

**Alternative Methods to Finance Inpatient  
Active Duty Psychiatric Care Within the  
Great Plains Regional Medical Command**

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### Abstract

Historically, the Army Medical Department has provided inpatient psychiatric services to its active duty members at locations proximate to the soldiers' home station. With the application of managed care principles and the reality of the downsizing of Army forces, inpatient psychiatric care has regionalized. In identifying a more cost effective method to deliver this care within the Great Plains Regional Medical Command, a two-stage, least-squares regression model was developed. Using demographic, cost, and workload data for the ten military treatment facilities within the region, it was determined that several alternatives are less costly than the current method of maintaining inpatient beds at several locations and simultaneously utilizing supplemental care funds to purchase inpatient psychiatric services. While operating a single regional referral center at Darnall Army Community Hospital is more cost effective than operating a single regional referral center at William Beaumont Army Medical Center, the most cost effective of the three alternatives considered is that of not maintaining military inpatient beds and relying solely on supplemental care arrangements for the provision of inpatient psychiatric care to our active duty patients. This study did not consider other important, non-financial influences in the provision of active duty inpatient psychiatric care, but the implication is that less costly alternatives to our current method exist.

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Alternative Methods to Finance Inpatient  
Active Duty Psychiatric Care Within the  
Great Plains Regional Medical Command

Background

Historically, the Army Medical Department (AMEDD) has provided inpatient psychiatric services to its active duty members at locations proximate to the soldiers' home station. Often, large inpatient psychiatric wards were significantly underutilized and consequently over-staffed in order to provide this service to active duty patients. With the application of managed care principles and the reality of the downsizing of Army forces, a shift in the mechanism of providing inpatient psychiatric care to active duty members occurred within the AMEDD. The current approach to providing this care involves the regionalization of inpatient psychiatric services. Using the Regional Medical Commands as a guide, AMEDD leadership identified specific facilities to serve as referral centers. Within the Great Plains Regional Medical Command (GPRMC), Darnall Army Community Hospital (DACH) at Fort Hood was selected to provide inpatient psychiatric care to active duty members (D.T. Orman, personal communication, September 19, 1997).

In 1995, the idea that DACH would provide tertiary inpatient psychiatric care to support the entire South Central Health Service Support Area, the precursor to the GPRMC, was formulated. Brigadier General Claypool, as the commander of the South Central Health Services Support Area, sought to create a health sciences center without walls and combine the assets of Brooke Army Medical Center and DACH to more efficiently provide medical care to the region (Claypool, 1995). His vision included merging the two facilities to: "recognize the Army centers

of gravity”, “focus on providing more care where the soldier and his family live and work”, and to make “more efficient use of people, time, dollars, information...” (Claypool, 1995).

Specifically, the inpatient active duty psychiatric capacity at DACH was to be increased from 15 to 30 beds. Since approximately 20% of all active duty soldiers assigned in the continental United States are stationed at Fort Hood, the merger of psychiatric resources would “support [the] readiness and deployability of soldiers by enhancing access, quality, and cost-effectiveness of mental health services delivery...” (Claypool, 1995). The realignment of psychiatric resources was to begin in April 1995 and be fully implemented by July 1996 (Claypool, 1995).

Although the regionalization of inpatient active duty psychiatric services was a new mission assigned to DACH, no additional resources were attached to this new mission. A majority of the remaining inpatient active duty psychiatric wards within the GPRMC were closed following the realignment of mission. However, those assets used to provide inpatient psychiatric care were not realigned to DACH. Instead, the personnel resources were typically diverted within the specific medical treatment facility or lost through reassignment outside the GPRMC by the Total Army Personnel Command (D.T. Orman, personal communication, September 19, 1997). It is also possible that these personnel resources were used as “billpayers” during the Army’s downsizing (C.I. Reineck, personal communication, November 7, 1997).

DACH began accepting patients from throughout the GPRMC in the spring of 1996 with no augmentation to the existing staffing or resourcing levels (D.T. Orman, personal communication, September 19, 1997).

### Conditions Which Prompted the Study

During the balance of fiscal year 1996, the increased census due to the regional mission was not so great as to over-burden the DACH's capacity. However, in the spring of 1997, unanticipated personnel losses resulted in DACH experiencing critical staffing shortages. A cap on the number of beds which could safely be staffed with the existing personnel was established in June 1997 based upon the Workload Management System for Nursing, a component of the Medical Expense and Performance Reporting System (MEPRS) (E.M. Hernandez, personal communication, September 24, 1997) and of the Defense Medical Human Resources System (DHMRS) (C.I. Reineck, personal communication, November 7, 1997). In early July 1997, DACH imposed a cap on the number of beds and no longer accepted patients from outside of Fort Hood (D.T. Orman, personal communication, September 19, 1997).

According to the Psychiatry Consultant to the Surgeon General, today DACH is the GPRMC referral center for inpatient active duty psychiatric care and accepts active duty patients from across the region (D.T. Orman, personal communication, September 19, 1997). However, the designation of DACH as the regional referral center remains a misnomer because the facility has never had its resourcing elevated to perform this mission. While DACH does accept patients as its staffing allows, it cannot function as a true regional referral center capable of accepting patients at all times from throughout the region.

Since the spring of 1997, due to the proposed regionalization of psychiatric services and the subsequent staffing shortages at DACH, medical treatment facilities in the GPRMC have had to define alternate arrangements to provide inpatient psychiatric services to active duty soldiers. Medical treatment facilities within the GPRMC have identified alternatives which include: coordination for the transfer of patients to local Department of Veterans Affairs hospitals, local

civilian hospitals, and military treatment facilities outside the GPRMC. In recent months, DACH has also employed these alternatives to meet the psychiatric needs of the Fort Hood active duty community on occasion.

Based upon the recent personnel shortages at DACH and the resultant turmoil in the provision of inpatient active duty psychiatric care throughout the GPRMC, a review of alternatives to provide this care is warranted.

### Statement of the Problem

Given the current concept of regionalization, what is the most cost effective method to finance inpatient active duty psychiatric care within the Great Plains Regional Medical Command?

### Literature Review

In identifying a cost effective method for delivering inpatient active duty psychiatric care, a cost analysis is helpful to determine the relevant costs which should be considered. A plethora of articles exists which propose solutions to defining costs in a hospital setting. The Department of Defense has its own method of collecting manpower, expense, and workload data. Both civilian and military costing methods are important and appropriate for review. However, non-financial considerations must also be reviewed. Significant to this study include a review of literature relating to the evolution of managed care and the provision of psychiatric care, the relationship between marital status and psychological well-being, and the impact of the military organization on the provision of healthcare to active duty soldiers.

Costing methods. Hospitals have historically done an inadequate job of identifying costs and associating those costs with specific procedures. The most recently touted and accepted method of aligning consumed resources with the output they produce is that of activity-based costing (ABC). Prior to the application of managed care principles and the increased influence of

third party payers, hospitals had not been overly concerned with their pricing structure (Udpa, 1996). And, since patients were not confronted directly with the costs of their care, they were not overly concerned either. However, as price competition increased and resources decreased, hospitals found themselves requiring more accurate and appropriate costing methods.

Prior to the advent of managed care, healthcare organizations predominantly utilized traditional costing methods which identify nonrevenue producing centers and revenue producing centers and then allocate the costs of those nonrevenue centers to the revenue centers. Before the introduction of prospective payment systems, this methodology was usually considered to be "good enough" (Finkler, 1994). While the methodology of traditional costing is relatively straightforward and easily applied, the downside to traditional costing methods is the inequity with which costs are allocated. Most traditional cost accounting systems are based on a volume-related method of allocation. Using such a method, "low-volume products are consistently undercosted and high-volume products are consistently overcosted" (Chan, 1993). When work is knowledge-based, abstract, or intangible, such as healthcare, traditional cost accounting methods have limited relevance. Their resulting analyses and ratios are inadequate to serve as a meaningful control mechanism for a healthcare organization (Stiles & Mick, 1997). As the inequities of traditional costing methods became more obvious and the need for a more accurate portrayal of cost allocation was recognized, ABC was developed.

ABC is an accounting method which provides a methodology for defining the "causal relationship between healthcare organizations' control-oriented transactions, the services whose quality they ensure, and the costs of both control activities and services delivered" (Stiles & Mick, 1997). Simply put, "ABC is an approach to determining the cost of products (patients) or product

lines (groups of similar patients)...by more accurately assigning overhead costs on a cause-and-effect basis" (Finkler, 1993).

Rather than allocate costs on a volume-related basis, ABC identifies any activity that generates a cost as a cost driver. The ABC method then focuses "on activities as the fundamental costs objects and uses the costs of these activities as building blocks for compiling the costs of other cost objects" (Chan, 1993). Using this methodology, cost drivers are identified and costs can be traced on the basis of their causal relationship to the total expense of operating a department or providing a service (Stiles & Mick, 1997).

ABC generates cost information which is more accurate than that available by traditional cost accounting methods. It is especially effective when either "products differ in their demand on various resources due to high diversity in volume, complexity, materials, and setup...[or] when there is a high proportion of volume-unrelated overhead costs" (Chan, 1993). However, as Chan (1993) also states, despite ABC's superiority in accurate cost determination, the cost of measurement must be compared to the cost of errors. In a highly competitive market, the cost of errors is so great that investment in measuring the large number of cost drivers is less than the cost of the errors attributable to traditional costing methods. In such a competitive environment, investment in ABC makes sense.

Unfortunately, the Army does not have an activity-based costing mechanism in place. The focus of the Army Medical Department (AMEDD) has been to "conserve the fighting strength". Previously, this was done with little regard for cost or efficiency. In recent years, however, the impact of personnel and budget cuts has forced the AMEDD to develop mechanisms to attempt to accurately define the costs associated with the products and product lines we deliver. The

primary mechanism in place to perform this function is the Medical Expense and Performance Reporting System (MEPRS).

The purpose of the MEPRS is "to provide a uniform healthcare cost management system for the Department of Defense" (DoD 6010.13, 1995). As early as 1973, concerns existed regarding the increased overhead and support costs throughout the Department of Defense (DoD). Similar concerns existed regarding how to develop and apply uniform standards to determine medical manpower requirements. From these studies and based on the recognition that the "most effective and efficient utilization of personnel recording data for the two systems was to merge the data capture functions and ultimately the two systems" (DoD 6010.13, 1995), the MEPRS was implemented beginning the first quarter of fiscal year 1986. The MEPRS provides "a uniform system for managing and reporting on the fixed military healthcare delivery system" (DoD 6010.13, 1995).

The MEPRS was developed as a "system of manpower and cost distribution and expense reporting" to provide managers with data on which to base decisions and evaluate performance. It offers managers a "basic framework for responsibility accounting and the flexibility to categorize financial information of functional activities that may cross organizational lines" (DoD 6010.13, 1995). However, the MEPRS is a fairly rigid system which wasn't designed to perform the individual product line costs that many military medical treatment facilities are now attempting to define. The original purpose of the MEPRS was to report financial information to higher commands, not to generate relevant data needed to make decisions at individual medical treatment facilities (Holmes, 1996).

According to DACH's Chief MEPR Analyst, the MEPRS has several shortcomings (M. Chapman, personal communication, October 23, 1997). First, although data is input on a monthly

basis, data available from which to derive specific reports is typically three months old. This lag hinders timely decision-making since unit costs available for consideration are outdated. Also, because data is input periodically, before inpatient records may be complete, the possibility exists that workload may not directly correspond with data available through other automated reporting systems. Finally, due to the inability to cost specific products or product lines, the resultant reports may not be as accurate as that required by the manager/decision maker.

Additionally, according to Holmes (1996), the MEPRS consists of historical data which a manager/decision-maker must use to influence future transactions. As newly defined work centers emerge, the historical data available through the MEPRS is not resilient to reflect these changes in how military healthcare is delivered (C.I. Reineck, personal communication, November 7, 1997). Despite these shortcomings, the MEPRS data is claimed to be increasingly accurate or "clean", and as long as the limitations of the system are acknowledged, the system can be used to provide valuable information to military treatment facility managers (Holmes, 1996 and M. Chapman, personal communication, October 23, 1997).

Modeling. Given the type of data available through the military systems and the desire to predict the cost effective alternative to providing inpatient active duty psychiatric care, modeling seems to be an appropriate method of evaluating costs. In the general sense, models use quantitative skills to construct and test conditions of the real world (Pindyck & Rubinfeld, 1991). More specifically, an econometric model is one which applies a statistical analysis to evaluate marketplace conditions (M. Perry, personal communication, October 30, 1997). In conducting this project, an econometric model was developed to evaluate the relative costs associated with various alternatives in the provision of inpatient psychiatric care to the active duty population of the GPRMC.

Evolution of managed care and the provision of psychiatric care. According to The Managed Health Care Handbook, managed care is a “regrettably nebulous term. At the very least, a system of health care delivery that tries to manage the cost of health care, the quality of that health care, and access to that care” (P.R. Kongstvedt, 1996). The concept of managed care evolved as a result of employers frustrations with the spiraling costs of health care in the post-World War II, and specifically the post-Medicare legislation, era. The elements of managed care can be traced back to the early 1900s and include the origins of health insurance at Baylor Hospital in 1929 (Kongstvedt, 1996). Today, employer-generated competition has resulted in “health care providers’ competing with one another on the basis of the price of their services” (Drake, 1997). The health care market has changed, and it will continue to change as the pressure for more efficient and effective health care continues. However, future change may be a result of patients who demand to be the beneficiaries of more efficient and effective health care. Although value can be defined as providing appropriate care at appropriate cost, in the long run, it is the patient who will define what is appropriate (Drake, 1997 and Andrianos & Dykan, 1996).

Just as the provision of health care in the general sense has been impacted by managed care, so too has the provision of psychiatric care. Special challenges related to psychiatric care include: the destigmatization of mental illness and chemical dependency, the erosion of social support systems, the increased complexity and stress in society (Kongstvedt, 1996). Each of these same challenges is mirrored in the military and is therefore cause for concern.

Private psychiatric hospitals expanded rapidly during the 1970s and early 1980s as a shift in the location of the provision of inpatient psychiatric care occurred. During this period and throughout the 1980s, treatment sites shifted toward the private, entrepreneurial sector. The result of privatization has been a tiered system in which the poor obtain care at public treatment sites

while the well-to-do patients seek care from private facilities (Kiesler & Simpkins, 1991, Fisher, Dorwart, Schlesinger & Davidson, 1991, and Kongstvedt, 1996). Military treatment facilities have traditionally provided local inpatient psychiatric care for their active duty patients. The current trend toward regionalization and the decreased staffing levels resulting from the military drawdown have forced most military treatment facilities to at least explore the civilian public and private alternatives for inpatient psychiatric care.

A review of six states' experiences with privatizing mental health services may provide insight to the military as the AMEDD explores the options available for providing inpatient psychiatric care. In her review, Dr. Bachman found that states typically privatize mental health services for political, economic, and organizational reasons (Bachman, 1996 and Bachman, 1996). These reasons parallel the basis for many policy decisions made in the military. While the results of Bachman's (1996) study reveal that contracting/privatization of mental health services will most likely continue in each of the states examined, the study did identify the need for better control of monitoring state contracts. States expressed the need for the development of outcome measures to monitor provider performance and outcomes measurement (Bachman, 1996). Development and application of outcome measures should be a consideration of the AMEDD as it explores the option of privatizing active duty inpatient psychiatric care.

As discussed in Bachman's review (1996), economics and anticipated cost savings are two of the reasons states privatize mental health services. Psychiatric care is one area in which managed care techniques are being applied to reduce costs. According to a study of non-federal hospitals conducted by Woolhandler and Himmelstein (1997), administrative costs comprised 26.0 percent of total hospital costs in fiscal year 1994. In that same year, administrative costs

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comprised 37.5 percent of psychiatric hospital costs. Regionalization of services is one way by which the AMEDD is attempting to reign in administrative costs.

The field of psychiatry is wrought with claims of being “discretionary”, “ill-defined”, and “subject to moral hazard”, although these claims are admittedly less applicable to inpatient care (Goldman, 1991). One of the most significant challenges facing this field is that of designing appropriate incentives to reduce psychiatric inpatient lengths of stay. Because the type of care provided is not fully observable, it is “difficult to know when providers are being efficient and when they are just providing too little treatment” (Goldman, 1991).

Two studies conducted within the Department of Veterans Affairs medical centers suggest that during the four year period, 1984-1988, when a prospective payment system was implemented for inpatient psychiatric care, the trends were not positive (Dilonardo, Kendrick & Seitz, 1991 and Rosenheck & Massari, 1991). In fact, “[i]n the case of VA psychiatric care, DRG-based budgeting was associated with more episodes of care, shorter lengths of stay, higher readmission rates, and more episodes of care per occupied bed” (Rosenheck & Massari, 1991). Despite the application of managed care principles, the results seem to validate Goldman’s study by reinforcing the concept that it is difficult to know when psychiatric providers are “just providing too little treatment” (1991). After the suspension of the prospective payment system, the quick reversal of the four year trends further brings into question whether provider practice patterns were influenced by the payment methodology (Rosenheck & Massari, 1991). As the military health services system becomes increasingly subject to managed care principles, safeguards must be put into place to ensure outcomes do not parallel those of the Department of Veterans Affairs medical system.

Relationship between marital status and well-being. In evaluating the costs of providing the active duty population of the GPRMC with inpatient psychiatric care, specific variables identified for consideration include the active duty population at each installation segmented by age, gender, and marital status. Several studies have been conducted which found a positive relationship between marital status and physical/psychological well-being. Numerous studies have also found a correlation between gender and well-being among individuals with differing marital status (Mookherjee, 1997).

In a general sense, it has been documented that "married persons have significantly lower mortality rates than unmarried persons" and that the mortality rate benefits of marriage "have been observed to be greater for men" (Lillard & Panis, 1996). In 1972, it was claimed by a researcher named Bernard that marriage is "beneficial to men but not beneficial to women" (Mookherjee, 1997), however, his claims have not been supported by subsequent research. More recent research indicates that the psychological well-being of married individuals is typically greater than that of never married individuals and much greater than that of divorced or widowed individuals (Mastekaasa, 1992). In 1997, Mookherjee's study indicated "married people reported they were more satisfied in life than unmarried people were, irrespective of gender. In other words, marriage was beneficial for both men and women." His work also suggested that women, rather than men, perceived greater well-being whether or not they were married (Mookherjee, 1997).

Military healthcare. The mission of the AMEDD is in part to "(1) Maintain the health of members of the Army [and] (2) Conserve the Army's fighting strength" (Army Regulation 40-1, 1983). As such, according to Army Regulation 40-3, members of the uniformed services on active duty are authorized complete and unqualified medical care. Included in this care are programs to

prevent, treat, and administratively manage neuropsychiatric disorders (Army Regulation 40-216, 1984).

Clinically, Army mental health providers are responsible for defining policy and guidance pertaining to the prevention, diagnosis, and treatment of combat stress casualties, battle fatigue, mental illness, and neurological diseases. In their advisory capacity, these professionals are responsible for identifying factors to unit commanders which may affect the "mental health and morale of troops" (Army Regulation 40-216). This advisory capacity and the relationship between a unit's soldiers and its commander represent one facet of the impact the military organization has on the provision of healthcare to the active duty soldier.

According to a study by McCarroll, Orman, and Lundy (1993), the military has often been successful in intervening with soldiers who have adjustment problems due to the early referral to mental health professional by unit commanders. This same study (McCarroll, Orman, & Lundy, 1993) found that soldiers who were command-referred for mental health intervention typically had fewer problems than the self-referred soldiers. Direct communication and treatment as early and as near the soldier's unit as practicable are basic principles of Army neuropsychiatric and mental health professionals (Army Regulation 40-216).

The McCarroll et al. (1993) study highlights additional military-unique features of the Army's health care system. The concept of minimal diagnosis is employed in military psychiatry to maximize the "patient's and the military's expectation of a return to duty and to decrease the likelihood of a patient assuming the "sick role" for secondary gain" (McCarroll, Orman, & Lundy, 1993). McCarroll et al. identify the low rate of prescriptions written by military psychiatrists as a reflection of the recognition of the patient's need to function in an "environment where the side effects of medication might prove hazardous." The study also indicates that there is no

confidentiality between a doctor and a client in military medicine. Under certain conditions when access is required by law, regulation, or judicial proceeding, medical information may be released (Army Regulation 40-66).

One of the conclusions drawn by McCarroll et al. (1993) is that psychiatric care in the military is different from that available in the civilian environment. The study further states that "In military community psychiatry, evaluation and treatment occur within the context of the military community and cannot be separated from it for administrative or economic purposes" (McCarroll, Orman, & Lundy, 1993). As regionalization of psychiatric care is further evaluated, these conclusions bear consideration.

#### Purpose

The regionalization of inpatient active duty psychiatric care within the Great Plains Regional Medical Command has already been implemented. The purpose of this project is to develop a methodology, using fiscal year 1996 data, which will allow the GPRMC to evaluate whether it is more cost effective to continue to provide regional inpatient active duty psychiatric care at DACH or to allow regional military treatment facilities to design facility-unique arrangements using supplemental care dollars to outsource their inpatient psychiatric care requirements.

The results of this project may be utilized by the GPRMC or other regional medical commands to determine the more cost effective alternative to provide inpatient active duty psychiatric care within a specific geographic region.

#### Method and Procedures

In the literature review, factors other than cost were identified as influential in the provision of inpatient psychiatric care to an active duty population. However, for the purpose of

this project, only cost factors were considered. Limiting the scope to consider only costs did not eliminate the difficulty in developing a means of evaluating alternate methods of providing psychiatric care. A simple method for comparing the cost of providing inpatient active duty psychiatric care within the GPRMC does not exist, nor is the identification and acquisition of the necessary data elements easily accomplished.

To evaluate the costs of providing inpatient active duty psychiatric care within the GPRMC, a quantitative analysis using fiscal year 1996 population, workload, and expense data was conducted. General population data was obtained through the Defense Eligibility Enrollment Reporting System (DEERS).

The MTF expense and workload data used in the analysis was obtained through the MEPRS database. The expenses of each facility were obtained from the MEPRS Computation Summary Report. Specifically, the Direct Expense, Ancillary Expense, and Cost Pool Expense were considered in the calculations. The Step Down Expense, or overhead cost, was not used in the calculations. It was not considered in the regressions since it was determined that if the overhead costs were not allocated to an inpatient active duty psychiatric ward, the space would be utilized for other services, and the overhead costs would continue to exist. Only the MTFs' variable costs associated with providing active duty inpatient psychiatric care were considered in this methodology. The MEPR<sup>6</sup> Total Direct Expense variable is the sum of the Direct Expense and the Cost Pool Expense categories of the Summary Report.

The supplemental care expense and workload data was generally obtained directly from each of the 10 MTFs within the GPRMC. They were extracted from original bills obligated during fiscal year 1996. Nine MTFs provided actual supplemental care costs. Only Munson Army Community Hospital at Fort Leavenworth did not supply this data. An approximation of their

supplemental care costs, both bed days and expenses, was made based on the total active duty population of the installation.

A two-stage, least-squares regression model was developed to allow comparison of the inpatient psychiatric costs for the military treatment facilities and the non-military treatment facilities within the region. The following steps outline the process.

1. Identify the dependent variables for consideration.
2. Identify the independent variables for consideration.
3. Input the raw data.
4. Convert the raw data to differences from the means.
5. Regress and estimate the expenses and occupied bed days based on the converted data (1st stage).
6. Regress and estimate the expenses and occupied bed days from the 1st stage predictions (2nd stage).
7. Convert the Estimates to Costs by Adding the Means
8. Create alternative data.
9. Regress alternative data.
10. Evaluate the differences in costs between the status quo and the alternatives.

To further explain the methodology, each of the steps will be described in greater detail in the following paragraphs.

**Step 1: Identify the Dependent Variables for Consideration**

The dependent variables for the regressions are workload, as measured in both occupied bed days and expenses. The specific dependent variables for the first stage regression are

1. MEPR Total Direct Expenses
2. MEPR Ancillary Expenses
3. MTF Occupied Bed Days
4. Supplemental Care Expenses
5. Supplemental Care Occupied Bed Days

The initial MTF workload data was obtained from the MEPRS database and verified with each facility within the region to reflect actual occupied bed days and expenses utilized during fiscal year 1996. As stated earlier, the supplemental care expenses and occupied bed days were obtained directly from the MTFs with the exception of the data from Fort Leavenworth.

In the second stage regression, each of the same five dependent variables was evaluated.

**Step 2: Identify the Independent Variables for Consideration**

Two sets of independent variables were considered. In the first stage regression, the total active duty population,  $AD_T$ , the female active duty population,  $AD_F$ , the active duty population segmented by age group, the marital status of the active duty population (married or not married), and the number of MTF active duty psychiatric bed months (number of beds \* number of months in FY 96 that those beds were available) were identified for each of the facilities within the GPRMC.

For the second stage regression, the predicted workload, both the MTF and supplemental care expenses and the MTF and supplemental care occupied bed days, were considered as the dependent variables.

**Step 3: Input the Raw Data**

Once the raw data was gathered from its source databases and documents, it was entered into an Excel spreadsheet by facility and variable as shown in Table 1. Since the MEPR data was unable to account for expenses incurred only by active duty patients, a modification to the data was made. All MEPR data was adjusted for each facility by the proportion of inpatient psychiatric workload that was generated by active duty patients. For example, at DACH, Fort Hood, 74% of all inpatient psychiatric care provided during fiscal year 1996 was consumed by active duty patients. For this reason, only 74% of the MEPRS expenses allocated to inpatient psychiatric care was considered in this methodology.

Table 1

**GPRMC Input Data Modified to Reflect Proportion of Inpatient Active Duty Workload**

DMIS ID	LOCATION	MEPR TOTAL DIRECT EXPENSE	MEPR ANCILLARY EXPENSE	SUPP CARE EXPENSE	MTF OBD	SUPP CARE OBD	Total AD POP	AD FEMALE	AGE B 25-34	AGE C 35-44	AGE D >=45	UNMAR AD MALE	MAR AD FEMALE	#MTF BED MONTHS
8	BLISS ACH-FT. HUACHUCA	111531.72	4736.8187	2640.5	216	9	5848	1178	2388	1276	194	1479	534	0
32	EVANS ACH-FT. CARSON	671704.62	71584.348	18241.34	985	30	18229	2338	8383	4174	561	4522	1319	120
57	IRWIN ACH-FT. RILEY	100196.93	3921.3948	76355.43	213	335	9954	1028	3959	1478	138	3147	521	88
58	MUNSON ACH-FT. LEAVENWORTH	23107.875	476.8134	2218.02	39	8	4896	498	1978	1936	264	871	285	0
64	BAYNE-JONES ACH-FT. POLK	390392.02	14412.8512	5544.8	531	11	7463	951	3172	1183	127	2044	525	70
75	L. WOOD ACH-FT. LEONARD WOOD	550956.55	44429.4025	0	1284	0	13694	2812	2975	1144	118	8862	735	288
88	REYNOLDS ACH-FT. SILL	202.7718	15.248	0	218	0	17522	1148	5508	2237	249	8218	850	0
108	WILLIAM BEAUMONT AMC-FT. BLIS	2031471.5	111608.755	6073	6229	8	9789	1637	3602	2334	398	2418	807	216
109	BROOKE AMC-FT. SAM HOUSTON	0	0	0	81	0	13526	3538	5577	4122	969	2310	1908	0
110	DARNALL ACH-FT. HOOD	3508823.8	150338.733	0	4145	0	42388	5805	17446	6504	713	13176	3066	216
	AVERAGE	738838.97	40152.4361	11107.289	1393.2	40.1	14431	2093.3	5499	2638.6	373.1	4504.5	1035	97.8

**Step 4: Convert the raw data to differences from the means**

The total for each variable was calculated as a sum of all of the facilities within the region to produce a total value for each variable within the GPRMC. For example, the total number of active duty females, AD<sub>F</sub>, was calculated from the data for each facility. This total was then divided by 10, the number of MTFs within the region, to yield an average (mean) value for each variable. The difference between the original data and the average value is the difference from the

mean. The use of the difference from the mean rather than the raw data reduces error bias during the regressions. For the regressions, all data used was based on difference from the mean values rather than original values.

**Step 5: Regress and Estimate the Expenses and Occupied Bed Days Based on the Converted Data (1st Stage Regression)**

The  $AD_T$ , the  $AD_F$ , the marital status, age group, and the number of bed months at the MTFs were used in the regression as the independent variables to determine their relationships to the five specific dependent variables. The results of the 1st stage regression provided the coefficients used to estimate of the quantity of occupied bed days and MEPR expenses utilized at the MTFs within the GPRMC and the quantity of occupied bed days and expenses funded through supplemental care funds for use in the 2nd stage regression.

**Step 6: Regress and Estimate the Expenses and Occupied Bed Days from the 1st Stage Predictions (2nd Stage)**

The estimated quantities calculated in the first regression, for each of the original five dependent variables were used as the variables in the second stage regression. The relationship between each of the expense variables (MEPR Total Direct Expenses, MEPR Ancillary Expenses, and Supplemental Care Expenses) and the independent variables (the remaining two expense variables, the MTF OBD variable, and the Supplemental Care OBD variable) was determined. During this stage, the relationship between each of the two occupied bed day variables (MTF OBD and Supplemental Care OBD) and the independent variables (the remaining OBD variable and the three expense variables) was also determined.

**Step 7: Convert the Estimates to Costs by Adding the Means**

Once the final expense estimates have been determined, the original mean for each variable must be added in to obtain an approximation of cost. Although final OBD estimates were also calculated, the focus of this project was an evaluation of inpatient active duty psychiatric care based on costs. The OBD estimates were reviewed, but recommendations were based primarily on a consideration of costs. The results provided the Status Quo estimates of variable expenses for each MTF within the GPRMC for comparison in evaluating alternatives in providing care.

**Step 8: Create Alternative Data**

In addition to the status quo data, alternatives exist to the method of providing inpatient active duty psychiatric care. The alternatives considered during this project include: use of DACH, Fort Hood as the only possible MTF source for beds, use of William Beaumont Army Medical Center (WBAMC), Fort Bliss as the only possible MTF source for beds, and no MTF beds available throughout the GPRMC. The third alternative would, in effect, force the further development of the supplemental care arrangements which existed during this fiscal year.

**Step 9: Regress Alternative Data**

This data is entered into the model to yield the alternate estimates of MEPRS and supplemental care expenses.

**Step 10: Evaluate the Differences in Costs Between the Status Quo and the Alternatives**

A comparison of the possible outcomes results in the identification of which alternative is most effective, from the cost perspective, in providing inpatient psychiatric care to the active duty population of the GPRMC. The comparison is based on cost savings as the difference between the status quo cost estimates and each of the three alternative cost estimates.

### Validity and Reliability

In evaluating a measurement tool, such as the model developed to evaluate the cost of providing inpatient active duty psychiatric care to the GPRMC, validity, reliability, and practicality are three criteria to be considered (Cooper & Emory, 1995). A model which does not measure what it is intended to measure on an accurate and repetitive basis and which is not relatively economic, convenient, and interpretable, is not a good measuring tool.

In this project, content validity for the model was established in part by considering a full year's worth of data. By evaluating a one year time span of data, it was felt the model contains a representative sample of the "universe of subject matter of interest" (Cooper & Emory, 1995). Additionally, instead of evaluating the delivery of inpatient active duty psychiatric care at only DACH, the scope of the study was increased to include all of the GPRMC to further add to the validity of the model. If fiscal year 1996 is representative of the workload consumed in providing inpatient active duty psychiatric care, the model should be valid.

The reliability of the model itself is demonstrated through the stability of the model to produce consistent results with the same input data. It is also improved by the use of interrater reliability in which a second individual ensured the accurate transcription of the raw data into the spreadsheet used for computation.

Apart from the reliability of the model, the reliability of the MEPRS data may be a cause for concern. As discussed in the literature review, the MEPRS has several shortcomings. One shortcoming not previously mentioned is related to the source of the manpower data. Because the manpower data input into the system is derived directly from the work center, the accuracy with which that data is reported can impact the entire system. However, the MEPRS is the only system currently available from which manpower and cost data can be obtained. The monetary and time

expense required to independently gather data for this project would make it impracticable. The time lag and the periodicity of the updating of the systems did not pose a problem in this study since prior fiscal year data was reviewed.

**Results**

The application of the developed methodology yielded regression statistics which indicate a strong model, ie- one which explains a significant amount of the variation in the studied variables. As depicted in Table 2, the R<sup>2</sup> values suggest this model explains between 81.5 and 98.7% of the variation in the dependent variables during the first stage regression and between 74.0 and 96.8% of the variation in the dependent variables during the second stage regression.

Table 2

R<sup>2</sup> Values for Each of the Five Dependent Variables of the Model

Dependent Variable	1st Regression R <sup>2</sup> Value	2nd Regression R <sup>2</sup> Value
MEPR Total Direct Expenses	.981	.956
MEPR Ancillary Expenses	.987	.968
MTF Occupied Bed Days	.929	.740
Supplemental Care Expenses	.847	.841
Supplemental Care Occupied Bed Days	.816	.810

Based on this model, the fiscal year 1996 data, and the selected alternatives, the greatest cost savings in providing inpatient active duty psychiatric care within the GPRMC could be obtained by using no MTF beds and relying on supplemental care. Of the two alternatives which utilize MTF beds, the total cost savings is greater at DACH than at WBAMC. All three of the

alternatives result in a cost savings over the status quo option in which several sites throughout the GPRMC maintain inpatient beds (see Table 3).

Table 3

Cost Savings Associated with Three Alternative Methods of Financing Inpatient Active Duty Psychiatric Care within the GPRMC

DMS ID	LOCATION	Status Quo	Alternative 1: Darnall ACH only MTF Beds		Alternative 2: WBAMC only MTF Beds		Alternative 3: No MTF Beds Available	
		Cost	Cost Estimates	Savings	Cost Estimates	Savings	Cost Estimates	Savings
8	BLISS ACH-FT. HUACHUCA	(\$239,434.96)	(\$239,434.96)	\$0.00	(\$239,434.96)	\$0.00	(\$239,434.96)	\$0.00
32	EVANS ACH-FT. CARSON	\$900,957.40	(\$1,252,310.10)	\$2,153,287.50	(\$1,143,767.45)	\$2,044,724.85	(\$1,143,767.45)	\$2,044,724.85
57	IRVIN ACH-FT. RILEY	(\$43,816.59)	(\$1,264,001.51)	\$1,220,184.92	(\$1,202,494.01)	\$1,158,677.42	(\$1,202,494.01)	\$1,158,677.42
58	MUNSON ACH-FT. LEAVENWORTH	\$33,893.34	\$33,893.34	\$0.00	\$33,893.34	\$0.00	\$33,893.34	\$0.00
64	BAYNE-JONES ACH-FT. POLK	\$590,437.40	(\$685,635.31)	\$1,256,072.71	(\$802,318.76)	\$1,192,756.16	(\$802,318.76)	\$1,192,756.16
75	L. WOOD ACH-FT. LEONARD WOOD	\$1,102,883.16	(\$4,064,958.84)	\$5,167,842.01	(\$3,804,456.48)	\$4,907,339.65	(\$3,804,456.48)	\$4,907,339.65
98	REYNOLDS ACH-FT. SILL	(\$20,038.15)	(\$20,038.15)	\$0.00	(\$20,038.15)	\$0.00	(\$20,038.15)	\$0.00
108	WILLIAM BEAUMONT AMC-FT. BLIS	\$1,999,063.15	(\$1,876,818.35)	\$3,875,881.50	\$1,999,063.15	\$0.00	(\$1,681,441.58)	\$3,680,504.73
109	BROOKE AMC-FT. SAM HOUSTON	\$23,385.57	\$23,385.57	\$0.00	\$23,385.57	\$0.00	\$23,385.57	\$0.00
110	DARNALL ACH-FT. HOOD	\$3,463,516.77	\$3,463,516.77	\$0.00	(\$216,987.97)	\$3,680,504.73	(\$216,987.97)	\$3,680,504.73
Total Savings:				\$13,673,248.64		\$12,984,002.81		\$16,664,507.55

Discussion

Evolution of the Methodology

During the initial stages of this research project, it appeared the availability and analysis of data related to the admission of active duty personnel with a psychiatric diagnosis would be fairly straightforward. However, that proved not to be the case. Although the demographic data for each installation within the GPRMC was readily available, discrepancies in data between the various Army legacy systems and the inability to “drill down” to the desired level of study in the Department of Defense’s Corporate Executive Information System made data collection an arduous task. Additionally, no system currently in existence requires accounting for supplemental care expenditures or occupied bed days at anything other than the facility level. Some MTFs within the GPRMC do account for their supplemental care expenses to a fairly high degree of specificity, but others track these expenses as a consolidated entry in the MEPRS. Despite the challenges, none were insurmountable in obtaining the required data elements.

The development of a methodology to analyze the data also involved an evolution. While a qualitative analysis of the costs associated with inpatient active duty psychiatric care was initially considered as a possibility, the researcher preferred a more quantitative approach. Given the relatively small number of MTFs within the GPRMC and the desire to utilize a regression model to evaluate the relationship between costs and consumption of services, the independent variables were selected with care. In the literature it has been shown that both gender and marital status may impact the need for psychiatric services. For this reason, both of these variables were identified for inclusion in the model.

The independent variable that was selected for manipulation during the regressions was the number of bed months available at each MTF. Recall that the number of bed months is defined as the number of beds\*number of months in FY 96 that those beds were available.

During FY 96, the regionalization of inpatient active duty psychiatric care was ongoing, and MTFs throughout the GPRMC were in the process of consolidating and closing psychiatric wards. By manipulating this variable, the model was able to predict the costs associated with each individual MTF and the entire GPRMC depending upon the number of bed months inpatient care was available at each facility. For example, Alternative 1 considered that bed months were only available at DACH. The model reflected this by having zero bed months available for each of the other nine MTFs within the region.

The purpose of the two-staged regression was to predict the quantity of beddays consumed and to then predict the costs associated with that quantity. The model allowed for evaluation and prediction based on actual consumption data rather than on Army or national standards (ie-six outpatient primary care visits per year). The results were an estimation of costs based on the quantity of inpatient active duty psychiatric occupied bed days consumed. For this

reason, the dependent variables studied all related to costs, MEPRS or supplemental care, and occupied bed days, MTF and supplemental care.

As stated in the Results section, the model is fairly strong in its predictive value. One measure of the strength of the model is its R<sup>2</sup> value, the square of the correlation coefficient between the dependent and independent variables (Norusis). The R<sup>2</sup> values measure the percentage of variation in the y [dependent] variable that is explained by its relationship to the x [independent] variables (Sanders, 1995). As shown previously in Table 2, the R<sup>2</sup> values range from 74.0 to 98.7%. Table 4 provides a sample of the full regression statistic output developed for each dependent variable.

Table 4

Sample Regression Summary Output for MEPR Total Direct Expense Variable

MEPR TOTAL DIRECT EXPENSE (1st Regression)								
SUMMARY OUTPUT								
<i>Regression Statistics</i>								
Multiple R	0.990494867							
R Square	0.981080081							
Adjusted R Square	0.414860366							
Standard Error	335661.4421							
Observations	10							
ANOVA								
	df	SS	MS	F	Significance F			
Regression	8	1.17E+13	1E+12	12.9636	0.211744941			
Residual	2	2.25E+11	1E+11					
Total	10	1.19E+13						
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
AD POP	-4428.347369	3975.046	-1.114	0.38119	-21531.601	12674.91	-21531.601	12674.90624
AD FEMALE	80.57817292	3056.967	0.0264	0.98136	-13072.4979	13233.65	-13072.4979	13233.65423
AGE B 25-34	5070.394431	5812.525	0.8723	0.47501	-19938.8985	30079.69	-19938.8985	30079.6874
AGE C 35-44	3527.875373	1318.699	2.6753	0.11592	-2146.03324	9201.784	-2146.03324	9201.783982
AGE D >=45	-3296.386874	10146.28	-0.3249	0.7761	-46952.3444	40359.57	-46952.3444	40359.57069
UNMAR AD MALE	4780.808191	4090.775	1.1687	0.36298	-12820.3882	22382	-12820.3882	22382.00455
MAR AD FEMALE	4569.533593	6739.757	0.678	0.5677	-24429.3191	33568.39	-24429.3191	33568.38632
#MTF BED MONTHS	20409.94783	9835.937	2.075	0.17366	-21910.7023	62730.6	-21910.7023	62730.59796

MEPR Total Direct Expense (2nd Regression)									
SUMMARY OUTPUT									
Regression Statistics									
Multiple R	0.977852559								
R Square	0.956195628								
Adjusted R Square	0.767626775								
Standard Error	294876.3387								
Observations	10								
ANOVA									
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>				
Regression	4	1.13683E+13	2.8E+12	32.743	0.0008837				
Residual	6	5.21712E+11	8.7E+10						
Total	10	1.19101E+13							
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>	
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Est MEPR Ancillary Ex	22.75685523	4.089186789	5.56513	0.0014	12.75096829	32.762742	12.75096829	32.76274216	
Est Supp Care Expens	-82.2386122	30.30209807	-2.714	0.0349	-156.3852293	-8.091995	-156.3852293	-8.09199511	
Est MTF OBD	-9.22361946	107.5038327	-0.0858	0.9344	-272.2762141	253.82898	-272.2762141	253.8289752	
Est Supp Care OBD	19112.04169	7118.393785	2.68488	0.0363	1693.946841	36530.137	1693.946841	36530.13654	

Analysis and Interpretation

The first alternative identified DACH as the only MTF within the GPRMC to treat inpatient active duty psychiatric patients. As shown in Table 3, the estimated cost savings associated with the use of DACH as the sole source of inpatient active duty psychiatric care is approximately \$13,673,248. According to the 1995 proposal by Brigadier General Claypool, consolidation of this care and realization of the anticipated cost savings were to occur by the summer of 1996. However, despite the desire to implement this change, neither the funds nor the staff ever materialized to make the proposal a reality.

The second alternative considered that all inpatient active duty psychiatric care would be received at WBAMC. As the only Army Medical Center in the GPRMC which currently treats inpatient psychiatric patients and as the MTF with the greatest number of occupied bed days during FY 96, this alternative seemed reasonable. While a costs savings of approximately \$12,984,002 could be achieved through this alternative, the savings are somewhat less, according to the model, than those possible through implementation of the DACH alternative.

The third alternative, and the one with the greatest non-financial implications, is that of treating all active duty patients requiring inpatient care through the use of supplemental care arrangements outside the MTFs. This alternative yielded the largest cost savings, approximately \$16,664,507.

A consideration not highlighted in the model which relates to alternative 3 is that of the supplemental care cost per occupied bed day throughout the GPRMC. During FY 96, the range of cost per day was from \$227.3 at Irwin ACH, Fort Riley to \$759.1 at William Beaumont AMC, Fort Bliss. While there may be no single agency which could support the Army's psychiatric inpatient needs for the entire GPRMC, it may be possible to gain economies of scale when purchasing the psychiatric supplemental care on a regional vice an installation level. If this were possible, the third alternative could be even more financially attractive.

One point worth noting in reviewing Table 3 is that the cost savings are reflected in the model only at locations which currently have no inpatient psychiatric capacity for active duty patients. At those locations where no inpatient capacity existed for the entire FY 96, no savings accrued. This is reasonable since no savings should accrue at these locations if the only variable being manipulated is the number of bed months variable. In other words, all cost savings accrued in the GPRMC by consolidating psychiatric services will accrue to those locations which currently serve that patient population.

#### Limitations

Although the model is fairly strong in its predictive value, it has limitations. As can be seen in Table 3, several of the cost estimates fall into the negative range. While the model is mathematically unaffected by negative numbers, those numbers represent costs which are outside the anticipated range. Typically a cost is a positive number and reflects an incurred expense. This

model implies that in some cases a negative expense (a savings) would accrue to MTFs under certain conditions. The reality is that no facility would have a budget augmentation, although it might realize a cost avoidance, by discontinuing inpatient psychiatric care.

One explanation of the negative cost estimates is that the model is based upon an anticipated linear relationship between the variables as depicted in Figure 1. In this case the supply line is drawn as a straight line which defines the relationship between the cost and quantity (occupied bed days) of care available. The reality of the relationship may be one of non-linearity as depicted in Figure 2. If the relationship is non-linear, this model artificially forces the relationship to reflect one of linearity and assumes a straight line relationship. If the model were to be used as a future decision-making tool, modification to the model would account for the possibility of a non-linear relationship between the variables.

A second potentially significant limitation of the model is its inclusion of only either MTF inpatient or supplemental care-funded inpatient treatment. The model does not account for any arrangements which do not involve a direct exchange of funds for the provision of care. For example, at BAMC for many years active duty inpatient psychiatric care was provided exclusively by the Air Force at Wilford Hall Medical Center. There was no direct bill attached to this care, however BAMC provided psychiatric nursing support to the Air Force if personnel were available. With the downsizing of military forces, BAMC has in recent years initiated an agreement with a local civilian psychiatric facility. At other MTFs in the region, relationships with local Department of Veteran Affairs (DVA) Medical Centers have developed so that inpatient psychiatric services may be received in exchange for services needed by the DVA. As the model is currently developed, neither of these types of arrangements are considered.

Finally, as mentioned in the Literature Review section, the accuracy of the MEPR data may be questioned. Although facilities and individuals need to further appreciate the significance of the data input to the information systems, any decision regarding the future allocation of patient services is likely to rely upon data from the same sources and reflect the same potential pitfalls. As military cost accounting mechanisms become more advanced, the potential for increasingly accurate and specific analysis is improved.

### Recommendations and Conclusions

Given the current concept of regionalization and the alternatives considered during this project, the most cost effective method to finance inpatient active duty psychiatric care within the GPRMC is through the exclusive use of supplemental care funds to purchase services outside the MTFs. With that said, an express acknowledgment of the importance of non-financial influences in necessary.

Despite the downsizing of the military medical forces, specified MTFs must still be available to support the training and development of those specialists associated with the psychiatric field. Since the GPRMC encompasses Fort Sam Houston, home of Army medicine, there may be an implied preference to retain this training presence within the region.

Additionally, the use of supplemental care funds to purchase inpatient psychiatric services may or may not allow the service member to remain in proximity to his or her family and unit support network. Regardless of its proximity, the unit's ability to gain personal medical information about the active duty member would most likely be hindered by use of a civilian facility. It could also be anticipated that the structure of the civilian service would not compare to

that of an MTF. Physical training or the goal of maintaining a military affiliation during treatment are not typical components of a civilian inpatient psychiatric center.

The purpose of this research was to evaluate only the financial alternatives to providing inpatient psychiatric care to active duty patients. Given that, the model developed yields an unbiased, reasonable estimation of those costs under various conditions. Continued study in this area could refine the estimation of costs through the inclusion of those factors previously mentioned.

If it is determined that maintaining an MTF as the provider of inpatient active duty psychiatric services is desirable, then the results of this study could be used to justify additional staffing or funding. The study may prove to be the discriminator within the GPRMC in deciding to fund DACH for the mission proposed in 1995. The model could be used by other regions within the Army Medical Command to evaluate whether inpatient active duty psychiatric care is being provided in the most cost effective manner in those regions. If the GPRMC values the cost avoidance possible through the use of supplemental care funding, then this study could encourage the closure of MTF wards and assist the region in gaining economies of scale in purchasing inpatient psychiatric services.

Today, the Army and the Department of Defense are developing better accounting systems as managed care, in the form of Tricare, requires us to make a more quantified examination of our business practices. From these examinations we will hopefully be able to define why military medicine should continue to provide peacetime medical care. Cost as well as quality and access are considerations. This study identifies that better practices to deliver inpatient

active duty psychiatric services exist. Now, the best practices need to be defined so that our primary beneficiaries, our active duty soldiers, can receive the care they deserve.

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**Figure Captions**

**Figure 1.** Depiction of linear supply relationship between cost and quantity of inpatient psychiatric care.

**Figure 2.** Depiction of non-linear supply relationship between cost and quantity of inpatient psychiatric care. Application of a linear model to such a relationship reduces the predictive value of the model.

Figure 1.

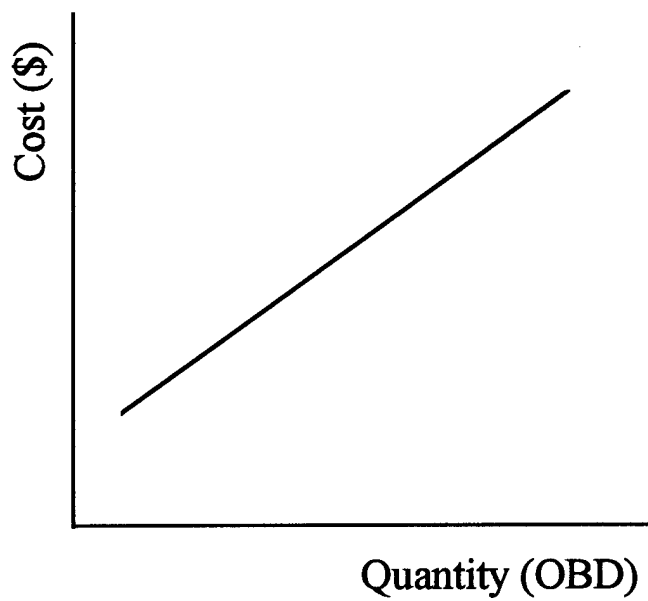


Figure 2.

