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Personnel Correlates of Behavioral Health Visits and Resource Utilizations

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“The willingness with which our young people are likely to serve in any war, no matter how justified, shall be directly proportional as to how they perceive the Veterans of earlier wars were treated and appreciated by their country.” ~George Washington

Short on words but long on gratitude I wish to thank the following, the gracious Lord, every honorable military service member, the superior Evans Army Community Hospital Staff, my beautiful wife, my patient preceptor LTC Noel Cardenas, my brilliant faculty reader Dr. Kenn Finstuen, and everyone else that has assisted me in this and every endeavor.

Abstract

Resource utilization for behavioral healthcare at Fort Carson has been increasing since the year 2000. Traditionally, a static algorithm based upon population and provider ratio has been used to forecast resource utilization. A more effective forecasting methodology would use a scientifically derived predictive equation based upon personnel correlates. Establishing personnel correlates with behavioral health resource utilization is the focus of this graduate management project. A literature review identified 11 personnel variables of interest. Study constraints eliminated five of these variables, while three (pay grade, age and unit of assignment) were determined to be correlated with resource utilization (encounters and Relative Value Units) and 3 (number of dependents, race and gender) were determined to not be correlated. In this retrospective field study, 1,953 records were pulled from the Military Health System Data Mart (M2) during the 2006 Fiscal Year (FY) and were analyzed using Pearson Product Moment Correlation, t tests, ANOVA and regression. The variables found to be related with encounters included; pay grade, $F(10, 1942) = 5.76, p < .001$, age, $F(1, 1951) = 5.51, p < .05$, and unit of assignment, $F(7, 1945) = 5.07, p < .001$. The variables found to be associated with RVU utilization included, pay grade, $F(10, 1943) = 4.94, p < .001$, and unit of assignment, $F(7, 1945) = 4.27, p < .001$. A regression analysis of the age variable revealed a trend for older soldiers to utilize less encounters, $\text{encounters} = 7.508 + (-.080)\text{age}$.

Disclosure Statement

The opinions or assertions contained herein are the private views of the author and are not to be construed as official or reflecting the views of the U.S. Department of the Army or the U.S. Department of Defense.

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Personnel Correlates of Behavioral Health Visits and Resource Utilizations

Introduction

The purpose of this paper is to establish personnel correlates of behavioral health visits and resource utilization at the Fort Carson Medical Activity (Fort Carson MEDDAC). This is important because it identifies soldier demographics that require attention when planning behavioral health care for this population. Identifying these demographic variables is also a prerequisite to creating a predictive model that would accurately forecast the demand for behavioral health resources within a population.

The challenge then is to align behavioral health resources with these identified demographics to deliver timely, effective, efficient care. The unit of analysis is behavioral health resource utilization and variables of interest include pay grade, age, number of dependents, race, gender, and unit of assignment.

Conditions that prompted the study

Increasing Behavioral Health Resource Utilization

Inpatient visits in the Evans Army Community Hospital (EACH) catchment area for behavioral health diagnoses, have increased from 112 in fiscal year (FY) 2002 to 317 in FY2005. Adjusted for population, this represents a 116% increase in behavioral health service utilization. The increased utilization of behavioral health resources has occurred following military deployments to Afghanistan in 2001 (Abrashi, 2006) and Iraq in 2003 (Frank, 2006). Furthermore, it has not been limited to inpatient and outpatient services. Medical boards initiated for mental health reasons including, Post Traumatic Stress Disorder (PTSD) and Anxiety Disorder, increased from four in FY2000 to 68 in FY2005 (data for 2006 are not complete yet).

Purchased care is care that cannot be provided by the military health system locally, and is purchased from civilian providers (Defense Health Program, 2007). This type of care is typically considered “expensive” compared to providing beneficiary care through military treatment facilities (MTFs). Purchased care for behavioral health inpatient stays has increased 468% from FY2002 to FY2005 (purchased care data not available prior to 2002).

This increase in behavioral health resource utilization is the unit of analysis. In determining the relationship between demographic personnel variables and resource utilization, a predictive model can be developed to match resource utilization with resource allocation.

Matching Demand with Resources

In order to continue efficiently matching resource deployment with demand, EACH must develop an accurate business plan. Just like civilian healthcare organizations must develop business plans based upon accurate forecasting, EACH should develop a behavioral health formula to forecast demand, utilizing a statistically rigorous methodology (PriceWaterhouseCoopers, 2005). The business plan developed utilizing this formula would then drive resource allocation as well as service expansion or contraction.

Current Resource Deployment Plan

The TRICARE Management Activity (TMA) is responsible for managing TRICARE; managing and executing the Defense Health Program (DHP) appropriation and the Department of Defense (DoD) Unified Medical Program; and supporting the Uniformed Services in implementation of the TRICARE Program and the Civilian Health

and Medical Program of the Uniformed Services (CHAMPUS) (DoD Directive 5136.12, 2007). The current methodology TMA uses to forecast behavioral health utilization is a factor multiplier based upon a static algorithm, adjusted for provider full time equivalents (FTEs) and enrollment population (D. Downs, personal communication, September 17, 2006). This forecast is then used by military treatment facilities to program resources to meet the need for services. In light of the current operational tempo of the Army, this static algorithm, developed during a peacetime environment and devoid of demographic inputs such as rank, age or unit of assignment, may not accurately forecast the behavioral health demand of Fort Carson soldiers.

A static formula also does not address the changing needs of the Fort Carson community. For instance, "In FY01 EACH closed its inpatient mental health due to low daily census and the increasing costs to maintain the ward (T. O'Haver, personal communication, September 10, 2006)." Since that time, and following increased utilization of inpatient behavioral health by the active duty population, a new business case analysis (BCA) has been initiated to reexamine the benefit of EACH providing inpatient psychiatric services. Accurate forecasting based upon a scientifically derived predictive formula would benefit the effort to match patient care needs with Fort Carson MEDDAC resources.

Periodic reexamination of resource matching to need is necessitated by changing soldier populations and changing healthcare needs. As an example, the Base Realignment and Closure mandates are adding almost 12,000 soldiers to Fort Carson over the next few years (N.J. Cardenas, personal communication, March 7, 2007). This almost doubles the current Army soldier population.

Future Deployment of Resources Plan

Congress has control of the Military Health System (MHS) budget and maintains oversight of expenditures by reviewing resource justification for requested resources (Organization of the Congress, 1993). A logical plan matching need with money is preferred when requesting an increase to an activity's budget. BCAs are used to delineate the costs and benefits of expending resources to care for beneficiaries (MEDCOM, 2006). It is imperative that an accurate forecast of resource utilization is developed when preparing the BCA to adequately analyze the cost and benefit of expending resources and caring for beneficiaries (MEDCOM, 2006). Difficult decisions in the strategic deployment of services or resources are wholly influenced by BCAs prepared with forecasted data. Thus, a formula derived from a sound statistical application of quantifiable personnel correlates can be paramount in forecasting demand for services.

Accurate resource deployment following business case analysis will increase the return on investment of the Fort Carson MEDDAC in providing behavioral health care to beneficiaries who need it. Resource requirements, such as personnel and supplies, must be requested, ordered and budgeted to accurately match the forecasted demand. Determining personnel correlates associated with increased resource utilization can help budget resources efficiently in the provision of care.

Additional Behavioral Health Considerations

In addition to the increased workload and necessary resources, scrutiny of the behavioral health provisioning for returning soldiers has dictated constant monitoring and improvement of behavioral health resource deployment. Increased requests for information regarding the status of ill soldiers, progress in the medical board process and

potential lost productivity to line units, from line commanders and media have prompted investigations into the efficacy of behavioral health resource allocation. Adequate forecasting of behavioral health utilization can position the Fort Carson MEDDAC Commander to proactively engage other unit commanders in plans to increase the efficacy of force protection measures and reduce the impact of behavioral health issues on Fort Carson soldiers.

Utility of Study

Identifying personnel correlates for increased behavioral health utilization will allow the USA MEDDAC Fort Carson Commander to strategically focus resources in the most efficient manner. Identifying personnel demographics correlated with high utilization of behavioral health services will allow the Commander to preposition personnel and supplies where needed. Pushing healthcare forward to those in need can prevent and mitigate behavioral health crises (Gidron, et al. 2001). With a more accurate indicator of utilization, the Commander can position the appropriate amount of providers at the Soldier Readiness Processing (SRP) sites or budget the appropriate amount of purchased care necessary to care for Fort Carson soldiers. Outreach programs can be developed to administer preventative care likely to reduce morbidity associated with behavioral health crises (Armfield, 1994). This is preferable to blanketing a soldier population with behavioral health resources that are not required.

Additional Benefits of Demographic Identification

The current screening tool used to identify soldiers with behavioral health issues before and after deployments is the Post Deployment Health Assessment (PDHA) DD 2796. Efforts to validate this screening tool are ongoing (Hoge & Wright, et al., 2004).

Identifying demographic personnel variables that correlate with higher behavioral health utilization can assist providers in identifying soldiers in need of service referral in addition to the PDHA.

Identification of at risk soldiers via the developed personnel correlates, will key behavioral health professionals in to those soldiers most likely to develop problems. Behavioral health professionals can then take a closer look at the answers provided on the PDHA screening tool, to assist with accurate reporting and identification of soldiers who need help.

Statement of the Problem

The increasing costs of behavioral health care for the Fort Carson MEDDAC (438% increase in purchased care over five years), the outdated forecasting technique for behavioral healthcare (static algorithm with no personnel correlates) and the increasing scrutiny of behavioral health care delivery, suggest the need for a review of behavioral health utilization at Fort Carson.

In the face of the current Army operational tempo, the increased rate of behavioral healthcare is likely to continue. Although the current resources in place to address behavioral health care are sufficient, this may not be the case, should the needs of the population continue to grow. A quantitative plan forecasting Fort Carson need must be presented to the Medical Command (MEDCOM) to receive resources. The current static algorithm that dictates the forecast only partially accounts for the factors that drive behavioral healthcare resource utilization.

The increasing media scrutiny of veteran's treatment especially in regards to behavioral healthcare, dictate the need for a plan to provide highly effective and efficient

care. In order to meet the needs of the behavioral health population, those needs must be identified through scientific study.

In short, by analyzing the demographics of the soldiers using behavioral health services at Fort Carson, using correlation and ANOVA, significant variables for inclusion in a predictive model may be identified.

Literature Review

Intense media focus regarding PTSD in Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF) combat veterans has spotlighted the military's efforts to care for wounded troops suffering from a variety of behavioral and mental issues (Armed Forces Press Service, 2005; MSNBC, 2004; Newsweek, 2005; USA Today, 2006). Hoge and Castro et al. (2004) claim the reported prevalence of behavioral and mental health problems among OIF veterans is between 15.6 and 17.1%, and for OEF, 11.2%. This can be compared to a rate of 15% among Vietnam veterans. These problems encompass a range of clinical diagnoses including major depression, generalized anxiety and PTSD. Friedman suggests that the "risk factors for persistent PTSD are primarily associated with variables relating to the current time frame: current emotional sustenance, current structural social support, and recent life events (Friedman, 2004)."

Wolf, Erickson, Sharansky, King and King (1998) showed that PTSD symptoms are stable or tend to increase over time. Additionally, there is evidence to suggest that PTSD can be reversible (Friedman, 2004). It is therefore crucial that combat veterans who suffer from PTSD or any other identifiable behavioral or mental health disorder be

identified and treated as early as possible (Foster, Jones, & Conduct Problems Prevention Research Group, 2005).

A complicating factor involved in treating afflicted soldiers is the reluctance of these soldiers to seek treatment (Bliese, Wright, Thomas, Adler, & Hoge, 2004). It is estimated between 60% and 73% of identified veterans do not receive treatment. Only 23% to 40% of veterans identified by screening measures as having a disorder indicated interest in receiving help (Hogue, Wright et al., 2004). Veterans identified as potentially having a mental health issue were twice as likely to be concerned about stigmatization and other barriers to treatment.

The literature is replete with studies that examine the effects of combat years after operations and thus interject an element of construct instability. "The long recall period after exposure introduces questionable validity in measurement. Very few studies have examined a broad range of mental health outcomes near to the time of subjects' deployment (Hogue, Castro, et al., 2004)." The current study eliminates the delay time between combat and symptom onset.

The Hogue study identified a significantly higher instance of positive screening for major depression, PTSD and alcohol misuse following deployment to combat operations. Furthermore, a linear relationship exists between the number of firefights a soldier engaged in and the prevalence of PTSD. This relationship held regardless of theater of operation (OEF or OIF) (Hogue, Wright, et al., 2004).

Pre-military and military trauma, have different effects on male and female soldiers (Knudson, Durand, & Stretch, 1996). In a 1996 study, women reported significantly more symptoms of PTSD than did male counterparts, and consequently

reported greater psychological stress (Knudson, et al., 1996). A study designed to include the effects of gender in PTSD outcomes from the Gulf War found women exceeded the screening criteria for PTSD at a rate over three times that for men. Re-screening for PTSD after a time lapse, the study showed women were still exceeding the screening limit at twice the rate of men. Thus, gender, seems to play a significant role in mental health outcomes, with women at greater risk of screening positive for PTSD (Adler, Bliese, Castro, & Huffman, 2005; Wolfe, et al., 1999). The Knudson et al. (1996) study also identified younger subjects and subjects with less reported marital satisfaction as having more PTSD symptoms. The Wolfe et al. (1999) study found more PTSD symptoms among younger soldiers, but this was only significant for males.

Further variables of interest in the literature include higher rank, associated with higher psychological wellbeing, and marriage, associated with better mental health (Adler, et al., 2005). Previous deployment is associated with less depression and less symptoms of PTSD in male soldiers (Adler, et al., 2005). Wolfe et al. (1999) found male soldiers with more education less likely to suffer from PTSD.

Purpose

The purpose of this study is to identify personnel demographics associated with increased usage of behavioral health resources in the U.S. Army at Fort Carson, Colorado. This study validated the correlation of several variables pulled from current literature with behavioral healthcare utilization at Fort Carson. The significant variables can be used to aid providers in profiling soldiers at higher risk of behavioral health problems and to align healthcare resources with the need for them at Evans Army Community Hospital.

The literature review has identified the following independent variables as having an effect on behavioral healthcare utilization; number of previous deployments, number of previous outpatient behavioral health visits, pay grade, age, marital status, number of dependents, years of education, home of record, race, gender, military occupational specialty and identification of religion. Six variables available from the military health system mart (M2) were examined in this study; pay grade (x_1), age (x_2), number of dependents (x_3), race (x_4), gender (x_5), and unit (x_6). An example of the study model is included in Figure 1. This model can then be used to align resources with need in the local soldier population.

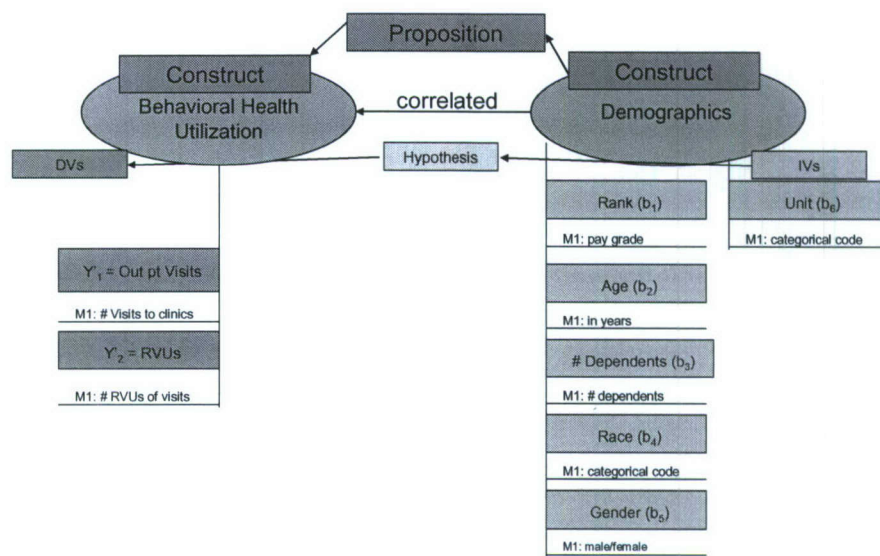


Figure 1. Behavioral Healthcare Utilization Correlates

Multiple measures of behavioral healthcare utilization have been defined and used to achieve construct validity from convergent alternative measurements (Bacharach, 1989). Thus, the measurement of the variables of interest are the number of behavioral health outpatient visits and the number of Relative Value Units (RVUs) produced by behavioral healthcare at EACH's clinics.

A difference in visits and utilization based upon the correlated variables is the expected result in this analysis. The working hypotheses are included as follows:

Null Hypothesis (H_0) – There is no difference in behavioral healthcare utilization by soldiers based upon the identified demographic variables.

Alternate Hypothesis (H_a) – There is a difference in behavioral healthcare utilization by soldiers based upon the identified demographic variables.

Methods and Procedures

Who (subjects, objects or events measured)

The major objective of this study is to identify personnel correlates with increased behavioral healthcare utilization for active duty soldiers. The medical records of a modern U.S. Army Brigade Combat Team (BCT) provided the subjects and events measured in this study. The records of all soldiers utilizing any of the Fort Carson MEDDAC behavioral health clinics, from September 2005 to September 2006, were included in this study. The records contain quantifiable measurements of all variables of interest. Therefore, 1,953 records provided the objects measured in this project.

What (study design, types of data and variables)

A retrospective cross sectional data analysis was conducted in a field environment. Following the identification of demographic variables that are associated with behavioral healthcare utilization from previous literature, Pearson Product Moment Correlations, ANOVA and regression were used to specify and estimate the correlation of the variables with visits and behavioral healthcare resource utilization.

The construct of interest is behavioral healthcare utilization. This construct is operationalized into two separate measurements to provide two different methods for evaluating the same construct. First, behavioral health utilization is defined as a count of all behavioral health visits, per record to EACH clinic, from the identified Army Brigade Combat Team from September 30, 2005 to September 30, 2006. Next, the number of RVUs produced per record for behavioral healthcare during the time period September 30, 2005 to September 30, 2006 provides the second dependent variable.

Independent variables identified in the literature as having an impact on behavioral health care utilization include pay grade, age in years, number of dependents, race and gender. Pay grade is a categorical value that represents the rank achieved by a service member based upon a number of advancement criteria. Within the military there are a total of 24 pay grades, while in the sample, 11 pay grades were represented (Table 1). To facilitate correlation analysis between pay grades, each pay grade was designated a binary variable coded 1, all others 0. Age is a continuous variable identified in the medical record as simply the number of years from birth. The number of dependents is also a continuous variable pulled from the record that includes all individuals recognized by the military database system, Defense Eligibility and Enrollment System (DEERS). These can include natural children, stepchildren, adopted children, spouses, parents, or in laws under certain circumstances. Race is a self reported categorical variable that is entered in the M2 database. In this study, race was designated a binary variable coded as Caucasian = 1, all others, 0. Gender is a binary variable with males coded 1, all others, 0.

Table 1
Code Sheet

Equation Coefficient	SPSS Code	Label	Description	Operationalized	Variable Type	Data Source	Literature Source
X1	PayGrade	Pay Grade	Military pay grade	1 = E1 2 = E2 3 = E3 4 = E4 5 = E5 6 = E6 7 = E7 8 = E8 14 = O1 15 = O2 16 = O3	Catagorical	M2	(Adler, 2005)
X2	Age	Age	Age in years		Continuous	M2	(Wolfe, 1999)
X3	Kids	# dependents	Number of dependents		Continuous	M2	(Adler, 2005)
X4	Race	Race	Self reported ethnicity	1 = Caucasian 0 = Other	Catagorical	M2	
X5	Gender	Gender	Gender	1 = Male 0 = Female	Catagorical	M2	(Knudson, 1996)
X6	UnitCodeSmall	Unit of Assignment	Unit soldier assigned	1 = BSB 2 = HHC, BDE 3 = 2 INF BN 4 = 1 INF BN 5 = CAV 6 = STB 7 = FA 8 = Other	Catagorical	M2	

How (the type of analysis to be employed)

The analysis of the data involved various statistical methods starting with descriptive statistics. Pearson Product Moment Correlation was used to identify the correlation between the variables of interest and encounters and RVUs. The use of the student t test identified statistically significant correlations between the developed bivariate variables of pay grade, race, gender and unit and the dependent variables encounters and RVUs. Additionally, one way ANOVA was used to analyze the difference of group means for the categorical variables of interest. Linear regression provided an analysis of the variable age. This analysis provides a means to test the hypotheses that each variable of interest is correlated with the level of behavioral health utilization of a soldier.

When

This cross sectional study utilized the electronic records of soldiers from September 30, 2005 to September 30, 2006, identified through an aggregated database maintained by the military health system. This period was chosen as a representative convenience sample because it includes the most recent and complete data available. The utilization of the military fiscal year, as opposed to the calendar year, was merely a conventional determination.

Where

This field study was conducted using documentation of care received at Fort Carson, Colorado, by a tenant Brigade of the local Army garrison. All encounters were recorded by six clinics of the local military treatment facility (psychiatry, psychology, social work services, social work manager program, family advocacy and Army Substance Abuse Program) and represent the total outpatient behavioral healthcare provided by the facility for active duty service members. The records used are stored on a national database used by the military health system to record, monitor and research military healthcare delivery. Access to this database is provided world wide by a dedicated internet connection that is restricted to those with a verified need to use the system.

Sampling procedures and means of gathering data

In 2005, one of the major units at Fort Carson had returned from deployment to Iraq. The year was spent refitting equipment and personnel, training for another deployment and attending to the administrative details of a modern combat team. This provided an opportunity for soldiers in the Brigade to seek health care from the Fort

Carson MEDDAC, a tenant organization of the Fort Carson garrison. This schedule provided a natural point from which a convenience sample was drawn to study the issue of personnel correlates with behavioral health care visits and resource utilization. Data were collected for the period September 30, 2005 through September 30, 2006, from M2 regarding behavioral health visits and RVUs.

A request for information was presented to a data analyst within the Fort Carson MEDDAC, to provide an Excel spreadsheet with the requested data, pulled from the M2 database. Once the data were gathered in Excel, it was exported to SPSS for analysis.

The Brigade Combat Team under study is representative of the range of Army units assigned to combat duty in Iraq. Chosen for convenience, it is composed of a similar number of soldiers, of similar background and job specialties as other active Brigades within the Army. It is organizationally aligned like other Brigade Combat Teams in the Army. This specific Brigade has deployed to Iraq more than once, as most Brigades have, and is stationed in the western United States. Only complete records were utilized and yielded a sample size of 1,953 records.

Validity and Reliability

Using two separate measurements, each representative of a similar construct, concurrent findings represent a multiple measures reliability check. Some variability in the results of correlations between the measures is expected as RVUs were created with the intent to more accurately record work effort by provider staff than that measured by visits. However, both are an accepted work effort measure used in the general literature. The use of commonly referenced variables of interest identified by literature review also

provides a repeated measures reliability check, as well as supporting the general validity of the study.

Reliability is strengthened using the M2 database, because well established data entry methods clarify both what and how data is entered into the database. This standardization is a positive step toward the reproduction of results in further studies. This aggregated database also provides information on a large enough population that sample sizes can be large and therefore provide more statistically powerful results, a further step in establishing confidence in reproducible results.

Data analysis techniques

Pearson Product Moment Correlations, t tests, ANOVA and regression were conducted on the data using the software package Statistical Package for the Social Sciences (SPSS) version 12.

Expected findings and utility of results

The validation of variables identified in the general literature as correlated with increased behavioral healthcare utilization was the expected finding of this study. By validating these variables, further study can be conducted in search of a predictive model of behavioral healthcare utilization for soldiers using Army Medical Department resources. It was expected that variables identified in the general literature were to be correlated with healthcare utilization within the military setting, as they do not represent a significant departure from the civilian relationship of these variables.

Higher awareness of personnel demographics associated with higher behavioral healthcare utilization also provides a useful starting point for further analysis of the

relationship between predisposing factors, mechanism of injury and necessary treatment resources.

Though beyond the scope of this study, the effects of the combined variables should provide the means to conduct a regression equation that will provide a highly accurate forecast of behavioral healthcare utilization among U.S. Army soldiers.

A predictive equation would prove more accurate than the current static algorithm used to forecast behavioral health resource requirements at the MEDDAC. A new more accurate prediction should lead to a better business plan that when executed by the Commander more efficiently meets the needs of the soldiers needing behavioral healthcare. This efficacy in treatment would translate to better stewardship of MEDDAC and taxpayer resources.

A predictive equation could also classify the risk a soldier has of being in need of behavioral health resources. This risk classification could then be translated to proactive health protection measures aimed at reducing the likelihood of necessary behavioral health treatment.

Results

Tables 2, 3, and 4, show the descriptive statistics for the outcome variables. Means and standard deviations for the continuous variables are shown in Table 2, with categorical means and standard deviations depicted in Table 3. Pearson Product Moment Correlations are presented in Table 4. Although there seems to be some variability between encounter and RVU means for the variables of race and gender, one way ANOVA indicates these differences are not statistically significant (Table 5). Likewise,

correlations in Table 4 indicate no significant change in resource utilization based upon the number of dependents a soldier has.

Table 2
Descriptive Statistics for Continuous Personnel Demographics

Variable	Mean	SD
Age (years)	25.02	5.26
# of Dependents	1.05	1.37

n = 1,953

Three variables exhibited significant correlations with resource utilization, pay grade, age and unit of assignment. Soldiers at the lowest pay grades (E1 and E2) generally used less encounters and RVUs for behavioral healthcare than average. Soldiers in the pay grade of E3 and E4 used significantly more encounters and RVUs than did other soldiers, while soldiers in the pay grade of E6 tended to use less behavioral health resources. Officers also tended to use less behavioral health resources, exhibiting significant negative correlations. These observations were supported by the results of a one way ANOVA for the pay grade variable (Table 5). These results suggest a curvilinear relationship between enlisted pay grade and behavioral health resource utilization.

Table 3

Descriptive Statistics for Categorical Personnel Demographics

Personnel Demographic	Sample Size		Encounters		RVUs	
	n	Percent	Mean	SD	Mean	SD
PayGrade						
E1	122	6.25	4.72	5.68	6.33	7.44
E2	129	6.61	4.50	5.01	6.98	7.40
E3	245	12.54	7.40	10.85	9.80	13.67
E4	805	41.22	6.36	8.45	8.59	10.14
E5	374	19.15	4.56	6.53	7.04	9.02
E6	165	8.45	4.13	7.47	6.20	9.56
E7	43	2.20	3.30	6.75	4.96	6.77
E8	11	0.56	2.18	2.64	3.23	4.91
O1	11	0.56	1.09	0.30	1.12	1.08
O2	20	1.02	2.00	3.20	2.38	2.49
O3	28	1.43	1.43	0.92	2.76	1.94
Race						
Caucasian	1295	66.31	5.62	8.21	7.97	10.44
African American	278	14.23	4.57	6.42	6.49	7.70
Hispanic	226	11.57	6.16	8.29	8.16	10.20
Asian	114	5.84	4.16	5.75	5.70	7.17
Other	40	2.05	7.93	11.88	10.34	12.85
Gender						
Male	1793	22.07	5.46	7.79	7.61	9.80
Female	160	8.65	5.93	9.83	8.68	11.86
Unit						
Brigade Support Bn (BSB)	431	22.07	4.51	6.32	6.61	7.57
Hqtrs Company, Bde (HHC)	169	8.65	7.52	11.84	10.02	13.58
2 Infantry Bn (INFBN2)	326	16.69	5.55	8.02	7.47	9.54
1 Infantry Bn (INFBN1)	361	18.48	4.84	6.76	6.90	8.90
Calvary (CAV)	226	11.57	5.74	7.92	8.29	10.77
Special Troops Bn (STB)	200	10.24	4.99	6.69	6.97	8.13
Field Artillery (FA)	176	9.01	6.16	9.48	8.97	12.99
Other	64	3.28	9.06	9.01	11.24	12.01

Table 4
Pearson Product Moment Correlations

	r Encounters	r RVU
Utilization Measures		
Encounters	1.000	0.884 **
RVU	0.884 **	1.000
Personnel Demographic		
Pay Grade		
E1	-0.025	-0.035
E2	-0.033	-0.019
E3	0.091 **	0.080 **
E4	0.091 **	0.075 **
E5	-0.057 *	-0.032
E6	-0.052 *	-0.045 *
E7	-0.041	-0.041
E8	-0.031	-0.034
O1	-0.042	-0.050 *
O2	-0.045 *	-0.054 *
O3	-0.062 **	-0.060 **
Age	-0.053 *	-0.032
# of Dependents	-0.014	0.039
Race	-0.002	-0.019
Gender	-0.016	-0.030
Unit		
BSB	-0.066 **	-0.058 *
HHC	0.078 **	0.072 **
INFBN2	0.003	-0.010
INFBN1	-0.039	-0.038
CAV	0.011	0.021
STB	-0.021	-0.025
FA	0.026	0.040
Other	0.082 **	0.065 **

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

n = 1953

Table 5
One Way ANOVA of Categorical Variables

Variable Source		Encounters				
		SS	df	MS	F	Sig
Pay Grade	Between Groups	3574.54	10	357.45	5.76	0.00
	Within Groups	120557.66	1942	62.08		
	Total	124132.19	1952			
Race	Between Groups	59.75	1	59.75	0.94	0.33
	Within Groups	124072.44	1951	63.59		
	Total	124132.19	1952			
Gender	Between Groups	33.22	1	33.22	0.52	0.47
	Within Groups	124098.97	1951	63.61		
	Total	124132.19	1952			
Unit	Between Groups	2223.39	7	317.63	5.07	0.00
	Within Groups	121908.80	1945	62.68		
	Total	124132.19	1952			

Variable Source		RVUs				
		SS	df	MS	F	Sig
Pay Grade	Between Groups	4822.25	10	482.23	4.94	0.00
	Within Groups	189695.49	1942	97.68		
	Total	194517.75	1952			
Race	Between Groups	288.99	1	288.99	2.90	0.09
	Within Groups	194228.75	1951	99.55		
	Total	194517.75	1952			
Gender	Between Groups	169.51	1	169.51	1.70	0.19
	Within Groups	194348.24	1951	99.61		
	Total	194517.75	1952			
Unit	Between Groups	2941.58	7	420.23	4.27	0.00
	Within Groups	191576.16	1945	98.50		
	Total	194517.75	1952			

Age was negatively correlated with behavioral healthcare utilization, although this appeared to be the case only for encounters and not for RVUs (Table 6). This variable exhibited a modest correlation ($r = -.053$) as well as a modest significance, $F = 5.51$, $p <$

.05. Greater correlations and effect sizes were seen for the variable, unit of assignment (Table 5), where the unit “Others” had an $r = .082$ for encounters and $.065$ for RVUs. The Headquarters element of the Brigade also tended to use more resources, $r = .078$ for encounters and $r = .072$ for RVUs. The Brigade Support Battalion had a negative correlation with behavioral healthcare utilization ($r = -.066$ for encounters and $r = -.058$ for RVUs). The ANOVA on this variable exhibited a stronger significance than the age variable, $F = 5.758$, $p < .001$.

Table 6
Regression Analysis of Age

Encounters					
	SS	df	MS	F	Sig.
Regression	349.426	1	349.426	5.507	0.019
Residual	123782.767	1951	63.446		
Total	124132.194	1952			
RVUs					
	SS	df	MS	F	Sig.
Regression	199.197	1	199.197	2.000	0.157
Residual	194318.548	1951	99.599		
Total	194517.745	1952			

Discussion

The statistically significant variables, pay grade, age and unit of assignment do provide a starting point in the search for predictor variables of behavioral healthcare utilization. No evidence emerged for the variables of, number of dependents, race and gender provide no useful input to a regression equation that could be used to predict resource utilization.

The modest correlations seen in this study however, indicate the relationship of the variables under study only provide modest explanation for resource utilization. This modest effect size provides little support for a strong predictive model needed to accurately match resource needs to resource provision within the Fort Carson MEDDAC. In order to produce a strong predictor of resource utilization, an equation would need to include more variables with stronger shared variance. The current study points to three good variables for use in a model, and three variables that probably should not be included.

As noted before, there is a higher usage of behavioral health services by soldiers in the pay grade of E3 and E4 and less utilization by higher ranking enlisted members and officers. The encounters for junior soldiers are almost twice that of the overall average. This has grave implications for behavioral services at EACH, because these pay grades have the largest number of soldiers in them, and Fort Carson is scheduled to receive almost as many soldiers as we already have, the bulk of which will be E3s and E4s. The curvilinear relationship between pay grade and resource utilization indicates that outreach efforts would be most effective on junior soldiers.

Age was found to be negatively correlated with utilization. However, this held true only for encounters and not for RVUs. This suggests younger soldiers will need more appointments available, but not necessarily an increase in provider work effort. These soldiers will be seen more frequently, for less complicated cases. This may indicate that hiring in the Behavioral Health section should focus on lower level practitioners that can treat patients under the supervision of psychiatrists. More

generalists and fewer specialists may be used to treat the soldier population coming in for assistance.

This would certainly be a cost savings to the organization, the average salary of a psychiatrist in the US is \$168,000, while the average salary of a psychologist is \$75,000 (Salary.com, 2007). These observations are in line with a Government Accountability Office (GAO) report advocating less level 1 providers in behavioral health throughout the Department of Defense (DoD) (U.S. GAO Rep. No. 97-83, 1997).

Unit of assignment was correlated with healthcare utilization. The results of the analysis on this variable indicated some units required significantly more healthcare services than the average and some units required significantly less healthcare services than the average. The Headquarters element and soldiers from "Other" units required almost twice as much healthcare as the remaining units. It is of little use to speculate on the causative factors of this finding at this time as it is beyond the scope of this study. However, this represents an important piece of information that should be followed up on in future research. Based upon the data presented in this study, this variable would be included in a predictive model to forecast needed resources. However, more study is needed to determine how to apply this variable to a regression equation.

Using the unstandardized B coefficients from the regression analysis done on the variable, age, a regression equation can be set up as: $\text{encounters} = 7.508 + -.080(\text{Age})$. This indicates that for every year older a soldier is, that soldier will use .080 less encounters. Alternatively, for every ten years older a soldier is, he or she will on average use almost one less encounter. When extrapolated out to the very large numbers of Army soldiers, this variable may be important in programming resources. The effects of this

variable may be important when determining marketing efforts aimed at assisting all soldiers, by tailoring efforts at younger soldiers, more likely to use behavioral health resources.

Conclusions/Recommendations

Tailoring behavioral healthcare to the soldier population at Fort Carson is an art as much as a science. Several variables have been validated for use in an overall predictive model to forecast utilization. However, the small correlations of the variables, along with the lack of causative analysis render this study far from complete. The increase in scope and magnitude of the research required to validate enough demographic variables to establish a predictive model are well beyond the resources of a graduate management project.

However, the research does point toward high utilization from junior enlisted troops, younger troops and certain units. Outreach efforts and training should be targeted toward these groups to help improve the efficacy of behavioral treatment at Fort Carson. Efforts have been underway to provide “Battle Minded” training for supervisors, designed to assist Army leaders in recognizing soldiers who need behavioral health help. This study should be cited in that training as support for the value of the assisting younger enlisted troops in accessing behavioral health care when needed. Programs should be developed and delivered to the at risk population when they arrive at Fort Carson. Specific training designed for young and lower enlisted troops should be administered upon arrival. Further research with considerably more resources could provide a more detailed look at an accurate forecasting model.

Continuing this project with research into causal relationships among variables would also provide valuable insight into resource utilization. For instance, unit of assignment turned out to be significantly correlated with resource utilization. Was this because of the unit's location on the battlefield, the unit's leadership, the stress of the mission requirements or simply the personnel making up that unit? Answers to this question could point the way toward further variables to include in a predictive model of healthcare utilization.

List of Abbreviations

BCA	Business Case Analysis
BCT	Brigade Combat Team
DoD	Department of Defense
EACH	Evans Army Community Hospital
FTEs	Full Time Equivalents
FY	Fiscal Year
GAO	Government Accountability Office
MHS	Military Health System
MEDCOM	U.S. Army Medical Command
MMD	Medical Management Division
MOS	Military Occupational Specialty
M2	MHS Mart
OEF	Operation Enduring Freedom
OIF	Operation Iraqi Freedom
PDHA	Pre and Post Deployment Health Assessment
PDHRA	Post Deployment Health Re-Assessment
PTSD	Post Traumatic Stress Disorder
SRP Site	Soldier Readiness Processing Site
USA MEDDAC	U.S. Army Medical Activity

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