Mental health users were found to have nearly two more physical health visits than nonusers. This fact, coupled with the finding that the average mental health user in the data set reported 4.8 mental health visits meant that increasing mental health access to those in need of mental health care would be extremely costly. Conservative estimates

based on direct care and CHAMPUS per visit costs resulted in an estimation of over \$400 million annually in order to provide mental health services to all active duty and active duty family beneficiaries with some evidence of need (MCS score ≤ 47) for such care based on mental health status.

C. Conclusion and Policy Implications of the Study Findings

The overall conclusion of this study is that there is no evidence of an offset effect in the military population. Therefore, expanding access to mental health services to those in need cannot be done without consideration of its cost consequences, which is the typical relationship observed between access and cost. This is particularly true for a general expansion of access through untargeted efforts to encourage people to use mental health services. Given the findings of a negative offset effect for mental health users with high mental health status, the likely result of a program to encourage beneficiaries to use mental health services will be a growth in demand by individuals already predisposed to seeking out care in the health services sector and no response from individuals reluctant to get care from the health care sector. The promised panacea of offset could not be detected in this study. Either it does not exist in the military population or shortcomings in the data prevented this effort to detect this important phenomenon. It is not possible to determine which of these rival explanations for the findings regarding offset is correct. In addition, the apparent underutilization of mental health services by military beneficiaries might be explained by differences in attitudes toward the use of health care of all types relative to the general population, but this too is a matter of speculation which goes beyond the scope of this study.

In light of these findings, a policy which pushes for expanded usage of mental health care through some effort at screening of individuals for low mental health status seems premature. The absence of offset in a military population means that expansion of access to mental health services would be an extremely costly endeavor. Furthermore, the salutary benefits to individuals who are ordered to see a mental health professional seem questionable. Much of effective mental health care relies on the cooperation of patient and provider. Mandatory treatment has a punitive aura and is, therefore, not as likely to provide desired benefits as voluntary treatment. Instead, it might be more beneficial to study why military beneficiaries are behaving as they do with regard to their utilization of mental health care. There are too many unknowns regarding the attitudes of military beneficiaries with regard to health care to allow decisive policy action at present. Targeted research seeking to determine the reasons why military beneficiaries seem reticent toward accessing mental health services must be carefully investigated. Specific recommendations are provided in the following section.

D. Recommendations for Action

A dearth of information makes definitive policy steps unwise at this juncture. However, this study has detected some areas of investigation which should prove fruitful. These recommendations for action are noted in this section.

The DoD needs to investigate why utilization of mental health services is low relative to the general population. The possibility, however unlikely, that there is a disproportionately heavy use of inpatient psychiatric services must be ruled out. Following this determination, a qualitative study which uses interview techniques to

determine the feelings of individuals associated with the military regarding health care in general and mental health care in particular would increase understanding related to the disconnect between need and use among military beneficiaries. Such a study should include active duty members and active duty family members from all Services, since there seem to be differences in behavior between subgroups. Researchers should consider using the health belief model as a conceptual paradigm to guide their investigation.

There has been some interest at the highest levels of the Office of the Assistant Secretary of Defense (Health Affairs) to use the PCS and MCS scores from the Congressionally-mandated annual DoD health beneficiaries survey as an outcome indicator for the effectiveness of DoD healthcare services (Graham, 1997). Such a desire reflects an interest in measuring "population health," a concept that has received widespread attention in recent years, particularly in Canada (Frank, 1995; Rafuse, 1995; Vail, 1995). The basic principle of population health is to back away from a paradigm of health which focuses on a highly individual-centered, treatment-oriented biomedical model to a broader perspective on health which considers the impact of cultural, social, and economic factors on health (Green, 1994; Roos et al, 1995). Indeed, in an effort to capture large scale shifts in population health, the Australian Bureau of Statistics recently chose the SF-36 as its measurement instrument for health status in its 1995 National Health Survey (McCallum, 1995). These developments all suggest that the annual monitoring of physical and mental health status of military beneficiaries at the catchment area level may provide a basis for resource allocation decision for the DoD. Indeed, the application of a population health approach to guide resource allocation decisions has

been suggested by Canadian researchers (Roos et al. 1996; Eyles and Birch, 1993).

Unfortunately, certain aspects of the military subculture prevent the usage of population health approaches in general and the the physical and mental health summary scores of the SF-36, in particular, as an effective tool to guide policy and the allocation of resources. First of all, the current bureaucratic structure of military healthcare makes resource allocation decisions of money and manpower a Service responsibility. As a result, DoD cannot make mandate changes to Service health care budgets unilaterally. For this reason, any savings from the health care manpower or budget requirements of a particular Service might not be redirected to the unmet health care resource needs of another Service but to a non-healthcare purpose within the original Service. In other words, if the Army finds that its beneficiaries in San Antonio are healthy and decides to close Brooke Army Medical Center, the resulting savings are more likely to go toward the purchase of more helicopter fuel or spare parts for tanks than to the Air Force medical service so the Air Force can better meet the health care needs of DoD beneficiaries in Minot, North Dakota. Secondly, the military assignment system which transfers the typical military family to a different locations once every three years means that by the time resource allocation changes could be effected, the individuals generating the health status data from the survey would have moved to a different population. The unhappy result would be unproductive churning and uncertainty in the medical resources of a given catchment area which would be linked to past, rather than present, needs of the catchment area population. Third, it is not clear that the availability of health care resources have a large effect on health status (Frank, 1995). If other factors play a more

important role in determining the health status of the relatively young military population. then using health status as an outcome indicator for the military health services system is highly inappropriate. As long as an annual population survey is required by Congress, continued monitoring of PCS and MCS scores over time is worthwhile in order to note shifts in the health status of Service members and their beneficiaries. However, should Congress eliminate this requirement and the organizational structure of the military health care system remains unchanged, it is not clear that the annual cost of the survey, which exceeded \$2 million in fiscal year 1994 (Opsut, 1996), is justified by its potential to guide policy or resource allocation decisions. Congress mandates research for its own purposes; these purposes do not always generate data which are useful to the agencies upon which the data collection burden is imposed. However, this research has uncovered areas for further study which may be able to inform executive decision-making by DoD health care officials, should funds be available to pursue them.

A follow-up study which collects data for the explicit purpose of detecting offset in the military population should be considered. Such a study should include children and should be designed as a longitudinal, rather than cross-sectional, study. The broad, population-based perspective should be retained. Offset should be studied in the military population using a panel design which overcomes the problem of bias toward zero associated with the cross-sectional design of this study. Individuals would be selected at random upon arrival at a new base. In addition, data on inpatient utilization as well as outpatient utilization should be collected in order to rule out the possibility that increased outpatient mental health usage decrease the number of physical health inpatient days over

time. Health status and visit information would be collected on a quarterly basis for a three year period. Individuals selected for the study should not be eligible for reassignment or separation during the study period. Such a study would be subject to testing and history effects, but would overcome the problems associated with not knowing the time-phasing of mental health visits and physical health visits. In this way, one could verify the finding of this study that offset is not present in the military setting.

Although widespread expansion of mental health access is unwise, consideration and small scale demonstration projects which expand mental health access by using targeted approaches such as PRIME-MD should be continued. The PRIME-MD tool, which seeks to help primary care physicians identify a need for mental health treatment among their patients, is a low cost screening tool which has shown to be effective in testing to date (Spitzer et al, 1994). Although the apparent absence of offset makes widespread increases in access to mental health care prohibitively costly, a targeted approach, while involving higher costs, may still be worth the increased costs if quality of care and force readiness was improved, as expected. A demonstration project using a relatively inexpensive targeting device such as PRIME-MD would help establish the true costs and benefits of limited and targeted expansions in mental health access for military populations.

The final recommendation of this study is directed to the health services research community at large. The veracity of the offset phenomenon remains in question due to poor data, poor methodological approaches, and a vested interest of many researchers to deliver findings which reveal the presence of offset. This study has shown that offset

does not appear to be present in a military population. However, the uniqueness of the military culture and military system does not make such a finding widely generalizable. An effort should be undertaken by researchers without a personal or professional vested interest in the results to study the presence of offset in the general population with a large sample which addresses methodological issues more carefully. Strong consideration for using the two stage least squares approach to combat the biasing effects of the endogenous predictor, mental health usage, should be considered. If offset indeed exists, it can be used as a basis of expanding mental health access. If a careful study denies its presence, then mental health providers can be disabused of their widely held belief that expanded use of mental health services leads to reduced total physical health care costs (Dinneen, 1997). A study which can settle the dispute regarding offset would represent a strong contribution not only to the scientific literature, but would also provide clarification on the consequences of an expansion of mental health access.

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APPENDIX A

Glossary of Regression Terms (Type of variable shown in brackets)

<u>REGRESSION TERM</u>	<u>DEFINITION</u>
ADBENCAT [X]	Dummy variable for beneficiary category. A 1 for active duty member. A zero for family member. There are no other or missing categories since selection into the database was predicated on this variable.
AGE [X]	A continuous variable for age. The sample includes only adults.
AGESEX [X]	Interaction variable resulting from the product of AGE and MSEX for each observation.
AGE2 [X]	The AGE term squared.
ARMY [X]	A variable associated with the catchment area of the facility in which the individual resides. Missing if individual does not reside in an MMTF catchment area. A one indicates an Army facility in the catchment area. A zero indicates the catchment area of an Air Force or Navy facility.
EGRADE [X]	A binary variable showing whether the individual belongs to a household where the sponsor is an officer (commissioned officer or warrant officer) or an enlisted Member. Officer=0 and Enlisted=1.
FACISOL [Z]	A variable associated with the catchment area of the facility in which the individual resides. A one indicates a location within a U.S. Standard Metropolitan Statistical Area (SMSA). A zero is indicative of a non-SMSA location or an overseas location. Facilities in Alaska and Hawaii which are within SMSAs are coded as a one.

APPENDIX A (Continued)
Glossary of Regression Terms

INOVER	[X]	A variable which indicates that the individual lives in an overseas area, defined to be anywhere outside of the continental United States (CONUS). Overseas=1 and CONUS=0.
INTERCEPT		The intercept term in the regression equation.
LASITE	[X]	A variable associated with the catchment area of the facility in which the individual resides. A one indicates the presence of a lead agent facility in the catchment area. A zero for other cases.
MARRIED	[X]	Dummy variable for marital status. Married=1; Other categories=0.
MCS	[X]	Mental component summary of the SF 36 instrument. Measures mental health status. A standardized score, for a general U.S. population the mean is 50 and the standard deviation is 10.

APPENDIX A (Continued)

Glossary of Regression Terms

MSEX	[X]	A binary variable for gender where 1=male and 0=female.
NAVY	[X]	A variable associated with the catchment area of the facility in which the individual resides. Missing if individual does not reside in an MMTF catchment area. A one indicates an Navy facility in the catchment area. A zero indicates the catchment area of an Air Force or Army facility. Air Force facilities are the omitted category in the regression.
NEW	[X]	Dummy variable for those reporting the recency of arrival at a duty location. A 1 is assigned for individuals with six months or less time on station. Otherwise, a zero is assigned.
PCS	[X]	Physical component summary of the SF 36 instrument. Measures physical health status. A standardized score, for a general U.S. population the mean is 50 and the standard deviation is 10.
PROVRAT	[Z]	A variable associated with the catchment area of the facility in which the individual resides. It indicates the ratio of authorized mental health providers (clinical social workers, psychologists, and psychologists) to the total number of beneficiaries in the catchment area, as reported by the Defense Medical Information System (DMIS) through records collected by the DEERS (Defense Eligibility Enrollment System). The resulting ratio shows the ratio of military mental health providers to population served.
SER4ARMY	[X]	Dummy variable to indicate that the individual is affiliated with the Army. Army members and their families are 1. All others are zero.

APPENDIX A (Continued)
Glossary of Regression Terms

SER4NAVY [X]	Dummy variable to indicate that the individual is affiliated with the Navy. Navy members and their families are 1. All others are zero.
SER4USMC [X]	Dummy variable to indicate that the individual is affiliated with the Marines. Marine members and their families are 1. All others are zero. Air Force is the omitted category in this group of categorical Service variables.
TOTVIS [Y]	The total number of ambulatory visits reported for illness or injury, follow-up for illness or injury, or physical exams. This is the sum of the responses to questions 7a, 7b and 7c on the questionnaire.
USAGE [MH]	Mental health usage in the past 12 month period. A binary variable with 1=yes and 0=no.
WRACE [X]	A binary variable for race. 1=White and 0=Not White (e.g. Black, Asian, Native American).

APPENDIX B

Section 724 of Public Law 102-484 (National Defense Authorization Act of 1993)

[Source: U.S. Congress, 1992]

SEC. 724. Annual Beneficiary Survey

(a) **SURVEY REQUIRED.**- The administering Secretaries shall conduct annually a formal survey of persons receiving health care under Chapter 55 of title 10, ?United States Code, in order to determine the following:

(1) The availability of health care services to such persons through the health care system provided under that chapter, the types of services received, and the facilities in which the services were provided.

(2) The familiarity of such persons with the services available under that system and with the facilities in which such services are provided.

(3) The health of such persons.

(4) The level of satisfaction of such persons with that system and the quality of the health care provided through that system.

(5) Such other matters as the administering Secretaries deem appropriate.

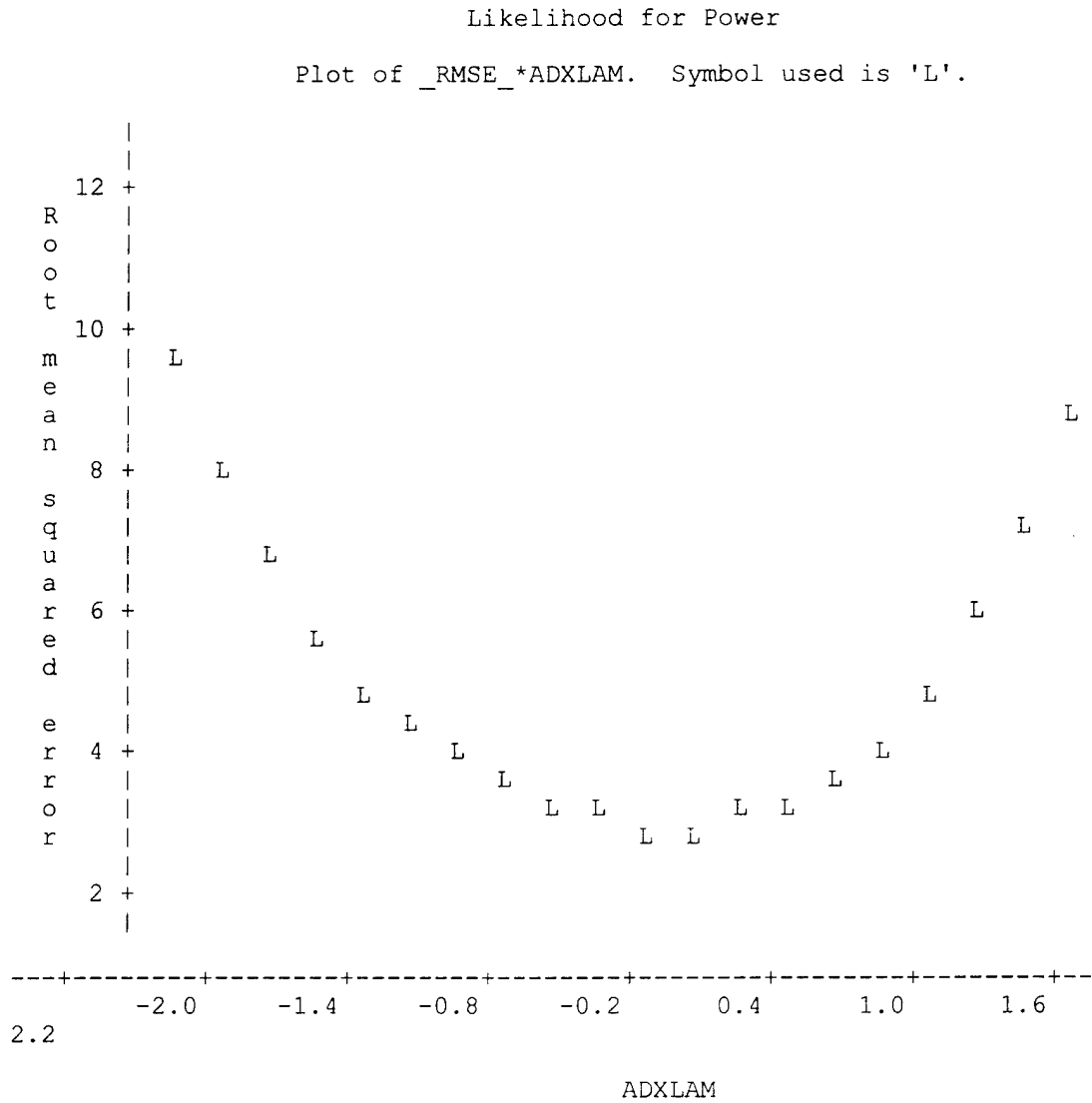
(b) **DEFINITION.**- For purposes of this section, the term "administering Secretaries" has the meaning given such a term in section 1072(3) of title 10, United States Code.

APPENDIX C **Box Cox Results for Research Question #2**

Box Cox Analysis for Research Question #2

OBS	ADXLAM	_RMSE_	ADXCONF
1	-2.00000	9.5400	
2	-1.80000	7.9852	
3	-1.60000	6.7400	
4	-1.40000	5.7451	
5	-1.20000	4.9539	
6	-1.00000	4.3302	
7	-0.80000	3.8463	
8	-0.60000	3.4812	
9	-0.40000	3.2201	
10	-0.20000	3.0534	
11	0.00000	2.9766	*
12	0.20000	2.9900	
13	0.40000	3.0994	
14	0.60000	3.3164	
15	0.80000	3.6602	
16	1.00000	4.1595	
17	1.20000	4.8553	
18	1.40000	5.8059	
19	1.60000	7.0922	
20	1.80000	8.8273	
21	2.00000	11.1683	

APPENDIX C (continued)
Box Cox Results for Research Question #2



APPENDIX D
Test of Instrument Strength
Regression Results for Test of Instruments
Are Instruments Sufficiently Strong to Minimize Bias in 2SLS Estimates?
Mental Health Usage Equation. Run of cases with NONZERO TOTVIS.
All Subgroups Included.

Dependent Variable is USAGE and is binary (0/1).

BOTH Mental health USERS and NONUSERS Included in this Run
Test of the instruments for the included endogenous variable

Model: MODEL1
Dependent Variable: USAGE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	17	4752.80118	279.57654	62.402	0.0001
Error	15438	69166.40818	4.48027		
C Total	15455	73919.20936			
Root MSE	2.11666	R-square	0.0643		
Dep Mean	0.05664	Adj R-sq	0.0633		
C.V.	3737.02633				

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > T
INTERCEPT	1	0.366457	0.03073987	11.921	0.0001
PCS	1	-0.003054	0.00021776	-14.024	0.0001
MCS	1	-0.005086	0.00018956	-26.833	0.0001
MSEX	1	0.025728	0.01435307	1.793	0.0731
EGRADE	1	0.003980	0.00497946	0.799	0.4242
INOVER	1	-0.026590	0.00951287	-2.795	0.0052
WRACE	1	0.019030	0.00425130	4.476	0.0001
SER4ARMY	1	-0.004308	0.00471852	-0.913	0.3612
SER4NAVY	1	-0.022621	0.00506459	-4.467	0.0001
SER4USMC	1	-0.038343	0.00702475	-5.458	0.0001
MARRIED	1	-0.010798	0.00477726	-2.260	0.0238
NEW	1	0.006764	0.00557021	1.214	0.2246
ADBENCAT	1	0.008817	0.00522771	1.687	0.0917
AGE	1	0.006731	0.00150853	4.462	0.0001
AGESEX	1	-0.001818	0.00047397	-3.835	0.0001
AGE2	1	-0.000079458	0.00002235	-3.555	0.0004
FACISOL	1	-0.017125	0.00736400	-2.326	0.0201
PROVRAT	1	48.842106	16.02706965	3.047	0.0023

The 21 Jan 97 Runs of ALL OBSERVATIONS
Secondary Equation. This is the Run of NONZERO TOTVIS for ALL
Dependent Variable, TOTVIS, is TRANSFORMED LN

BOTH Mental health USERS and NONUSERS Included in this Run
Test of the instruments for the included endogenous variable

17:17 Tuesday, January 21,

1997

Dependent Variable: USAGE

Test: LOC3TEST	Numerator:	36.1340	DF:	2	F value:	8.0651
	Denominator:	4.48027	DF:	15438	Prob>F:	0.0003

Instruments are reasonably strong. The approximate bias in the coefficient of the Mental Health USAGE (endogenous independent) variable will be less than one percent relative to the case where endogeneity was not a factor.

APPENDIX E **Regression Results for Test of Hypothesis 1F** **Does Relative Newness Result in Decreased Mental Health Status?**

Dependent Variable: MCS

Variance Estimation Method: Jackknife 1 with full sample weights
And replicate weights RWT1X..RWT40X

PC WESVAR Version Number: 2.02

Number of Replicates: 40

Number of Observations Read: 26,535

Number of Weighted Observations Read: 2,429,103.002

ESTIMATED FULL SAMPLE REGRESSION COEFFICIENTS:

Parameter	Parameter Estimate	Standard Error of Estimate	T for H0: Parameter=0	Prob > T
Intercept	46.29	1.779	26.01	.0000
ADBENCAT	-0.02	0.262	- 0.08	.9356
AGE	0.24	0.101	2.37	.0228
AGE2	0.00	0.001	- 1.67	.1023
AGESEX	-0.02	0.028	- 0.61	.5455
EGRADE	-2.55	0.260	- 9.82	.0000
INOVER	-0.63	0.386	- 1.62	.1131
MARRIED	1.86	0.338	4.79	.0000
MSEX	2.45	1.026	2.39	.0218
NEW	-0.14	0.391	- 0.36	.7184
SER4ARMY	-1.08	0.334	- 3.24	.0024
SER4NAVY	-0.69	0.530	- 1.30	.1999
SER4USMC	-1.39	0.731	- 1.90	.0643
WRACE	-0.45	0.381	- 1.18	.2454
FACILITY VARIABLES BELOW				
ARMY	0.34	0.339	1.01	.3173
NAVY	0.27	0.577	0.47	.6421
FACISOL	-0.45	0.337	- 1.34	.1863
LASITE	-0.18	0.362	- 0.48	.6212
PROVRAT	152.02	649.479	0.23	.8161

APPENDIX F

Logit Results for Test of Hypothesis 1F

Does relative newness increase the likelihood of getting a mental health visit?

Dependent Variable: USAGE
Variance Estimation Method: Jackknife 1 with full sample weights
And replicate weights RWT1X..RWT40X
PC WESVAR Version Number: 2.02
Converging Criterion: 0.025
Maximum Number of Iterations: 25 Used: 7 for Full sample iterations
Number of Replicates: 40
Number of Observations Read: 26,535
Number of Weighted Observations Read: 2,429,103.002

Success = Records with dependent value equal to 1 : 990 (unweighted)
81460.899985
(weighted) Failure = Records with dependent value equal to 0 : 19089
(unweighted) 1725793.500196 (weighted)

-2 Log Likelihood for full sample : 595782.09555
-2 Log Likelihood for model containing intercept only : 664160.04604

ESTIMATED FULL SAMPLE REGRESSION COEFFICIENTS:

Parameter	Parameter Estimate	Standard Error of Estimate	T for H0: Parameter=0	Prob > T
Intercept	-1.62	0.824	- 1.97	.0557
ADBENCAT	-0.18	0.185	- 0.97	.3379
AGE	0.09	0.041	2.17	.0358
AGE2	0.00	0.001	- 1.46	.1517
AGESEX	-0.02	0.014	- 1.72	.0934
EGRADE	0.37	0.139	2.67	.0108
INOVER	-0.43	0.174	- 2.48	.0176
MARRIED	-0.24	0.164	- 1.44	.1563
MCS	-0.07	0.005	-13.73	.0000
MSEX	0.00	0.415	0.00	.9967
NEW	0.07	0.158	0.45	.6566
SER4ARMY	-0.09	0.166	- 0.53	.5971
SER4NAVY	-0.22	0.298	- 0.74	.4615
SER4USMC	-0.50	0.352	- 1.43	.1613
WRACE	-0.47	0.153	- 3.08	.0038
FACILITY VARIABLES BELOW				
ARMY	0.07	0.149	0.50	.6196
NAVY	-0.35	0.284	- 1.24	.2233
FACISOL	-0.33	0.157	- 2.10	.0422
LASITE	0.02	0.158	0.14	.8918
PROVRAT	680.74	328.636	2.07	.0448

APPENDIX G

REGRESSION RESULTS FOR LOWEST QUARTILE (USERS)

The Runs of NONZERO TOTAL VISIT OBSERVATIONS ONLY
This is the Run of NONZERO TOTVIS for the LOWEST FOURTH of MCS
Dependent Variable, TOTVIS, is TRANSFORMED LN
Mental health USERS Only Included in this Run

Model: MODEL1A

Dependent Variable: LNTOTVIS

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	20	8140.38368	407.01918	7.121	0.0001
Error	496	28350.92967	57.15913		
C Total	516	36491.31336			
Root MSE	7.56037	R-square	0.2231		
Dep Mean	1.84438	Adj R-sq	0.1917		
C.V.	409.91328				

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > T
INTERCEP	1	1.905944	0.65435913	2.913	0.0037
PCS	1	-0.029039	0.00348103	-8.342	0.0001
MCS	1	-0.000938	0.00375548	-0.250	0.8029
MSEX	1	0.572505	0.31030042	1.845	0.0656
EGRADE	1	-0.001514	0.12120761	-0.012	0.9900
INOVER	1	0.250035	0.18755133	1.333	0.1831
WRACE	1	0.164437	0.09893635	1.662	0.0971
SER4ARMY	1	0.084678	0.15487567	0.547	0.5848
SER4NAVY	1	-0.407430	0.14801517	-2.753	0.0061
SER4USMC	1	-0.254242	0.18979168	-1.340	0.1810
MARRIED	1	-0.171464	0.09092142	-1.886	0.0599
NEW	1	0.197123	0.10727327	1.838	0.0667
ADBENCAT	1	0.305499	0.10643166	2.870	0.0043
AGE	1	0.060025	0.03951815	1.519	0.1294
AGESEX	1	-0.026084	0.01046263	-2.493	0.0130
AGE2	1	-0.000592	0.00061089	-0.969	0.3330
ARMY	1	-0.115677	0.15491698	-0.747	0.4556
NAVY	1	0.205800	0.15567266	1.322	0.1868
LASITE	1	-0.056468	0.09453454	-0.597	0.5506
FACISOL	1	0.122907	0.13392917	0.918	0.3592
PROVRAT	1	115.913225	344.68109638	0.336	0.7368

MCS not significant. In other words, for users in the lowest quartile of mental health status, as mental health status decreases, insufficient evidence exists to reject the null hypothesis that there is no resulting impact on the number of physical health visits, other covariates equal.

APPENDIX H

REGRESSION RESULTS FOR LOWEST QUARTILE (NONUSERS)

The Runs of NONZERO TOTAL VISIT OBSERVATIONS ONLY
This is the Run of NONZERO TOTVIS for the LOWEST FOURTH of MCS - LN DV
Dependent Variable, TOTVIS, is TRANSFORMED LN
Mental health NONUSERS only

Model: MODEL1B

Dependent Variable: LNTOTVIS

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	20	29558.30804	1477.91540	23.760	0.0001
Error	3209	199605.77640	62.20186		
C Total	3229	229164.08444			
Root MSE	7.88682	R-square	0.1290		
Dep Mean	1.47583	Adj R-sq	0.1236		
C.V.	534.39962				

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > T
INTERCEP	1	3.447637	0.25016209	13.782	0.0001
PCS	1	-0.030516	0.00165381	-18.452	0.0001
MCS	1	-0.011522	0.00171053	-6.736	0.0001
MSEX	1	0.169818	0.11044807	1.538	0.1243
EGRADE	1	0.057191	0.04851175	1.179	0.2385
INOVER	1	-0.049416	0.07500337	-0.659	0.5100
WRACE	1	-0.060266	0.03248873	-1.855	0.0637
SER4ARMY	1	-0.028369	0.05873648	-0.483	0.6291
SER4NAVY	1	0.093196	0.06392249	1.458	0.1450
SER4USMC	1	-0.073494	0.07342646	-1.001	0.3169
MARRIED	1	-0.037917	0.03515533	-1.079	0.2809
NEW	1	0.064650	0.04188458	1.544	0.1228
ADBENCAT	1	0.219063	0.03983656	5.499	0.0001
AGE	1	-0.006876	0.01323303	-0.520	0.6033
AGESEX	1	-0.012759	0.00379418	-3.363	0.0008
AGE2	1	0.000274	0.00020638	1.326	0.1851
ARMY	1	0.061663	0.05864535	1.051	0.2931
NAVY	1	0.023422	0.06436464	0.364	0.7160
LASITE	1	0.067246	0.03462507	1.942	0.0522
FACISOL	1	-0.068060	0.05988907	-1.136	0.2559
PROVRAT	1	65.141554	139.48511511	0.467	0.6405

MCS is significant and the sign of the coefficient is negative. In other words, for nonusers in the lowest quartile of mental health status, as mental health status decreases, physical health visits, other covariates equal. This is not offset, however, unless the difference between the nonuser coefficient and the user coefficient for mental health status is significant.

APPENDIX I

TWO STAGE LEAST SQUARES APPROACH TO INVESTIGATE OFFSET IN THE LOWEST MCS QUARTILE

Two Stage Least Squares Regression Approach using Stata 4.0

```
. *Here is the Second Stage, Final Results of the 2SLS Model
. reg lntotvis usage $rhs ($rhs uhat) [aweight=$wgts]
(sum of wgt is 3.6729e+02)
```

Source	SS	df	MS		(2SLS)
Model	401.666741	16	25.1041713	Number of obs	= 3747
Residual	2362.83018	3730	.633466536	F(16, 3730)	= 38.21
Total	2764.49692	3746	.737986364	Prob > F	= 0.0000
				R-squared	= 0.1453
				Adj R-squared	= 0.1416
				Root MSE	= .79591

lntotvis	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
usage	.2685763	.3362245	0.799	0.424	-.3906255	.9277781
PCs	-.0298452	.0023352	-12.781	0.000	-.0344235	-.0252668
mcs	-.0092848	.0028094	-3.305	0.001	-.0147928	-.0037767
age	.0024254	.0139821	0.173	0.862	-.0249879	.0298386
adbencat	.2334735	.0372162	6.273	0.000	.1605075	.3064395
age2	.0001547	.0002108	0.734	0.463	-.0002587	.0005681
mssex	.2023526	.1041646	1.943	0.052	-.0018726	.4065778
agesex	-.0139775	.0036387	-3.841	0.000	-.0211116	-.0068435
inover	.0227246	.0485147	0.468	0.640	-.0723934	.1178426
egrade	.05915	.0449196	1.317	0.188	-.0289194	.1472194
ser4army	.0086521	.0344983	0.251	0.802	-.0589852	.0762895
ser4navy	.0720612	.0425591	1.693	0.091	-.0113803	.1555026
ser4usmc	-.0649718	.0556819	-1.167	0.243	-.1741417	.0441981
married	-.0560812	.0374593	-1.497	0.134	-.129524	.0173616
wrace	-.0342771	.0368246	-0.931	0.352	-.1064754	.0379212
new	.093886	.0392923	2.389	0.017	.0168495	.1709225
_cons	3.130954	.2565545	12.204	0.000	2.627954	3.633955

Usage Variable is not significantly different from zero. Indeed, it is positive, reflecting that mental health users tend to have more visits than nonusers, other things equal, which corroborates the finding of no offset in the initial approach.

The first stage of the 2SLS Model is shown below

```
. probit usage $rhs $zside [aweight=$wgts]
```

```
(sum of wgt is 3.6729e+02)
Iteration 0: Log Likelihood =-1386.0489
Iteration 1: Log Likelihood =-1249.4292
Iteration 2: Log Likelihood =-1246.7348
Iteration 3: Log Likelihood =-1246.7297
```

Probit Estimates

```
Number of obs = 3747
chi2(17) = 278.64
Prob > chi2 = 0.0000
Pseudo R2 = 0.1005
```

Log Likelihood = -1246.7297

usage	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
PCs	-.0252878	.0028984	-8.725	0.000	-.0309686	-.0196071
mcs	-.0331647	.0030906	-10.731	0.000	-.0392222	-.0271073
age	.1088283	.0280734	3.877	0.000	.0538054	.1638512
adbencat	-.0395165	.0783709	-0.504	0.614	-.1931207	.1140877
age2	-.001447	.0004356	-3.322	0.000	-.0023007	-.0005933
msex	.154238	.2307731	0.668	0.504	-.2980689	.606545
agesex	-.0122794	.0078413	-1.566	0.117	-.0276481	.0030892
inover	-.4438161	.1442788	-3.076	0.002	-.7265973	-.1610349
egrade	.0124915	.0942379	0.133	0.895	-.1722113	.1971943
ser4army	-.018734	.0716921	-0.261	0.794	-.1592478	.1217799
ser4navy	-.2526658	.0819653	-3.083	0.002	-.4133149	-.0920166
ser4usmc	-.3435273	.1105585	-3.107	0.002	-.560218	-.1268366
married	-.2924631	.068669	-4.259	0.000	-.4270519	-.1578743
wrace	.350184	.0706215	4.959	0.000	.2117685	.4885995
new	.0466476	.0824372	0.566	0.571	-.1149264	.2082216
facisol	-.2286047	.1060088	-2.156	0.031	-.4363782	-.0208312
provrat	825.749	231.2559	3.571	0.000	372.4958	1279.002
_cons	-.2956103	.492603	-0.600	0.548	-1.261094	.6698738

```
. predict uhat
(1110 missing values generated)
```

```
. test $zside
```

```
( 1) facisol = 0.0
( 2) provrat = 0.0
```

```
chi2( 2) = 18.86
Prob > chi2 = 0.0000
```

Evidence of a high quality instrument is shown by the partial F of an OLS regression of the instruments on the endogenous independent variable. Here it is nearly 10.

```
. regress usage $rhs $zside [aweight=$wgts]
(sum of wgt is 3.6729e+02)
```

Source	SS	df	MS	Number of obs =	3747
Model	31.0598611	17	1.82705065	F(17, 3729) =	18.47
Residual	368.895022	3729	.098925991	Prob > F =	0.0000
				R-squared =	0.0777
				Adj R-squared =	0.0735
				Root MSE =	.31453
Total	399.954883	3746	.106768522		

usage	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
PCs	-.0054133	.0005802	-9.329	0.000	-.0065509	-.0042757
mcs	-.0070325	.0006031	-11.661	0.000	-.0082148	-.0058501
age	.0191382	.0049328	3.880	0.000	.009467	.0288094
adbencat	-.0054025	.0146965	-0.368	0.713	-.0342164	.0234115
age2	-.0002464	.0000769	-3.203	0.001	-.0003972	-.0000956
msex	.0383551	.0409082	0.938	0.349	-.0418495	.1185596
agesex	-.002595	.0013998	-1.854	0.064	-.0053394	.0001494
inover	-.0914032	.0273045	-3.348	0.000	-.1449364	-.0378699
egrade	-.0019664	.0177799	-0.111	0.912	-.0368257	.0328928
ser4army	-.0042377	.0137412	-0.308	0.758	-.0311788	.0227034
ser4navy	-.0483098	.0149565	-3.230	0.001	-.0776335	-.0189861
ser4usmc	-.0698463	.0196056	-3.563	0.000	-.1082851	-.0314075
married	-.0537201	.0128593	-4.178	0.000	-.078932	-.0285082
wrace	.0612586	.0121211	5.054	0.000	.0374939	.0850233
new	.0137552	.0153715	0.895	0.371	-.0163821	.0438925
facisol	-.0491332	.0211544	-2.323	0.020	-.0906084	-.0076579
provrat	164.1067	46.73736	3.511	0.000	72.47337	255.7399
_cons	.3958832	.0907238	4.364	0.000	.2180101	.5737563

```
. test $zside
```

```
( 1) facisol = 0.0
( 2) provrat = 0.0
```

F(2, 3729) = 9.72 EXCELLENT INSTRUMENT!
 Prob > F = 0.0000

MODEL SPECIFICATION TESTS. Both the Pregibon linktest and the Hosmer-Lemeshow linearity test attest to adequate specification of the model with no discontinuities or nonlinearities

```
. * Pregibon linktest
. hreg $depv yhat yhat2 [pweight=$wgts]
```

Regression with Huber standard errors	Number of obs	=	4717
	R-squared	=	0.1377
	Adj R-squared	=	0.1373
	Root MSE	=	.806365

Intotvis	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
yhat	.8639525	.4073783	2.121	0.034	.0653006	1.662604
yhat2	.0306924	.1164898	0.263	0.792	-.197682	.2590667
_cons	.1389587	.340797	0.408	0.683	-.5291627	.8070801

```
. * Hosmer Lemeshow linearity test
. hreg rsid $lst [pweight=$wgts], nocons
```

Regression with Huber standard errors	Number of obs	=	4717
	R-squared	=	0.0046
	Adj R-squared	=	0.0024
	Root MSE	=	.805234

rsid	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
xcat1	.0175724	.057905	0.303	0.762	-.0959485	.1310933
xcat2	.1161535	.0821038	1.415	0.157	-.0448084	.2771154
xcat3	-.0808406	.0803171	-1.007	0.314	-.2382997	.0766185
xcat4	.0151258	.06547	0.231	0.817	-.1132261	.1434777
xcat5	-.0309983	.0892012	-0.348	0.728	-.2058744	.1438779
xcat6	.0055655	.0584764	0.095	0.924	-.1090756	.1202067
xcat7	-.0104695	.0848545	-0.123	0.902	-.176824	.155885
xcat8	.0347358	.0629454	0.552	0.581	-.0886667	.1581383
xcat9	-.0559469	.0875096	-0.639	0.523	-.2275066	.1156129
xcat10	.0481534	.0635874	0.757	0.449	-.0765077	.1728145

APPENDIX J

ORDINARY LEAST SQUARES APPROACH TO INVESTIGATE OFFSET IN THE LOWEST MCS QUARTILE

```
*Theoretical model of WHOLE LOW QUARTILE
. *Model using plain vanilla OLS with instruments
. reg $depv usage $rhs $zside [aweight=$wgts]
(sum of wgt is 3.6729e+05)
```

Source	SS	df	MS	Number of obs =	3747
Model	403.506619	18	22.4170344	F(18, 3728) =	35.40
Residual	2360.9903	3728	.63331285	Prob > F =	0.0000
				R-squared =	0.1460
				Adj R-squared =	0.1418
Total	2764.49692	3746	.737986365	Root MSE =	.79581

Intotvis	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
usage	.206108	.0414341	4.974	0.000	.1248723	.2873437
PCs	-.0301905	.0014852	-20.328	0.000	-.0331023	-.0272787
mcs	-.0097311	.0015534	-6.264	0.000	-.0127767	-.0066854
age	.0038375	.012506	0.307	0.759	-.0206818	.0283569
adbencat	.2329706	.0371857	6.265	0.000	.1600643	.3058769
age2	.0001365	.0001949	0.700	0.484	-.0002456	.0005186
msex	.2062579	.1035178	1.992	0.046	.0033008	.4092151
agesex	-.0141943	.0035433	-4.006	0.000	-.0211413	-.0072472
inover	-.0072207	.0691895	-0.104	0.917	-.1428737	.1284323
egrade	.0606036	.0449866	1.347	0.178	-.0275973	.1488044
ser4army	.013701	.0347684	0.394	0.694	-.054466	.0818681
ser4navy	.077158	.0378957	2.036	0.042	.0028597	.1514564
ser4usmc	-.0601935	.0496904	-1.211	0.226	-.1576165	.0372295
married	-.0587199	.0326125	-1.801	0.072	-.12266	.0052202
wrace	-.0301785	.0307737	-0.981	0.327	-.0905134	.0301564
new	.092769	.038897	2.385	0.017	.0165075	.1690304
facisol	-.019072	.0535634	-0.356	0.722	-.1240883	.0859444
provrat	93.64901	118.45	0.791	0.429	-138.584	325.882
_cons	3.149999	.2301342	13.688	0.000	2.698798	3.6012

Positive coefficient on usage parameter indicates no offset effect.

APPENDIX K

ORDINARY LEAST SQUARES APPROACH WITH MCS*USAGE INTERACTION TO INVESTIGATE OFFSET IN THE LOWEST MCS QUARTILE

```
. *Theoretical model of WHOLE LOW QUARTILE
. reg $depv mcsuse usage $rhs $zside [aweight=$wgts]
(sum of wgt is 3.6729e+05)
```

Source	SS	df	MS	Number of obs =	3747
Model	408.473728	19	21.4986172	F(19, 3727) =	34.01
Residual	2356.0232	3727	.632150039	Prob > F =	0.0000
				R-squared =	0.1478
				Adj R-squared =	0.1434
Total	2764.49692	3746	.737986365	Root MSE =	.79508

Intotvis	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
mcsuse	.0115505	.0041206	2.803	0.005	.0034717	.0196293
usage	-.1831142	.1448925	-1.264	0.206	-.4671905	.1009621
PCs	-.030188	.0014838	-20.345	0.000	-.0330972	-.0272789
mcs	-.0116568	.0016973	-6.868	0.000	-.0149845	-.0083292
age	.0022587	.0125072	0.181	0.857	-.022263	.0267804
adbencat	.2363447	.037171	6.358	0.000	.1634672	.3092223
age2	.0001591	.0001949	0.816	0.414	-.000223	.0005411
msex	.2016438	.1034359	1.949	0.051	-.0011526	.4044402
agesex	-.0141296	.0035402	-3.991	0.000	-.0210704	-.0071887
inover	-.0132519	.0691594	-0.192	0.848	-.1488459	.1223422
egrade	.0523157	.0450425	1.161	0.246	-.0359946	.140626
ser4army	.0127705	.0347381	0.368	0.713	-.055337	.080878
ser4navy	.0745346	.0378725	1.968	0.049	.0002818	.1487874
ser4usmc	-.067007	.0497042	-1.348	0.178	-.1644571	.0304431
married	-.0564761	.0325924	-1.733	0.083	-.1203768	.0074246
wrace	-.0314396	.0307487	-1.022	0.307	-.0917255	.0288463
new	.0929775	.0388613	2.393	0.017	.016786	.169169
facisol	-.0248897	.0535544	-0.465	0.642	-.1298885	.0801091
provrat	93.4895	118.3412	0.790	0.430	-138.5303	325.5093
_cons	3.260026	.2332493	13.977	0.000	2.802718	3.717335

The main effect usage variable is still not significant in this interaction model. This means that the finding of no offset effect is corroborated using this methodological approach as well.

The significance of the MCS*USAGE interaction variable means that the slope of the mcs variable for mental health users is significantly different from that of mental health nonusers (and positive). Therefore, as had been demonstrated in the figure contrasting users and nonusers, the main affect of MCS, which shows that declining mental health status leads to increased physical health usage ($t = -7.1$ on MCS) is strongly mitigated in the case of mental health users (t is strongly positive on MCSUSE). This is not news, but supports the result from the comparison of users versus nonusers.

APPENDIX L

STEPWISE REGRESSION APPROACH TO INVESTIGATE OFFSET IN THE LOWEST MCS QUARTILE

*Stepwise Model using plain vanilla OLS with instruments and interaction

```
. stepwise $depv usage mcsuse $rhs $zside [aweight=$wgts], forward stepwise
fen
> ter(4) fstay(1)
```

(sum of wgt is 3.6729e+05)

```
Adding: PCs F= 445.1
Adding: mcs F= 52.34
Adding: mcsuse F= 34.67
Adding: adbencat F= 17.05
Adding: agesex F= 25.91
Adding: age2 F= 20.12
Adding: ser4navy F= 5.837
Adding: new F= 5.489
Adding: msex F= 5.158
```

Source	SS	df	MS	(stepwise)
Model	400.779662	9	44.5310736	Number of obs = 3747
Residual	2363.71726	3737	.63251733	F(9, 3737) = 70.40
Total	2764.49692	3746	.737986365	Prob > F = 0.0000
				R-squared = 0.1450
				Adj R-squared = 0.1429
				Root MSE = .79531

Intotvis	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
mcsuse	.0067565	.0011645	5.802	0.000	.0044733 .0090397
PCs	-.0302797	.0014485	-20.904	0.000	-.0331197 -.0274397
mcs	-.0107817	.0015185	-7.100	0.000	-.0137589 -.0078045
adbencat	.2529857	.0360271	7.022	0.000	.182351 .3236205
age2	.0001848	.0000376	4.919	0.000	.0001111 .0002584
msex	.2245866	.0988881	2.271	0.023	.0307067 .4184665
agesex	-.0147825	.0033969	-4.352	0.000	-.0214424 -.0081226
ser4navy	.0725526	.0296081	2.450	0.014	.014503 .1306022
new	.093462	.0387554	2.412	0.016	.0174783 .1694457
_cons	3.230866	.1100867	29.348	0.000	3.01503 3.446702

Under stepwise regression, only significant predictors of the dependent variable are retained in the final model after a series of steps, not printed by Stata in their entirety, adds variables one at a time according to their predictive power. In some cases, variables included in preliminary models will be dropped as new variables are added. This did not occur in this instance.

Offset would require the identification of the main effect usage variable to be included in the model with a negative t value. The failure of usage to appear in the final model means that the affect of mental health usage is not distinguishable from zero.

APPENDIX M

TWO STAGE LEAST SQUARES APPROACH FOR MIDDLE HALF OF MCS SCORES

Source	SS	df	MS		(2SLS)
Model	566.546935	16	35.4091835	Number of obs =	6747
Residual	4150.48809	6730	.616714427	F(16, 6730) =	66.20
				Prob > F =	0.0000
				R-squared =	0.1201
				Adj R-squared =	0.1180
Total	4717.03503	6746	.699234365	Root MSE =	.78531

Intotvis	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
usage	.9817532	.7491124	1.311	0.190	-.486744	2.450251
PCs	-.0319521	.0020214	-15.807	0.000	-.0359147	-.0279895
mcs	.0043245	.0051018	0.848	0.397	-.0056767	.0143257
age	.022546	.0084326	2.674	0.008	.0060154	.0390765
adbencat	.2309822	.032247	7.163	0.000	.1677678	.2941966
age2	-.0001584	.0001226	-1.293	0.196	-.0003987	.0000819
msex	-.0045653	.0802378	-0.057	0.955	-.1618567	.1527261
agesex	-.0063959	.0029452	-2.172	0.030	-.0121694	-.0006224
inover	.0540625	.0352718	1.533	0.125	-.0150814	.1232064
egrade	.1811093	.0259247	6.986	0.000	.1302887	.2319299
ser4army	.1105319	.0250101	4.419	0.000	.0615042	.1595596
ser4navy	.1104675	.0291638	3.788	0.000	.0532973	.1676378
ser4usmc	.1302516	.0430509	3.026	0.002	.0458582	.214645
married	-.1703499	.0273623	-6.226	0.000	-.2239886	-.1167111
wrace	-.0041909	.0273421	-0.153	0.878	-.0577901	.0494082
new	-.0352426	.0296641	-1.188	0.235	-.0933936	.0229085

Positive, but statistically insignificant, coefficient on offset indicates no offset effect on these individuals who fall in the range of the national average for mental health status (between 47 and 56). This is consistent with the expectation of no offset effect for those who do not need mental health services.

Results from the first stage of the two stage least squares are presented below for the sake of completeness.

Probit Estimates

Number of obs = 6747
 chi2(17) = 117.60
 Prob > chi2 = 0.0000
 Pseudo R2 = 0.0530

Log Likelihood = -1051.6335

usage	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
PCs	-.0194319	.0032253	-6.025	0.000	-.0257533	-.0131105
mcs	-.0547814	.0114435	-4.787	0.000	-.0772102	-.0323526
age	.0376444	.0276232	1.363	0.173	-.0164961	.091785
adbencat	.2301875	.0806907	2.853	0.004	.0720365	.3883385
age2	-.0004623	.0004158	-1.112	0.266	-.0012772	.0003526
msex	.3736347	.2449772	1.525	0.127	-.1065117	.8537811
agesex	-.023485	.0083016	-2.829	0.005	-.0397559	-.0072142
inover	.042592	.1451157	0.294	0.769	-.2418296	.3270137
egrade	.0499884	.0798487	0.626	0.531	-.1065123	.206489
ser4army	-.0668845	.0721168	-0.927	0.354	-.2082308	.0744619
ser4navy	-.2165119	.0806736	-2.684	0.007	-.3746292	-.0583946
ser4usmc	-.4587508	.1422706	-3.224	0.001	-.737596	-.1799056
married	.1205616	.0813074	1.483	0.138	-.038798	.2799213
wrace	.278957	.0769514	3.625	0.000	.128135	.4297789
new	.0104965	.0889236	0.118	0.906	-.1637905	.1847834
facisol	-.0446156	.1157398	-0.385	0.700	-.2714615	.1822303
provrat	49.73618	246.0403	0.202	0.840	-432.4939	531.9663
_cons	1.18514	.7855327	1.509	0.131	-.3544762	2.724755

APPENDIX N **REGRESSION RESULTS FOR SECOND LOWEST QUARTILE (USERS)**

Runs of NONZERO TOTAL VISIT OBSERVATIONS ONLY
This is NONZERO TOTVIS for the 2ND LOWEST FOURTH OF MCS
Dependent Variable, TOTVIS, is TRANSFORMED LN and WEIGHTS
Mental health USERS Only Included in this Run

Model: MODEL2A
Dependent Variable: LNTOTVIS

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	20	3244.18906	162.20945	3.911	0.0001
Error	176	7300.27741	41.47885		
C Total	196	10544.46647			
Root MSE	6.44041	R-square	0.3077		
Dep Mean	1.67613	Adj R-sq	0.2290		
C.V.	384.24334				

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > T
INTERCEP	1	3.937258	2.00734349	1.961	0.0514
PCS	1	-0.035252	0.00586955	-6.006	0.0001
MCS	1	0.026549	0.03270573	0.812	0.4180
MSEX	1	-0.081599	0.57454404	-0.142	0.8872
EGRADE	1	0.267895	0.15429170	1.736	0.0843
INOVER	1	0.083569	0.27927698	0.299	0.7651
WRACE	1	0.104411	0.16162817	0.646	0.5191
SER4ARMY	1	0.181427	0.25057364	0.724	0.4700
SER4NAVY	1	0.293089	0.23023537	1.273	0.2047
SER4USMC	1	0.229245	0.35225142	0.651	0.5160
MARRIED	1	0.044812	0.14898621	0.301	0.7639
NEW	1	0.190000	0.19538038	0.972	0.3322
ADBENCAT	1	0.284172	0.14397318	1.974	0.0500
AGE	1	-0.137399	0.06726551	-2.043	0.0426
AGESEX	1	-0.007923	0.01926154	-0.411	0.6813
AGE2	1	0.002304	0.00100948	2.283	0.0236
ARMY	1	-0.100792	0.23996196	-0.420	0.6750
NAVY	1	-0.151619	0.24369357	-0.622	0.5346
LASITE	1	-0.030164	0.13242223	-0.228	0.8201
FACISOL	1	-0.280199	0.21054450	-1.331	0.1850
PROVRAT	1	-648.089148	455.99367580	-1.421	0.1570

As in the run for lowest quartile mental health status mental health users, MCS not significant here. In other words, for users in the second lowest quartile of mental health status, as mental health status decreases, insufficient evidence exists to reject the null hypothesis that there is no resulting impact on the number of physical health visits, other covariates equal.

APPENDIX O

REGRESSION RESULTS FOR SECOND LOWEST QUARTILE (NONUSERS)

NONZERO TOTAL VISIT OBSERVATIONS ONLY
This is the Run of NONZERO TOTVIS for the 2ND LOWEST FOURTH
Dependent Variable, TOTVIS, is TRANSFORMED LN and WEIGHTS
Mental health NONUSERS only

Model: MODEL 2B

Dependent Variable: LNTOTVIS

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	20	34875.01527	1743.75076	33.305	0.0001
Error	3381	177021.61338	52.35777		
C Total	3401	211896.62865			
Root MSE	7.23587	R-square	0.1646		
Dep Mean	1.33896	Adj R-sq	0.1596		
C.V.	540.40877				

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > T
INTERCEP	1	2.139476	0.44634605	4.793	0.0001
PCS	1	-0.034936	0.00174836	-19.982	0.0001
MCS	1	0.009231	0.00757791	1.218	0.2233
MSEX	1	0.189212	0.10702502	1.768	0.0772
EGRADE	1	0.189968	0.03664830	5.184	0.0001
INOVER	1	-0.045807	0.06880865	-0.666	0.5056
WRACE	1	0.041215	0.03077743	1.339	0.1806
SER4ARMY	1	0.004494	0.05564812	0.081	0.9356
SER4NAVY	1	0.164062	0.06331153	2.591	0.0096
SER4USMC	1	-0.085013	0.07121741	-1.194	0.2327
MARRIED	1	-0.122573	0.03612915	-3.393	0.0007
NEW	1	-0.123208	0.04349013	-2.833	0.0046
ADBENCAT	1	0.292279	0.03887323	7.519	0.0001
AGE	1	0.017690	0.01184459	1.494	0.1354
AGESEX	1	-0.016128	0.00354816	-4.545	0.0001
AGE2	1	-0.000057127	0.00017779	-0.321	0.7480
ARMY	1	0.103943	0.05623673	1.848	0.0646
NAVY	1	0.025340	0.06361992	0.398	0.6904
LASITE	1	0.042466	0.03442916	1.233	0.2175
FACISOL	1	-0.144616	0.05322928	-2.717	0.0066
PROVRAT	1	4.983249	131.98906219	0.038	0.9699

In contrast to the run for lowest quartile mental health status mental health nonusers, MCS not significant here. In other words, for nonusers in the second lowest quartile of mental health status, as mental health status decreases, insufficient evidence exists to reject the null hypothesis that there is no resulting impact on the number of physical health visits, other covariates equal.

APPENDIX P

REGRESSION RESULTS FOR SECOND HIGHEST QUARTILE (USERS)

Run of NONZERO TOTAL VISIT OBSERVATIONS ONLY

This is the Run of NONZERO TOTVIS for 2ND HIGHEST FOURTH of MCS

Dependent Variable, TOTVIS, is TRANSFORMED LN

Mental health USERS Only Included in this Run

Model: MODEL3A

Dependent Variable: LNTOTVIS

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	20	2675.65006	133.78250	4.290	0.0001
Error	85	2650.49761	31.18232		
C Total	105	5326.14768			

Root MSE	5.58411	R-square	0.5024
Dep Mean	1.91159	Adj R-sq	0.3853
C.V.	292.11883		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > T
INTERCEP	1	6.259073	5.23860538	1.195	0.2355
PCS	1	-0.017643	0.00705694	-2.500	0.0143
MCS	1	-0.088404	0.09372377	-0.943	0.3482
MSEX	1	0.031365	0.60521556	0.052	0.9588
EGRADE	1	0.050548	0.23065117	0.219	0.8271
INOVER	1	0.165094	0.37834080	0.436	0.6637
WRACE	1	0.213846	0.18620543	1.148	0.2540
SER4ARMY	1	0.369852	0.31287953	1.182	0.2405
SER4NAVY	1	-0.321830	0.34611853	-0.930	0.3551
SER4USMC	1	-0.516809	0.47251750	-1.094	0.2772
MARRIED	1	-0.402994	0.23930188	-1.684	0.0958
NEW	1	0.166540	0.20411869	0.816	0.4168
ADBENCAT	1	0.459898	0.24582689	1.871	0.0648
AGE	1	0.056491	0.08236319	0.686	0.4947
AGESEX	1	-0.013306	0.02142930	-0.621	0.5363
AGE2	1	-0.000844	0.00129102	-0.654	0.5149
ARMY	1	0.164833	0.31389132	0.525	0.6009
NAVY	1	0.424726	0.29250084	1.452	0.1502
LASITE	1	-0.243422	0.19395699	-1.255	0.2129
FACISOL	1	0.112628	0.33934147	0.332	0.7408
PROVRAT	1	6.116395	614.36467288	0.010	0.9921

Similar to the run for the second lowest quartile mental health status mental health users, MCS not significant here. In other words, for users in the second highest quartile of mental health status, as mental health status decreases, insufficient evidence exists to reject the null hypothesis that there is no resulting impact on the number of physical health visits, other covariates equal.

APPENDIX Q

REGRESSION RESULTS FOR SECOND HIGHEST QUARTILE (NONUSERS)

Runs of NONZERO TOTAL VISIT OBSERVATIONS ONLY
The Run of NONZERO TOTVIS for the of 2ND HIGHEST FOURTH MCS
Dependent Variable, TOTVIS, is TRANSFORMED LN
Mental health NONUSERS only

Model: MODEL3B
Dependent Variable: LNTOTVIS

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	20	21990.42696	1099.52135	20.466	0.0001
Error	3021	162302.94079	53.72491		
C Total	3041	184293.36776			
Root MSE	7.32973	R-square	0.1193		
Dep Mean	1.29516	Adj R-sq	0.1135		
C.V.	565.93335				

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > T
INTERCEP	1	2.460584	0.93754312	2.625	0.0087
PCS	1	-0.031692	0.00204433	-15.502	0.0001
MCS	1	-0.003821	0.01666824	-0.229	0.8187
MSEX	1	-0.134978	0.11616264	-1.162	0.2453
EGRADE	1	0.176516	0.03693874	4.779	0.0001
INOVER	1	0.065025	0.07766603	0.837	0.4025
WRACE	1	-0.015544	0.03549276	-0.438	0.6615
SER4ARMY	1	0.124622	0.05732522	2.174	0.0298
SER4NAVY	1	0.163590	0.06611473	2.474	0.0134
SER4USMC	1	0.414773	0.07624714	5.440	0.0001
MARRIED	1	-0.178594	0.03976104	-4.492	0.0001
NEW	1	0.026999	0.04165589	0.648	0.5169
ADBENCAT	1	0.168790	0.04177818	4.040	0.0001
AGE	1	0.028140	0.01158191	2.430	0.0152
AGESEX	1	0.001571	0.00391018	0.402	0.6880
AGE2	1	-0.000270	0.00016542	-1.632	0.1027
ARMY	1	-0.009176	0.05726499	-0.160	0.8727
NAVY	1	-0.165883	0.06730771	-2.465	0.0138
LASITE	1	-0.049641	0.03485167	-1.424	0.1545
FACISOL	1	0.043778	0.06223131	0.703	0.4818
PROVRAT	1	52.869478	137.00697676	0.386	0.6996

Similar to the run for the second lowest quartile mental health status mental health nonusers, MCS is not significant here. In other words, for nonusers in the second highest quartile of mental health status, as mental health status decreases, insufficient evidence exists to reject the null hypothesis that there is no resulting impact on the number of physical health visits, other covariates equal. Since the coefficient on mental health status (MCS) is not significantly different from zero for both users and nonusers in this MCS quartile, it is unlikely that an offset effect will be found when comparing the differences between coefficients.

APPENDIX R

TWO STAGE LEAST SQUARES RESULTS FOR TOP MCS QUARTILE

Second Stage of 2SLS Model for Top Quartile

Source	SS	df	MS		(2SLS)
Model	622.285302	16	38.8928314	Number of obs =	4962
Residual	2766.6061	4945	.559475449	F(16, 4945) =	69.58
				Prob > F =	0.0000
				R-squared =	0.1836
				Adj R-squared =	0.1810
Total	3388.8914	4961	.683106511	Root MSE =	.74798

Intotvis	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
usage	.813422	1.659305	0.490	0.624	-2.439552	4.066396
PCs	-.036262	.003268	-11.096	0.000	-.0426687	-.0298553
mcs	.0045893	.0072746	0.631	0.528	-.0096722	.0188507
age	.0207064	.0091442	2.264	0.024	.0027798	.0386331
adbencat	.1587164	.0358348	4.429	0.000	.0884643	.2289684
age2	-.0002196	.0001245	-1.764	0.078	-.0004637	.0000245
msex	.1346464	.0915629	1.471	0.141	-.0448576	.3141504
agesex	-.0052316	.0036858	-1.419	0.156	-.0124574	.0019942
inover	.0078464	.0394769	0.199	0.842	-.0695458	.0852386
egrade	.063511	.0295966	2.146	0.032	.0054884	.1215335
ser4army	.0161168	.0303941	0.530	0.596	-.0434692	.0757028
ser4navy	-.0026444	.0366545	-0.072	0.942	-.0745035	.0692146
ser4usmc	.0536502	.0601698	0.892	0.373	-.0643092	.1716097
married	-.0585967	.0292648	-2.002	0.045	-.1159687	-.0012247
wrace	.007141	.0315243	0.227	0.821	-.0546605	.0689426
new	.01056	.0343971	0.307	0.759	-.0568736	.0779936
_cons	2.372741	.5771569	4.111	0.000	1.241258	3.504225

No evidence of offset, as expected. USAGE coefficient not significantly different from zero.

First stage results presented below for completeness.

.Probit Estimates

Number of obs = 4962
 chi2(17) = 103.95
 Prob > chi2 = 0.0000
 Pseudo R2 = 0.0895

Log Likelihood = -528.64966

usage	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
PCs	-.0237029	.0040365	-5.872	0.000	-.0316142	-.0157916
mcs	-.0473122	.0202667	-2.334	0.020	-.0870341	-.0075903
age	.0532292	.0321413	1.656	0.098	-.0097666	.116225
adbencat	.107414	.105387	1.019	0.308	-.0991407	.3139688
age2	-.0005677	.0004564	-1.244	0.214	-.0014622	.0003268
msex	.5309102	.3562835	1.490	0.136	-.1673927	1.229213
agesex	-.032604	.0116301	-2.803	0.005	-.0553985	-.0098095
inover	-.1956376	.203017	-0.964	0.335	-.5935436	.2022683
egrade	.1968813	.114492	1.720	0.086	-.0275189	.4212816
ser4army	-.1536495	.0975999	-1.574	0.115	-.3449418	.0376429
ser4navy	-.249405	.1120617	-2.226	0.026	-.4690419	-.0297681
ser4usmc	-.852119	.2811645	-3.031	0.002	-1.403191	-.3010467
married	-.0678424	.1116534	-0.608	0.543	-.286679	.1509942
wrace	-.2014054	.0877033	-2.296	0.022	-.3733008	-.0295101
new	.0004305	.1327251	0.003	0.997	-.259706	.260567
facisol	-.1552752	.157617	-0.985	0.325	-.4641987	.1536484
provrat	255.2973	328.0556	0.778	0.436	-387.6799	898.2745
_cons	1.353017	1.378613	0.981	0.326	-1.349016	4.055049

APPENDIX S

REGRESSION RESULTS FOR HIGHEST QUARTILE (USERS)

Runs of NONZERO TOTAL VISIT OBSERVATIONS ONLY
 This is the Run of NONZERO TOTVIS for the TOP FOURTH of MCS
 Dependent Variable, TOTVIS, is TRANSFORMED LN
 Mental health USERS Only Included in this Run

Model: MODEL4A
 Dependent Variable: LNTOTVIS

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	20	4018.09371	200.90469	7.826	0.0001
Error	100	2567.09844	25.67098		
C Total	120	6585.19215			
Root MSE	5.06665	R-square	0.6102		
Dep Mean	1.92377	Adj R-sq	0.5322		
C.V.	263.37161				

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > T
INTERCEP	1	-2.162834	2.02529777	-1.068	0.2881
PCS	1	-0.029880	0.00526074	-5.680	0.0001
MCS	1	0.089673	0.03148378	2.848	0.0053
MSEX	1	0.737946	0.54192657	1.362	0.1763
EGRADE	1	0.358823	0.15880934	2.259	0.0260
INOVER	1	-0.875627	0.28192137	-3.106	0.0025
WRACE	1	-0.213992	0.13138500	-1.629	0.1065
SER4ARMY	1	-0.412555	0.22196435	-1.859	0.0660
SER4NAVY	1	-0.147950	0.47749539	-0.310	0.7573
SER4USMC	1	-0.280643	0.65124341	-0.431	0.6674
MARRIED	1	0.242599	0.17096197	1.419	0.1590
NEW	1	0.019579	0.17538307	0.112	0.9113
ADBENCAT	1	0.149781	0.12631356	1.186	0.2385
AGE	1	-0.023001	0.04773593	-0.482	0.6310
AGESEX	1	-0.023420	0.01737640	-1.348	0.1808
AGE2	1	0.000435	0.00072740	0.598	0.5510
ARMY	1	0.540144	0.22688726	2.381	0.0192
NAVY	1	0.202705	0.48278909	0.420	0.6755
LASITE	1	-0.132607	0.14658496	-0.905	0.3678
FACISOL	1	-0.037273	0.21617960	-0.172	0.8635
PROVRAT	1	401.359124	568.34997798	0.706	0.4817

MCS is positive and significant for users of mental health care in the highest quartile of mental health status. This is the first time that the MCS coefficient is found to be positive and significant. It is also the first instance in this analysis by quartile that users display an MCS coefficient which is distinguishable from zero. In this case, the data are saying that for users in the highest quartile of mental health status, as mental health

status increases, the number of physical health visits increases as well. This could be alternatively viewed as people who are intensely interested in all aspects of their well-being and seek out counsel from experts or as the worried well, or hypochondriacs, who seek out health care services of all types for reasons unrelated to their health status. The implications of this result will be addressed in the text.

APPENDIX T

REGRESSION RESULTS FOR HIGHEST QUARTILE (NONUSERS)

Runs of NONZERO TOTAL VISIT OBSERVATIONS ONLY
The Run of NONZERO TOTVIS for the TOP FOURTH of MCS
Dependent Variable, TOTVIS, is TRANSFORMED LN
Mental health NONUSERS only

Model: MODEL4B

Dependent Variable: LNTOTVIS

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	20	48244.83532	2412.24177	50.962	0.0001
Error	4820	228149.47899	47.33392		
C Total	4840	276394.31431			
Root MSE	6.87996	R-square	0.1746		
Dep Mean	1.31391	Adj R-sq	0.1711		
C.V.	523.62522				

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > T
INTERCEP	1	2.644819	0.39140892	6.757	0.0001
PCS	1	-0.037184	0.00137989	-26.947	0.0001
MCS	1	0.000925	0.00552915	0.167	0.8672
MSEX	1	0.127584	0.08805059	1.449	0.1474
EGRADE	1	0.061811	0.02707666	2.283	0.0225
INOVER	1	-0.025148	0.05769313	-0.436	0.6629
WRACE	1	0.013389	0.02513688	0.533	0.5943
SER4ARMY	1	-0.018731	0.04100237	-0.457	0.6478
SER4NAVY	1	-0.077557	0.04801522	-1.615	0.1063
SER4USMC	1	-0.025377	0.05581827	-0.455	0.6494
MARRIED	1	-0.069824	0.02947906	-2.369	0.0179
NEW	1	0.016580	0.03498349	0.474	0.6356
ADBENCAT	1	0.159597	0.03236622	4.931	0.0001
AGE	1	0.021854	0.00851905	2.565	0.0103
AGESEX	1	-0.005371	0.00277498	-1.935	0.0530
AGE2	1	-0.000230	0.00012200	-1.886	0.0594
ARMY	1	0.046213	0.04159419	1.111	0.2666
NAVY	1	0.086847	0.04822701	1.801	0.0718
LASITE	1	0.031744	0.02740377	1.158	0.2468
FACISOL	1	-0.040701	0.04489405	-0.907	0.3647
PROVRAT	1	41.232251	102.32248281	0.403	0.6870

MCS not significant for this group, just as was the case for nonusers in all of the quartile analyses except for the lowest quartile (where it was negative). In other words, for nonusers in the highest quartile of mental health status, as mental health status changes, insufficient evidence exists to reject the null hypothesis that there of no resulting impact on the number of physical health visits, other covariates equal.

APPENDIX U **TWO STAGE LEAST SQUARES RESULTS FOR ACTIVE DUTY ONLY** **(Lowest Quartile off MCS)**

Final Results from Second Stage of 2SLS model.

Source	SS	df	MS	(2SLS)	
Model	227.749958	15	15.1833306	Number of obs =	1942
Residual	1144.56562	1926	.594270832	F(15, 1926) =	24.98
				Prob > F =	0.0000
				R-squared =	0.1660
				Adj R-squared =	0.1595
Total	1372.31558	1941	.707014725	Root MSE =	.77089

lntotvis	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
usage	.0744694	.3483523	0.214	0.831	-.6087178	.7576566
PCs	-.0323178	.0030063	-10.750	0.000	-.0382137	-.0264218
mcs	-.0152384	.0032561	-4.680	0.000	-.0216244	-.0088525
age	.0190079	.0204778	0.928	0.353	-.021153	.0591689
agesex	-.0042585	.0061173	-0.696	0.486	-.0162558	.0077388
msex	-.0895079	.1671808	-0.535	0.592	-.4173822	.2383664
age2	-.0002378	.0003216	-0.740	0.460	-.0008686	.0003929
inover	.0726665	.0585702	1.241	0.215	-.042201	.1875341
egrade	.0464092	.0682691	0.680	0.497	-.08748	.1802983
ser4army	.0048239	.0461484	0.105	0.917	-.0856822	.09533
ser4navy	-.0063716	.057645	-0.111	0.912	-.1194248	.1066816
ser4usmc	-.0100277	.0705691	-0.142	0.887	-.1484275	.1283721
married	-.0853953	.0437547	-1.952	0.051	-.1712068	.0004162
wrace	.0137764	.04301	0.320	0.749	-.0705747	.0981275
new	.1958375	.0587039	3.336	0.000	.0807076	.3109674
_cons	3.604832	.3763337	9.579	0.000	2.866767	4.342896

First Stage of 2SLS Results.

Probit Estimates

Log Likelihood = -581.82459

Number of obs = 1942

chi2(16) = 171.15

Prob > chi2 = 0.0000

Pseudo R2 = 0.1282

usage	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
PCs	-.0296647	.0042287	-7.015	0.000	-.0379527	-.0213767
mcs	-.0366326	.0045753	-8.007	0.000	-.0456001	-.0276651
age	.0738105	.0473295	1.560	0.119	-.0189537	.1665746
agesex	-.0145765	.0130759	-1.115	0.265	-.0402048	.0110518
msex	.2548441	.3665436	0.695	0.487	-.4635682	.9732565
age2	-.0007072	.0007585	-0.932	0.351	-.0021938	.0007794
inover	-.4390369	.1896172	-2.315	0.021	-.8106798	-.0673939
egrade	.3532644	.1706905	2.070	0.038	.0187172	.6878116
ser4army	-.0202596	.1046576	-0.194	0.847	-.2253848	.1848656
ser4navy	-.4276229	.1272582	-3.360	0.000	-.6770443	-.1782014
ser4usmc	-.3216506	.1532882	-2.098	0.036	-.6220899	-.0212113
married	-.3094863	.0895972	-3.454	0.000	-.4850936	-.1338789
wrace	.2222284	.0980723	2.266	0.023	.0300103	.4144465
new	.3092321	.1173109	2.636	0.008	.079307	.5391572
facisol	-.2717994	.1468555	-1.851	0.064	-.5596309	.0160321
provrat	737.0882	330.4812	2.230	0.026	89.35707	1384.819
_cons	.1882501	.8110737	0.232	0.816	-1.401425	1.777925

. predict uhat
(585 missing values generated)

. test \$zside

(1) facisol = 0.0

(2) provrat = 0.0

chi2(2) = 9.12
Prob > chi2 = 0.0105

APPENDIX V

TWO STAGE LEAST SQUARES RESULTS FOR FAMILY MEMBERS ONLY (Lowest Quartile off MCS)

Final Stage of 2SLS Model

Source	SS	df	MS		(2SLS)
Model	70.5412443	15	4.70274962	Number of obs =	1805
Residual	1342.63325	1789	.750493709	F(15, 1789) =	17.64
				Prob > F =	0.0000
				R-squared =	0.0499
				Adj R-squared =	0.0420
Total	1413.17449	1804	.783356147	Root MSE =	.86631

lntotvis	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
usage	.9594101	.4855854	1.976	0.048	.007036	1.911784
PCs	-.0230394	.0029934	-7.697	0.000	-.0289104	-.0171684
mcs	.0019728	.0041178	0.479	0.632	-.0061034	.010049
age	-.0256842	.0192144	-1.337	0.181	-.0633693	.0120009
agesex	-.0244689	.0092158	-2.655	0.008	-.0425438	-.0063941
msex	.7327685	.2872606	2.551	0.011	.1693669	1.29617
age2	.0006006	.0002893	2.076	0.038	.0000332	.0011679
inover	-.1314046	.0945056	-1.390	0.165	-.3167575	.0539484
egrade	.1036549	.0682743	1.518	0.129	-.0302509	.2375606
ser4army	.0327255	.0550827	0.594	0.553	-.0753077	.1407586
ser4navy	.1751925	.0600627	2.917	0.004	.057392	.292993
ser4usmc	-.1099258	.0888482	-1.237	0.216	-.2841829	.0643312
married	.0451219	.0678231	0.665	0.506	-.0878989	.1781427
wrace	-.1694781	.0664548	-2.550	0.011	-.2998153	-.0391409
new	.0158359	.0603585	0.262	0.793	-.1025447	.1342164
_cons	2.635972	.3441628	7.659	0.000	1.960968	3.310975

Usage coefficient is positive. No evidence of offset for active duty force.

First Stage of 2SLS Method

Probit Estimates

Log Likelihood = -665.51467

Number of obs = 1805
 chi2(15) = 135.34
 Prob > chi2 = 0.0000
 Pseudo R2 = 0.0923

usage	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
PCs	-.0194104	.0041062	-4.727	0.000	-.0274584	-.0113623
mcs	-.0312439	.0042329	-7.381	0.000	-.0395402	-.0229476
age	.1171416	.0363437	3.223	0.001	.0459094	.1883739
agesex	-.034335	.0248759	-1.380	0.168	-.0830908	.0144207
msex	.5303389	.7247711	0.732	0.464	-.8901863	1.950864
age2	-.0016464	.0005624	-2.927	0.003	-.0027487	-.000544
inover	-.3928742	.1967913	-1.996	0.046	-.778578	-.0071704
egrade	-.1740024	.1133779	-1.535	0.125	-.396219	.0482142
ser4army	-.0374231	.0990944	-0.378	0.706	-.2316446	.1567984
ser4navy	-.1147101	.1072554	-1.070	0.285	-.3249269	.0955066
ser4usmc	-.3900279	.1695873	-2.300	0.021	-.7224128	-.0576429
married	-.1587211	.1215352	-1.306	0.192	-.3969257	.0794834
wrace	.5120692	.1053768	4.859	0.000	.3055345	.718604
new	-.2215781	.118927	-1.863	0.062	-.4546707	.0115145
provrat	1064.873	330.66	3.220	0.001	416.7916	1712.955
_cons	-1.028445	.6202514	-1.658	0.097	-2.244116	.1872251

. test \$zside

(1) provrat = 0.0

chi2(1) = 10.37
 Prob > chi2 = 0.0013

(2SLS)

APPENDIX W

TWO STAGE LEAST SQUARES RESULTS FOR MALES ONLY (Lowest Quartile off MCS)

Final Stage of 2SLS Model.

Source	SS	df	MS		(2SLS)
Model	135.40761	14	9.67197213	Number of obs =	1547
Residual	963.030396	1532	.628609919	F(14, 1532) =	19.15
				Prob > F =	0.0000
				R-squared =	0.1233
				Adj R-squared =	0.1153
Total	1098.43801	1546	.710503238	Root MSE =	.79285

Intotvis	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
usage	-.3182486	.3749477	-0.849	0.396	-1.053714	.4172164
PCs	-.0373168	.0032228	-11.579	0.000	-.0436384	-.0309952
mcs	-.0181835	.0032754	-5.551	0.000	-.0246083	-.0117587
age	.0139393	.0207829	0.671	0.503	-.0268266	.0547051
adbencat	.0994007	.0991928	1.002	0.316	-.0951673	.2939687
age2	-.0002705	.000328	-0.825	0.410	-.0009139	.0003729
inover	.0199931	.0700257	0.286	0.775	-.1173633	.1573495
egrade	-.0138428	.0788967	-0.175	0.861	-.1685997	.140914
ser4army	-.0236413	.0532381	-0.444	0.657	-.1280685	.080786
ser4navy	-.06172	.0648348	-0.952	0.341	-.1888943	.0654544
ser4usmc	.0045261	.0759777	0.060	0.953	-.1445053	.1535575
married	-.0214384	.0504747	-0.425	0.671	-.1204453	.0775685
wrace	.0060099	.048544	0.124	0.901	-.0892098	.1012295
new	.122925	.068388	1.797	0.072	-.0112189	.257069
_cons	3.942653	.3629632	10.862	0.000	3.230695	4.65461

First Stage of 2SLS Model below

Probit Estimates

Log Likelihood = -435.13598

Number of obs = 1547
chi2(15) = 127.85
Prob > chi2 = 0.0000
Pseudo R2 = 0.1281

usage	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
PCs	-.0283626	.0047775	-5.937	0.000	-.0377262	-.0189989
mcs	-.0321148	.0053015	-6.058	0.000	-.0425056	-.0217241
age	.0961365	.0504097	1.907	0.057	-.0026646	.1949376
adbencat	.2806731	.2391	1.174	0.240	-.1879544	.7493005
age2	-.0013302	.0008182	-1.626	0.104	-.0029338	.0002734
inover	-.5740096	.214126	-2.681	0.007	-.9936889	-.1543304
egrade	.4065609	.2070758	1.963	0.050	.0006998	.812422
ser4army	.1223244	.1205109	1.015	0.310	-.1138725	.3585213
ser4navy	-.4233381	.1511012	-2.802	0.005	-.7194911	-.1271852
ser4usmc	-.1833269	.1748327	-1.049	0.294	-.5259926	.1593389
married	-.3019456	.1077049	-2.803	0.005	-.5130434	-.0908478
wrace	.2199445	.1135589	1.937	0.053	-.0026269	.4425159
new	.2841381	.1387416	2.048	0.041	.0122095	.5560666
facisol	-.2962725	.1558549	-1.901	0.057	-.6017425	.0091974
provrat	1236.738	387.4133	3.192	0.001	477.4216	1996.054
_cons	-.7425879	.8636534	-0.860	0.390	-2.435317	.9501417

. test \$zside

(1) facisol = 0.0

(2) provrat = 0.0

chi2(2) = 14.98
Prob > chi2 = 0.0006

APPENDIX X

TWO STAGE LEAST SQUARES RESULTS FOR FEMALES ONLY

(Lowest Quartile of MCS)

Final Stage of 2SLS output.

Source	SS	df	MS		(2SLS)
Model	7.7097212	14	.550694371	Number of obs =	2200
Residual	1658.47836	2185	.759028999	F(14, 2185) =	22.42
				Prob > F =	0.0000
				R-squared =	0.0046
				Adj R-squared =	0.0018
Total	1666.18808	2199	.75770263	Root MSE =	.87122

Intotvis	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
usage	1.173074	.6149179	1.908	0.057	-.0328112	2.378959
PCs	-.0216844	.0036328	-5.969	0.000	-.0288084	-.0145604
mcs	.0023953	.005545	0.432	0.666	-.0084787	.0132693
age	-.0257255	.020711	-1.242	0.214	-.0663409	.0148899
adbencat	.2579848	.0445681	5.789	0.000	.1705846	.345385
age2	.0005773	.0003103	1.860	0.063	-.0000313	.0011859
inover	.0041225	.0744519	0.055	0.956	-.1418814	.1501264
egrade	.1570417	.0624896	2.513	0.012	.0344966	.2795869
ser4army	.0831969	.0545543	1.525	0.127	-.0237869	.1901807
ser4navy	.1902008	.0622065	3.058	0.002	.0682108	.3121908
ser4usmc	-.069067	.095594	-0.723	0.470	-.2565317	.1183976
married	-.0632011	.0607542	-1.040	0.298	-.1823431	.0559409
wrace	-.1355887	.066976	-2.024	0.043	-.266932	-.0042454
new	.1357782	.0535519	2.535	0.011	.0307602	.2407962
_cons	2.512923	.4016605	6.256	0.000	1.725246	3.300599

Usage coefficient is positive. No evidence of offset for women.

First Stage of 2SLS output.

Probit Estimates

Number of obs = 2200
 chi2(14) = 165.19
 Prob > chi2 = 0.0000
 Pseudo R2 = 0.0923

Log Likelihood = -811.91498

usage	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
PCs	-.0222442	.0036984	-6.015	0.000	-.029493	-.0149954
mcs	-.036125	.0038525	-9.377	0.000	-.0436757	-.0285743
age	.1038922	.0333305	3.117	0.002	.0385656	.1692189
adbencat	-.0705481	.0843622	-0.836	0.403	-.235895	.0947988
age2	-.0014165	.0005202	-2.723	0.006	-.002436	-.000397
inover	-.2004592	.1466483	-1.367	0.172	-.4878846	.0869662
egrade	-.1101346	.1061971	-1.037	0.300	-.3182772	.0980079
ser4army	-.1248558	.0893328	-1.398	0.162	-.2999448	.0502333
ser4navy	-.199831	.0980717	-2.038	0.042	-.3920479	-.007614
ser4usmc	-.4613502	.1481743	-3.114	0.002	-.7517665	-.170934
married	-.2727928	.0922367	-2.958	0.003	-.4535735	-.0920122
wrace	.4219864	.0908762	4.644	0.000	.2438723	.6001004
new	-.086254	.103123	-0.836	0.403	-.2883714	.1158633
provrat	646.3715	287.8147	2.246	0.025	82.26513	1210.478
_cons	-.3245964	.5628049	-0.577	0.564	-1.427674	.7784809

APPENDIX Y

TWO STAGE LEAST SQUARES RESULTS FOR OFFICER HOUSEHOLDS ONLY (Lowest Quartile of MCS)

Final stage of 2SLS Model.

Source	SS	df	MS		(2SLS)
Model	64.0595323	15	4.27063549	Number of obs =	722
Residual	407.422071	706	.577085086	F(15, 706) =	7.96
				Prob > F =	0.0000
				R-squared =	0.1359
				Adj R-squared =	0.1175
Total	471.481603	721	.653927327	Root MSE =	.75966

Intotvis	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
usage	.6656698	.4110374	1.619	0.106	-.1413322	1.472672
PCs	-.0279103	.0041744	-6.686	0.000	-.036106	-.0197146
mcs	-.0048474	.0075489	-0.642	0.521	-.0196684	.0099737
age	-.0175665	.0279656	-0.628	0.530	-.0724723	.0373393
agesex	-.026986	.0069242	-3.897	0.000	-.0405804	-.0133916
adbencat	.1467752	.0807153	1.818	0.069	-.0116955	.305246
msex	.8781314	.2384783	3.682	0.000	.4099198	1.346343
age2	.0004264	.000386	1.105	0.270	-.0003315	.0011842
inover	.039566	.1138569	0.348	0.728	-.1839728	.2631047
ser4army	.0305721	.0715701	0.427	0.669	-.1099437	.1710879
ser4navy	.1233583	.081082	1.521	0.129	-.0358325	.2825491
ser4usmc	-.0399939	.1259403	-0.318	0.751	-.2872562	.2072684
married	.0435728	.0819346	0.532	0.595	-.1172918	.2044374
wrace	-.0642562	.0838675	-0.766	0.444	-.2289158	.1004035
new	.1478586	.084592	1.748	0.081	-.0182234	.3139406
_cons	3.034485	.5361172	5.660	0.000	1.981911	4.08706

Usage coefficient is positive. No evidence of offset.

First stage of 2SLS Method is shown below:

Probit Estimates

Log Likelihood = -202.87142

Number of obs = 722
 chi2(16) = 153.41
 Prob > chi2 = 0.0000
 Pseudo R2 = 0.2744

usage	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
PCs	-.0289848	.0080134	-3.617	0.000	-.0446908	-.0132787
mcs	-.0740048	.0081962	-9.029	0.000	-.0900691	-.0579406
age	.2654988	.0788819	3.366	0.000	.1108932	.4201045
agesex	-.0000346	.0230093	-0.002	0.999	-.045132	.0450628
adbencat	-.4298985	.1965609	-2.187	0.029	-.8151508	-.0446463
msex	-.5646036	.8259916	-0.684	0.494	-2.183517	1.05431
age2	-.0035414	.0011231	-3.153	0.002	-.0057426	-.0013401
inover	.4694663	.4623708	1.015	0.310	-.4367639	1.375696
ser4army	-.14866	.1662431	-0.894	0.371	-.4744904	.1771704
ser4navy	-.3545986	.2016407	-1.759	0.079	-.7498071	.04061
ser4usmc	.1351853	.3116758	0.434	0.664	-.475688	.7460586
married	-.1893268	.20571	-0.920	0.357	-.592511	.2138574
wrace	.4498544	.2419695	1.859	0.063	-.024397	.9241059
new	-.1300526	.2054001	-0.633	0.527	-.5326295	.2725242
facisol	.4334009	.3819482	1.135	0.256	-.3152039	1.182006
provrat	607.6833	490.3584	1.239	0.215	-353.4015	1568.768
_cons	-1.923653	1.374019	-1.400	0.162	-4.61668	.7693741

. test \$zside

(1) facisol = 0.0

(2) provrat = 0.0

chi2(2) = 2.79
 Prob > chi2 = 0.2481

APPENDIX Z

TWO STAGE LEAST SQUARES RESULTS FOR ENLISTED HOUSEHOLDS ONLY (Lowest Quartile of MCS)

Final stage of 2SLS Model

Source	SS	df	MS		(2SLS)
Model	327.546124	15	21.8364082	Number of obs =	3075
Residual	1957.02918	3059	.639761091	F(15, 3059) =	33.07
				Prob > F =	0.0000
				R-squared =	0.1434
				Adj R-squared =	0.1392
Total	2284.5753	3074	.743193006	Root MSE =	.79985

Intotvis	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
usage	.2440382	.3705594	0.659	0.510	-.4825324	.9706087
PCs	-.0298682	.0025875	-11.543	0.000	-.0349415	-.0247948
mcs	-.0088188	.0028314	-3.115	0.002	-.0143704	-.0032672
age	-.0001393	.0164524	-0.008	0.993	-.0323981	.0321195
agesex	-.0130312	.0042501	-3.066	0.002	-.0213647	-.0046978
adbencat	.2462795	.0419162	5.876	0.000	.1640927	.3284662
msex	.1523902	.1191947	1.278	0.201	-.0813196	.3860999
age2	.000197	.0002555	0.771	0.441	-.000304	.000698
inover	.0128444	.0539993	0.238	0.812	-.0930341	.1187229
ser4army	-.0035318	.0385768	-0.092	0.927	-.0791708	.0721072
ser4navy	.0572007	.0471416	1.213	0.225	-.0352317	.149633
ser4usmc	-.0804147	.0613388	-1.311	0.190	-.2006842	.0398548
married	-.0761184	.0416751	-1.826	0.068	-.1578323	.0055955
wrace	-.0432158	.0401882	-1.075	0.282	-.1220143	.0355827
new	.0852098	.0445104	1.914	0.056	-.0020635	.172483
_cons	3.25062	.2865916	11.342	0.000	2.688689	3.812552

Positive coefficient on usage parameter. No evidence of offset.

First stage of 2SLS Method

Probit Estimates

Number of obs = 3075
 chi2(16) = 212.80
 Prob > chi2 = 0.0000
 Pseudo R2 = 0.0945

Log Likelihood = -1019.636

usage	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
PCs	-.0252634	.0031804	-7.943	0.000	-.0314969	-.0190299
mcs	-.0294993	.0034275	-8.607	0.000	-.036217	-.0227815
age	.0991079	.0323952	3.059	0.002	.0356144	.1626014
agesex	-.0059341	.0090427	-0.656	0.512	-.0236575	.0117892
adbencat	-.0058821	.0879607	-0.067	0.947	-.1782819	.1665177
msex	-.00829	.2591193	-0.032	0.974	-.5161545	.4995744
age2	-.0013357	.0005111	-2.613	0.009	-.0023375	-.0003339
inover	-.4963754	.1572237	-3.157	0.002	-.8045282	-.1882226
ser4army	.0069091	.0807142	0.086	0.932	-.1512877	.165106
ser4navy	-.2297541	.0915041	-2.511	0.012	-.4090987	-.0504094
ser4usmc	-.3219365	.1206528	-2.668	0.008	-.5584115	-.0854614
married	-.2917919	.0758059	-3.849	0.000	-.4403688	-.143215
wrace	.348094	.0763033	4.562	0.000	.1985423	.4976458
new	.0802924	.0912362	0.880	0.379	-.0985273	.2591121
facisol	-.2521549	.1141324	-2.209	0.027	-.4758502	-.0284595
provrat	924.6157	264.1424	3.500	0.000	406.9061	1442.325
_cons	-.2702487	.5409662	-0.500	0.617	-1.330523	.7900256

. test \$zside

(1) facisol = 0.0

(2) provrat = 0.0

chi2(2) = 18.82
 Prob > chi2 = 0.0000

APPENDIX AA

TWO STAGE LEAST SQUARES RESULTS FOR NEW ARRIVALS (LESS THAN SIX MONTHS TIME ON STATION) ONLY (Lowest Quartile of MCS)

Final stage of 2SLS Method Results.

(2SLS)

Source	SS	df	MS	Number of obs =	469
Model	35.1892791	15	2.34595194	F(15, 453) =	6.10
Residual	289.97205	453	.6401149	Prob > F =	0.0000
				R-squared =	0.1082
				Adj R-squared =	0.0787
Total	325.161329	468	.694789165	Root MSE =	.80007

Intotvis	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
usage	1.142645	.4650061	2.457	0.014	.2288085	2.056482
PCs	-.0260077	.0048912	-5.317	0.000	-.0356199	-.0163955
mcs	.0044244	.0060238	0.734	0.463	-.0074137	.0162626
age	-.0351339	.0430448	-0.816	0.415	-.1197262	.0494583
egrade	-.0408393	.1290635	-0.316	0.752	-.2944768	.2127983
agesex	-.0080394	.0121642	-0.661	0.509	-.0319446	.0158657
adbencat	.5503079	.1103636	4.986	0.000	.3334197	.7671961
msex	-.2245582	.3414996	-0.658	0.511	-.8956781	.4465618
age2	.0006308	.0007035	0.897	0.370	-.0007516	.0020133
inover	.065319	.1411809	0.463	0.644	-.2121316	.3427697
ser4army	-.1241389	.0995319	-1.247	0.213	-.3197404	.0714625
ser4navy	.2060698	.1228072	1.678	0.094	-.0352728	.4474123
ser4usmc	-.1372542	.1491198	-0.920	0.358	-.4303065	.1557981
married	.0852285	.1449536	0.588	0.557	-.1996364	.3700934
wrace	.0146582	.1063925	0.138	0.890	-.1944259	.2237423
_cons	2.944764	.7667666	3.840	0.000	1.437903	4.451625

Positive coefficient on usage parameter. No evidence of offset

Results from first stage of 2SLS Method is below:

Probit Estimates

Log Likelihood = -141.07799

Number of obs = 469
 chi2(16) = 84.65
 Prob > chi2 = 0.0000
 Pseudo R2 = 0.2308

usage	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
PCs	-.0103196	.010445	-0.988	0.323	-.0307915	.0101523
mcs	-.0442492	.0101787	-4.347	0.000	-.064199	-.0242994
age	.0628413	.1009068	0.623	0.533	-.1349324	.2606151
egrade	.3714419	.2849427	1.304	0.192	-.1870356	.9299194
agesex	-.0175506	.0263996	-0.665	0.506	-.0692929	.0341917
adbencat	.0329506	.2606313	0.126	0.899	-.4778774	.5437786
msex	.3613168	.7428457	0.486	0.627	-1.094634	1.817268
age2	-.0005039	.0016332	-0.309	0.758	-.0037048	.0026971
inover	-.6132475	.4010094	-1.529	0.126	-1.399211	.1727165
ser4army	.1014756	.202964	0.500	0.617	-.2963265	.4992777
ser4navy	-.7196653	.2591879	-2.777	0.005	-1.227664	-.2116663
ser4usmc	-1.02667	.4369952	-2.349	0.019	-1.883165	-.1701757
married	-1.036237	.2110643	-4.910	0.000	-1.449916	-.6225589
wrace	.676459	.2346007	2.883	0.004	.2166501	1.136268
facisol	-.0673197	.2898192	-0.232	0.816	-.6353548	.5007154
provrat	603.0117	553.4498	1.090	0.276	-481.7301	1687.753
_cons	-.3484444	1.673102	-0.208	0.835	-3.627663	2.930775

. test \$zside

(1) facisol = 0.0

(2) provrat = 0.0

chi2(2) = 1.26
 Prob > chi2 = 0.5317

APPENDIX AB
TWO STAGE LEAST SQUARES RESULTS FOR INDIVIDUALS WITH
MORE THAN SIX MONTHS TIME ON STATION ONLY
(Lowest Quartile of MCS)

				(2SLS)		
Source	SS	df	MS	Number of obs	=	3288
Model	365.852006	15	24.3901337	F(15, 3272)	=	37.31
Residual	2082.85511	3272	.636569411	Prob > F	=	0.0000
				R-squared	=	0.1494
				Adj R-squared	=	0.1455
				Root MSE	=	.79785
Intotvis	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
usage	.1708262	.3659679	0.467	0.641	-.546723	.8883755
PCs	-.0309809	.0026245	-11.805	0.000	-.0361266	-.0258351
mcs	-.0108207	.0030154	-3.588	0.000	-.016733	-.0049084
age	.0063506	.0147694	0.430	0.667	-.0226077	.0353089
agesex	-.0140555	.0038084	-3.691	0.000	-.0215226	-.0065885
adbencat	.1788371	.0399936	4.472	0.000	.100422	.2572522
egrade	.06061	.0487152	1.244	0.214	-.0349054	.1561255
msex	.2435783	.1098925	2.217	0.027	.0281132	.4590434
age2	.0000944	.0002227	0.424	0.672	-.0003423	.000531
inover	.037554	.0515845	0.728	0.467	-.0635871	.1386951
ser4army	.0196669	.0373655	0.526	0.599	-.0535952	.092929
ser4navy	.0568314	.0450654	1.261	0.207	-.0315279	.1451907
ser4usmc	-.0411482	.0571933	-0.719	0.472	-.1532865	.07099
married	-.0450793	.0364758	-1.236	0.217	-.1165971	.0264385
wrace	-.0492025	.0380699	-1.292	0.196	-.1238458	.0254407
_cons	3.212542	.2775463	11.575	0.000	2.66836	3.756724

Positive coefficient on usage parameter. No evidence of offset.

First stage of 2SLS Method is below:

Probit Estimates

Log Likelihood = -1085.6149

Number of obs = 3288
 chi2(16) = 235.96
 Prob > chi2 = 0.0000
 Pseudo R2 = 0.0980

usage	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
PCs	-.0271356	.0030485	-8.901	0.000	-.0331105	-.0211606
mcs	-.0330596	.0032758	-10.092	0.000	-.03948	-.0266392
age	.1056494	.0295792	3.572	0.000	.0476753	.1636235
agesex	-.0096634	.0082768	-1.168	0.243	-.0258857	.0065589
adbencat	-.0768493	.0837605	-0.917	0.359	-.2410168	.0873183
egrade	-.0441639	.1007493	-0.438	0.661	-.2416288	.153301
msex	.0899038	.2453059	0.366	0.714	-.3908869	.5706945
age2	-.0014431	.0004576	-3.154	0.002	-.00234	-.0005462
inover	-.4177815	.1576249	-2.650	0.008	-.7267206	-.1088423
ser4army	-.0539239	.0779519	-0.692	0.489	-.2067067	.0988589
ser4navy	-.2237002	.0875786	-2.554	0.011	-.395351	-.0520493
ser4usmc	-.2365128	.1169666	-2.022	0.043	-.4657631	-.0072625
married	-.1635826	.0744942	-2.196	0.028	-.3095885	-.0175767
wrace	.3003151	.0744583	4.033	0.000	.1543795	.4462507
facisol	-.2420904	.117451	-2.061	0.039	-.4722901	-.0118906
provrat	873.2274	257.3945	3.393	0.000	368.7435	1377.711
_cons	-.1012423	.5206547	-0.194	0.846	-1.121707	.9192221

. test \$zside

(1) facisol = 0.0

(2) provrat = 0.0

chi2(2) = 17.26
 Prob > chi2 = 0.0002

APPENDIX AC
TWO STAGE LEAST SQUARES RESULTS FOR INDIVIDUALS
AFFILIATED WITH THE ARMY
(Lowest Quartile of MCS)

Source	SS	df	MS			
Model	-.049941158	13	-.003841628			
Residual	814.769067	1079	.755114984			
Total	814.719126	1092	.746079786			

				(2SLS)		
				Number of obs =	1093	
				F(13, 1079) =	10.85	
				Prob > F	= 0.0000	
				R-squared	= .	
				Adj R-squared	= .	
				Root MSE	= .86897	

Intotvis	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
usage	1.28069	.5512777	2.323	0.020	.1989925	2.362388
PCs	-.016434	.0053925	-3.048	0.002	-.0270151	-.0058529
mcs	.0005068	.0061736	0.082	0.935	-.0116067	.0126204
age	.0137345	.0295786	0.464	0.642	-.0443036	.0717726
egrade	.063027	.0919402	0.686	0.493	-.1173748	.2434289
agesex	-.0057955	.0070941	-0.817	0.414	-.0197153	.0081243
adbencat	.2784277	.0758273	3.672	0.000	.1296421	.4272133
msex	-.0982674	.2069886	-0.475	0.635	-.5044132	.3078783
age2	-.0001019	.000445	-0.229	0.819	-.0009751	.0007714
inover	.1221369	.1003779	1.217	0.224	-.0748211	.3190949
married	.0203219	.0799601	0.254	0.799	-.136573	.1772167
wrace	-.1382249	.078043	-1.771	0.077	-.291358	.0149083
new	-.0691428	.090797	-0.762	0.447	-.2473015	.109016
_cons	1.878837	.4803066	3.912	0.000	.9363966	2.821278

First stage of 2SLS Method

Probit Estimates

Number of obs = 1093
chi2(14) = 132.56
Prob > chi2 = 0.0000
Pseudo R2 = 0.1494

Log Likelihood = -377.42562

usage	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
PCs	-.0360773	.0051252	-7.039	0.000	-.0461225	-.026032
mcs	-.0436365	.0059251	-7.365	0.000	-.0552494	-.0320235
age	.1625905	.0514704	3.159	0.002	.0617103	.2634706
egrade	.0150421	.1802827	0.083	0.934	-.3383055	.3683897
agesex	-.0092087	.0143546	-0.642	0.521	-.0373431	.0189257
adbencat	-.0959757	.1492429	-0.643	0.520	-.3884864	.1965351
msex	.2937771	.4202127	0.699	0.484	-.5298247	1.117379
age2	-.0023365	.0008	-2.921	0.003	-.0039045	-.0007685
inover	-.6692998	.2850092	-2.348	0.019	-1.227908	-.110692
married	-.3969539	.1272889	-3.119	0.002	-.6464356	-.1474722
wrace	.5032199	.1217198	4.134	0.000	.2646536	.7417863
new	.3230982	.1462213	2.210	0.027	.0365097	.6096868
facisol	-.2404553	.2136582	-1.125	0.260	-.6592177	.1783072
provrat	243.6348	408.0743	0.597	0.550	-556.1762	1043.446
_cons	-.2101181	.8970386	-0.234	0.815	-1.968281	1.548045

```
. test $zside
( 1) facisol = 0.0
( 2) provrat = 0.0
```

```
chi2( 2) = 1.72
Prob > chi2 = 0.4235
```

The instruments are awful for the Army subset. The two stage least squares regression model therefore returns estimates which are worse than a prediction of the sample mean of ln physical health visits for the Army subgroup. This is reflected in a negative sum of squares for the model, which is possible under two stage least squares when instruments are poor. Therefore, estimation using the methodologically appropriate, 2SLS model, is not appropriate. Lacking alternative instruments, we cannot precisely estimate offset for the Army population. However, OLS regression shows a positive coefficient on the USAGE parameter, indicating no offset effect.

APPENDIX AD
TWO STAGE LEAST SQUARES RESULTS FOR INDIVIDUALS AFFILIATED WITH
THE AIR FORCE
(Lowest Quartile of MCS)

				(2SLS)		
Source	SS	df	MS	Number of obs	=	1797
Model	182.0668	13	14.0051385	F(13, 1783)	=	21.82
Residual	1184.33952	1783	.664239777	Prob > F	=	0.0000
				R-squared	=	0.1332
				Adj R-squared	=	0.1269
Total	1366.40632	1796	.760805302	Root MSE	=	.81501

lntotvis	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
usage	-.0429013	.7608891	-0.056	0.955	-1.53523	1.449427
PCs	-.0334438	.0038742	-8.632	0.000	-.0410423	-.0258453
mcs	-.0168101	.0076341	-2.202	0.028	-.0317828	-.0018375
age	-.0446945	.019393	-2.305	0.021	-.0827298	-.0066591
egrade	.0679882	.0581221	1.170	0.242	-.0460065	.1819829
agesex	-.0088862	.0055566	-1.599	0.110	-.0197843	.0020119
adbencat	.2335504	.058148	4.016	0.000	.1195049	.3475958
msex	.0908988	.151352	0.601	0.548	-.2059472	.3877447
age2	.0008347	.0002808	2.973	0.003	.0002841	.0013854
inover	.034463	.059082	0.583	0.560	-.0814143	.1503403
married	-.054319	.0499161	-1.088	0.277	-.1522193	.0435812
wrace	.0275359	.0583582	0.472	0.637	-.0869219	.1419936
new	.149847	.0600291	2.496	0.013	.0321123	.2675817
_cons	4.321806	.4821701	8.963	0.000	3.376128	5.267484

Negative coefficient on USAGE, but standard error is so great that the point estimate is virtually indistinguishable from zero.

First stage of 2SLS Method Below:

Probit Estimates

Log Likelihood = -670.98288

Number of obs = 1797

chi2(14) = 142.37

Prob > chi2 = 0.0000

Pseudo R2 = 0.0959

usage	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
PCs	-.0175059	.0045284	-3.866	0.000	-.0263815	-.0086303
mcs	-.0384335	.0042204	-9.107	0.000	-.0467053	-.0301617
age	.0709184	.0354789	1.999	0.046	.0013809	.1404559
egrade	-.0081226	.1120322	-0.073	0.942	-.2277017	.2114565
agesex	-.007963	.0104437	-0.762	0.446	-.0284323	.0125062
adbencat	.1165666	.1062558	1.097	0.273	-.091691	.3248242
msex	-.1175264	.319419	-0.368	0.713	-.7435761	.5085233
age2	-.0008221	.000546	-1.506	0.132	-.0018923	.000248
inover	-.3504564	.1644154	-2.132	0.033	-.6727047	-.028208
married	-.0983744	.0947816	-1.038	0.299	-.284143	.0873941
wrace	.2449861	.1013139	2.418	0.016	.0464146	.4435577
new	.0932281	.1108016	0.841	0.400	-.1239391	.3103954
facisol	-.2167719	.1290418	-1.680	0.093	-.4696893	.0361454
provrat	628.915	280.0373	2.246	0.025	80.05207	1177.778
_cons	-.0289463	.6336849	-0.046	0.964	-1.270946	1.213053

. test \$zside

(1) facisol = 0.0

(2) provrat = 0.0

chi2(2) = 9.55
Prob > chi2 = 0.0084

APPENDIX AE
TWO STAGE LEAST SQUARES RESULTS FOR INDIVIDUALS
AFFILIATED WITH THE DEPARTMENT OF THE NAVY
(Lowest Quartile of MCS)

Final Stage of 2SLS.

Source	SS	df	MS		(2SLS)
Model	102.047016	13	7.84977048	Number of obs	= 857
Residual	509.111339	843	.603928041	F(13, 843)	= 13.00
				Prob > F	= 0.0000
				R-squared	= 0.1670
				Adj R-squared	= 0.1541
Total	611.158355	856	.713970041	Root MSE	= .77713

Intotvis	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
usage	.0048132	.5370377	0.009	0.993	-1.049275	1.058901
PCs	-.0325544	.0033076	-9.842	0.000	-.0390465	-.0260624
mcs	-.0077529	.003528	-2.198	0.028	-.0146777	-.0008282
age	.0128416	.0289967	0.443	0.658	-.0440725	.0697557
egrade	.0595259	.1043328	0.571	0.568	-.1452567	.2643084
agesex	-.0264126	.0079741	-3.312	0.001	-.042064	-.0107613
adbencat	.2025944	.0789171	2.567	0.010	.0476973	.3574914
msex	.5514122	.2258128	2.442	0.015	.1081909	.9946335
age2	.0001531	.0004598	0.333	0.739	-.0007493	.0010556
inover	-.027147	.131399	-0.207	0.836	-.2850546	.2307606
married	-.0465465	.0743797	-0.626	0.532	-.1925377	.0994447
wrace	-.0553665	.0684584	-0.809	0.419	-.1897354	.0790025
new	.122115	.0800454	1.526	0.127	-.0349966	.2792266
_cons	3.008053	.4809648	6.254	0.000	2.064024	3.952082

Positive coefficient on USAGE parameter. No evidence of offset for Navy.

First Stage of 2SLS Method below:

Probit Estimates

Log Likelihood = -234.68437

Number of obs = 857
 chi2(14) = 44.09
 Prob > chi2 = 0.0000
 Pseudo R2 = 0.0859

usage	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
PCs	-.0149638	.0066261	-2.258	0.024	-.0279506	-.0019769
mcs	-.0185252	.0070061	-2.644	0.008	-.0322569	-.0047935
age	.062252	.0689802	0.902	0.367	-.0729467	.1974508
egrade	.0338634	.2395749	0.141	0.888	-.4356947	.5034215
agesex	-.0212365	.0189353	-1.122	0.262	-.058349	.0158759
adbencat	-.0782199	.1770787	-0.442	0.659	-.4252878	.2688479
msex	.1821887	.5468321	0.333	0.739	-.8895825	1.25396
age2	-.0006689	.0010947	-0.611	0.541	-.0028145	.0014767
inover	-.8095632	.4450298	-1.819	0.069	-1.681806	.0626792
married	-.3579977	.1613608	-2.219	0.027	-.6742589	-.0417364
wrace	.2254672	.1710905	1.318	0.188	-.1098641	.5607985
new	-.3146351	.2129108	-1.478	0.139	-.7319327	.1026624
facisol	-.3069616	.2429352	-1.264	0.206	-.7831058	.1691826
provrat	2762.268	814.8609	3.390	0.000	1165.17	4359.366
_cons	-.8133244	1.129187	-0.720	0.471	-3.02649	1.399841

. test \$zside

(1) facisol = 0.0

(2) provrat = 0.0

chi2(2) = 12.54
 Prob > chi2 = 0.0019

APPENDIX AF

The 1994-95 DoD Health Beneficiary Survey Instrument

A copy of the original survey follows on the next pages.

1994-95 Health Care Survey of DoD Beneficiaries



DMDC Survey No. 94-004

DEFENSE MANPOWER DATA CENTER
SURVEY PROCESSING ACTIVITY
c/o DATA RECOGNITION CORPORATION
5900 BAKER ROAD
MINNETONKA, MN 55345-5967

245754

Approved
OMB No.: 0704-0362
Expires: 03/31/97
RCS: DD-HA(A) 1942
Expires: 04/15/97

PLEASE NOTE:

Agency Disclosure Notice

Public reporting for this collection of information is estimated to average 30 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302; and to the Office of Management and Budget, Paperwork Reduction Project (0704-0362), Washington, DC 20503. PLEASE DO NOT RETURN YOUR QUESTIONNAIRE TO EITHER OF THESE ADDRESSES. SEND YOUR COMPLETED QUESTIONNAIRE TO THE ADDRESS SHOWN ON THE FRONT OF THIS BOOKLET.

Privacy Notice

According to the Privacy Act of 1974 (Public Law 93-573), the Department of Defense is required to inform you of the purposes and use of this survey. Please read it carefully.

Authority: The Federal Government may collect the information requested in the 1994 Health Care Survey of DoD Beneficiaries under the authority of Public Law 102-484 (10 USC 1071 note), Section 724 of the FY 1993 Defense Authorization Act.

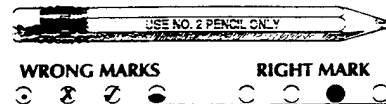
Principal Purpose: This survey is being conducted to help policy makers learn more about the military health care system. Information from the survey will be used to assist in the formulation of policies that may be needed to improve the military health care system. In addition, the survey information will be used by military medical treatment facility commanders to evaluate the services provided. This survey will be conducted on an annual basis.

Disclosure: Providing information in this questionnaire is voluntary. There is no penalty if you choose not to respond. However, maximum participation is essential to ensure that the data are complete and representative. Your survey questionnaire will be treated as confidential. Any identifiable information will be used only by persons involved in the survey. Only group statistics will be reported in findings from this project.

Routine Uses: An annual report to Congress will be prepared using the survey data. Other reports will be provided to the Office of the Assistant Secretary of Defense (Health Affairs), each military service and to military medical treatment facility commanders. Some findings may be reported in manuscripts presented at conferences, symposia, scientific meetings, and professional journals.

MARKING INSTRUCTIONS

- Make heavy black marks that fill the response circles.
- Do not make any marks outside of the response circles.
- If you change your mind, erase completely.



U.S. GOVERNMENT PRINTING OFFICE: 1994-300-722/0001

You have been selected at random to be a part of the group of people which represent all people entitled to use the military health care system. There are over 8 million people who are entitled to use the military health care system. Enough people were selected to participate in this survey so that valid conclusions can be made about the military health services system.

In general, statistics from surveys provide valuable information to policy makers and planners about particular programs. Survey data helps identify the parts of our health care system that work well and the parts of our system that need to be improved. Changes to the system may take time, but filling out this survey will help make sure we make the right changes as quickly as possible. **Your response counts.**

Yes. Under no circumstances will any information about identifiable individuals be released to anyone. Any identifiable information will be used only by persons engaged in, and for the purposes of, the survey. Your information will be combined with the information from many other people to report how groups of people view the health care they receive.

Yes. Although people will have different views on what is or is not personal, most people will consider at least some of the questions to be very personal. We are asking these questions to evaluate the military health care system. Good estimates can be made only if most people answer all the questions in the survey. However, you can choose not to answer particular items. **Please do not discard the entire survey because there are some particular items that you want to skip.**

We want to know about the health care you received during the past 12 months. Unless the instructions tell you otherwise, answer each question for the health care you received as an individual during the past 12 months.

A health care provider is someone you receive health care from. This individual may be a doctor or a medical doctor who is a specialist. A health care provider can also be a physician's assistant, psychologist, nurse, nurse practitioner, dentist, optometrist, physical therapist, pharmacist, chiropractor, podiatrist, etc.

This is where you may receive health care, usually given by a health care provider at a military facility. This may include a military hospital, clinic, doctor's office, infirmary, or sick call.



SECTION I: YOUR USE OF MEDICAL SERVICES

1. Which of the following places do you USUALLY go to when sick or when advice is needed about your health? DO NOT include places you go for dental care. MARK ONLY THE ONE BEST ANSWER.

- ☐ Military hospital, clinic, or dispensary (including sick call)
- ☐ Military hospital emergency room
- ☐ PRIMUS or NAVCARE clinic
- ☐ Veterans Administration (VA) hospital outpatient clinic
- ☐ Civilian doctor's office
- ☐ Civilian hospital or clinic
- ☐ Civilian hospital emergency room
- ☐ Another type of military place (specify) →

☐ Another type of civilian place (specify) →

- ☐ I do not have a usual source of care
- ☐ Don't know what kind of place

2. Are you now covered by any of the following health insurance programs? MARK ALL THAT APPLY.

- ☐ Does not apply; I am not covered by any health insurance program
- ☐ CHAMPUS
- ☐ Medicare, Part B
- ☐ Supplemental insurance (Medical insurance you usually get through military or retiree associations. It helps pay the amount due after CHAMPUS or MEDICARE pays its share of charges for medical care.)
- ☐ Private health insurance (Blue Cross/Blue Shield, Prudential, AARP, etc. or a prepaid health plan or HMO (Health Maintenance Organization))
- ☐ Other (specify) →
- ☐ Don't know

3. If you are covered by private health insurance or by a prepaid health plan or HMO (Health Maintenance Organization), who pays for this insurance?

- ☐ Does not apply; do not have this type of plan
- ☐ Cost paid entirely by myself or my family
- ☐ Cost shared by my family and current or former employers
- ☐ Cost paid entirely by current or former employers
- ☐ Other (specify) →

4. Please indicate whether or not you received the following preventive services during the past 12 months. If you did not receive the service, please indicate why not.

a. General physical exam

- ☐ Yes
- ☐ No → ☐ It was not needed
- ☐ It was needed but I did not try to get it
- ☐ I tried but could not get the service
- ☐ Not sure

b. Blood pressure check

- ☐ Yes
- ☐ No → ☐ It was not needed
- ☐ It was needed but I did not try to get it
- ☐ I tried but could not get the service
- ☐ Not sure

c. Cholesterol screening

- ☐ Yes
- ☐ No → ☐ It was not needed
- ☐ It was needed but I did not try to get it
- ☐ I tried but could not get the service
- ☐ Not sure

d. Wellness screening

- ☐ Yes
- ☐ No → ☐ It was not needed
- ☐ It was needed but I did not try to get it
- ☐ I tried but could not get the service
- ☐ Not sure

e. Immunizations

- ☐ Yes
- ☐ No → ☐ It was not needed
- ☐ It was needed but I did not try to get it
- ☐ I tried but could not get the service
- ☐ Not sure

f. Dental exam

- ☐ Yes
- ☐ No → ☐ It was not needed
- ☐ It was needed but I did not try to get it
- ☐ I tried but could not get the service
- ☐ Not sure

g. Smoking cessation

- ☐ Yes
- ☐ No → ☐ It was not needed
- ☐ It was needed but I did not try to get it
- ☐ I tried but could not get the service
- ☐ Not sure

h. Weight control

- ☐ Yes
- ☐ No → ☐ It was not needed
- ☐ It was needed but I did not try to get it
- ☐ I tried but could not get the service
- ☐ Not sure

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7. Please indicate how many times you went to a doctor's office or outpatient clinic for your own health care during the past 12 months? MARK ONE RESPONSE IN EACH ROW.

	No visits	1	2	3	4	5	6	7	8	9	10	11 or more
a. Illness or injury	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
b. Follow up for injury or illness	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
c. General physical exam	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
d. Prescription refill only	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
e. Eye exam only	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
f. Prenatal care	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
g. Same day surgery	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
h. Mental health	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
i. Substance abuse	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
j. Other type of care	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

(If you marked 1 or more for other type of care, please specify type of care.) →

8. During the past 12 months, how many times did you visit a health care provider at any of the following places for your own health care? DO NOT count doctors seen while an overnight patient in a hospital, dental care, or visits to pick up prescriptions. Your best guess will do.

	No visits	1	2	3	4	5	6	7	8	9	10	11 or more
a. Military or field/fleet hospital or clinic (not including sick call)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
b. Sick call visits to a military hospital or clinic (If you are not an active duty member, mark NA.)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
c. Civilian doctor's office, hospital, or clinic	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
d. PRIMUS or NAVCARE clinic	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
e. Veterans Administration (VA) hospital or clinic	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
f. Another type of place	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

(If you marked 1 or more for another type of place, please specify type of place.) →

9. During the past 12 months, how many nights did you personally stay OVERNIGHT as a patient in a military or civilian hospital? Your best guess will do.

	No nights	1	2	3	4	5	6	7	8	9	10	11 or more
a. Military or field/fleet hospital	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
b. Civilian hospital	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
c. Veterans Administration (VA) hospital	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
d. Another type of place	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

(If you marked 1 or more for another type of place, please specify type of place.) →

10. What type of medical facility did you use for your **MOST RECENT** doctor's office/outpatient visit? **MARK ONE.**

- ☐ Military hospital emergency room
- ☐ Military or field/fleet hospital, clinic, or dispensary (including sick call)
- ☐ Civilian hospital emergency room
- ☐ Civilian doctor's office, hospital, or clinic
- ☐ PRIMUS or NAVCARE Clinic
- ☐ Veterans Administration (VA) hospital or clinic
- ☐ Another type of military place (specify) →

- ☐ Another type of civilian place (specify) →

- ☐ I had no visits in the past 12 months

11. Thinking about your own health care during the past 12 months, how many telephone calls did you or a family member **USUALLY** make to get an appointment for you?

For civilian providers? MARK ONE.

- ☐ I had no visits to civilian providers
- ☐ None; someone at the facility arranged these appointments
- ☐ 1-2
- ☐ 3-5
- ☐ 6-9
- ☐ 10 or more
- ☐ Facility does not schedule appointments by telephone

For military providers? MARK ONE.

- ☐ I had no visits to military providers
- ☐ None; someone at the facility arranged these appointments
- ☐ 1-2
- ☐ 3-5
- ☐ 6-9
- ☐ 10 or more
- ☐ Facility does not schedule appointments by telephone

12. Thinking about your own health care during the past 12 months, how long did you **USUALLY** wait between the time you scheduled an appointment and the day you actually saw the provider? (Exclude follow-on visits scheduled by the provider.)

For civilian providers? MARK ONE.

- ☐ I had no visits to civilian providers
- ☐ Less than 3 days
- ☐ 3 days to less than 1 week
- ☐ 1 week to less than 2 weeks
- ☐ 2 weeks to less than 4 weeks
- ☐ 4 weeks to less than 6 weeks
- ☐ 6 weeks to less than 8 weeks
- ☐ More than 8 weeks

For military providers? MARK ONE.

- ☐ I had no visits to military providers
- ☐ Less than 3 days
- ☐ 3 days to less than 1 week
- ☐ 1 week to less than 2 weeks
- ☐ 2 weeks to less than 4 weeks
- ☐ 4 weeks to less than 6 weeks
- ☐ 6 weeks to less than 8 weeks
- ☐ More than 8 weeks

13. Again, thinking about your own health care during the past 12 months, how long did you **USUALLY** wait in the office or clinic to see the health care provider?

For civilian providers? MARK ONE.

- ☐ I had no visits to civilian providers
- ☐ Less than 10 minutes
- ☐ 11 to 15 minutes
- ☐ 16 to 30 minutes
- ☐ 31 to 45 minutes
- ☐ 46 minutes to 1 hour
- ☐ More than 1 hour, but less than 2 hours
- ☐ 2 hours or more

For military providers? MARK ONE.

- ☐ I had no visits to military providers
- ☐ Less than 10 minutes
- ☐ 11 to 15 minutes
- ☐ 16 to 30 minutes
- ☐ 31 to 45 minutes
- ☐ 46 minutes to 1 hour
- ☐ More than 1 hour, but less than 2 hours
- ☐ 2 hours or more



PLEASE DO NOT WRITE IN THIS AREA

245754

- ☐ I had no visits to military providers
- ☐ Less than 10 minutes
- ☐ 11 to 15 minutes
- ☐ 16 to 30 minutes
- ☐ 31 to 45 minutes
- ☐ 46 minutes to 1 hour
- ☐ More than 1 hour, but less than 2 hours
- ☐ 2 hours or more

- ☐ I do not use military providers
- ☐ Always
- ☐ Most of the time
- ☐ About half the time
- ☐ Sometimes
- ☐ Rarely or never

- ☐ Yes
☐ No
☐ Don't know

SECTION II: SATISFACTION WITH YOUR HEALTH CARE

This section asks about how you feel about the health care you received during the **PAST 12 MONTHS**. Your responses should be based only on the health care you as an individual received. (Later, this survey will have questions on your children's care.)

17. Please mark the one statement that best describes your use of civilian and military health care services during the past 12 months and follow the instructions. Your answer to this question will decide how you answer questions 18 to 60. **MARK ONLY THE ONE BEST ANSWER AND THEN FOLLOW THE INSTRUCTIONS.**

☐ I have used **only** health care or services provided by military medical treatment facilities (MMTF), PRIMUS, or NAVCARE (ANSWER QUESTIONS 18-60 IN COLUMN B ONLY)

☐ I have used health care or services provided **both** by CHAMPUS, private insurance, Medicare, VA, or other sources **and** by military medical treatment facilities, PRIMUS or NAVCARE (ANSWER QUESTIONS 18-60 IN **BOTH** COLUMNS A AND B)

☐ I have used **only** health care or services provided by CHAMPUS, private insurance, Medicare, VA, or other sources (ANSWER QUESTIONS 18-60 IN COLUMN A ONLY)

Column A
CHAMPUS, Private,
Medicare, VA, Other

Column B
Military Medical Treatment
Facility, PRIMUS, NAVCARE

Please indicate how much you agree or disagree with the following.

Strongly Disagree
Disagree
Neither Agree nor Disagree
Agree
Strongly Agree

Strongly Disagree
Disagree
Neither Agree nor Disagree
Agree
Strongly Agree

18. I am satisfied with the health care I receive

SA A N D SA

19. I would recommend this type of health care to my family or friends who needed care

SA A N D SA

PLEASE DO NOT WRITE IN THIS AREA

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Please rate the following aspects of your health care. (If a question does not apply to you, please mark Not Applicable.)

	Column A CHAMPUS, Private, Medicare, VA, Other					Column B Military Medical Treatment Facility, PRIMUS, NAVCARE				
	Excellent	Very Good	Good	Fair	Not Applicable	Excellent	Very Good	Good	Fair	Not Applicable
20. Convenience of location of treatment	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
21. Convenience of hours	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
22. Access to health care whenever you need it	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
23. Access to a specialist if you need one	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
24. Access to inpatient hospital care if you need it	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
25. Access to medical care in an emergency	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
26. Ease of making appointments for health care by phone	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
27. Length of time you wait at office to see the health care provider	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
28. Length of time you wait between making an appointment for routine care and the day of your visit	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
29. Availability of health care information or advice by phone	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
30. Services available for getting prescriptions filled	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
31. Thoroughness of examination	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
32. Ability to diagnose my health care problems	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
33. Skill of health care providers	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Column A
CHAMPUS, Private,
Medicare, VA, Other

Column B
Military Medical Treatment Facility,
PRIMUS, NAVCARE

Thinking about your own health care
during the past 12 months, how would
you rate the following OUTPATIENT
SERVICES? (If you did not use a specific
service, please mark Not Applicable.)

	Column A CHAMPUS, Private, Medicare, VA, Other					Column B Military Medical Treatment Facility, PRIMUS, NAVCARE						
	Not Applicable	Poor	Fair	Good	Very Good	Excellent	Not Applicable	Poor	Fair	Good	Very Good	Excellent
52. Family practice/primary care	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
53. Emergency Room	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
54. OB/GYN	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
55. Surgery	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
56. Optometry	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
57. Mental Health	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
58. Physical Therapy	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
59. Laboratory	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
60. Pharmacy	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

61a. Please indicate how many times you went to a dental office or clinic for your own dental care during the past 12 months.

- ☐ No visits → GO TO QUESTION 62.
- ☐ 1 visit
- ☐ 2 visits
- ☐ 3 visits
- ☐ 4 visits
- ☐ 5 visits
- ☐ 6 visits
- ☐ 7 visits
- ☐ 8 visits
- ☐ 9 visits
- ☐ 10 visits
- ☐ 11 or more visits

61b. In thinking about your own dental care during the past 12 months, how would you rate the dental care provided by Military Dental Treatment Facilities? MARK ONE.

- ☐ Excellent
- ☐ Very good
- ☐ Good
- ☐ Fair
- ☐ Poor
- ☐ Not applicable; I have not received dental care from a military dental treatment facility

61c. In thinking about your own dental care during the past 12 months, how would you rate the dental care provided by Delta Dental, private insurance, or other sources? MARK ONE.

- ☐ Excellent
- ☐ Very good
- ☐ Good
- ☐ Fair
- ☐ Poor
- ☐ Not applicable; I have not received dental care provided by Delta Dental, private insurance, or other sources during the past 12 months

SECTION 6 - CARE FOR YOUR ELIGIBLE CHILDREN

Eligible children are UNMARRIED children, including adopted children or stepchildren, who are legally dependent on you for over half their support AND:

- Are not yet 21 years old; OR
- Attend college and are not yet 23 years old; OR
- Are of any age and have a mental or physical handicap

62. As defined above, how many eligible children do you have?

- ☐ None → GO TO QUESTION 68.
- ☐ One
- ☐ Two
- ☐ Three
- ☐ Four
- ☐ Five
- ☐ Six or more

63. How many of your eligible children are now living with you?

- ☐ None → GO TO QUESTION 68.
- ☐ One
- ☐ Two
- ☐ Three
- ☐ Four
- ☐ Five
- ☐ Six or more

64. Thinking about your children's health care during the past 12 months, how many telephone calls did you or a family member USUALLY make to get an appointment?

For civilian providers? MARK ONE.

- ☐ My child (children) had no visits to civilian providers
☐ None; someone at the facility arranged these appointments
☐ 1-2
☐ 3-5
☐ 6-9
☐ 10 or more
☐ Facility does not schedule appointments by telephone

For military providers? MARK ONE.

- ☐ My child (children) had no visits to military providers
☐ None; someone at the facility arranged these appointments
☐ 1-2
☐ 3-5
☐ 6-9
☐ 10 or more
☐ Facility does not schedule appointments by telephone

65. Thinking about your children's health care during the past 12 months, how long did you USUALLY wait between the time you scheduled an appointment for care and the day your children actually saw the provider?

For civilian providers? MARK ONE.

- ☐ My child (children) had no visits to civilian providers
☐ Less than 3 days
☐ 3 days to less than 1 week
☐ 1 week to less than 2 weeks
☐ 2 weeks to less than 4 weeks
☐ 4 weeks to less than 6 weeks
☐ 6 weeks to less than 8 weeks
☐ More than 8 weeks

For military providers? MARK ONE.

- ☐ My child (children) had no visits to military providers
☐ Less than 3 days
☐ 3 days to less than 1 week
☐ 1 week to less than 2 weeks
☐ 2 weeks to less than 4 weeks
☐ 4 weeks to less than 6 weeks
☐ 6 weeks to less than 8 weeks
☐ More than 8 weeks

66. Again, thinking about your children's health care during the past 12 months, how long did you USUALLY wait in the office or clinic to see the health care provider?

For civilian providers? MARK ONE.

- ☐ My child (children) had no visits to civilian providers
☐ Less than 10 minutes
☐ 11 to 15 minutes
☐ 16 to 30 minutes
☐ 31 to 45 minutes
☐ 46 minutes to 1 hour
☐ More than 1 hour, but less than 2 hours
☐ 2 hours or more

For military providers? MARK ONE.

- ☐ My child (children) had no visits to military providers
☐ Less than 10 minutes
☐ 11 to 15 minutes
☐ 16 to 30 minutes
☐ 31 to 45 minutes
☐ 46 minutes to 1 hour
☐ More than 1 hour, but less than 2 hours
☐ 2 hours or more

67. Please rate your experience with your children's health care during the past 12 months. If you have NO EXPERIENCE with a specific type of provider, please mark Not applicable.

For civilian providers? MARK ONE.

- ☐ Poor
☐ Fair
☐ Good
☐ Very good
☐ Excellent
☐ Not applicable

For military providers? MARK ONE.

- ☐ Poor
☐ Fair
☐ Good
☐ Very good
☐ Excellent
☐ Not applicable



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SECTION 2: CHAMPUS BENEFITS

This section asks about your familiarity with various aspects of your military health care benefit.

68. Do you know who to contact or where to get information about the following?

MARK ONE ANSWER FOR EACH ITEM.

	Yes, I know	No, I don't know	Does not apply
Health services and procedures available at Military Medical Treatment Facilities	☐	☐	☐
Charges for overnight stays at military hospitals	☐	☐	☐
Health services and procedures covered by CHAMPUS	☐	☐	☐
Charges for health services and procedures covered by CHAMPUS	☐	☐	☐
DEERS enrollment procedures	☐	☐	☐
When you need to obtain a Nonavailability Statement (NAS)	☐	☐	☐
Choice in selecting military doctors, clinics, and hospitals	☐	☐	☐
Choice in selecting civilian doctors, clinics, and hospitals	☐	☐	☐
CHAMPUS claims filing procedures	☐	☐	☐
Problems with a CHAMPUS claim	☐	☐	☐
Health benefits available after age 65	☐	☐	☐
Dental care available at Military Medical Treatment Facilities	☐	☐	☐
Active Duty Dependents Dental Plan (DDP★Delta)	☐	☐	☐

69. Are you or any family member covered by CHAMPUS?

- ☐ Yes —————→ **GO TO QUESTION 70.**
☐ No —————→ **GO TO QUESTION 71.**
☐ Not sure —————→ **GO TO QUESTION 71.**

70. How satisfied are you with the following aspects of your CHAMPUS benefits?

	Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	Does not apply
Doctors' willingness to file CHAMPUS claims	☐	☐	☐	☐	☐	☐
CHAMPUS claims filing procedures	☐	☐	☐	☐	☐	☐
Time it takes to solve claims problems	☐	☐	☐	☐	☐	☐
Time waiting for payments from CHAMPUS	☐	☐	☐	☐	☐	☐
Amount of CHAMPUS deductible	☐	☐	☐	☐	☐	☐
Amount of CHAMPUS copayment	☐	☐	☐	☐	☐	☐
Services and procedures covered by CHAMPUS	☐	☐	☐	☐	☐	☐
Ease of obtaining a Nonavailability Statement	☐	☐	☐	☐	☐	☐

71. In general, how satisfied are you with your military health care benefit, considering both military care and CHAMPUS?

- ☐ Very satisfied
☐ Satisfied
☐ Neither satisfied nor dissatisfied
☐ Dissatisfied
☐ Very dissatisfied

72. In general, would you say your health is:

- ☐ Excellent
- ☐ Very good
- ☐ Good
- ☐ Fair
- ☐ Poor

73. Compared to one year ago, how would you rate your health in general now?

- ☐ Much better now than one year ago
- ☐ Somewhat better now than one year ago
- ☐ About the same
- ☐ Somewhat worse now than one year ago
- ☐ Much worse now than one year ago

74. The following questions are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

	Yes, limited a lot	Yes, limited a little	No, not limited at all
a. Vigorous activities, such as running, lifting heavy objects, participating in strenuous sports	☐	☐	☐
b. Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	☐	☐	☐
c. Lifting or carrying groceries	☐	☐	☐
d. Climbing several flights of stairs	☐	☐	☐
e. Climbing one flight of stairs	☐	☐	☐
f. Bending, kneeling, or stooping	☐	☐	☐
g. Walking more than a mile	☐	☐	☐
h. Walking several blocks	☐	☐	☐
i. Walking one block	☐	☐	☐
j. Bathing and dressing yourself	☐	☐	☐

75. During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of your physical health? (Please answer YES or NO for each question.)

	Yes	No
a. Cut down on the amount of time you spent on work or other activities	☐	☐
b. Accomplished less than you would like	☐	☐
c. Were limited in the kind of work or other activities	☐	☐
d. Had difficulty performing the work or other activities (for example, it took extra effort)	☐	☐

76. During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)? (Please answer YES or NO for each question.)

	Yes	No
a. Cut down on the amount of time you spent on work or other activities	☐	☐
b. Accomplished less than you would like	☐	☐
c. Didn't do work or other activities as carefully as usual	☐	☐



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77. During the past 4 weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?

- ☐ Not at all
- ☐ Slightly
- ☐ Moderately
- ☐ Quite a bit
- ☐ Extremely

78. How much bodily pain have you had during the past 4 weeks?

- ☐ None
- ☐ Very mild
- ☐ Mild
- ☐ Moderate
- ☐ Severe
- ☐ Very severe

79. During the past 4 weeks, how much did pain interfere with your normal work (including work both outside the home and housework)?

- ☐ Not at all
- ☐ A little bit
- ☐ Moderately
- ☐ Quite a bit
- ☐ Extremely

80. These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please indicate the one answer that comes closest to the way you have been feeling.

	All of the time	Most of the time	A good bit of the time	Some of the time	A little of the time	None of the time
How much of the time during the <u>past 4 weeks</u> . . .						
a. did you feel full of pep?	☐	☐	☐	☐	☐	☐
b. have you been a very nervous person?	☐	☐	☐	☐	☐	☐
c. have you felt so down in the dumps nothing could cheer you up?	☐	☐	☐	☐	☐	☐
d. have you felt calm and peaceful?	☐	☐	☐	☐	☐	☐
e. did you have a lot of energy?	☐	☐	☐	☐	☐	☐
f. have you felt downhearted and blue?	☐	☐	☐	☐	☐	☐
g. did you feel worn out?	☐	☐	☐	☐	☐	☐
h. have you been a happy person?	☐	☐	☐	☐	☐	☐
i. did you feel tired?	☐	☐	☐	☐	☐	☐

81. During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting with friends, relatives, etc.)?

- ☐ All of the time
- ☐ Most of the time
- ☐ Some of the time
- ☐ A little of the time
- ☐ None of the time

82. How TRUE or FALSE is each of the following statements for you?

	Definitely true	Mostly true	Not sure	Mostly false	Definitely false
a. I seem to get sick a little easier than other people.	☐	☐	☐	☐	☐
b. I am as healthy as anybody I know.	☐	☐	☐	☐	☐
c. I expect my health to get worse.	☐	☐	☐	☐	☐
d. My health is excellent.	☐	☐	☐	☐	☐

83. During the past 12 months, how many work/duty days did you miss due to your own illness or injury (do not include normal maternity visits or routine exams)?

- ☐ None
- ☐ 1-2 days
- ☐ 3-4 days
- ☐ 5-6 days
- ☐ 7-10 days
- ☐ 11-20 days
- ☐ 21-30 days
- ☐ 31 days or more
- ☐ Not applicable

84. Are you?

- ☐ Male → GO TO QUESTION 87.
- ☐ Female

85. Have you been pregnant in the past 12 months?

- ☐ No → GO TO QUESTION 87.
- ☐ Yes, but I am not currently pregnant
- ☐ Yes, I am currently pregnant
- ☐ I am not sure → GO TO QUESTION 87.

86. When did you first see a health care provider about your pregnancy?

- ☐ During first 3 months
- ☐ During second 3 months
- ☐ During last 3 months
- ☐ During labor and delivery
- ☐ Never

This final section asks for additional information about you. This information will be used to study differences in responses based on categories of beneficiaries. This will not be used to identify you personally.

87. What age were you on your last birthday?

(If you are 99 years old or older, mark "99")

Years
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55
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99

88a. Are you an active duty or retired service member?

- ☐ Yes, an active duty service member
- ☐ Yes, a retired service member
- ☐ No → GO TO QUESTION 89a.

88b. To which service do you belong or from which service did you retire? MARK ONE.

- ☐ Army
- ☐ Air Force
- ☐ Coast Guard
- ☐ National Oceanic and Atmospheric Administration
- ☐ Navy
- ☐ Marine Corps
- ☐ Public Health Service
- ☐ Other (specify)

88c. What is your paygrade or what was your paygrade at retirement?

☐ E-1	☐ E-8	☐ O-1	☐ O-8
☐ E-2	☐ E-9	☐ O-2	☐ O-9
☐ E-3	☐ W-1	☐ O-3	☐ O-10
☐ E-4	☐ W-2	☐ O-4	☐ Cadet/Midshipman
☐ E-5	☐ W-3	☐ O-5	☐ Not sure
☐ E-6	☐ W-4	☐ O-6	
☐ E-7	☐ W-5	☐ O-7	



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89a. Are you eligible for DoD health care benefits because you are a family member or survivor of an active duty or retired service member?

- ☐ Yes, I have eligibility from a sponsor who is active duty
- ☐ Yes, I have eligibility from a sponsor who is retired
- ☐ Yes, I have eligibility as a survivor of an active duty service member
- ☐ Yes, I have eligibility as a survivor of a retired service member
- ☐ No → **GO TO QUESTION 90.**

89b. To which service does/did your sponsor belong or from which service did your sponsor retire? MARK ONE.

- ☐ Army
- ☐ Air Force
- ☐ Coast Guard
- ☐ National Oceanic and Atmospheric Administration
- ☐ Navy
- ☐ Marine Corps
- ☐ Public Health Service
- ☐ Other (specify)

89c. What is your sponsor's paygrade or what was your sponsor's last paygrade?

☐ E-1	☐ E-8	☐ O-1	☐ O-8
☐ E-2	☐ E-9	☐ O-2	☐ O-9
☐ E-3	☐ W-1	☐ O-3	☐ O-10
☐ E-4	☐ W-2	☐ O-4	☐ Cadet/Midshipman
☐ E-5	☐ W-3	☐ O-5	☐ Not sure
☐ E-6	☐ W-4	☐ O-6	
☐ E-7	☐ W-5	☐ O-7	

90. Which category best describes your eligibility for DoD health care benefits? MARK ONE.

- ☐ Active duty service member
- ☐ Family member of active duty service member
- ☐ Retired service member
- ☐ Family member of retired/deceased service member
- ☐ Other (specify)

91. Which of the following best describes your current marital status?

- ☐ Never married
- ☐ Married
- ☐ Separated
- ☐ Divorced
- ☐ Widowed

92. What is the highest school grade or academic degree that you have?

- ☐ Less than 12 years of school (no diploma)
- ☐ GED or other high school equivalency certificate
- ☐ High school diploma
- ☐ Some college, but did not graduate
- ☐ 2-year college degree (AA/AS)
- ☐ 4-year college degree (BA/BS)
- ☐ Some graduate school, but no degree
- ☐ Master's, doctoral degree, or professional school degree (MA/MS/PhD/MD/JD/DVM)

93. Are you of Hispanic/Spanish origin or descent?

- ☐ No (not Spanish/Hispanic)
- ☐ Yes, Mexican, Mexican-Amer., Chicano
- ☐ Yes, Puerto Rican
- ☐ Yes, Cuban
- ☐ Yes, other Spanish/Hispanic

94. What race do you consider yourself to be?

- ☐ White
- ☐ Black/African-Amer.
- ☐ Indian (Amer./Eskimo/Aleut)
- ☐ Asian or Pacific Islander
- ☐ Other (specify)

95. How long have you lived in your current local area?

- ☐ Less than 6 months
- ☐ 6-12 months
- ☐ 1-3 years
- ☐ More than 3 years

96. What is the ZIPCODE, APO, or FPO where you now live?

ZIPCODE

0	1	2	3	4	5
6	7	8	9	0	1
2	3	4	5	6	7
8	9	0	1	2	3
4	5	6	7	8	9
0	1	2	3	4	5
6	7	8	9	0	1
2	3	4	5	6	7
8	9	0	1	2	3
4	5	6	7	8	9

- ☐ Does not apply; I do not have a ZIPCODE, APO, or FPO.

97. Mark the Military Medical Treatment Facility at which you received most of your medical care during the past 12 months. If you do not receive most of your care at a Military Medical Treatment Facility, mark the one that you would most likely use. (If you do not find the Facility you use or plan to use on the list, turn to page 22 and write it in the block.)

ALABAMA

- ☐ Fort McClellan
- ☐ Fort Rucker
- ☐ Maxwell Air Force Base
- ☐ Redstone Arsenal

ALASKA

- ☐ Branch Hospital, Adak
- ☐ Eileson Air Force Base
- ☐ Elmendorf Air Force Base
- ☐ Fort Wainwright

ARIZONA

- ☐ Davis Monthan Air Force Base
- ☐ Fort Huachuca
- ☐ Luke Air Force Base

ARKANSAS

- ☐ Little Rock Air Force Base

CALIFORNIA

- ☐ Beale Air Force Base
- ☐ Castle Air Force Base
- ☐ Edwards Air Force Base
- ☐ Fort Irwin
- ☐ Fort Ord
- ☐ Letterman Army Medical Center
- ☐ Los Angeles AFS
- ☐ March Air Force Base
- ☐ McClellan Air Force Base
- ☐ Naval Hospital, Camp Pendleton
- ☐ Naval Hospital, Lemoore
- ☐ Naval Hospital, Long Beach
- ☐ Naval Hospital, Twentynine Palms
- ☐ Naval Medical Center, Oakland
- ☐ Naval Medical Clinic, Port Hueneme
- ☐ Naval Medical Center, San Diego
- ☐ Travis Air Force Base
- ☐ Vandenberg Air Force Base

COLORADO

- ☐ Fitzsimons Army Medical Center
- ☐ Fort Carson
- ☐ Lowry Air Force Base
- ☐ Peterson Air Force Base
- ☐ USAF Academy

97. continued . . .

CONNECTICUT

- ☐ Naval Hospital, Groton

DELAWARE

- ☐ Dover Air Force Base

DISTRICT OF COLUMBIA

- ☐ Bolling Air Force Base
- ☐ Walter Reed Army Medical Center

FLORIDA

- ☐ Eglin Air Force Base
- ☐ MacDill Air Force Base
- ☐ Naval Hospital, Jacksonville
- ☐ Naval Hospital, Orlando
- ☐ Naval Hospital, Pensacola
- ☐ Naval Medical Clinic, Key West
- ☐ Patrick Air Force Base
- ☐ Tyndall Air Force Base

GEORGIA

- ☐ Fort Benning
- ☐ Fort Gordon
- ☐ Fort Stewart
- ☐ Moody Air Force Base
- ☐ Naval Medical Clinic - Kings Bay
- ☐ Robins Air Force Base

HAWAII

- ☐ Hickam Air Force Base
- ☐ Naval Medical Clinic, Pearl Harbor
- ☐ Tripler Army Medical Center

IDAHO

- ☐ Mountain Home Air Force Base

ILLINOIS

- ☐ Naval Hospital, Great Lakes
- ☐ Scott Air Force Base

INDIANA

- ☐ Grissom Air Force Base

KANSAS

- ☐ Fort Leavenworth
- ☐ Fort Riley
- ☐ McConnell Air Force Base

KENTUCKY

- ☐ Fort Campbell
- ☐ Fort Knox



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97. continued . . .

LOUISIANA

- Barksdale Air Force Base
- Fort Polk
- Naval Medical Clinic, New Orleans

MAINE

- Loring Air Force Base
- Martin's Point - Portland

MARYLAND

- Andrews Air Force Base
- Fort Meade
- National Naval Medical Center, Bethesda
- Naval Hospital, Patuxent River
- Naval Medical Clinic, Annapolis
- Wyman Park, Baltimore

MASSACHUSETTS

- Brighton Marine USTF - Boston
- Fort Devens
- Hanscom Air Force Base

MICHIGAN

- K.I. Sawyer Air Force Base

MISSISSIPPI

- Columbus Air Force Base
- Keesler Air Force Base

MISSOURI

- Fort Leonard Wood
- Whiteman Air Force Base

MONTANA

- Malmstrom Air Force Base

NEBRASKA

- Offutt Air Force Base

NEVADA

- Nellis Air Force Base

NEW HAMPSHIRE

- Naval Medical Clinic, Portsmouth, N.H.

NEW JERSEY

- Fort Monmouth
- McGuire Air Force Base/Fort Dix

NEW MEXICO

- Cannon Air Force Base
- Holloman Air Force Base
- Kirtland Air Force Base

NEW YORK

- Bayley Seton - Staten Island
- Griffiss Air Force Base

97. continued . . .

NEW YORK

- Plattsburgh Air Force Base
- West Point

NORTH CAROLINA

- Fort Bragg
- Naval Hospital, Camp Lejeune
- Naval Hospital, Cherry Point
- Pope Air Force Base
- Seymour Johnson Air Force Base

NORTH DAKOTA

- Grand Forks Air Force Base
- Minot Air Force Base

OHIO

- Lutheran Medical - Cleveland
- Wright-Patterson Air Force Base

OKLAHOMA

- Altus Air Force Base
- Fort Sill
- Tinker Air Force Base
- Vance Air Force Base

PENNSYLVANIA

- Naval Medical Clinic, Philadelphia

RHODE ISLAND

- Naval Hospital, Newport

SOUTH CAROLINA

- Charleston Air Force Base
- Fort Jackson
- Naval Hospital, Beaufort
- Naval Hospital, Charleston
- Shaw Air Force Base

SOUTH DAKOTA

- Ellsworth Air Force Base

TENNESSEE

- Naval Hospital, Millington

TEXAS

- Brooks Air Force Base
- Dyess Air Force Base
- Fort Bliss
- Fort Hood
- Fort Sam Houston
- Goodfellow Air Force Base
- Kelly Air Force Base
- Lackland Air Force Base
- Laughlin Air Force Base
- Naval Hospital, Corpus Christi
- Randolph Air Force Base
- Reese Air Force Base
- St. John's - Nassau Bay

97. continued ...

TEXAS

- ☐ St. Joseph's - Houston
- ☐ St. Mary's - Galveston
- ☐ St. Mary's - Port Arthur
- ☐ Sheppard Air Force Base

UTAH

- ☐ Hill Air Force Base

VIRGINIA

- ☐ Fort Belvoir
- ☐ Fort Eustis
- ☐ Fort Lee
- ☐ Langley Air Force Base
- ☐ Naval Medical Center, Portsmouth
- ☐ Naval Medical Clinic, Quantico

WASHINGTON

- ☐ Fairchild Air Force Base
- ☐ Fort Lewis
- ☐ McChord Air Force Base
- ☐ Naval Hospital, Bremerton
- ☐ Naval Hospital, Oak Harbor
- ☐ Naval Medical Clinic, Seattle
- ☐ Pacific Medical, Seattle

WYOMING

- ☐ F.E. Warren Air Force Base

OVERSEAS FACILITIES

BELGIUM

- ☐ 196th Station Hospital, Shape

CUBA

- ☐ Naval Hospital, Guantanamo Bay

ENGLAND

- ☐ 48th TFW Hospital Lakenheath
- ☐ RAF Chicksands
- ☐ RAF Upwood
- ☐ 20th TFW Hospital - Upper Heyford

GERMANY

- ☐ Geilenkirchen AFB
- ☐ Hahn Air Force Base
- ☐ 98th General Hospital, Nurnberg
- ☐ 97th General Hospital, Frankfurt
- ☐ 130th Station Hospital, Heidelberg
- ☐ Ramstein AFB
- ☐ Rhein-Main AFB
- ☐ 2nd General Hospital, Landstuhl
- ☐ Sembach AFB
- ☐ 7100th CSW Medical Center, Weisbaden
- ☐ 67th Evacuation Hospital, Wurzburg

97. continued ...

GERMANY

- ☐ Spangdahlem AFB
- ☐ 34th General Hospital, Augsburg
- ☐ 36th TFW Hospital, Bitburg
- ☐ USAH Berlin

GREECE

- ☐ 76th ABG Hospital, Iraklion

GUAM

- ☐ Anderson AFB
- ☐ Naval Hospital, Guam

ICELAND

- ☐ Naval Hospital, Keflavik

ITALY

- ☐ Aviano AFB
- ☐ 45th Field Hospital, Vicenza
- ☐ Naval Hospital, Naples
- ☐ Naval Hospital, NAS Sigonella

JAPAN

- ☐ 475th Medical Group Yokota AB
- ☐ 432nd Medical Group Misawa
- ☐ Kadena AFB
- ☐ Naval Hospital Okinawa
- ☐ Naval Hospital Yokosuka

KOREA

- ☐ 8th Medical Group Kunsan AB
- ☐ 51st Medical Group Osan AB
- ☐ 121st Evacuation Hospital Seoul

PANAMA

- ☐ Gorgas ACH
- ☐ Howard AFB

PORTUGAL

- ☐ USAF Hospital, Lajes

PUERTO RICO

- ☐ Naval Hospital, Roosevelt Roads

SPAIN

- ☐ Naval Hospital, Rota

TURKEY

- ☐ 39th TAC Group Hospital, Incirlik

OTHER FACILITY NOT LISTED

- ☐ (specify) →



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Month	Day
☐ January	
☐ February	
☐ March	☒ 1
☐ April	☐ 1
☐ May	☐ 2
☐ June	☐ 3
☐ July	☐ 4
☐ August	☐ 5
☐ September	☐ 6
☐ October	☐ 7
☐ November	☐ 8
☐ December	☐ 9

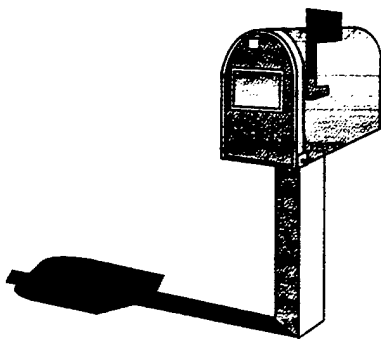
We have attempted to be thorough in examining issues that are related to the health care you receive. If you have comments that may help us to better understand your experiences with the military health care system, please write them in the space below (continue on the back if necessary).

If your comments concern a particular question, be sure to write the question number before your comment.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There is no handwriting or other markings on the paper.

Your cooperation in completing this survey is greatly appreciated.

THANK YOU FOR COMPLETING THIS SURVEY!



**PLEASE RETURN YOUR COMPLETED SURVEY IN THE
BUSINESS REPLY ENVELOPE.**

**IF YOU ARE RETURNING THE SURVEY FROM ANOTHER
COUNTRY, BE SURE TO RETURN THE BUSINESS REPLY
ENVELOPE ONLY THROUGH A U.S. GOVERNMENT
MAIL ROOM OR POST OFFICE.**

**FOREIGN POSTAL SYSTEMS WILL NOT DELIVER
BUSINESS REPLY MAIL.**



PLEASE DO NOT MARK IN THIS AREA

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