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The Determinants of Post-discharge Healthcare Utilization and Outcomes for Veterans with Posttraumatic Stress Disorder: A Social Ecological Perspective

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A Dissertation submitted in partial fulfillment of the requirements for
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To Shu-Ying, my lovely wife,

with the deepest love and gratitude for her immeasurable encouragement and sacrifice in all these years

To Sabrina, Cynthia, and Victor, my three adorable children,

with appreciation for the understanding and forgiveness

that I could not spend more time with you

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LIST OF ABBREVIATIONS

Aggressive Assault..ASLT

American Hospital Association ....AHA

Analysis of Covariance ....ANCOVA

Analysis of Variance ....ANOVA

Area Resource File ....ARF

Barriers of Access to Care...AC2

Centers for Disease Control..CDC

Community Residential Facilities ....CRF

Confidence Interval ....C. I.

Confirmatory Factor Analysis ....CFA

Critical Ratio ....C.R.

Department of Defense..DoD

Department of Veteran Affairs ....VA

Diagnostic Interview Schedule ....DIS

Diagnostic and Statistical Manual of Mental Disorder..........................DSM

Distance between Residence and VAMC...DIST

Electromyography ....EMG

Enhancement of Access to Care...AC1

Executive Leadership Council ....ELC

Fiscal Year ....FY

Full-time Equivalent Employee ....FTE

Functional Social Support ....FSS

Health Maintenance Organizations...HMOs

Hierarchical Linear Modeling ....HLM

International Classification of Disease, ninth version ICD-9

Intraclass Correlation ICC

Low-income Status...MEAN

Major Depressive Disorder..MDD

Myocardial Infarction ....MI

National Vietnam Veterans Readjustment Study ....NVVRS

Length of Stay ....LOS

Length of Stay for Medical Conditions..PHLOS

Length of Stay for Mental Disorder..OMHLOS

Length of Stay for PTSD...PDLOS

Medical Encounters...PHE

Modification Indices ....MI

Murder Rates...MUR

Muthen's Maximum Likelihood-based estimator ....MUML

Non-VA Length of Stay after Index Discharge...LNVAI

Non-VA Length of Stay before Index Admission...PNVAI

Non-VA Outpatient Visits after Index Discharge..LNVAO

Non-VA Outpatient Visits before Index Admission……………..……………..PNVAO

Number of Mental Comorbidities…………………………………………...NMHCO

Number of Physical Comorbidities………………………………………….NPHCO

Odd Ratio ……………………………………………………………………OR

Other Mental Health Encounters……………………………………………OMHE

Outpatient Care File...………………………………………………………OPT

Post-discharge Ambulatory Care……………………………………………PDAC

Patient Treatment File ………………………………………………………PTF

Percentage of Service-connected Disability………………………………..SCPER

Post-discharge Medical Visit………………………………………………...AFMED

Post-discharge Mental Visit…………………………………………………AFMEN

Post-discharge PTSD Visit…………………………………………………AFPTSD

Post-discharge Social Work Visit……………………………………………AFSOC

Posttraumatic Stress Disorder……………………………………………..PTSD

Prepulse Inhibition …………………………………………………………..PPI

Prior Use of Inpatient Services……………………………………………….PIU

Prior Use of Outpatient Services……………………………………………POU

Prisoners of War ……………………………………………………………POWs

Property Crime Rates……………………………………………………...PROP

Psychiatrist…………………………………………………………………...PSYMD

Psychologist…………………………………………………………………PCHO

PTSD Encounters……………………………………………………………PTSDE

Registered Nurses ....RNs

Resource Sharing Index....................AC_INX

Schedule for Affective Disorders and Schizophrenia- Lifetime version ....SADS-L

Service Line ....SL

Service Line chief ....SLC

Service Line Director....................SLD

Service Line Manager ....SLM

Severity of Mental Comorbidity....................MHCOS

Severity of Physical Comorbidity....................PHCOS

Short Form 36 ....SF-36

Social Disintegration....................SD

Social Economical Status ....SES

Social Networks....................SOCNW

Social Workers....................SOC

Square Multiple Correlations ....SMC

Standardized Mortality Rates ....SMR

Structural Equation Modeling ....SEM

Structural Social Support ....SSS

Structured Interview for PTSD ....PTSD-SI

Substance-Abuse-Related Crime Rates....................SA

Uniform Crime Report ....UCR

Veterans Affairs Medical Centers....................VAMCs

ABSTRACT

THE DETERMINANTS OF POST-DISCHARGE HEALTHCARE UTILIZATION AND OUTCOMES FOR VETERANS WITH POSTTRAUMATIC STRESS DISORDER: A SOCIAL ECOLOGICAL PERSPECTIVE

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A Dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University

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Posttraumatic stress disorder (PTSD) has a persistent nature: PTSD troubles patients even decades after the occurrence of traumatic events. The "health behavioral model" is adopted to examine the effects of external environmental, predisposing, enabling, and need for care factors on the use of VA post-discharge ambulatory care and readmissions. Data were obtained form the Patient Treatment File (PTF) and the Outpatient Care File (OPT), the Area Resource File (ARF), American Hospital Association data sets (AHA), and the Uniform Crime Report (UCR).

The use of VA post-discharge ambulatory care is analyzed by using structural equation modeling (SEM). The readmission to VAMCs is evaluated by Cox regression with forward selection. A cross-sectional study is performed on 1,420 PTSD veterans admitted to Veterans Affairs Medical Centers (VAMCs) in 1994 and 1,517 veterans in 1998 in the Veterans Integrated Services Networks 6 (VISN 6).

In both years, the most important determinants of the use of VA post-discharge ambulatory care is "prior use of outpatient care services." For the 1994 sample, prior use of inpatient services impeded the utilization of post-discharge ambulatory care. For the 1998 sample, barriers to access to care and the length of stay for other mental health encounters in the last year reduced the utilization of post-discharge ambulatory care.

For readmission in both years, higher numbers of medical or mental VA post-discharge visits reduce the likelihood of readmission to VAMCs.

The service lines program was found to increase the use of VA post-discharge ambulatory care and decrease readmission rates for PTSD veterans.

The application of the "health behavioral model" can be extended to outcome research to investigate the contributing factors. A risk adjustment system can also be developed based upon the findings.

Communities, VAMCs, and PTSD patients and their families should work to raise awareness of the factors that contributing to both use of care and outcomes, and should form a comprehensive network to improve the well-being of PTSD veterans.

CHAPTER 1
INTRODUCTION

The effects of war on US military personnel can be expressed by their losses, including deaths and casualties. It is estimated by the Department of Defense (DoD) (1998) that the number of battle deaths ranges from thirty-three thousand for the Korean conflict to two hundred ninety-one thousand for World War II. As for the wounded, one hundred and three thousand for the Korean Conflict, and six hundred and seventy-one thousand for World War II are documented (Table 1). Moreover, the damages of war include not only the loss of many troops and the physical damage of the wounded, but also psychological effects of the loss of the will to fight, for both the wounded soldier and his/her fellow soldiers (Sun tze, 1988).

These physical damages and psychological effects may impede soldiers' lives long after their discharge from the military. Some of them need compensation and pensions provided by the Department of Veteran Affairs (VA) (Coppola et al., 1998; Frueh et al., 1997). Some veterans, after discharge from the Armed Forces, face problems reentering society and adjusting to occupational and family life (Forman et al., 1990; Johnson et al., 1996; Jordan et al., 1992; McFall et al. 1991). Using a 1987 national survey of veterans, Rosenheck et al. (1993) found that high illness level, service-connected disability, and lack of health insurance are the strongest predictors of veterans' health service use. Significant associations were also found between military service during a wartime era, in a war zone, and in combat, and health service utilization by veterans. These studies indicate that veterans who had directly or indirectly participated in a combat experienced adverse effects from war. The war experience creates a hazard to veterans' physical or mental health that warrants proper medical attention.

Table 1. Number of Deaths and Casualties from War World I to the Vietnam Conflict, for U.S. Military Personnel

War/ Conflict	Branch of Service	Number of Serving	Battle Deaths	Other Deaths	Wounds
WWI (1917-1918)	**Total**	**4,734,991**	**53,402**	**63,114**	**204,002**
	Army	4,057,101	50,510	55,868	193,663
	Navy	599,051	431	6,856	819
	Marines	78,839	2,461	390	9,520
WWII (1941-1946)	**Total**	**16,112,566**	**291,557**	**113,842**	**671,846**
	Army	11,260,000	234,874	83,400	565,861
	Navy	4,183,466	36,950	25,664	37,778
	Marines	669,100	19,733	4,778	68,207
Korean Conflict (1950-1953)	**Total**	**5,720,000**	**33,651**	**3,262**	**103,284**
	Army	2,834,000	27,709	2,452	77,596
	Navy	1,117,000	475	173	1,576
	Marines	424,000	4,269	339	23,744
	Air Force	1,285,000	1,198	298	368
Vietnam Conflict (1964-1973)	**Total**	**8,744,000**	**47,378**	**10,799**	**153,303**
	Army	4,368,000	30,922	7,273	96,802
	Navy	1,842,000	1,631	931	4,178
	Marines	794,000	13,084	1,753	51,392
	Air Force	1,740,000	1,741	842	931

Source: Table 2-23, Principal wars in which United States participated, U.S. military personnel serving and casualties. Military Casualty Information, Department of Defense. (1998). Internet site:web1.whs.osd.mil/mmid/m01/sms223r.htm.
Note: WWI: World War I, WWII: World War II.

Statement of Problem

Among various medical and psychiatric conditions that trouble veterans, posttraumatic stress disorder (PTSD) is a psychiatric disorder that has disturbed veterans even decades after they have been discharged from the military. PTSD was call 'shell shock' during World War I and later, in World War II, 'combat fatigue' (Lipton, 1994). Different names and codes for the same disorder were presented in different versions of Diagnostic and Statistical Manual of Mental Disorder (DSM). In DSM III, for instance, it was separately coded as 308.30 for post-traumatic stress disorder, Acute, and 309.81 for post-traumatic stress disorder, chronic or delayed. In DSM III-R (Revised), it was coded as 309.89 and with only one name: post-traumatic stress disorder. However, in latest version: DSM-IV (Frances et al., 1995), it is coded 309.81, and with a new name: posttraumatic stress disorder.

DSM-IV specifies diagnostic criteria for PTSD as follows:

A. The person has been exposed to a traumatic event in which both of the following were present:
   (1) The person experienced, witnessed, or was confronted with an event or events that involved actual or threatened death or serious injury, or a threat to the physical integrity of self or others.
   (2) The person's response involved intense fear, helplessness, or horror.

B. The traumatic event is persistently reexperienced in one (or more) of the following ways:
   (1) Recurrent and intrusive distressing recollection of the event, including images, thoughts, or perceptions.
   (2) Recurrent distressing dreams of the events.
   (3) Acting or feeling as if the traumatic event were recurring (includes a sense of reliving the experience, illusions, hallucinations, and dissociative flashback episodes, including those that occur on awakening or when intoxicated).

(4) Intense psychological distress at exposure to internal or external cues that symbolize or resemble an aspect of the traumatic event.
(5) Physiological reactivity on exposure to internal or external cues that symbolize or resemble an aspect of the traumatic event.

C. Persistent avoidance of stimuli associated with the trauma and numbing of general responsiveness (not present before the trauma), as indicated by three (or more) of the following:
(1) Efforts to avoid thoughts, feelings, or conversations associated with the trauma.
(2) Effort to avoid activities, places, or people that arouse recollections of the trauma.
(3) Inability to recall an important aspect of the trauma.
(4) Markedly diminished of interest or participation in significant activity.
(5) Feeling of detachment or estrangement from others.
(6) Restricted range of affect (e.g., unable to have loving feelings).
(7) Sense of a foreshortened future (e.g., does not expect to have a career, marriage, children, or a normal life span).

D. Persistent symptoms of increased arousal (not present before the trauma), as indicated by two (or more) of the following;
(1) Difficulty falling or staying asleep.
(2) Irritability or outbursts of anger.
(3) Difficulty concentrating.
(4) Hypervigilance.
(5) Exaggerated startle response.

E. Duration of the disturbance (symptoms in Criteria B, C, D) is more than 1 month.

F. The disturbance causes clinically significant distress or impairment in social, occupational, or other important areas of functioning.

Specify if:
Acute: if duration of symptoms is less than 3 months.
Chronic: if duration of symptoms is 3 months or more.

Specify if:
With Delayed Onset: if onset of symptoms is at least 6 months after the stressor.

Besides symptoms specified in DSM IV, other comorbidities such as substance abuse, depression, anxiety, and paranoia have been documented (Bullman et al., 1994; Davidson et al., 1990; Kulka et al., 1990). This indicates that PTSD is a complex mental disorder and may have severe effects on a patient’s functioning and social interaction.

The current prevalence rates of PTSD have been estimated as15.2% for male Vietnam theater veterans and 8.5% for their female counterparts. Lifetime prevalence rates were 30.9 % and 26.9% for male and female veterans, respectively (Kulka et al., 1990). Engdahl et al. (1991) conducted a study on sixty-two prisoners of war (POWs) from World War II: fifty percent met the DSM-III PTSD criteria within 1 year of release, and 29% continued to meet the criteria 40 years later at examination (chronic PTSD). Engdahl et al. (1997) studied another group of 262 U.S. World War II and Korean War former POWs. More than half of the men (53%) met the criteria for lifetime PTSD, and 29% met the criteria for current PTSD. The most severely traumatized group (POWs held by the Japanese) had PTSD lifetime rates of 84% and current rates of 59%. One hundred and fifty-six wounded Vietnam veterans were studied by Pitman et al. (1989) for PTSD; 40% had a definite or probable lifetime diagnosis of PTSD. Among 27 interviewed patients with lifetime PTSD, 81% currently met the PTSD criteria. Stretch et al. (1996) studied 4,251 veterans of the Persian Gulf War, 1,524 of whom deployed and 2,727 of whom did not deploy to the Persian Gulf. The study results indicated the likelihood of PTSD symptoms in approximately 8.0% of the active duty veterans and in 9.3% of the reserve veterans who were deployed to the Persian Gulf. In a study of sixty Israeli veterans who had fought in the Lebanon war, Bleich et al. (1994) found that the current prevalence rate for PTSD was 87% and the lifetime prevalence rate was 100%.

In reviewing earlier outcome studies done on PTSD patients, Hammarberg et al. (1994) found that a one-year follow-up for veterans who had completed treatment showed a return to pretreatment levels for PTSD symptom measures. Johnson et al.

(1996) found that the overall group of veterans studied revealed an increase in symptoms from admission to follow-up, and a decrease in violent actions, and thoughts and legal problems. Family and interpersonal relationships and overall morale were improved at discharge, but then returned to pretreatment levels 18 months later. The above studies indicate that PTSD is highly prevalent among veterans, and that they need medical treatment. The treatment provided, however, may not ensure a complete recovery from PTSD: the studies show that the symptoms of PTSD may rebound to pretreatment level, and the patient may have to be readmitted.

Other studies on PTSD have focused on etiology (Fontana et al., 1994; Foy et al., 1987; Gren et al., 1987; Orsillo et al, 1996); symptomatology (Baker et al., 1997; Bremner et al., 1993; Brockway, 1988; Davidson et al., 1990; Freueh et al., 1994; Hamner, 1997; Woolfolk et al., 1988); and treatment and outcomes (Davidson et al., 1990; Johnson et al., 1997; Frueh et al., 1997; Motta, 1993; Ragsdale et al., 1996; Rosenheck et al., 1997). Very few studies discuss readmission of veterans with PTSD and related factors (Bodewyns et al., 1991; Brown et al., 1995; Perconte et al., 1989; Williams et al., 1998). The intention of this study is to identify factors contributing to the readmission of veterans with PTSD as an adverse outcome.

Donabedian (1985) has broadly defined healthcare outcomes as follows:

> Outcomes are those changes, either favorable or adverse, in the actual or potential health status of persons, groups, or communities that can be attributed to prior or concurrent care. What is included in the category of "outcomes" depends, therefore, on how narrowly or broadly one defines "health" and the corresponding responsibilities of … practitioners or the health care system as a whole.

In their work, Shaughnessy et al. (1997) further categorized outcomes as: end-result outcomes, intermediate-result outcomes, and utilization outcomes. An end-result outcome refers to a change in patient health status between two or more time points. An example of an end-result outcome is the improvement of functional status of a patient between admission and discharge. An intermediate result is the change in a patient's or caregiver's behavior, emotion, or knowledge that can influence the patient's end-result outcomes, such as the change in compliance by a patient during the course of treatment. A utilization outcome refers to a type of health service use that reflects a change in patient health status over time. A substantial change in hospital admissions or discharges over time illustrates the essence of utilization outcomes. However, the change in volume of admissions or discharges alone, may not accurately reflect the change in patient health status, because the volume is subject to other environmental factors: the pressure from government regulatory authorities, Health Maintenance Organizations (HMOs), health insurance companies, or hospital administrations to contain costs (Kongstvedt, 1997; Luft, 1985).

Multiple factors influence the readmission of PTSD patients after they are discharged from Veterans Affairs Medical Centers (VAMCs), including the presence of post-discharge ambulatory care, access to care, comorbidity, social stress, and social support. The exploration of medical care outcomes at VAMCs may not capture a full picture of PTSD patients' recovery and adjustment. There is a need to explore the factors that may cause readmission of PTSD, from a multidimensional perspective that includes individual and environmental factors (Phillips et al., 1998).

Scope of Healthcare Services in Veterans Affairs Medical Centers

For veterans who need medical care, the VAMCs are a significant source of care, especially for those with service-connected disabilities or low incomes (Kizer, 1995). To provide better management and more integrated medical services, the Veterans Integration Service Network 6 (VISN 6), including 8 VAMCs in Virginia, North Carolina, and West Virginia, implemented three Service Line (SL) programs: primary care, mental health, and spinal cord injury in 1997. Primary care is the service line expected to serve as the gatekeeper, but is not limited to this function. The entry point for care can be either one of the first two service lines, depending on patients' medical conditions, and they can be referred to other service lines when the need arises (Kizer et al., 1997).

The concept of service line was first introduced by Proctor & Gamble in 1928, when it was termed product line (Hesterly & Robisons, 1988), and was first implemented by Lava soap (Rice, 1986). In the 1960's, starting from General Electric, service line management quickly spread to other Fortune 500 companies such as Union Carbide, Mead Paper, General Food, and others (Manning, 1987). The goal of a service line is to centralize planning and operations for individual services or service lines, so the organization can optimize operations and make as much profit as possible.

In the healthcare environment, the traditional departmental focus did not provide the best organizational foundation for clinical and financial evaluation and enhancement of patient care and financial performance. The organization of a service line, by centralizing both planning and operations under a single responsible executive, allows for direct management and measurement of both business and clinical processes (Kerfoot, 1993; Wojner et al., 1997).

The health services provided by the VA through VAMCs have been departmentalized and lacked integration among departments and VAMCs. The newly adopted structure of VISN is intended to align resources around patients, rather than around treatment facilities, professional disciplines, or administrative structures. VAMCs in the Network are expected to pool their resources, coordinate their services, and thus rigorously manage their costs (Kizer, 1995 & 1996). One way to realize the concept of VISN is as the implementation of service lines that link treatment facilities, caregivers, clinical services, and administrative support according to function or purpose. A service line attempts to share of resources, ideas, and information as much as possible in order to improve access, quality, efficiency, and customer satisfaction.

The basic structure of a service line is composed of a service line director (SLD) and a service line manager (SLM) at the VISN level, and a service line chief (SLC) and a staff matrix at the VAMC level (VISN 6, 1997a&b). The SLD is the internal resource and advocate for the service line at the Executive Leadership Council (ELC), and also the leader of strategic planning for the service line. The SLM is the chief operating officer for the service line and is responsible for overseeing the implementation of the plan, developing and executing the budget, monitoring outcomes, and assessing effectiveness. The SLC is responsible for planning, staffing and budget execution in terms of program administration and daily operations in each VAMC. The staff matrix or interdisciplinary team, for example, in the mental health service line, is composed of professionals from psychiatry, psychology, nursing, and social work, to provide comprehensive care to veterans with health needs.

Purpose

The primary purpose of this study is to explore the social ecological factors in terms of social and health characteristics that influence veterans' healthcare utilization and the healthcare outcome, readmission. Veterans with PTSD who have received medical care from the VAMCs in VISN 6 are the target groups in this study. The study's secondary purpose is to develop an appropriate theoretical framework for validating the proposed conceptual model. Thirdly, the study aims to adopt an appropriate methodology to analyze multi-level data that so as to tease out the relative contributions of personal and environmental factors in explaining the variation in utilization and readmission.

When multi-level data are used in a study, researchers tend to disintegrate the aggregated data to the lower level, i.e., assign the value of aggregated data to the lower level; or aggregate the lower level data to the upper level, that is, use the mean or median of the lower level to compromise the need of the upper level. From the methodological viewpoint, the former cannot satisfy the assumption of the independence of observations that underlies the traditional statistical approach (Bryk & Raudenbush, 1992; Duncan et al., 1998). Another problem posed by disaggregation is that statistical tests involving the variable at the upper-level unit are based on the total number of lower-level units, which can influence estimates of the standard errors and the associated statistical inference (Bryk & Raudenbush, 1992; Hoffmann, 1997). The aggregation may lose valuable information, in that the meaningful lower level variance in the outcome measure is ignored due to the process of aggregation (Hoffmann, 1997). It may cause the 'ecological fallacy', i.e., analyzing upper level data but interpreting the result at the lower level. In fact, most data are hierarchical; for example, individuals are nested in families, families are part of communities, and communities are nested in counties and/or states. The hierarchical nature of data should not be neglected in either theory building or data analyzing (Muthen, 1991; Phillips et al. 1998).

To overcome the pitfalls of the above two approaches, this study adopt a multi-level analytical approach to explore the factors that affect the post-discharge ambulatory care of veterans with PTSD. This approach, first, is able to recognize the partial independence of individuals within the same group, by modeling both individual- and community-level residuals. Second, it allows researchers to investigate both the lower-level unit and the upper-level unit variance in an outcome measure, while maintaining the appropriate level of analysis for the predictor variables (Hoffmann, 1997; Muthen, 1994). It is, therefore, able to provide much more accurate inference from the results for both lower- and upper-level predictors without jeopardizing the statistical assumptions.

Research Questions

The fundamental research question for this study centers on the causal factors that explain the readmission of veterans with PTSD. Readmission of PTSD patients may be influenced by (1) individual factors, such as age, socioeconomic status (SES), comorbidities; (2) health care provided by VAMCs through the implementation of service lines, in terms of pre- and post-discharge utilization. The relationship between the readmission of PTSD veterans, and the availability of local health resources and the social environment needs to be identified. Specific research questions are presented below:

1. Is the healthcare utilization of PTSD veterans influenced by individual and/or environmental factors?
2. Is the healthcare outcome, readmission, of PTSD veterans influenced by individual and/or environmental factors?
3. What impact do service line programs have on PTSD veterans' utilization and outcomes?
4. Are there any differences in utilization for PTSD veterans in terms of discharge placement, gender, and race?

This study adopts a social ecological perspective to examine the healthcare utilization and outcomes of veterans with PTSD at the individual and community levels. By using two cross-sectional patient level data of 1994 and 1998 and also multiple community-level data, the contribution of each factor to the healthcare utilization and outcomes of veterans with PTSD can be compared.

Significance

The study will show the relative importance of multiple factors in explaining the variation in healthcare utilization and outcomes of veterans with PTSD. It further enhances the body of knowledge about the recovery process of veterans with PTSD. Identifying factors affecting the post-discharge ambulatory care and readmission of

PTSD veterans can aid the development of specific preventive, treatment, and rehabilitative programs. From the viewpoint of methodology, the study will illustrate the utility of multi-level analysis. It can also pinpoint the relative contribution of factors from different levels of analysis. The study will yield results to show clear directions and weighting strategies to develop needed programs.

For policy makers and regulatory bodies, this study may provide new directions for integrating health and social services, designing a comprehensive care network for PTSD veterans, and minimizing unnecessary duplication of services. For VAMCs, by differentiating favorable and unfavorable outcomes, the study may offer direction for strengthening treatment programs. It also may help VAMCs extend treatment programs from hospitals to communities by linking the locally available health resources through thorough discharge planning. It can increase awareness of the potential adverse effects of personal and environmental attributes on PTSD patients, and thus help patients, care-givers and family members to take effective steps to prevent hospital readmission for PTSD.

Theoretical Framework

The theoretical framework for this study is the "Health Behavioral Model" proposed by Andersen (1995). It focuses on utilization behavior at the individual level, i.e., the patient level. Previous studies have shown that prior utilization of health care is the strongest predictor for readmission (Appleby et al., 1993; Booth et al., 1992; Camberg et al., 1997; Holloway et al., 1990; Reed et al., 1991). Post-discharge ambulatory care is inversely associated with readmission (Byers et al., 1979; Moos et al., $1995_{a \& b}$; Sands, 1984). The framework proposed by Andersen (1995) can be extended to outcome research such as a readmission study.

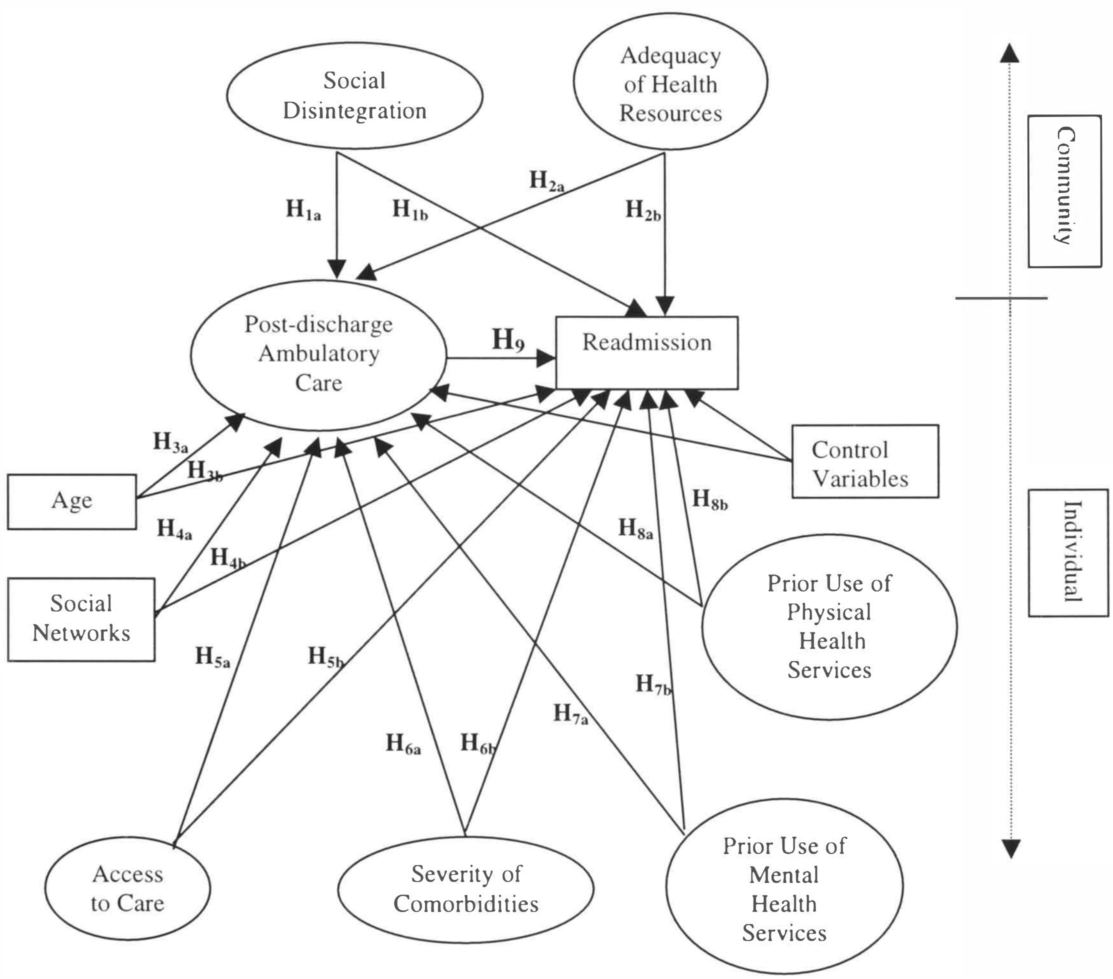
For patients seeking health care, Andersen (1995) has proposed three groups of individual-level factors that influence their behavior: predisposing, enabling, and need factors. The predisposing factors include gender, ethnicity/race, age, education, and employment. The enabling factors are income, insurance coverage, type and convenience of access to a regular source of health care, and residence. The need factors are health status, episode of illness, severity of illness, and disability. The influence of all these factors on health behavior will be modified by several external factors coming from community and/or health care organizations. The availability of health care organizations and professionals in terms of type and number, as well as their distribution, will shape patients' decisions when seeking help.

Another micro-level point of view comes from social network theory (Barnes, 1954). Network size, composition, density, and degree of connection are referred to as social structural characteristics. Another aspect is component linkages, which include intensity, durability, multidimensionality, and reciprocity. With larger size, or higher density, or higher degree of connections in a network, social support is improved, and health outcomes are better.

At the macro level, social economic status of the community, unemployment, and crime rates not only affect on patients' long term health, but also influence the availability of health resources, which may further restrict access to health care. In turn, patients' healthcare outcomes may deteriorate when they reside in a disintegrated community. Another macro-level factor is the availability of health care services: the number of facilities, human resources, and their distribution. A community characterized by abundant health care resources provides more options to consumers. On the other hand, when a community's health resources are scarce, they may not match the residents' health needs. That limits their use of care and causes unwanted health outcomes.

This study will explore the social ecological determinants of health care utilization and hospital readmission for veterans with PTSD. Two levels of factors will be investigated: individual and environmental. At the individual level, age, social network, access to care, severity of comorbidities, and prior use of both physical and mental health services will be the focus. At the community level, adequacy of health resources and social disintegration are considered as environmental factors (Figure 1).

Figure 1. Conceptual Model of Healthcare Utilization and Outcomes for Veterans with Posttraumatic Stress Disorder



Hypotheses

Hypotheses, based on the literature review and the proposed theoretical framework, are presented as follows:

Hypothesis 1a:

There is a positive relationship between social disintegration and use of post-discharge ambulatory care by veterans with PTSD.

Hypothesis 1b:

There is a positive relationship between social disintegration and readmission to VAMCs for veterans with PTSD.

Hypothesis 2a:

There is an inverse relationship between community health resources and use of post-discharge ambulatory care by veterans with PTSD.

Hypothesis 2b:

There is an inverse relationship between community health resources and readmission to VAMCs for veterans with PTSD.

Hypothesis 3a:

There is an inverse relationship between age and use of post-discharge ambulatory care by veterans with PTSD.

Hypothesis 3b:

There is an inverse relationship between age and readmission to VAMCs for veterans with PTSD.

Hypothesis 4a:

There is a positive relationship between the size of the social network and use of post-discharge ambulatory care by veterans with PTSD.

Hypothesis 4b:

There is a negative relationship between the size of the social network and readmission to VAMCs for veterans with PTSD.

Hypothesis 5a:

There is a positive relationship between access to care and use of post-discharge ambulatory care by veterans with PTSD.

<u>Hypothesis 5b</u>:

There is a positive relationship between access to care and readmission to VAMCs for veterans with PTSD.

<u>Hypothesis 6a</u>:

There is a negative relationship between severity of comorbidities and use of post-discharge ambulatory care by veterans with PTSD.

<u>Hypothesis 6b</u>:

There is a positive relationship between severity of comorbidities and readmission to VAMCs for veterans with PTSD.

<u>Hypothesis 7a</u>:

There is a positive relationship between prior mental health services utilization and use of post-discharge ambulatory care by veterans with PTSD.

<u>Hypothesis 7b</u>:

There is a positive relationship between prior mental health services utilization and readmission to VAMCs for veterans with PTSD.

Hypothesis 8a:

There is a positive relationship between prior physical health services utilization and use of post-discharge ambulatory care by veterans with PTSD.

Hypothesis 8b:

There is a positive relationship between prior physical health services use and readmission to VAMCs for veterans with PTSD.

Hypothesis 9:

There is an inverse relationship between use of post-discharge ambulatory care and readmission to VAMCs for veterans with PTSD.

Methodology

This study was based on two cross-sectional data sets, for 1994 and 1998, with the implementation of service lines as the intervention. Veterans with PTSD who have been seeking care from VAMCs in VISN 6 were the unit of analysis. Four data sets were compiled. The first data set was the Patient Treatment File (PTF) and the Outpatient Care File (OPT) generated by the VA. The second data set is the Area Resource File (ARF). The third data set was American Hospital Association data sets (AHA). The fourth data set was the Uniform Crime Report (UCR) generated by the Department of Justice - Federal Bureau of Investigation.

At the individual level, PTF provided the information on hospitalization, and OPT provided outpatient data. Demographics, social network, comorbidity, prior use of mental health and physical health services, post-discharge ambulatory care, and readmission were provided by PTF and OPT.

At the community level, ARF and AHA were used for information about local health resources in terms of human resources and hospital beds. The human resources at Vet centers were important for treating PTSD, so the number of full-time equivalent employees (FTE) at each Vet center will be included. UCR documents all reported crimes and related arrests, which were used to measure the construct of social disintegration.

Three analyses of post-discharge ambulatory care and readmission for veterans with PTSD were performed: univariate, bivariate, and multivariate analysis.

The purpose of univariate analysis is to provide a descriptive profile of the variables, for further transformation if the distribution is found to deviate from the normal distribution. The bivariate analysis is to facilitate the understanding of the relationship between the two variables and to serve as a preliminary analysis for multivariate analysis.

Two multivariate analyses were performed: structural equation modeling (SEM) and survival analysis, for the analysis of post-discharge ambulatory care and readmission, respectively. Intraclass correlation (ICC) served as a diagnostic procedure to verify whether a uni-level or multi-level SEM should be conducted. In survival analysis, Cox regression with forward selection is used to analyze the log-transformed readmission time, in order to investigate the proportional contribution of each of the predictor variables.

Organization of the Study

Chapter one provides an overview of the origin, diagnosis, and effects of PTSD. The factors influencing the utilization and outcome of PTSD veterans are briefly presented. The research questions, the significance, and the estimated contribution of the study are illustrated. A brief introduction of the theoretical framework and methodology is presented.

Chapter two reviews relevant literatures on PTSD and related mental disorders. It includes individual and environmental factors that influence the post-discharge ambulatory care and readmissions of PTSD veterans.

Chapter three presents a theoretical framework based on the "health behavioral model" proposed by Andersen (1995). In this chapter, hypotheses deduced from a review of the scientific literature and the theoretical framework are presented.

Chapter four is dedicated to methodological discussion. Research design, unit of analysis, sample selection, data source, measuring variables, and data analysis are presented.

CHAPTER 2

LITERATURE REVIEW

This chapter reviews literature relevant to PTSD. Previous empirical studies conducted on PTSD and related fields are examined. Particular attention is paid to factors contributing to post-discharge ambulatory care and readmissions of veterans with PTSD, as illustrated at two different levels: individual and environmental.

At the environmental level, inadequate local health resources and social disintegration are the major concerns. At the individual level, age, social network, access, comorbidity, use of both physical and mental health services, and post-discharge ambulatory care are the focus.

The Trend of Readmissions

The readmission rates to hospitals for PTSD have been estimated at 49.2% for one year (Boudewyns et al., 1991) and 69% for two years (Perconte et al., 1989). Perconte et al. (1989) used a chi-square test to test the difference in readmissions among 102 PTSD patients. They concluded that patients with follow-up were less likely to be readmitted. Boudewyns et al. (1991) also applied a chi-square test for 102 PTSD patients. They found that the patients with comorbidity of schizophrenia or affective disorder with psychotic features were more likely to be readmitted in a one-year period than were the patients without these psychoses. The diagnoses of alcohol abuse or dependence and drug abuse or dependence did not contribute to readmission. Brown et al. (1995) studied 84 substance abuse patients, 25% of whom had PTSD. The results of a t test revealed that the PTSD patients had more lifetime admissions. The common weaknesses of the above studies are lack of theoretical support and small sample size. Multivariate analysis of results was not performed.

Williams et al. (1998) applied multiple regression for 500 psychiatric patients. The results indicated that the PTSD patients had more hospitalizations ($p = 0.04$) with longer medical stays ($p = 0.03$). Those results imply that the PTSD patients had medical comorbidities requiring hospitalization. The subsequent Cox regression revealed that those patients without PTSD had longer community tenures ($p < 0.001$). It showed that the PTSD patients were rehospitalized much more quickly than were the other psychiatric patients. However, the contributing factors for more and quicker admissions for PTSD patients were not identified in the study.

In another study, short-term medical readmission rates, i.e., those less than 31 days after discharge, vary between 5.2% for total cholecystectomy and 29.5% for disorders of the biliary duct (Thomas et al., 1991). Long-term readmission rates (longer than one year) range from 17% to 79.1%. Victor & Vetter (1985) found that 17% of 2,353 medical patients were readmitted. Camberg et al. (1997) found that 79.1 % patients with chronic obstructive pulmonary disease (COPD) were readmitted, in a study of 20% random sample of all national discharged veterans.

Short-term psychiatric readmission rates have been found to vary between 6.8% and 23.1% for readmission within 30 days (Appleby et al., 1996). The lower percentage was for 74 schizophrenic patients who had received more than 31 days of treatment, and the higher percentage was for 91 patients with the same diagnosis who had received less than 30 days of treatment. Long-term readmissions, the rates vary between 0.6% within five years, for 524 depression patients in 5 years (Daniels et al., 1998) and 81% within 10 years, for a national sample of 8,705 schizophrenic patients (Motensen et al., 1994).

Normally, hospitalized patients are discharged when their conditions are stabilized. They need follow-up outpatient visits, however, to ensure their recovery and prevent readmissions. The next section discusses the relationship between post-discharge ambulatory care and readmission.

Use of Post-discharge Ambulatory Care

In some earlier articles on readmissions for mental patients, post-discharge ambulatory care is often referred as aftercare. The two terms are used interchangeably in this study. The status of aftercare receivers (Green, 1988; Peterson et al., 1994; Tessler & Mason, 1979; Winston et al., 1977); the type of post-discharge ambulatory care received (Byers et al., 1978; Sands, 1984; Soloman et al., 1984); and the numbers or frequency of post-discharge ambulatory care (Byers et al., 1978; Franklin et al., 1975; McCranie & Mizell, 1978; Moos et al., 1995 $_{a\,\&\,b}$; Sands, 1984; Soloman et al., 1984; Walker et al., 1996) were used for measurement in the studies reviewed here.

McCranie et al. (1978) studied the relationship between aftercare and readmission for 421 psychiatric patients. The patients were followed for from 12 to 56 months. There were 167 patients who had been rehospitalized at least once, resulting in a readmission rate of 39.67%. The aftercare consisted mainly of drug maintenance therapy provided by the aftercare clinic. The number of aftercare visits varied from 1 to 65, which the authors divided into three groups---one to nine, ten to seventeen, and eighteen and more. The chi-square test results showed that the number of aftercare visits differentiated readmitted and non-readmitted patients, but only for certain studied factors. Among patients with ten or more aftercare visits, the following factors significantly reduced readmission: psychotic diagnosis ($p < 0.01$), female ($p < 0.01$), blacks ($p < 0.05$), and age over 40 ($p < 0.001$).

The authors did not, however, investigate living arrangements, social support, or discharge placement for the sample. These factors may contribute to the difference found in this study. Another weakness is the lack of multivariate analysis to investigate the contribution of each factor while controlling for other factors. The effects of interaction among variables were not addressed, a third weakness. Lastly, this study did not apply any theory to support its perspective.

Moos & Moos (1995_a) used a national sample of 1,070 substance abuse patients who had been discharged from VAMCs' inpatient programs. They had been discharged to community residential facilities (CRFs) and had been followed for four years. This study examined the relationship between the length of stay in CRFs and outpatient mental health aftercare, and readmission for inpatient care. The patients were divided into three groups: alcohol-related ($n = 400$), drug-related ($n = 280$), and substance abuse and psychiatric diagnoses (n = 390). The readmission rates in 6 months, one year, and four years for patients who stayed in CRFs for more than 8 weeks were as follows: for alcohol-related diagnoses-11.8%, 21.5%, and 40.3%; for drug-related diagnoses-14.1%, 18.3%, and 43.0%; and for substance abuse and psychiatric diagnoses- 23.8%, 40.1%, and 61.2%. The number of outpatient mental health visits was used to measure aftercare. Logistic regression results showed that patients with longer lengths of stay in CRFs and more post-discharge mental health visits were able to reduce readmissions.

The main weaknesses of the study are the lack of a control group and lack of a supporting theory. However, the lack of a control group was remedied in another study by Moos et al. (1995_b). An equal number of patients discharged to the community matched a group of 5,176 substance abuse patients discharged to CRFs. The readmission rates in 6 months and in 1 years for patients who had stayed more than 8 weeks in CRFs were: for alcohol-related diagnoses- 13.8% and 21.6%; for drug-related diagnoses- 11.6% and 22.6%; and for substance abuse and psychiatric diagnoses- 26.1% and 42.9%. For community patients, the readmission rates in 6 months and in 1 year were: for alcohol-related diagnoses- 20.1% and 29.3%; for drug-related diagnoses- 19.9% and 29.3%; and for substance abuse and psychiatric diagnoses- 37.4% and 49.3%. The results of logistic regression revealed that length of stay at CRFs and the number of post-discharge mental health visits were the independent predictors for readmission. The interaction of these two variables indicated that shorter stay in CRFs and more outpatient mental health visits was strongly associated with fewer readmissions. The results could be attributed to motivation, severity of illness, or chronicity, which were not tested in the study.

Soloman et al. (1984) studied 486 patients with mental disorders who had been discharged from two state hospitals, for one year. The readmission rate was 41%. The study examined the type and amounts of aftercare rendered by the Welfare Department, the Social Security Administration, the Bureau of Vocational Rehabilitation, and other outpatient mental health services. Among readmitted patients, there was no significant difference in readmission rates between aftercare receivers and non-receivers. However, aftercare receivers had significantly longer average community tenure (288 days, $t = 1.60$, $p = 0 .0001$) than did non-receivers (244 days). It seems that aftercare stabilized their conditions and prolonged the time to readmission.

A discriminant analysis was performed to differentiate those who readmitted and who did not. The results showed that social demographic and clinical characteristics were less important, as compared to aftercare variables, in distinguishing readmissions from non-readmissions. The number of prior hospitalizations was the only clinical variable differentiating the two groups. Among aftercare variables, the number of different services received and the proportion of needed services received were the two most important variables in differentiating readmissions from non-readmissions.

The study did not address the problem of multicollinearity, so it did not uncover whether the insignificant variables were due to multicollinearity or really to lack of discriminant power. Another weakness of this study is its lack of theory in supporting the approach to investigating readmissions for mental patients.

Winston et al. (1977) investigated the effects of the aftercare of 114 psychiatric patients on their readmission. Aftercare was measured by whether or not a patient received individual supportive psychotherapy, group psychotherapy, and pharmacotherapy. The readmission rates in one year after discharge were, respectively, 27.19% and 34.6 % for total sample and for schizophrenic sub-sample. The results of chi-square tests showed that the readmission rate was significantly higher for patients without aftercare ($p < 0.005$). The schizophrenic group also had a higher readmission rate than other diagnostic groups did ($p < 0.01$). The schizophrenic patients who received aftercare, however, had a lower rate of readmission ($p < 0.005$). The findings indicate that aftercare does reduce readmission. However, the lack of multivariate analysis, theoretical support, and other contextual variables makes these study findings less valuable in understanding the mechanism of readmission for psychiatric patients.

Sands (1984) studied 92 rural psychiatric patients who had been discharged from a state mental hospital, to determine the factors that correlate with desinstitutionalization. The outcomes were measured by readmissions in the last year, the last 5 years, and in the following year of discharge. The readmission rates were 16.3%, 51.6%, and 14.1%, respectively, for these three outcome variables. Aftercare was measured by the frequency of follow-up by outpatient services and by the number of follow-up agencies. The results of a stepwise multiple regression showed that neither aftercare variable had an impact on readmissions. Age and living with others were significant for readmission in the last year. For readmission in the last 5 years, affective disorder, taking medication irregularly, and having a hobby were statistically significant. Taking medication irregularly was the only variable able to separate the readmission and nonreadmission in the following year after discharge.

The author acknowledged that all patients in the study received aftercare and that lack of a control group might reduce the power to detect the difference in readmissions. The lack of a supporting theory is another weakness of this study. The study did not consider contextual variables from providers or from the community, which created another weakness.

Franklin et al. (1975) surveyed 107 mental patients from a 5% random sample of 2,849 patients discharged from a state mental hospital, to investigate the factors related to readmission. The readmission rate was 33.64% in the 13 months of follow-up. The analytic method was not reported; only the p-value was given. Aftercare was measured by the number of contacts with a community health center and the reasons for the contacts. The number of contacts with a community mental health center was higher for the group that were readmitted than for those not readmitted ($p < 0.05$). However, the authors also found that the reasons for the health center contacts were significantly different for the two groups ($p < 0.001$). The contacts initiated by the readmitted were mostly to ask for admission. Those in the non-readmitted group were seeking counseling, medication, or follow-up services. The results indicate that aftercare does help to reduce readmissions for mental patients. The important issue is the content or quality, rather than the quantity of aftercare.

This study's failure to indicate the analytic method used is its first weakness. It can be surmised from the comparison of variables that the method used may have been chi-square tests and t tests. In the absence of a multivariate analysis, the relative contribution of each variable cannot be seen. Lack of theoretical support is another weakness.

As summarized in Table 2, most of the studies reviewed suggest that post-discharge ambulatory care can reduce readmissions for patients with mental disorders (Byers et al., 1978; McCranie & Mizell, 1978; Moos et al., 1995 $_{a\ \&\ b}$; Peterson et al., 1994; Soloman et al., 1984; Walker et al., 1996; Winston et al., 1977). Some studies found that association to be insignificant (Green, 1988; Sands, 1984; Tessler & Mason, 1979). One study found a positive association between post-discharge ambulatory care and readmission (Franklin et al., 1975), but that result is explained by the reasons for the contacts with the community mental health clinic being made to seek readmission.

The major weaknesses among these studies are lack of theoretical support, failure to investigate interaction among variables, lack of multivariate analysis, and small sample sizes.

The relationship between post-discharge ambulatory care and readmission may not be straightforward. Several factors may have to be examined, for example, discharge placement (Byers et al., 1978; Moos et al., 1995 $_{a\ \&\ b}$; Walker et al., 1996), living arrangement or social support (Peterson et al., 1994). The factors that may be related to post-discharge ambulatory care are detailed in the following sections.

Table 2. The Relationship between Post-discharge Ambulatory Care and Readmission

Author	Condition	Sample size	Readmission rate	Finding	Theory	Analytic method
Byers (1978)	Mental disorders	129	32% for aftercare receivers and 44% for non-receivers.	The amount of aftercare received (-)	NA	Multiple regression
Franklin (1975)	Mental disorders	107	33.64%	The frequency of contacts with the aftercare agency(+)	NA	NA
Green (1988)	Mental disorders	748	NA	Noncompliance with aftercare (NS)	NA	x^2 and Fisher's exact test
Mccranie (1978)	Mental disorders	421	39.67%	Number of aftercare visits (-)	NA	x^2
Moos (1995$_a$)	Substance abuse	1,070	See text.	The number of post-discharge mental health visits (-)	NA	Logistic regression

Note: (-): negative association; (+): positive association; NA: not applicable; NS: not statistically significant; x^2: chi-square test

Table 2 (continued). The Relationship between Post-discharge Ambulatory Care and Readmission

Author	**Condition**	**Sample size**	**Readmission rate**	**Finding**	**Theory**	**Analytic method**
Moos (1995b)	Substance abuse	Case: 5,176 Control: 5,176	See text.	The number of post-discharge mental health visits (-)	NA	Logistic regression
Peterson (1994)	Substance abuse	101 programs (40,747 patients)	25%	Aftercare receiver (-)	NA	Logistic regression and multiple regression
Sands (1984)	Mental disorders	92	16.3% (last year), 51.6% (last 5 years), and 14.1% (following year)	The frequency of follow-up by outpatient services (NS) and the number of follow-up agencies (NS).	NA	Multiple regression

Note: (-): negative association; (+): positive association; NA: not applicable; NS: not statistically significant; x^2: chi-square-test.

Table 2 (continued). The Relationship between Post-discharge Ambulatory Care and Readmission

Author	**Condition**	**Sample size**	**Readmission rate**	**Finding**	**Theory**	**Analytic method**
Soloman (1984)	Mental disorders	486	41%	Number of different services received (-) and proportion of needed services received (-)	NA	Discriminant analysis
Tessler (1979)	Mental disorders	98	Aftercare user: 20.4%, Non-user: 30.2%	Aftercare (NS)	NA	x^2 and regression
Walker (1996)	Mental disorders	368	25%	Amount of aftercare (-)	NA	Cox regression
Winston (1977)	Mental disorders	114	27.19%	Aftercare receiver (-)	NA	x^2

Note: (-): negative association; (+): positive association; NA: not applicable; NS: not statistically significant; x^2: chi-square test.

Age

A negative effect of age on mental disorders has been found, including fewer or less severe symptoms among the elderly (Engdahl et al., 1991; Fontana & Rosenheck, 1994;

Taft et al., 1999; Tennant et al., 1997). Engdahl et al. (1991) conducted research on 989 former POWs of WW II and the Korean War to assess the effects of age, education, maltreatment, and social support on chronic depression. The results of multiple regression indicated that age at capture had a negative effect on the total depression score ($\beta = -0.10$, $p < 0.01$), negative affect ($\beta = -0.12$, $p < 0.01$), and interpersonal problems ($\beta = -0.09$, $p < 0.01$).

Tennant et al. (1997) compared 101 POWs and 107 controls 9 years apart, in 1982 and 1991. A decreasing prevalence of psychiatric disorders among the two cohorts was found, but much more so among the former POWs. The anxiety prevalence for POWs was 46.5% in 1982; it decreased to 24.8% in 1991 ($p < 0.001$, McNemar test). There was a 36.6% of prevalence rate for depression among POWs, which shrank to 9.9% in 1991 ($p < 0.001$, McNemar test). The results of paired t tests revealed that the severity of both anxiety ($t = 7.96$, $p < 0.001$) and depression ($t = 3.78$, $p < 0.001$) has decreased significantly in 9 years for the POWs.

In PTSD studies, both Fontana et al. (1994) and Taft et al. (1999) found that age is negatively associated with PTSD symptoms. Taft et al. (1999) included age as a covariate in assessing physical health and functioning health status for 1,632 Vietnam veterans. The results of hierarchically nested regression indicated that age has a negative impact on PTSD symptoms ($\beta = -0.10$, $p < 0.05$) for males, but has an insignificant effect for females.

Fontana et al. (1994) tested the effect of age on PTSD. A total of 5,138 war zone veterans who were seeking treatment from specialized VA outpatient clinical teams made up the sample: 320 World War II, 199 Korean War, and 4,619 Vietnam War veterans. The multiple regression results indicated that age has a negative effect on four symptom measures: PTSD (β = - 0.20, $p < 0.0001$), general psychiatric symptoms (β = - 0.22, $p < 0.0001$), guilt (β = - 0.20, $p < 0.0001$), and suicidality (β = - 0.10, $p < 0.05$).

From the above studies, it can be concluded that age is inversely associated with PTSD. Although traumatic exposure and symptoms may vary across subjects from different cohorts, it appears time likely that plays a role in mitigating their harsh experiences.

The Relationship between Age and the Use of Post-discharge Ambulatory Care

The majority of the studies indicate that age has no effect on the use of post-discharge ambulatory care (Axelrod & Wetzler, 1989; Del Gaudio et al., 1977; Fink & Heckerman, 1981; Hershorn, 1993; Kirk, 1977; Matas et al., 1992; Winston et al., 1977). However, Carpenter et al. (1981) pointed out that younger age is associated with fewer post-discharge outpatient visits. Raynes & Warren (1971) showed that both older male of black and white, and black female (over 40) were more likely to attend post-discharge ambulatory care. Keane & Fahy (1982) found that advanced age is related to day care attendance and participation in social case work, but not to outpatient clinic attendance.

Carpenter et al. (1981) applied chi-square tests to investigate attendance at the first outpatient appointment after discharge, for 1,106 medical and psychiatric patients. Twenty-seven percent of patients were between 18 – 24 years old; this group of patients were less likely to keep their appointments ($x^2 = 22.16$, $p < 0.001$). In studying 267 psychiatric patients, Raynes & Warren (1970) found that both black and white males, and black females over 40 years old had higher attendance rates for post-discharge clinic visits ($p < 0.05$). Analyzing 216 psychiatric patients through multiple regression, Keane & Fahy (1982) found that older age was associated only with day care attendance ($\beta = 0.13$, $p < 0.05$) and social case work ($\beta = 0.30$, $p < 0.01$) after discharge, but not with follow-up clinic visits.

As shown in Table 3, only three studies found age to be positively related to post-discharge care and not to ambulatory care only. However, since veterans were not the subjects for these studies, the results may not be generalized to veterans. The common weakness of these studies is that none is grounded in theory. The second common flaw is related to analytic methods. Because Chi-square tests were used in most of the studies, the contributions of multiple factors were not controlled simultaneously. As pointed out by Keane & Fahy (1982), elderly psychiatric patients may need more help for daily living functions, rather than medical attention.

Table 3. The Relationship between Age and Post-discharge Ambulatory Care

Author	Condition	Sample size	Finding	Theory	Analytic method
Axelrod (1989)	Psychiatric diagnoses	134	NS	NA	ANOVA
Carpenter (1981)	Medical and psychiatric diagnoses	1,106	(+)	NA	x^2
Del Gaudio (1977)	Psychiatric diagnoses	263	NS	NA	x^2
Fink & Heckerman (1981)	Psychiatric diagnoses	120	NS	NA	x^2
Hershron (1993)	Psychiatric diagnoses	56	NS	NA	x^2
Keane (1982)	Psychiatric diagnoses	216	Day care and social case work (+) outpatient visits (NS)	NA	Multiple regression
Klinkenberg (1998)	Psychiatric diagnoses	319	NS	NA	Logistic regression
Kirk (1977)	Psychiatric diagnoses	579	NS	NA	Correlation analysis
Matas (1992)	Psychiatric diagnosis	874	NS	NA	x^2
Raynes (1971)	Psychiatric diagnoses	267	Male and black female over 40 (+)	NA	x^2
Winston (1977)	Psychiatric diagnoses	114	NS	NA	x^2

Note: (-): negative association; (+): positive association; NA: not applicable; NS: not statistically significant; x^2: chi-square test.

The Relationship between Age and Readmission

Age has a mixed effect on psychiatric readmission. Several authors found that age has no effect on psychiatric rehospitalization (Bene-Koclemba et al., 1979; Byers et al., 1979; Boydell et al., 1991; Craig et al., 1985; Peterson et al., 1994; Tomasson et al., 1998). Other studies found that advanced age is associated with readmission (Labbate et al., 1997; Rabinowitz et al., 1995; Snowden et al., 1992). Quite a few studies point out that for psychiatric patients, younger age is related to readmission (Appleby et al., 1993; Blow et al., 1998; Daniels et al., 1998; Gooch & Leef 1996; Green, 1988; Mojtabai et al., 1997; Sands 1984; Solomon et al., 1984; Stack et al., 1983; Thornicroft et al., 1992 Vogel & Huguelet 1997).

Three studies were conducted on the veteran population by Blow et al. (1998), Labbate et al. (1997), and Peterson et al. (1994), with varying results in terms of the effect of age on psychiatric readmission. Blow et al. (1998) investigated 2-year inpatient utilization and outcomes for 682 veterans with serious mental illness. Twenty-nine percent of the patients had a comorbidity of substance abuse and/or dependence. The readmission was predicted by age over time for patients with substance abuse and/or dependence ($F = 4.082$, $p = 0.0172$) through analysis of covariance (ANCOVA). The net effect of age on substance abuse and/or dependence after adjusting for other factors indicates that younger veterans were more likely to be readmitted for hospital care.

The records of patients admitted with major depressive disorders (MDD) to a large military medical center were reviewed during the years 1991-1995 by Labbate et al. (1997). The group of recidivists were 46 consecutive patients who had been admitted three or more times. The comparison sample was the 50 consecutive patients admitted for the first time in 1993 and having no subsequent admissions to the hospital. By using analysis of variance (ANOVA), age was found to be a predictor for recidivism. Peterson et al. (1994) analyzed readmissions to 101 VA substance abuse treatment programs. The first stage of analysis applied logistic regression to records for 40,747 veterans, to investigate the factors that influenced their readmissions. The results indicated that age had no effect on readmissions.

Although the above three veteran studies shown conflicting results, the majority of community studies documented that younger age increases psychiatric readmissions. For instance, Appleby et al. (1993) followed 1,500 schizophrenia patients discharged from 10 state hospitals, for 18 months. Cox regression was used to analyze time-to-event data. There was a negative effect of age on both 30-day (β = - 0.028, $p < 0.001$) and 18-month (β = - 0.022, $p < 0.001$) readmissions. Mojtabai et al. (1997) also applied Cox regression to records of 2,002 patients with psychiatric diagnoses. The readmission rate was 36.4% in a two-year period. The authors found that younger patients were more likely to be readmitted (β = - 0.53, $p < 0.01$). The finding, however, interacted with the variable of "living alone". Vogel & Huguelet (1997) applied logistic regression to 1,575 psychiatric patients' records to study their 1-year readmissions. The readmission rate was 34.0%. The results revealed that greater age has a protective effect, with an odds ratio (OR) of 0.96 and confidence interval (C. I.) = 0.93 – 0.98 for readmissions, indicating that younger patients had a higher risk of readmission by one year after discharge.

As summarized in Table 4, none of these studies used a supporting theory. Except for Angermeyer et al. (1989), the studies with positive or with insignificant results did not use time-to-event analysis to investigate readmission patterns for psychiatric patients. Although in Angermeyer et al. (1989) the finding for the effect of age on readmission was insignificant, its direction was negative. Most of the studies indicate that younger age is a risk factor for readmission. With the findings from PTSD studies, It can be surmised that increased age may reduce readmissions.

Social Networks

The concept of social networks was outlined by Barnes (1954) to describe social connections with other people. Network members provide both emotional and material help to the focal person (Caplan, 1974). The size of a social network becomes an important factor. Social isolation may be viewed as an indicator of the absence of social bonds tying an individual to conventional life styles. Either living alone or single status may represent social isolation with a shrinking social network. Both offer less support to the focal person (Gainey et al. 1993; Stahler et al., 1995).

Other than the availability and/or the size of social network (Escobar et al., 1983), functional social support such as instrumental assistance and emotional sustenance was also examined in studies of veterans with PTSD (Boscarino, 1995; Fontana & Rosenheck, 1994 & 1998; Green et al., 1987; Keane et al., 1985; King et al., 1998). Among these studies, only one study, by Green et al. (1987) indicated that social support had no effect

Table 4. The Relationship between Age and Readmission Rate

Author	**Condition**	**Sample size**	**Finding**	**Theory**	**Analytic method**
Angermeyer (1989)	Schizo-phrenia	278	NS	NA	Cox regression
Appleby (1993)	Schizo-phrenia	1,500	(-)	NA	Cox regression
Blow (1998)	Psychiatric diagnoses	682	(-)	NA	ANCOVA
Byers (1979)	Psychiatric diagnoses	129	NS	NA	Multiple regression
Bene-Koclemba (1979)	Psychiatric diagnoses	160	NS	NA	Correlation analysis
Boydell (1991)	Psychiatric diagnoses	200	NS	NA	x^2
Craig (1985)	Schizo-phrenia	223	NS	NA	Logistic regression
Daniels (1998)	Psychiatric diagnoses	1,172	(-) (Schizo-phrenia)	NA	ANOVA
Gooch (1996)	Psychiatric diagnoses	615	(-)	NA	Cox regression
Green (1988)	Psychiatric diagnoses	698	(-)	NA	x^2
Vogel (1997)	Psychiatric diagnoses	1,575	(-)	NA	Logistic regression
Labbate (1997)	Major depressive disorder	96	(+)	NA	ANOVA

Note: (-): negative association; (+): positive association; ANOVA: analysis of variance; ANCOVA: analysis of covariance; NA: not applicable. NS: not statistically Significant; x^2: chi-square test.

Table 4 (continued). The Relationship between Age and Readmission Rate

Author	**Condition**	**Sample size**	**Finding**	**Theory**	**Analytic method**
Mojtabai (1997)	Psychiatric diagnoses	2,002	(-)@	NA	Cox regression
Peterson (1994)	Substance abuse	40,747	NS	NA	Logistic regression
Rabinowitz (1994)	Psychiatric diagnoses	2,220	(+)	NA	Discriminant analysis
Sands (1984)	Psychiatric diagnoses	92	(-)	NA	Multiple regression
Snowden (1992)	Psychiatric diagnoses	187	(+)	NA	Multiple regression
Solomon (1984)	Psychiatric diagnoses	550	(-)	NA	Discriminant analysis
Stack (1983)	Psychiatric diagnoses	269	(-)	NA	Multiple regression
Tomasson (1998)	Psychiatric diagnoses	351	NS	NA	Logistic regression
Tornicroft (1992)	Psychiatric diagnoses	357	(-)	NA	Logistic regression

Note: @: interaction with living arrangement; (-): negative association; (+): positive association; NA: not applicable; NS: not statistically significant.

on PTSD symptoms. The other studies found that both structural and functional social support could ease PTSD symptoms.

Both Fontana & Rosenheck (1994) and King et al. (1998) applied SEM to records of veterans with PTSD to study the impact of functional social support (FSS) and structural social support (SSS). Fontana & Rosenheck (1994) studied 1,198 male Vietnam veterans and found two factors to be most influential in developing PTSD: lower social support and post-military trauma. Lower social support, both FSS and SSS, had a significant direct path coefficient of 0.41 on PTSD. Its indirect path for post-military trauma was 0.18.

King et al. (1998) studied 432 female and 1,200 male veterans through a resilience-recovery model. The results for female veterans indicated that FSS had a significant path coefficient of – 0.47 on PTSD symptoms. SSS had no direct effect on PTSD, but an indirect effect through FSS of 0.22. Both FSS and SSS had a direct effect on PTSD for male veterans, with path coefficients of – 0.42 and – 0.7, respectively. SSS had an indirect effect of 0.18 through FSS on PTSD.

In summary, either SSS or FSS can ease the development or symptoms of PTSD. With the presence of FSS, SSS may have a small direct impact on PTSD. Nevertheless, SSS should not be ignored when investigating the service utilization and outcomes for PTSD patients. Table 5 summarizes the findings on social support and PTSD.

Table 5. The Relationship between Social Support and PTSD

Author	Condition	Sample size	Finding	Theory	Analytic method
Boscarino (1995)	PTSD	4,462	(-)	NA	Logistic regression
Escobar (1983)	PTSD	41	Network size (-)	Community support system	T test
Fontana (1994)	PTSD	1,198	(-)	NA	SEM
Fontana (1998)	PTSD	327	(-)	NA	Path analysis
Green (1987)	PTSD	60	NS	NA	Multiple regression
Keane (1985)	PTSD	45	FSS (-) & SSS (-)	NA	ANOVA & post hoc test
King (1998)	PTSD	1,632	Female: FSS (-) Male: FSS (-) & SSS (-)	Resilience-recovery model	SEM

Note: (-): negative association; (+): positive association; ANOVA: analysis of variance; FSS: functional social support; NA: not applicable; NS: not statistically Significant; PTSD: posttraumatic stress disorder; SEM: structural equation Modeling; SSS: structural social support.

The Relationship between Social Networks and Post-discharge Ambulatory Care

Marital status and living arrangement, two proxies of social isolation, were found to have a negative relationship with post-discharge ambulatory care in two studies (Appleby et al., 1997; Matas et al., 1992). Klinkenberg & Calsyn (1998) found that male patients with severe mental illness accompanying by family members when they were admitted to hospital had a positive effect on the patients' receiving post-discharge ambulatory care. Johnsen & Herringer (1993) revealed that for 50 patients, the number of support activities from aftercare staff, family members, or co-attenders of aftercare programs had a positive impact on the outcome of substance abuse treatment.

Huselid et al. (1991), using attribution theory, and found a mixed effect of social support sources on the treatment outcomes of 30 women with chemical dependency. The only significant support source was shown to be the staff of aftercare programs. Support from families, friends, church groups, and peers had no significant relationship to outcomes.

Humphreys & Noke (1997) investigated the influence that participation in post-treatment mutual help groups had on the friendship networks of 2,337 substance abuse veterans. SEM technique was applied to examine the relationship between general friendship and friends' support for substance use, at baseline and at one-year follow-up, and post-treatment program involvement. The baseline results showed that general friendship had no direct effect on program involvement, but did have an indirect effect of - 0.25 through friends' support for substance use. The latter factor had a modest effect on participation ($\beta = -0.07$). At one-year follow-up, participation in a post-treatment program had a 0.25 direct effect on general friendship and a - 0.27 direct effect on friends' support for substance use. The results show that negative supports hinder participation in a post-treatment program. After a post-treatment program, veterans with substance abuse were able to increase general friendships and resist the temptation from friends practicing substance abuse. The results also imply that participants in post-treatment programs are less vulnerable to relapse and readmission.

Both Culter et al. (1987) and Graham et al. (1996) found comparable outcomes for different formats of post-discharge treatment programs. A study by Culter et al. (1987), based on network theory, studied 30 schizophrenic patients through ANOVA. The authors found that for the socialization group, SSS, but not FSS, was higher than for the other two groups. Graham et al. (1996), using a cognitive-behavioral model examined two post-discharge programs, with an individual and a group approach, for 57 substance abuse patients at two sites. The ANCOVA results indicated that patients in the group treatment program had more social support from friends at 12-month follow-up. Keane & Fahy (1982), using multiple regression analysis, found that neither marital status, number of children, living arrangement, nor number of visitors at index admission affected participation in post-discharge treatment by 216 psychiatric patients.

These three studies imply that neither FSS nor SSS affects participation in, and outcomes of post-discharge treatment. It may be that the sample sizes were too small to yield sufficient statistical power. Another possibility may be inadequate methodology in the first two of the three studies.

As summarized in Table 6, only three studies were grounded in theory (Culter et al., 1987; Graham et al., 1996; Huselid et al., 1991). The sample sizes range from 30 to over 2,000, and the methodology varies from study to study. These studies present inconsistent results and seem to yield a less than clear direction for the effect of social support on post-discharge treatment. Combining the findings of PTSD studies in the previous section, however, allow the surmise that social support, either FSS and/or SSS, should be able to increase the use of post-discharge treatment.

Table 6. The Relationship between Social Network and Post-discharge Treatment

Author	**Condition**	**Sample size**	**Finding**	**Theory**	**Analytic method**
Appleby (1997)	Severely mentally ill	375	(+)	NA	x^2
Culter (1987)	Schizo-phrenia	30	NS	Network theory	ANOVA
Graham (1996)	Substance abuse	57	NS	Cognitive-behavioral model	ANCOVA
Humphreys (1997)	Substance abuse	2,337	Benign support (NS) Malignant support (-)	NA	SEM
Huselid (1991)	Chemical dependency	30	Aftercare staff (+) Others (NS)	Attribution theory	Correlation analysis
Johnsen (1993)	Substance abuse	50	(+)	NA	x^2
Keane (1982)	Psychiatric diagnoses	216	NS	NA	Multiple regression
Klinkenberg (1998)	Severe mental illness	319	Male (+) Female (NS)	NA	Logistic regression
Matas (1992)	Psychiatric diagnoses	874	(+)	NA	x^2

Note: (-): negative association; (+): positive association; ANCOVA: analysis of covariance; ANOVA: analysis of variance; NA: not applicable; NS: not statistically significant; SEM: structural equation modeling; x^2: chi-square test.

The Relationship between Social Networks and Readmission

The protective effect of larger network size has been indicated by several authors (Caton et al., 1985; Cohen & Sokolovsky, 1978; Dayson et al., 1992; Lipton et al., 1981). Being single has been found to be a factor contributing to readmission (Moos et al., 1994 & 1995_b; Peterson et al., 1994; Rabinowitz et al., 1995). Sands (1984) found that living with others help to prevent readmission. This finding suggests that functional social support is negatively associated with readmission (Booth et al., 1992; Caton et al., 1985; Postrado & Lehman, 1995).

Dozier et al. (1987) found that social network size was not related to readmission. Having a mid-size network with moderate density, however, was related to reduced readmission days. Holmes-Eber & Riger (1990) found that the network size remained stable for readmitted patients, as the people met in the mental health system replaced the network of relatives and friends. A mixed relationship between living arrangement and readmission was found by Mojtabai et al. (1997). Ross et al. (1995) reported that there was no relationship between social support and readmission.

In a sub-analysis of 28 out of 44 schizophrenic patients, using ANOVA, Cohen & Sokolvosky (1978) found that readmitted patients had a smaller network ($p < 0.05$) than non-readmitted patients did. In another study, the logistic regression results revealed that, among 369 psychiatric patients, those with a larger network size (more than 9 members) had only 13% of relative odds to be readmitted than did those asocial patients (Dayson et al., 1992). Lipton et al. (1981) applied t tests and compared the social networks of 15 first-admission patients to those of 15 multiple-admission patients with schizophrenia.

The results indicated that readmitted patients had smaller total networks ($p = 0.01$) and fewer relatives and friends ($p = 0.02$).

Dozier et al. (1987) found that a network of 14 – 19 members with a network density of 0.29-0.48 was able to reduce inpatient days for 30 'revolving door' psychiatric patients. This network size is relatively small, comparing to a normal individual's average network size of 20 - 30 members (Pattisson et al., 1975). Using Cox regression on 2,002 psychiatric patients, Mojtabai et al. (1997) found interaction effects between living arrangement, age, and employment status. Living alone was associated with higher rates of readmission, especially for younger patients ($p < 0.01$). Living with others increased readmissions for employed patients ($p < 0.01$). For patients who lived alone, however, employment had a protective effect. The possible explanation for more readmissions among the first group could be that multiple sources of interpersonal stress generating from both the occupational and the living environment affected them.

Only four studies were grounded in theory (Booth et al., 1992; Cohen & Sokolovsky, 1978; Lipton et al., 1981; Moos et al., 1994). In comparison to the studies using proxies of marital status and living arrangement, the studies focused on FSS and SSS had relatively small sample sizes. They seldom included variables other than social networks. The interaction effect was not examined. Although multivariate analyses were applied in most studies, except for Cohen & Sokolovsky (1978), Lipton et al. (1981), Rabinowitz et al. (1995), most studies used cross-sectional designs, which cannot establish causal relationships.

As shown in Table 7, FSS, SSS, and marital status can help to protect psychiatric patients from readmission. Living arrangement may interact with age and with employment status. However, living with others may protect from being readmitted. The independent effects of FSS and SSS on readmission are not clear, since they have been integrated into a composite index.

Table 7. The Relationship between Social Network and Readmission

Author	**Condition**	**Sample size**	**Finding**	**Theory**	**Analytic method**
Booth (1992)	Alcoholism	61	FSS (-)	Social provisions model	Cox regression
Caton (1985)	Schizo-phrenia	119	FSS (-) SSS (-)	NA	Multiple regression
Cohen (1978)	Schizo-phrenia	28	SSS (-)	Social network theory	ANOVA
Dayson (1992)	Psychiatric Diagnoses	369	SSS (-)	NA	Logistic regression
Dozier (1987)	Psychiatric Diagnoses	30	SSS (NS)	NA	Multiple regression
Holmes-Eber (1990)	Psychiatric Diagnoses	310	SSS (NS)	NA	Multiple regression
Lipton (1981)	Schizo-phrenia	30	SSS (-)	Social network theory	T test

Note: (-): negative association; (+): positive association; ANOVA: analysis of variance; FSS: functional social support; NA: not applicable; NS: not statistically Significant; SSS: structural social support.

Table 7 (continued). The Relationship between Social Networks and Readmission

Author	**Condition**	**Sample size**	**Finding**	**Theory**	**Analytic method**
Mojtabai (1997)	Psychiatric diagnoses	2,002	Living alone and young (+) Living with others and employed (+)	NA	Cox regression
Moos (1994)	Substance abuse	21,139	Single (+)	Health behavioral model	Logistic regression
Moos (1995)	Substance abuse	10,352	Single (+)	NA	Logistic regression
Peterson (1994)	Substance abuse	40,747	Single (+)	NA	Logistic regression
Postrado (1995)	Severe mental illness	559	FSS (-)	NA	Logistic regression
Rabinowitz (1995)	Psychiatric diagnoses	2,220	Single (+)	NA	x^2
Ross (1995)	Alcoholism	276	FSS (NS)	NA	Cox regression
Sands (1984)	Psychiatric diagnoses	92	Living with others (-)	NA	Multiple regression

Note: (-): negative association; (+): positive association; ANOVA: analysis of variance; FSS: functional social support; NA: not applicable; x^2: chi-square test.

Access to Care

Aday (1974) refers to access to care as the process of gaining entrance to the healthcare system. Andersen (1970) equates entry to access, and defines entry to care as:

> "the means through which the patient gains entry to the medical care system and continues the treatment process."

Such a definition of access to care is particular relevant to the VA health care system, since VA provides medical care services based on the eligibility of the veterans. Almost all veterans are legally eligible for VA health care; nevertheless, limited resources have led the VA to prioritize veterans in terms of their eligibility. Title 38 USC (Department of Veterans Affairs, 1993) defines veterans' eligibility.

Eligibility is based on the following three criteria, in order of priority (Beattie et al., 1996; Fonseca et al., 1996; Kosloski et al., 1987; Page et al., 1982; Romm et al., 1984; Rosenheck & Massari 1993; Rosenheck & Stolar 1998):

1. The extent of disabling war or service-connected injuries, measured from 0% to 100%, for specified service-connected conditions;
2. Special categories of veterans: World War I veterans, Mexican border veterans, former prisoners of war, veterans exposed to Agent Orange or radiation; and
3. VA pensioners, veterans eligible for state Medicaid, or veterans with a 'means tested' low income, irrespective of their service-connected injuries or medical conditions.

The priority for veterans with service-connected conditions to receive VA medical care is modified by the status of special categories and of low income. In 1996, VA proposed an 'Eligibility Reform' that further divided veterans into seven categories based on the three criteria mentioned above (Pane, 1998). According to the new classification system, priority group 1 veterans are those with service-connected conditions rated at 50 percent or more disability, whereas priority group 7 veterans are those who do not have service-connected conditions, whose income and net worth are above the statutory threshold, and who agree to pay specified copayments.

For the general public, lower income usually means less access to healthcare facilities; it is the opposite for veterans seeking care in the VA healthcare system. Veterans with lower income have better access to VA health care facilities. For veterans with low incomes, three categories (A, B, and C) have been established by a means test based on income thresholds, number of dependents, and net worth. Category A has the highest priority. In 1993, for category A the income threshold was $23,290 and the cap for net worth was $50,000 for a veteran with no dependents (Smith et al., 1996); in 1998, the income threshold became $22,064 (Kizer, 1997).

Most of the studies on access to care are survey-based (Kosloski et al., 1987; Page 1982; Rosenheck & Massari 1993; Rosenheck & Stolar 1998; Wolinsky et al., 1985). Most indicate that both service-connected conditions and low-income status are positively associated with access to VA health care, whereas travel distance is negatively related to access.

Page (1982) used log-linear analysis to analyze factors influencing the veteran's choice of VA for hospitalization, among 1,260 veterans from a 1978 national sample. The results showed that an interaction effect between income and service-connected conditions, which may be related to the VA eligibility criteria. Among service-connected veterans, low-income veterans were more than twice as likely as their counterparts to use VA facilities. Among non-service-connected veterans, low-income veterans were 4.9 time as likely as high-income veterans to use VAMCs. Among low-income veterans, the veterans with service-connected conditions were 2.5 times as likely as the others to go to a VAMC; among high-income veterans, those with service-connected conditions were six times as likely as the other to use a VAMC. It can be seen that service-connected conditions are an important factor irrespective of income, which may be because of the entitlement criteria set by the VA. The effect of "low-income" status was observed as the same after controlling for service-connected conditions.

Kosloski et al. (1987) applied a series of multivariate regression analyses on 3,013 veterans aged 55 years and over who were screened from 34,500 households as a national probability sample in 1983. The results showed that income was negatively associated with both previous and future utilization of a VAMC with R-squares of 3.4% and 4.6%, respectively – meaning that veterans with low income used and intended to use the VA as their source of medical care. Service-connected conditions were positively associated with previous utilization, with an R-square of 3.6%; however, they were not statistically significantly associated with intended use. This result could be attributed by the VA priority classification system for controlling access, and/or to veterans with service-connected conditions being aware of their medical care benefits. The proximity of residence to VA facilities emerged as a positive significant predictor of previous utilization, with an R-square of 1.2%. That held true only for inpatient care, because of the large service areas that a VAMC has; in turn, veterans who needed inpatient care were willing to travel further to obtain it.

Rosenheck & Massari (1993) used data from a 1987 national survey of veterans to compare VA users and non-users. The authors applied the "health behavioral model" to examine predisposing, enabling, and illness characteristics that were associated with use of VA health care services. The results of logistic regression showed that, after high illness level and lack of health insurance, the factor of service-connected disability was the strongest predictor of VA service use, with an OR of 5.00. That result indicates that veterans with service-connected conditions are 5 times more likely than their counterparts to use VA facilities. Income had an OR of 0.76 for the medium-income group ($10,000-20,000) with a negative sign, meaning that low-income veterans were more than likely to use VAMCs as their healthcare sources.

In another study, conducted by Rosenheck & Stolar (1998), using 1990 Decennial Census and VA databases with a theoretical framework of the "health behavioral model", the authors found that 36 % of the variation in the multiple regression analysis was explained by sociodemographic factors. Low-income status and service-connected conditions were the most important predictors, with 0.38 and 0.24 standardized regression coefficients, respectively. Distance to VA facilities was included as an unmanaged factor affecting access to VA health care services, and was significantly associated with utilization, with a coefficient of – 0.45. After controlling for service-connected conditions for psychosis, the effects of sociodemographic factors reduced to 2%, and low income was no longer statistically significant. However, the R-square for unmanaged factors affecting access to VA health care services increased to 22% with a coefficient of – 0.59, for distance. That indicates that low income, service-connected conditions, and distance to VA facilities were the most important predictors for access to VA health care. After controlling for service-connected conditions, the distance to VA facilities was the predominant factor in measuring access to VA health care, and income status was not associated with utilization.

Wolinsky et al. (1985), using a 1978 national survey, compared the healthcare utilization of veterans and non-veterans. After adjusting for differences in the predisposing, enabling, and need characteristics based on the model of health behavior, virtually no meaningful differences were found between veterans and non-veterans in the use of health services. There were no meaningful or consistent effects of veteran cohorts on the use of health services. The results of logistic regression showed that the two most dominant factors were service-connected disability and age less than 65 years, and service-connected disability and age greater than 64 years, with coefficients of 0.11 and 0.10, respectively. Family income was also significant, with a coefficient of – 0.002.

In summary, service-connection conditions, low income, and geographic proximity to VA health care facilities are positively associated with access to VA health care. However, after controlling for service-connected conditions, low income may lose its significance in predicting access. Table 8 presents the findings for these three factors.

Table 8. Factors in Access to Care by Veterans

Factor	Condition	Finding	Theory	Analytic method
Distance				
	Kosloski (1987) Survey	(+)*	NA	Multivariate regression
	Rosenheck (1998) Survey	(-)	Health behavioral model	Multiple regression
Low income				
	Kosloski (1987) Survey	(+)	NA	Multiple regression
	Page (1982) Survey	(+)	NA	Log-linear analysis
	Rosenheck (1993) Survey	(+)	Health behavioral model	Logistic regression
	Rosenheck (1993) Survey	(+)	Health behavioral model	Multiple regression
	Wolinsky (1985) Survey	(+)	Health behavioral model	Logistic regression
Service-connected disability	Kosloski (1987) Survey	(+)	NA	Multiple regression
	Page (1982) Survey	(+)	NA	Log-linear analysis

Note: (+): positive association; (-): negative association; *: Holds only for inpatient care; NA: not applicable.

<u>The Relationship between Access to Care and Post-discharge Ambulatory Care</u>

Druss et al. (1997) applied the "health behavioral model" and examined timeliness, access, and intensity of outpatient medical service use in a national sample of veterans with comorbid medical disorders who had been discharged from VA psychiatric units (N = 44,533). The results of logistic regression revealed that the odd ratios for medical-surgical follow-up within 6 months after discharge, an indicator for overall access, were 1.73 and 1.06, respectively, for receipt of VA compensation payments (a proxy for service-connected conditions) and proximity to a VA outpatient clinic. For short-term follow-up (within 30 days), an indicator for timeliness of access, the odds ratio were 1.20 and 1.07, respectively. The intensity of medical service use was analyzed with a general linear model. The authors found that those receiving VA compensation payments, on average, had 0.45 more medical-surgical visits and 0.26 more visits for every 10 miles decreases, within 6 months after discharge.

Fortney et al. (1995) examined the relationship between geographical accessibility, patient characteristics, and participation in alcoholism aftercare programs, among 4,621 male veterans. Logistic regression analysis was used to model the decision to enter aftercare treatment as a function of travel distance, age, marital status, ethnicity, severity of illness, and urbanization. The results showed that travel barriers significantly reduced aftercare participation, especially for elderly and rural veterans. Both younger and older veterans were less likely than middle-aged veterans to keep their aftercare appointments. From a further analysis that included an interaction term for age and distance, the authors found that older veterans were much more impeded by travel distance than younger veterans were. Married patients were more likely than unmarried patients to use outpatient services. Ethnic status, severity of illness, and urban size all negatively affected the likelihood of using post-discharge care.

Piette et al. (1996) examined the relationship between distance and post-discharge ambulatory care among 4,637 myocardial infarction (MI) veterans discharged in 1992. Logistic regression results revealed that, apart from severity of illness the odd ratios for veterans with service-connected conditions receiving one or more post-discharge visits were, respectively, 1.35 and 1.27 for 30 days and 90 days after discharge. Patients living more than 20 miles from their admitting hospitals were less likely to use ambulatory services (for 30 days after discharge, OR were 0.84 and 0.67, respectively, for 21-50 miles and 50 or more miles; for 90 days after discharge, those OR were 0.89 and 0.56, respectively).

The Relationship between Access to Care and Readmission

Peterson et al. (1994) investigated 101 substance abuse treatment programs with 40,747 patients, in order to discover the factors contributing to patient readmission within six months after discharge. The average readmission rate in 180 days was 25%. The study first stage analysis was conducted on patient-level data. The results of logistic regression indicated that service-connected disability ($\beta = 0.072$, $p < 0.05$) was positively associated with readmission, whereas a means test result in category C ($\beta = -0.705$, $p < 0.05$) was negatively associated with readmission. In other words, low-income veterans were more than likely to be readmitted. The authors also found that the interaction of PTSD and cocaine diagnoses ($\beta = 0.251$, $p < 0.05$) increased readmission risk. That means that the effects of comorbidity should not be overlooked in studying readmission.

A major weakness of this study is the lack of theoretical support. Although a two-stage analytic method was adopted, the variances and the model fit could be improved by using multi-level analysis to assess both individual and group levels simultaneously.

In a randomly selected, 50 percent sample of 6,317 veterans with medical or surgical diagnoses who had been discharged from a VAMC, Holloway et al. (1990) found that 22% were readmitted within 30 days after discharge. The results of logistic regression revealed that increasing the distance from the VA hospital increased readmission risk for both the original data set (OR = 1.18) and the validation data set (OR = 1.23). The factor, service-connected condition yielded unstable results in predicting readmission: OR was 1.66 in the original data set and jumped to 3.30 in the validation data set.

Severity of condition was not a factor included in the study. Results based on severity as a marker for multiple group analysis would have revealed whether remotely located veterans were severely ill. Local health resources was not a factor considered in the study, but could have indicated whether veterans in remote areas were lacking alternatives. The absence of theoretical support undermines the importance of this study.

As shown in Table 9, service-connected conditions are positively associated with post-discharge ambulatory care and readmission. Travel distance is inversely related to post-discharge ambulatory care. The findings of Holloway et al. (1990), of a positive relationship between distance and readmission, may be masked by severity or lack of alternatives. Low income is positively related to readmission.

In summary, service-connected conditions and low income may increase veterans' access to care in terms of post-discharge ambulatory care and readmission, as shown in Table 8 and 9. Increased distance from residence to a VAMC may impede access to care.

Table 9. The Relationship between Access, Post-discharge Ambulatory Care, and Readmission

Factor	Condition	Finding	Theory	Analytic method
Post-discharge ambulatory care				
Distance	Fortney (1995) Substance abuse	(-)	Health behavioral model	Logistic regression
	Piette (1996) Myocardial infarction	(-)	NA	Logistic regression
Service-connected disability	Druss (1997) Psychiatric conditions	(+)	Health behavioral model	Logistic regression
	Piette (1996) Myocardial infarction	(+)	NA	Logistic regression

Note: (+): positive association; (-): negative association; NA: not applicable.

Table 9 (continued). The Relationship between Access, Post-discharge Ambulatory Care, and Readmission

Factor	Condition	Finding	Theory	Analytic method
Readmission				
Distance	Holloway (1990) Medical and surgical diagnoses	(+)	NA	Logistic regression
Low income	Peterson (1994) Substance abuse	(+)	NA	Logistic regression
Service-connected disability	Peterson (1994) Substance abuse	(+)	NA	Logistic regression
	Holloway (1990) Medical and surgical diagnoses	Unstable	NA	Logistic regression

Note: (+): positive association; (-): negative association; NA: not applicable.

Comorbidity

The validity of the PTSD diagnosis has been questioned because of a number of separate symptom criteria overlap with other diagnoses such as depression and anxiety disorders (Breslau & Davis, 1987; Maes et al., 1998; March, 1990; Schutzwohl & Maercker, 1999). The way to conduct validation is to remove the overlapped symptoms and distinguish the confounded diagnoses. After separating overlapped symptoms, Bleich et al. (1997) found that PTSD could be discriminated from major depression disorder among 60 Israeli veterans by using the Schedule for Affective Disorders and

Schizophrenia- Lifetime version (SADS-L) and the Structured Interview for PTSD (PTSD-SI).

The problem of overlapping criteria can also be overcome by examining the pattern of shared risk factors, the relationship of the comorbidity to the cause of PTSD, and the relative onset of PTSD and the comorbidity. O'Toole et al. (1998) confirmed that, apart from antisocial personality disorder, PTSD was able to account for the variance between combat (a shared risk factor) and other comorbidities related to combat. Chronological studies confirmed that PTSD is a distinct diagnosis independent of other mental disorders, through investigation of their onsets (Davidson et al., 1990; Mellman et al., 1992; O'Toole et al, 1998; Skodol et al., 1996).

Mental Comorbidity

In veterans studies, alcohol abuse or dependence was found to be the most prevalent psychiatric comorbidity of PTSD [Bullman et al., 1994; the Centers for Disease Control (CDC) 1988_a; Davidson et al., 1990; Kulka et al., 1990; Mellman et al., 1992; O'Toole et al., 1998; Roszell et al., 1991]. The following disorders were also found as comorbidities of PTSD: anxiety disorders (CDC 1988_a; Davidson et al., 1990; Kulka et al., 1990; Long et al., 1996; Mellman et al., 1992; O'Toole et al., 1998; Roszell et al., 1991); depression (Bullman et al., 1994; Davidson et al., 1990; Kulka et al., 1990; Long et al., 1996; Mellman et al., 1992; Roszell et al., 1991; Skodol et al., 1996); phobia disorders (Kulka et al., 1990; Mellman et al., 1992; Orsillo et al., 1996; O'Toole et al., 1998; Roszell et al., 1991); substance abuse or dependence (Bullman et al., CDC 1988_a; Roszell et al., 1991;

Kulka et al., 1990; Skodol et al., 1996); panic disorder (Davidson et al., 1990; Kulka et al., 1990; Orsillo et al., 1996); dysthymia (Kulka et al., 1990; O'Toole et al., 1998; Roszell et al., 1991); somatization (O'Toole et al., 1998; Roszell et al., 1991); obsessive-compulsive disorder (Mellman et al., 1992; Orsillo et al., 1996); and antisocial personality disorder (Kulka et al., 1990).

In community studies, major depressive disorder and generalized anxiety disorder were found to be the most prevalent disorders among PTSD subjects (Davidson et al., 1991; Green et al., 1992; Kessler et al., 1995; Shore et al., 1989). Phobia disorders, dysthymia, somatization, obsessive-compulsive disorder, conduct disorders, and schizophrenia were also uncovered as comorbidities of PTSD. Alcohol abuse/dependence and substance abuse/dependence were less prevalent in community samples than among veteran subjects.

The results of the Vietnam Experience Study (VES) conducted by the CDC (1988_a) found a lifetime prevalence rate of 15% and a current prevalence rate of 2.2% for PTSD among 2,490 Vietnam veterans. The results of logistic regression indicated that, as compared to non-Vietnam veterans, Vietnam veterans had elevated lifetime prevalence rates for alcohol abuse or dependence of 13.7% (OR = 1.5), for generalized anxiety disorder of 4.9% (OR = 1.5), and for depression of 4.4% (OR = 2.0). Among PTSD veterans, 66% had a concurrent diagnosis of anxiety or depression. Thirty-nine percent had alcohol abuse or dependence.

In the National Vietnam Veterans Readjustment Study (NVVRS), which includes 32,766 Vietnam War veterans, Kulka et al. (1990) found that for male veterans, the lifetime and current prevalence rates of PTSD were, respectively, 30.9 % and15.2%. For female veterans, those rates were 26.9% and 8.5%. As a sub-study of NVVRS, 1,600 Vietnam theater veterans, 730 era veterans, and a comparison group of 650 civilians were assessed by the Diagnostic Interview Schedule (DIS). In comparison of non-PTSD era veterans and civilians, chi-square results showed significantly elevated prevalence rates of mental comorbidities among Vietnam theater veterans with PTSD. Among those male veterans, 73.8% had lifetime diagnoses of alcohol abuse or dependence, and 43.5% had generalized anxiety disorder. The lifetime prevalence rates were 30.6% for antisocial personality disorder, 26.4% for major depressive disorder, 21.0% for dysthymia, and 11.3% for drug abuse and dependence. In female veterans with PTSD, 42.3% had lifetime diagnoses of major depressive disorder, 38.2% of generalized anxiety disorder, 33.2% of dysthimia, 28.5% of alcohol abuse/dependence, and 20.8% of panic disorder.

Alcohol abuse/dependence was far more prevalent in male than in female veterans with PTSD, which might due to the difference in their service branches. Most of the women who served in Vietnam were nursing personnel. Antisocial personality disorder and drug abuse/dependence were found only in male veterans, which may be attributable to a different degree of exposure to combat and to the difference in the branch of service. Female veterans, however, had much higher rates of major depressive and panic disorders than their male counterparts did.

The mortality risk of 4,247 male Vietnam veterans with a diagnosis of PTSD from the Agent Orange Registry (AOR), as compared to that of 12,010 male Vietnam veterans from the AOR with no diagnosis of PTSD, was calculated using the Cox proportional hazards model. Bullman et al. (1994) found that the PTSD veterans were more likely than the non-PTSD veterans to die from suicide (relative risk = 3.97, 95%), from accidental poisoning (relative risk = 2.89). Twenty three percent of PTSD veterans were diagnosed with additional mental disorders. Alcohol and drug dependence accounted for 56% of the PTSD subjects, neurotic disorder for 11%, and depression for 10%. In comparison to the U.S. male population, the PTSD veterans, both with and without comorbidity, had statistically significantly elevated standardized mortality rates (SMR) for all external causes, all accidents, motor vehicle accidents, and suicides. With the U.S. male population used as a comparison group, PTSD veterans with comorbidities had higher excess SMRs than did PTSD veterans without comorbidity. For instance, the suicide SMR was 9.81 for the former and 5.78 for the latter. This result indicates that mental comorbidity has a severe impact on the outcome of interest; however, the study did not perform separate analyses for each comorbidity to discover the relative effects.

The findings for help-seeking PTSD veterans, though a small sample size with selection bias, and using different instruments and methodology, were comparable to the findings from large-scale surveys of community veterans, in terms of mental comorbidity pattern. Alcohol abuse or dependence was found to be the most prevalent comorbidity for PTSD, especially among Vietnam veterans, and was followed by anxiety and depression disorders. Studies of veterans of different nationalities found both lifetime and current prevalence rates for PTSD to be comparable. The pattern of mental comorbidity was also similar, except that substance abuse was lower among Israeli veterans, which may be due to the availability of substances or to cultural difference (Skodol et al., 1996). The number of comorbidities was positively associated with the severity of PTSD, service-seeking behavior, and mortality risk (Bullman et al., 1994; Skodol et al., 1996), which implies that mental comorbidities have severe effects on health outcomes.

Recall bias cannot be ruled out in the clinical studies, because the traumatic events have been past for a time. In addition, most authors of the clinical studies did not use multivariate analysis, so the relative effects of multiple variables were not revealed. Although most of the epidemiological studies of PTSD comorbidity applied logistic regression and Cox regression, only Skodol et al. (1996) indicated that the presence of mental comorbidity has a positive association with utilization. Most of the studies were cross-sectional instead of longitudinal, so the causal relationship between the dependent and the independent variables could not be ascertained. Another weakness of these studies is the failure to use a theory appropriate to the proposed research question. Table 10 presents the comorbidities of PTSD found in the literature.

Table 10. Summary of Comorbidity for PTSD

Author	**Sample size**	**PTSD Prevalence rates @ (%)**	**Analytic method**	**Instru-ment**	**Mental comorbi-dity (%)**	**Physical comorbi-dity (%)**
Treatment – seeking veterans						
Davidson (1990)	44 male PTSD veterans	(NA, 100)	Chi-square test	SADS-L	ALC@ (WW II: 47.3, NA; VN: 68.0, NA), GAD@ (WW II: 73.6, NA; VN: 56.0, NA), IDD@ (WW II: 47.3, NA; VN: 60.0, NA), MDD@ (WW II: 57.8, NA; VN: 60.0, NA), and PD@* (WW II: 10.5, NA; VN: 44.0, NA).	NA

Note: @: prevalence rates (lifetime, current); *: $p < 0.05$; ALC: alcoholism; GAD: generalized anxiety disorder; IDD: intermittent depressive disorder; MDD: major depression disorder; NA: not applicable; PD: panic disorder; SADS-L: the Schedule for Affective Disorders and Schizophrenia- Lifetime version; VN: Vietnam veterans; WW II: World War II veterans.

Table 10 (continued). Summary of Comorbidity for PTSD

Author	Sample size	PTSD Prevalence rates @ (%)	Analytic method	Instrument	Mental comorbidity (%)	Physical comorbidity (%)
Litz (1992)	37 male treatment-seeking veterans	(NA, 51.35)	Z test	SCID, MMPI, and CMI.	NA	BV* (26.3), DIA* (47.4), IMP* (31.6), NAU* (44.4), RB* (47.4), RIE* (47.7), SB* (36.7), and SEX-D* (36.8).
Orsillo (1996)	311 male service-seeking veterans	(NA, 63)	Chi-square test	SCID and CAPS	MDD* (70, 55), OCD (6*, 5), PD* (28, 25), and SP* (17, 15).	NA

Note: @: prevalence rates (lifetime, current); *: $p < 0.05$; A/D: alcohol dependence; AGOP: agoraphobia; BV: blurred vision; CAPS: Clinician Administered PTSD Scale; CMI: Cornell Medical Index; DIA: diarrhea; IMP: impotence; MDD: major depression disorder; MMPI: Minnesota Multiphasic Personality Inventory; NA: not applicable; NAU: nausea; PD: panic disorder; OCD: obsessive-compulsive disorder; RB: rapid breathing; RIE: ringing in ear; SB: shortness of breath; SCID: Structured Clinical Interview for DSM-III-R; SEXD: sexual disinterest; SP: social phobia.

Table 10 (continued). Summary of Comorbidity for PTSD

Author	Sample size	PTSD Prevalence rates @ (%)	Analytic method	Instru-ment	Mental comorbi-dity (%)	Physical comorbi-dity (%)
Roszell (1991)	48 male PTSD veterans	(NA, 100)	Descriptive study	SCID	A/D@ (70.8, 33.3), AGOP@ (25.0, 25.0), D/A@ (20.8, 4.2), D/D@ (33.3, 10.4), DYS (14.6,14.6), GAD@ (25.0, 25.0), MDD@ (68.7, 64.4), and SOM (10.4, 10.4).	NA
White (1989)	543 discharged veterans	(NA, 60.0)	Descriptive study	Discharge summary review	NA	CAR (6.5), MUS-SK (24.1), NEU(6.8), NSI (7.4), SI (9.2), and T/I (14.7).

.Note: @: prevalence rates (lifetime, current); *: $p < 0.05$; AGOP: agoraphobia; CAR: cardiovascular symptoms; D/D: drug dependence; DYS: dysthymia; GAD: generalized anxiety disorder; MDD: major depression disorder; MUS-SK: musculoskeletal symptoms; NA: not applicable; NEU: neurological symptoms; NSI: non-system infection; SADS-L: the Schedule for Affective Disorders and Schizophrenia- Lifetime version; SCID: Structured Clinical Interview for DSM-III-R; SI: sensory impairment; SOM: somatization; T/I: trauma/injury.

Table 10 (continued). Summary of Comorbidity for PTSD

Author	Sample size	PTSD Prevalence rates @ (%)	Analytic method	Instru-ment	Mental comorbi-dity (%)	Physical comorbi-dity (%)
Community veterans study						
Boscarino (1997)	1,399 male veterans	(23.73, NA)	Logistic regression	DIS, MMPI, and medical examination	NA	CIR@* (25.0, NA), DIG@* (22.9, NA), INF-D@* (10.8, NA), MUS-SK@* (15.4, NA), NS@* (19, NA), and RES@* (15.1, NA).
Bullman (1994)	4,247 male PTSD and 12,010 male non-PTSD veterans	NA	Cox regression	SADS-L	A/SD (56), DD (10), and ND (11).	NA

Note: @: prevalence rates (lifetime, current); *: $p < 0.05$; A/SD: alcohol and substance dependence; CIR: circulatory; DD: depressive disorder; DIG: digestive; DIS: Diagnostic interview Schedule; INF-D: infectious diseases; MMPI: Minnesota Multiphasic Personality Inventory; MUS-SK: musculoskeletal; NA: not applicable; ND: neurotic disorder; NS: nervous system; RES: respiratory; SADS-L: the Schedule for Affective Disorders and Schizophrenia- Lifetime version.

Table 10 (continued). Summary of Comorbidity for PTSD

Author	**Sample size**	**PTSD Prevalence rates[@] (%)**	**Analytic method**	**Instru-ment**	**Mental comorbi-dity (%)**	**Physical comorbi-dity (%)**
Hovens (1998)	147 male WW II veterans	(NA, 51.02)	Chi-square test and Fisher's exact test.	SCID, STAI, and ZSD.	NA	ART* (42.6), BRON* (17.5), BP* (32.8), HEM* (27.0), HD* (22.4), HYP* (27.0), IH* (8.8), LBP* (18.4), M/H* (26.8), PP* (14.2), SC* (25.2), SD* (15.9), and VAR* (12.8).

Note: @: prevalence rates (lifetime, current); *:$p < 0.05$; ART: arthritis; BRON: bronchitis; BP: back pain; HD: heart diseases; HAEM: hemorrhoids; HYP: hypertension; IH: inguinal hernia; LBP: large bowel problems; M/H: migraine or headaches; PP: prostate problems; SC: stomach complaints; SCID: Structured Clinical Interview for DSM-III-R; SD: skin diseases; STAI: the Spielberger Trait-Anxiety Inventory; VAR: varicosis; WWII: World War II veterans; ZSD: the Zung Self-rating Depression scale.

Table 10 (continued). Summary of Comorbidity for PTSD

Author	Sample size	PTSD Prevalence rates@ (%)	Analytic method	Instru-ment	Mental comorbi-dity (%)	Physical comorbi-dity (%)
Kulka (1990)	1,600 Vietnam theater veterans.	Male (30.9, 15.2) Female: (26.9, 8.5)	Chi-square test	DIS	Male: AA/D @* (73.8, 22.2), ASPD @* (30.6, 10.8), DA/D@* (11.3, 6.1), DYS @ (21.0*, NA), GAD@* (43.5, 19.8), MDD@* (26.4, 15.7), and PD* (8.0, 4.9). Female: AA/D@ (28.5*, 10.1) , DYS@ (33.2*, NA), GAD@* (38.2, 29.4), MDD@* (42.3, 23.0), and PD@* (20.8, 12.7).	NA

Note: @: prevalence rates (lifetime, current); *: $p < 0.05$; AA/D: alcohol abuse/dependence; ASPD: antisocial personality disorder; DA/D: drug abuse/dependence; DIS: Diagnostic Interview Schedule; DYS: dysthymia; GAD: generalized anxiety disorder; MDD: major depressive disorder; NA: not applicable; PD: panic disorder.

Table 10 (continued). Summary of Comorbidity for PTSD

Author	Sample size	PTSD Prevalence rates @ (%)	Analytic method	Instru-ment	Mental comorbi-dity (%)	Physical comorbi-dity (%)
Long (1996)	573 male New Zealand Vietnam veterans	(NA, 10.0)	Descriptive study	STAI and BDI	A@ (NA,15), A&D@ (NA, 73), and D@ (NA, 6).	NA
O'Toole (1998)	1,000 male Australian Vietnam veterans	(20.9, 11.6)	Logistic regression	PDEQ-R, SCID, and DIS	AA, DYS GAD, SP, and SPD#.	NA
Skodol (1996)	617 male Israeli veterans	(16.5, NA)	Logistic regression	SADS-L	AD@* (10.93, NA), MDD@* (6.01, NA), RDC@* (49.18, NA), and SM@* (14.75, NA).	NA

Note: @: prevalence rates (lifetime, current); #: no prevalence rate available; *: $p < 0.05$; A: anxiety; AA: alcohol abuse; AD: affective disorder; A&D: anxiety & depression; BDI: Beck Depression Inventory; CAPS: Clinician-Administered PTSD Scale; CAR: cardiovascular symptoms; D: depression; DIS: Diagnostic Interview Schedule; DYS: dysthymia; GHQ: General Health Questionnaire; GAD: generalized anxiety disorder; MDD: major depression disorder; MUS-SK: musculoskeletal symptoms; NA: not applicable; NEU: neurological symptoms; PDEQ-R: Peritraumatic Dissociative Experience Questionnaire-Rater version; RDC: Research Diagnostic Criteria; RES: respiratory symptoms; SADS-L: the Schedule for Affective Disorders and Schizophrenia-Lifetime version; SCID: Structured Clinical Interview for DSM-III-R; STAI: State-Trait Anxiety Inventory; SM: substance misuse; SP: social phobia; SPD: somatoform pain disorder.

Table 10 (continued). Summary of Comorbidity for PTSD

Author	Sample size	PTSD Prevalence rates @ (%)	Analytic method	Instru-ment	Mental comorbi-dity (%)	Physical comorbi-dity (%)
General public						
Davidson (1991)	2,985 community subjects	(1.30, 0.44)	Logistic regression, chi-square test, and Fisher's exact test.	DIS	AGOP @* (31.6, NA), DA/D@* (9.0, NA), GAD @* (53.3, NA), MDD@* (29.9, NA), OCD@* (14.5, NA), PD@* (13.6, NA), SCHIZO @* (10.9), SIM-P@* (50.1, NA), SOM @* (11.7, NA), and SP@* (22.3, NA).	BA@* (13.5, NA), HYP@* (31.4, NA), and PU @* (12.8, NA).
Green (1992)	193 community samples exposed to disaster	(59.4, 25.0)	Correlation analysis	SCID	AGOP@* (3.7, 2.1), DYS@ (5.5, 3.8*), GAD@* (15.0, 10.4), MDD@* (31.6, 10.4), OCD@ (2.6*, 1.6),	NA

Note: @: prevalence rates (lifetime, current); *: p <0.05; AGOP: agoraphobia; BA: Bronchial asthma; DA/D: drug abuse/dependence; DIS: Diagnostic Interview Schedule; DYS: dysthymia; GAD: generalized anxiety disorder; HYP: hypertension; MDD: major depression disorder; OCD: obsessive-compulsive disorder; PD: panic disorder; PU: peptic ulcer; SCID: Structured Clinical Interview for DSM-III-R; SCHIZO: schizophrenia; SIM-P: simple phobia; SOM: somatization; SP: social phobia.

Table 10 (continued). Summary of Comorbidity for PTSD

Author	Sample size	PTSD Prevalence rates @ (%)	Analytic method	Instru-ment	Mental comorbi-dity (%)	Physical comorbi-dity (%)
Green (con't)					PD@* (5.2, 3.6), SA@ (6.3, 2.1*), SIM-P@* (13.0, 7.3), and SOM@* (2.1, 1.6).	
Kessler (1995)	5,877 community samples	(Male: 5.0, NA; female: 10.4, NA)	Logistic regression	DIS and CIDI	Male: AA/D@* (51.9, NA), AGOP@* (16.1, NA), CD@* (43.3, NA), DA/D @* (34.5, NA), DYS @* (21.4, NA), GAD @* (16.8, NA), MAN @* (11.7, NA), MDD@* (47.9, NA), PD @* (7.3, NA), SIM-P@* (31.4, NA), SP @* (27.6, NA).	NA

Note: @: prevalence rates (lifetime, current); *: $p < 0.05$; AA/D: alcohol abuse/dependence; AGOP: agoraphobia; CD: conduct disorder; CIDI: the Composite International Diagnostic Interview; DA/D: drug abuse/dependence; DIS: Diagnostic Interview Schedule; DYS: dysthymia; GAD: generalized anxiety disorder; MDD: major depression disorder; PD: panic disorder; SIM-P: simple phobia; SP: social phobia.

Table 10 (continued). Summary of Comorbidity for PTSD

Author	Sample size	PTSD Prevalence rates @ (%)	Analytic method	Instru-ment	Mental comorbi-dity (%)	Physical comorbi-dity (%)
Kessler (con't)					Female: AA/D@* (27.9, NA), AGOP@* (22.4, NA), CD@* (15.4, NA), DA/D @* (26.9, NA), DYS @* (23.3, NA), GAD @* (15.0, NA), MAN @* (5.7, NA), MDD@* (48.5, NA), PD @* (12.6, NA), SIM-P@* (29.0, NA), and SP @* (28.4, NA).	
McFarlane (1994)	70 PTSD and 70 non-PTSD fire-fighters	NA	Chi-square test	DIS, IES, and GHQ	NA	CAR* (21.43),), MUS-SK* (45.71), NEU* (34.29). and RES* (34.29).

Note: @: prevalence rates (lifetime, current); *: p <0.05; AA/D: alcohol abuse/dependence; AGOP: agoraphobia; CAR: cardiovascular symptoms; CD: conduct disorder; DA/D: drug abuse/dependence; DIS: Diagnostic Interview Schedule; DYS: dysthymia; GAD: generalized anxiety disorder; GHQ: General Health Questionnaire; IES: Impact of Events Scale; MAN: mania; MDD: major depression disorder; MUS-SK: musculoskeletal symptoms; NEU: neurological symptoms; PD: panic disorder; RES: respiratory symptoms; SIM-P: simple phobia; SP: social phobia.

Table 10 (continued). Summary of Comorbidity for PTSD

Author	Sample size	PTSD Prevalence rate @ (%)	Analysis	Instru-ment	Mental comorbi-dity (%)	Physical comorbi-dity (%)
Shalev (1990)	50 PTSD and 48 non-PTSD male Israeli combat veterans	NA	Chi-square test and t-test	SCL-90, IES, PSES and medical exami-nation.	NA	AUD* (66), BP* (42), CAR* (66), GAS* (44), H* (62), and NEU* (48)
Shore (1989)	955 community samples (548: exposed to disaster.)	(Male: 2.9, NA; female: 3.3, NA)	Descriptive study	DIS	AA/D@: (27.03, NA), D@ (51.35, NA), GAD@ (75.68, NA), OCD @ (10.81, NA), and P@ (35.13, NA).	NA

Note: @: prevalence rates (lifetime, current); *: $p < 0.05$; AA/D: alcohol abuse/dependence; AUD: audiological symptoms; BP: back pain; CAR: cardiovascular symptoms; D: depression; DIS: Diagnostic Interview Schedule; GAD: generalized anxiety disorder; GAS: gastrointestinal symptoms; H: headaches; IES: Impact of Events Scale; NEU: neurological symptoms; P: phobia; PSES: Perceived Self-Efficacy Scale; RES: respiratory symptoms; SCL-90: Symptom Check List-90; SIM-P: simple phobia; SP: social phobia.

Physical Comorbidity

CDC (1988$_b$) found that Vietnam veterans had more reported current and past health problems. Other than in hearing loss and lower sperm concentrations, the overall physical health status from medical examinations of Vietnam and non-Vietnam veterans were comparable. Eberly & Engdahl (1991) found there were no elevated rates of physical disorders among 426 POWs as compared to the general population. Elder et al. (1997)

found that overseas and combat experiences predicted the decline of physical health status for 328 WW II veterans. Stretch et al. (1995) also confirmed that overseas deployment during Operation Desert Storm had a negative effect on the physical health of 40,000 troop. Hovens et al. (1998) compared 147 male Dutch WW II Resistance veterans and 252 men from the general population. The t test results indicated that PTSD veterans reported more diseases than non-PTSD veterans did. The results of chi-square also revealed that the veterans had higher prevalence rates for 13 diseases than the general population group did.

Kulka et al. (1990) found that, as compared to PTSD free veterans, Vietnam theater veterans with PTSD, both males and females, reported poorer perceived physical health. The results of chi-square tests revealed that they also had more current chronic health problems. An extension of NVVS (Zatzick et al., 1997) showed that 31.9% of PTSD veterans had four or more medical conditions. The PTSD veterans had poorer health status, more diminished well-being, and more physical limitations than did non-PTSD veterans. Beckham et al. (1998) found that PTSD veterans had more physical health problems, both self-reported and physician-rated, than did PTSD free veterans.

PTSD status was either not assessed or not stratified by disease category (CDC 1988_b; Eberly & Engdahl, 1991; Elder et al., 1997; Hovens, et al., 1998; Stretch et al.; 1995). If PTSD status had been stratified, discrepancies would been revealed for PTSD and non-PTSD subjects. However, these studies indicate that veterans who have been deployed overseas and/or have participated in combat duty have poorer physical health than others do, irrespective of the status of PTSD. Beckham et al. (1998), Kulka et al.

(1990), and Zatzick et al. (1997) further demonstrated that PTSD impedes the physical health and the well-being of a veteran.

As summarized in Table 10, cardiovascular symptoms are the most prevalent physical comorbidity found in the studies (Boscarino, 1997; Davidson et al., 1991; Hovens et al., 1998; McFarlane et al., 1994; Shalev et al., 1990; White et al., 1989). The next most prevalent physical comorbidities found are respiratory complaints (Boscarino, 1997; Davidson et al., 1990; Hovens et al., 1998; Litz et al., 1992; McFarlane et al., 1994); musculoskeletal symptoms (Boscarino, 1997; Hovens et al., 1998; McFarlane et al., 1994; Shalev et al., 1990; White & Faustman, 1989); and gastrointestinal complaints (Boscarino, 1997; Davidson et al., 1991; Hovens et al., 1998; Litz et al., 1992; Shalev et al., 1990). Neurological symptoms are common in PTSD sufferers (Boscarino, 1997; Hovens et al., 1998; Shalev et al., 1990; White et al., 1989). Sensory complaints, including audiological and visionary, have been reported in several studies (Litz et al., 1992; McFarlane et al., 1994; Shalev et al., 1990; White et al., 1989). Infectious diseases are also found (Boscarino, 1997; White et al., 1989). Hovens et al. (1998) and White et al. (1989) report skin diseases that present with PTSD. Sexual dysfunction is found only by Litz et al. (1992). White et al. (1989) reports trauma/injury as the physical comorbidity for PTSD.

Although the correlation coefficients between self-reported physical symptoms and physician diagnosis range from low to moderate, deteriorated physical health and diminishing well-being have been found in the studies. This indicates that PTSD subjects having the aforementioned physical comorbidities may complicate the process of diagnosis, treatment, and recovery.

The Relationship between Comorbidity and Post-discharge Ambulatory Care

The comorbidity of substance abuse has been found inversely related to post-discharge ambulatory care for psychiatric patients (Kozaric-Kovacic et al., 1995; Moos & Moos, 1995_a; Solomon, 1986). Cocaine dependent patients with psychiatric comorbidity were also found to have fewer post-discharge outpatient visits (Killeen et al., 1995; Wolpe et al., 1993). Patients with coexisting dementia and depression had less post-discharge ambulatory care (Kales et al., 1999). On the other hand, Moos et al. (1994) indicates that comorbidity increases post-discharge ambulatory care. Dixon et al. (1997) found a mixed relationship between comorbidity and post-discharge outpatient care.

In a study of veterans aged 60 years or older, Kales et al. (1999) applied ANOVA to the records of patients with dementia ($n = 5,060$), of patients with coexisting dementia and depression ($n = 265$), and of patients with depression ($n = 1,790$), to investigate their health care use after index hospitalization for two years. The results revealed that dually diagnosed patients had significantly fewer total outpatient visits ($p < 0.001$), psychiatric visits, and all other visits ($p < 0.001$) than did patients with depression only. However, the authors found that patients with dual diagnoses had significantly more inpatient days ($p <0.001$) and readmissions ($p < 0.0001$). This implies that dually diagnosed veterans may have a substitution effect on utilization. Another explanation could be that the severity of their conditions prevented them from using post-discharge ambulatory care and led to their being treated in inpatient settings.

Using Andersen's health behavioral model, Moos et al. (1994) discovered that, among 21,139 veterans, patients with dual diagnoses received more post-discharge mental and medical outpatient visits, as shown by ANOVA and chi-square tests ($p < 0.01$). In a later study of 1,070 substance abuse veterans (Moos et al., 1995_a), the results of ANOVA revealed that dually diagnosed veterans had less post-discharge ambulatory care ($p < 0.05$) and were more likely to be readmitted ($p < 0.01$).

Dixon et al. (1997) compared 71 patients with independent mental disorders and substance use disorders to 38 patients with substance-induced mental disorders with substance use disorders and 59 patients with a single mental disorder, through chi-square tests. The authors found that the first group had a significantly higher rate of post-discharge substance abuse treatment than the other two groups did ($p < 0.001$). However, they also had a significantly lower rate of follow-up mental health visits than the other two groups did ($p < 0.001$). This implies that follow-up outpatient visits are diagnosis-specific.

As summarized in Table 11, there is a downward trend in post-discharge ambulatory care for psychiatric patients with comorbidities, except in the studies of Dixon et al. (1997) and Moos et al. (1994). Some of the studies have small samples (Killeen et al., 1995; Wolpe et al., 1993). None of them uses a multivariate analytic method to investigate multiple factors contributing to post-discharge ambulatory care. The study conducted by Moos et al. (1994) was the only one that was grounded in theory.

Table 11. The Relationship between Comorbidity and Post-discharge Ambulatory Care

Author	Condition	Sample size	Finding	Theory	Analytic method
Dixon (1997)	Substance use disorder and mental disorder	168	Mixed	NA	x^2
Kales (1999)	Dementia and depression	7,115	(-)	NA	ANOVA
Kileen (1995)	Cocaine dependence and mental disorder	30	(-)	NA	x^2
Kozarc-Kovacic (1995)	Schizo-phrenia and alcoholism	402	(-)	NA	x^2
Moos (1994)	Substance abuse and mental disorder	21,139	(+)	Health behavioral model	x^2 and ANOVA
Moos (1995)	Substance abuse and mental disorder	1,070	(-)	NA	ANOVA
Solomon (1986)	Substance abuse and mental disorder	497	(-)	NA	x^2
Wolpe (1993)	Substance abuse and mental disorder	48	(-)	NA	x^2

Note: (+): positive association; (-): negative association; ANOVA: analysis of variance; NA: not applicable; x^2: chi-square test.

The Relationship between Comobidity and Readmission of PTSD

In PTSD studies, comorbidity of schizophrenia, affective disorder, borderline personality disorder, and substance abuse were related to readmission (Boudewyns et al., 1991; Brown et al., 1995; Williams et al., 1998). Boudewyns et al. (1991) studied 65 male veterans with PTSD to determine the relationship between comorbidity and readmission. The psychiatric readmission rate was 49.2%. The results of a chi-square test showed that patients with schizophrenia or affective disorder with psychotic features were more likely than the non-psychotic patients to be readmitted in the following year ($p = 0.012$). Recent problems with alcohol, drug abuse, or dependence were not related to readmission.

Brown et al. (1995) compared 20 substance abuse patients with PTSD to 63 non-PTSD substance abuse patients. The results indicated that those in the PTSD group had more lifetime admissions than did those non-PTSD group ($t = 2.68$, $p < 0.01$). Williams et al. (1998) analyzed the readmission pattern of 500 veterans diagnosed with PTSD and various personality disorders, through logistic regression. The results revealed that patients with the comorbidity of borderline personality disorder had twice the readmission rates of those without the comorbidity, with a 95% C.I. of 1.20 - 5.01 ($p = 0.02$).

The small sample may have prevented the authors' dividing patients into subgroups, which may have impeded the power to detect differences among patients with different comorbidities (Boudewyns et al., 1991; Brown et al.; 1995). Not adopting multivariate analysis further impedes the demonstration of the relative effects of comordities on readmission. The problem of small sample size was overcome by Williams et al., (1998). The common weaknesses of these studies are lack of information on medical comorbidity and having no supporting theory.

The Relationship between Comorbidity and Readmission among other Mental Disorders

The majority of studies on other mental disorders found that comorbidity is positively related to readmission (Blow et al., 1998; Haywood et al., 1995; Moos & Moss, 1995a; Kales et al., 1999; Sullivan et al., 1995; Tomasson & Vaglum, 1998; Vogel & Huguelet, 1997). Only two studies found that comorbidity has no influence on readmission (Caton et al., 1994; Sanguineti et al., 1996). Caton et al. (1994) compared 100 each of homeless and never-homeless schizophrenic patients and found no differences in lifetime hospitalization among single, double, and triple disorder groups. Sanguineti et al. (1996) studied 1,755 involuntarily admitted psychiatric patients and found that there was no relationship between substance abuse and readmission. Peterson et al. (1994) found a mixed effect of comorbidity on readmission.

Peterson et al. (1994) found that the comorbidities of schizophrenia, manic/bipolar, PTSD, depression, borderline personality, and certain lung problems ($p < 0.05$) were positively related to readmission. The physical comorbidities of cancer, heart problems, arthritis, anemia, bronchitis, and back problems, however, were found to be negatively related to readmission for veterans with substance abuse ($p < 0.05$).

Blow et al. (1998) followed 682 seriously mentally ill veterans for two years. Twenty-nine percent of them had secondary diagnoses of substance abuse/dependence.

The results of ANCOVA showed that dually diagnosed patients had more admissions prior to and during the study period ($p = 0.0067$). Moos & Moos (1995_a) applied ANOVA to records of 1,070 substance abuse patients. The authors found that patients with secondary diagnoses of psychiatric disorders were more likely than substance abuse only patients to be readmitted in 3 months, 6 months, one year, and four years (all, $p < 0.01$). Kales et al. (1999) followed 7,115 veterans with dementia, depression, or both diagnoses. The results of ANOVA revealed that the co-disorder group was more likely than those with dementia ($p < 0.0001$) to be readmitted during the follow-up period, but no difference was found between the group with depression and the co-disorder group.

As shown in Table 12, the majority of the studies exhibit positive relationships between comorbidity and readmission, with the exception of three studies (Caton et al., 1994; Peterson et al., 1994; Sanguineti et al., 1996). The findings indicate that not only do psychiatric comorbidities contribute to readmission, but medical comorbidities also play a major role in rehospitalization for patients with mental disorders. Most of the studies apply multivariate analysis to control for other factors. The major weakness is lack of a theoretical grounded approach to the study problem.

Table 12. The Relationship between Comorbidity and Readmission

Author	Condition	Sample size	Finding	Theory	Analytic method
Boudewyns (1991)	PTSD	102	(+)	NA	x^2
Blow (1998)	Seriously mentally ill and substance use disorders	82	(+)	NA	ANOVA
Brown (1995)	PTSD and substance abuse	84	(+)	NA	x^2
Caton (1994)	Schizo-phrenia	200	NS	NA	Multiple regression
Haywood (1995)	Schizo-phrenic, schizo-affective, and affective disorders	135	(+)	NA	x^2 and multiple regression
Kales (1999)	Dementia and depression	7,115	(+)	NA	ANOVA
Moos (1995a)	Substance abuse and mental disorder	1,070	(+)	NA	ANOVA
Peterson (1994)	Substance abuse	40,747	Mixed	NA	Logistic regression
Sanguineti (1996)	Psychiatric diagnoses	1,755	NS	NA	x^2

Note: (+): positive association; ANOVA: analysis of variance; NA: not applicable; NS: not significant; PTSD: posttraumatic stress disorder; x^2: chi-square test.

Table 12 (continued). The Relationship between Comorbidity and Readmission

Author	Condition	Sample size	Finding	Theory	Analytic method
Sullivan (1995)	Seriously mentally ill	202	(+)	NA	Logistic regression
Tomasson (1998)	Substance abuse	351	(+)	NA	Logistic regression
Vogel (1997)	Psychiatric diagnoses	1,575	(+)	NA	Logistic regression
Williams (1998)	PTSD and mental disorders	500	(+)	NA	Multiple regression
Boudewyns (1991)	PTSD	102	(+)	NA	x^2

Note: (+): positive association; NA: not applicable, NS: not statistically significant, PTSD: posttraumatic stress disorder; x^2: chi-square test.

Prior Utilization

Prior utilization is defined as previous use of health care, including both outpatient visits and hospitalizations for both physical and mental health conditions.

Patients who have sought health care indicate that they have had health problems that required professional treatment. However, medical attention does not guarantee patients a full recovery in a short time, particularly from mental disorders.

The Relationship between Prior Utilization and Post-discharge Ambulatory Care

A positive effect of prior utilization on post-discharge outpatient care has been found in several studies (Axelrod & Wetzler, 1989; Blouin et al., 1985; Carpenter et al., 1981; Keane & Fahy, 1982; Kirk S. A., 1977). Klinkenberg & Calsyn (1998) found a mixed effect of prior utilization on post-discharge outpatient care. Other authors found no relationship between the two (Byers et al., 1978; Del Gaudio et al., 1977; Fink & Heckman, 1981; Hershorn, 1993; Matas et al, 1992).

In a one-year follow-up study of 216 psychiatric patients, Keane & Fahy (1982) investigated the effect of patients' attributes on post-discharge ambulatory care utilization. The results of multiple regression indicated that rural residence ($p < 0.01$), diagnosis of schizophrenia ($p < 0.01$), current care receiver ($p < 0.01$), and the number of previous psychiatric admissions ($p < 0.05$) had a positive effect on post-discharge ambulatory care utilization. The distance from home to hospital ($p < 0.05$) was negatively associated with aftercare. Blouin et al. (1985) studied the compliance behavior of 998 psychiatric patients who had been referred to ambulatory care. The results of chi-square tests revealed that the higher compliance rate was associated with more prior outpatient visits ($p < 0.001$), more previous admissions and ambulatory care ($p < 0.01$), personality disorders ($p < 0.001$), and schizophrenia ($p < 0.01$).

In a six-month follow-up study on aftercare compliance of 134 psychiatric patients, Axelrod & Wetzler (1989) discovered several group differences among the non-attenders, the dropouts, and the completers of an aftercare program. Clinical attributes consisted most of the group differences, whereas patient attitude played only a minor role. The results of ANOVA showed that post-discharge ambulatory care was associated with length of stay (LOS), with a p value less than 0.005, as were waiting time for first aftercare ($p < 0.005$), prior hospitalization ($p < 0.04$), and need for aftercare ($p < 0.005$). The post hoc analysis indicated that completers had longer LOS, more prior hospitalization, and more need for aftercare. The waiting time for first aftercare was shorter for completers. All the post hoc results reached a statistically significant level, i.e., $p < 0.05$. A study conducted by Klinkenberg & Calsyn (1998) on 319 psychiatric patients revealed a gender difference in terms of post-discharge ambulatory care. The findings of logistic regression showed that prior admissions predict aftercare only for men ($p < 0.1$, OR = 2.40), not for women. Prior outpatient treatment had no effect on aftercare for either gender.

The studies found no effect of prior utilization on post-discharge ambulatory care are either failure to perform multivariate analysis to control confounding factors (Byers et al., 1978; Del Gaudio et al., 1977; Fink & Heckman, 1981; Hershorn, 1993; Matas et al, 1992) or are small in sample size (Byers et al., 1978; Hershorn, 1993). Both Keane & Fahy (1982) and Klinkenberg & Calsyn (1998) have avoided these flaws by using multiple regression and logistic regression with sample sizes of 216 and 319, respectively. Unfortunately, no theories were adopted to support their viewpoints, nor were prior medical treatment and admission included in their studies.

As indicated in Table 13, post-discharge ambulatory care is related to prior psychiatric admission and to prior psychiatric outpatient visits. The effect of prior psychiatric admission seems to be stronger than that of prior psychiatric ambulatory care.

It may be that a substitute effect exists between psychiatric hospitalization and outpatient visits: patients with more admissions may reduce their outpatient utilization. Another explanation lies in the severity of disorders or the barriers of access to care that underlies prior inpatient utilization. Without controlling for comorbidity - either psychiatric or medical, access, and previous medical utilization, the results may be very misleading (Blouin et al., 1985; Keane & Fahy, 1982; Klinkenberg & Calsyn, 1998).

Table 13. The Relationship between Prior Utilization and Post-discharge Ambulatory Care

Author	**Condition**	**Sample size**	**Finding**	**Theory**	**Analytic method**
Axelrod (1989)	Psychiatric diagnoses	134	Prior admissions (+)	NA	ANOVA
Blouin (1985)	Psychiatric diagnoses	998	Prior psychiatric admissions (+) and outpatient visits (+).	NA	x^2
Byers (1978)	Psychiatric diagnoses	129	NS	NA	x^2
Carpenter (1981)	Medical and psychiatric diagnoses	1,106	Prior psychiatric treatments (+)	NA	x^2
Del Gaudio (1977)	Psychiatric diagnoses	263	NS	NA	x^2

Note: (+): positive association; ANOVA: analysis of variance; NA: not applicable; NS: not statistically significant; x^2: chi-square test.

Table 13. (continued). The Relationship between Prior Utilization and Post-discharge Ambulatory Care

Author	Condition	Sample size	Finding	Theory	Analytic method
Fink & Heckerman (1981)	Psychiatric diagnoses	120	NS	NA	x^2
Hershron (1993)	Psychiatric diagnoses	56	NS	NA	x^2
Keane (1982)	Psychiatric diagnoses	216	Prior psychiatric admissions (+)	NA	Multiple regression
Klinkenberg (1998)	Psychiatric diagnoses	319	Mixed: Prior admission (+ for male). Prior outpatient visits (NS).	NA	Logistic regression
Kirk (1977)	Psychiatric diagnoses	579	Prior psychiatric admissions (+)	NA	Correlation analysis
Matas (1992)	Psychiatric diagnosis	874	NS	NA	X^2

Note: (+): positive association; NA: not applicable; NS: not statistically significant; x^2: chi-square test.

The Relationship between Prior Utilization and Readmission

The majority of the studies shown that prior utilization has a positive impact on readmission (Appleby et al., 1993; Daniels et al., 1998; Gooch & Leff, 1996; Moos et al., 1994 & 1995_b; Moos & Moos, 1995_a; Peterson et al., 1994; Postrado et al., 1995; Ross et al., 1995; Snowden & Holschuh, 1992; Solomon et al., 1984; Walker et al., 1996). Only three studies show no relationship between prior utilization and readmission (Byers & Cohen, 1979; Criag et al., 1985; Sands, 1984).

Moos et al. (1994) investigated the readmission pattern of 10,352 veterans with substance abuse, using the "health behavioral model" proposed by Andersen (1973). The authors found, through logistic regression, that readmission was associated with the number of prior admissions for either substance abuse or psychiatric disorders ($p < 0.001$) and with the number of previous outpatient visits ($p < 0.001$). Two other large-scale studies on veterans with substance abuse who resided in residential facilities yielded similar results. In Moos & Moos (1995_a), previous psychiatric or substance abuse admissions was the strongest predictor for both one-year ($p < 0.01$) and four-year ($p < 0.05$) readmission. Prior medical admissions predicted only four-year readmission ($p < 0.01$). Prior medical outpatient visits predicted one-year readmission ($p < 0.01$), but not four-year readmission. Previous mental outpatient visits had no impact on rehospitalization for either time point. In Moos et al. (1995_b), more prior admissions for substance abuse or more psychiatric admissions ($p < 0.01$) and more medical admissions ($P < 0.01$ for six-month readmission, $p < 0.05$ for one-year readmission) were found to be associated with readmissions.

Peterson et al. (1994) also applied logistic regression to records of 40,747 veterans with substance abuse and found that the number of prior admissions for substance abuse, psychiatric diagnoses, or medical detoxication was the strongest predictor for readmission. Ross et al. (1995) studied the readmission pattern of 276 alcoholic male veterans, using Cox regression. The findings indicated that the number of prior alcoholism admissions was the strongest predictor for one-year readmission ($p < 0.0001$).

Although multivariate analysis was used by each of the three studies that found no effect of prior utilization on readmission (Byers & Cohen, 1979; Craig et al., 1985; Sands, 1984), the study sample sizes were relatively small (less than 250), which might yield inadequate statistical power to detect the difference. As summarized in Table 14, none of the studies applied theory, except Moos et al. (1994). Only Moos et al. (1994, $1995_{a\&b}$) included prior use of medical outpatient and inpatient care as well as psychiatric outpatient and admission, to predict subsequent readmission. As for the results in post-discharge ambulatory care, there seems to be a substitute effect between outpatient and inpatient utilization, for either psychiatric or medical conditions. However, the substitute effects vary by the time points studied.

Table 14. The Relationship between Prior Utilization and Readmission

Author	Condition	Sample size	Finding	Theory	Analytic method
Appleby (1993)	Schizo-phrenia	1,500	Prior admissions (+)	NA	Cox regression
Byers (1979)	Psychiatric diagnoses	129	NS	NA	Multiple regression
Craig (1985)	Schizo-phrenia	223	NS	NA	Logistic regression
Daniels (1998)	Schizo-phrenia, bipolar disorder, and depression	1,172	Prior admissions (+)	NA	Multiple regression
Gooch (1996)	Psychiatric diagnoses	615	Prior admissions (+)	NA	Cox regression
Moos (1994)	Substance abuse	21,139	Prior admission (+), prior medical outpatient visits (+)	Health behavioral model	Logistic regression
Moos (1995_a)	Substance abuse	1,070	Prior substance abuse or psychiatric admissions (+), prior medical admissions (+)[@], prior medical outpatient visits (+)[#].	NA	Logistic regression

Note: @: Readmission within 4 years; #: Readmission within 1 year; (+): positive association; NA: not applicable; NS: not statistically significant.

Table 14 (continued). The Relationship between Prior Utilization and Readmission

Author	Condition	Sample size	Finding	Theory	Analytic method
Moos (1995_b)	Substance abuse	10,352	Prior substance abuse or psychiatric admissions (+), prior medical admissions (+)	NA	Logistic regression
Peterson (1994)	Substance abuse	40,747	Prior substance abuse or psychiatric admissions (+)	NA	Logistic regression
Postrado (1995)	Severely mentally ill	559	Prior admissions (+)	NA	Logistic regression
Ross (1995)	Substance abuse	276	Prior admissions (+)	NA	Cox regression
Sands (1984)	Psychiatric diagnoses	92	NS	NA	Multiple regression
Snowden (1992)	Severely mentally ill	187	Prior admissions (+)	NA	Multiple regression
Solomon (1984)	Psychiatric diagnoses	486	Prior admissions (+)	NA	Discriminant analysis

Note: (+): positive association; NA: not applicable; NS: not statistically significant.

Table 14 (continued). The Relationship between Prior Utilization and Readmission

Author	**Condition**	**Sample size**	**Finding**	**Theory**	**Analysis**
Walker (1996)	Psychiatric diagnoses	368	Prior admissions (+)	NA	Cox regression

Note: (+): positive association; NA: not applicable.

Social Disintegration

Social disintegration means that a community is in a chaotic state with disorganized social order and economic activities, and cultural conflicts. That imposes tremendous stress on local residents, both directly and indirectly. The following section discusses the effects of social disintegration on mental health in general and its relationship with PTSD patients.

The Relationship between Social Disintegration and Mental Health

Community studies find crime to be related to increased mental health problems (Perkins & Taylor, 1996; Thompson & Norris, 1992). Chapman & Beaudet (1983), however, found no relationship between the two among older adults in a mid-size city. For community children and adolescents, the stressors of community crime and violence play a significant role in the deterioration of their mental health (Aneshensel & Sucoff, 1996; Hughes, 1988; Kliewer & Kung, 1998; Miller et al., 1999; Shumow et al., 1998; Stiffman et al. 1999).

Thompson & Norris (1992) applied alienation theory to study the effects of individual crimes against property and violence, and community crime rates as related to alienation among 682 community adults. Community crime rates were taken from the Uniform Crime Report (UCR). The regression results indicated that after controlling for individual-level crime, community crime rates had a significant main effect on fear ($\beta = 0.115$, $p < 0.05$). Community crime rates provided only an additional 1.0 % of the variance to the model. However, it had an interaction effect in conjunction with urbanity ($\beta = 0.087$, $p < 0.05$). The ecological fallacy here is that the authors used aggregated community crime rates to predict individual behavior, without performing proper statistical adjustment. Though the variance explained by community crime rates was small, the authors did prove that the mental state of an individual could be influenced by an ecological factor.

Perkins & Taylor (1996) used incivility theory to assess the relationship between community disorder and fear of crime among 412 community adults in Baltimore. Community crime was content-analyzed, using newspaper reports from two local Baltimore newspapers. Hierarchical linear modeling (HLM) was applied to analyze the effect of community crime rates on the study subjects. The results of HLM revealed that level II predictors, including crime reported by newspapers (disorder news, $\beta = 0.166$, $p < 0.05$), explained 7.6% of the total outcome variation and 44.7% of the between-group variation. Although the strongest predictors were individual variables of perceived social disorders ($\beta = 0.214$, $p < 0.05$) and physical disorders ($\beta = 0.289$, $p < 0.05$), the authors demonstrated that proper methodology increased the ability to detect the contribution of variables from different analytical levels.

Stiffman et al. (1999) applied human development theory to explore the effects of environment on 792 adolescents' mental health and behavior. The exogenous constructs included environmental support, objective environment, violence exposure, and perceived environment. Objective environment was measured by several archived indicators; environmental support was measured by peer and family support; violence exposure was measured by various stressful life events; and perceived environment consisted of subjective ratings of neighborhood problems. The endogenous construct of mental health included indicators of depression, conduct disorder, substance abuse or dependence, and violent behavior. The results of SEM revealed that violence exposure and perceived environment had positive effects on mental health, with path coefficients of 0.44 and 0.11, respectively. Environmental support had a negative effect (- 0.42) on outcome; it also had negative effects on violence exposure (- 0.35) and perceived environment (- 0.13). Violence exposure had a path coefficient of 0.12 on perceived environment. Objective environment, however, had no direct effect on outcome; it offered an indirect effect through perceived environment, with a coefficient of 0.44.

In comparison to other studies on children/adolescents (Aneshensel & Sucoff, 1996; Hughes, 1988; Kliewer & Kung, 1998; Miller et al., 1999; Shumow et al., 1998), Stiffman et al. (1999) used a more complex methodology and a sufficiently large sample size, and used human development theory to validate their model. The authors nevertheless fell into the trap of the ecological fallacy, i.e., using aggregated data without the necessary statistical adjustment.

Most of the studies shown in Table 15, other than Chapman et al. (1983), proved, regardless of methodological flaws, that witnessed/experienced community crime or violence had either a direct or an indirect negative impact on mental health. It indicates that the stressors of community crime and exposure to violence can worsen the mental health of a healthy individual.

Table 15. The Relationship between Crime and Mental Health

Author	Subject	Sample size	Finding	Theory	Analytic method
Aneshensel (1996)	Community adolescents	877	(+)	Contextual effects model	Multiple regression
Chapman (1983)	Community adults	224	NS	NA	Multiple regression
Hughes (1988)	Community children	180	(+)	NA	ANOVA & MANOVA
Kliewer (1998)	Community children	99	(+)	Stress and adjustment model	Multiple regression
Miller (1999)	Community children	97	(+)	Social interactional model	Multiple regression
Perkins (1996)	Community adults	412	(+)	Incivilities theory	HLM

Note: (+): positive association; ANOVA: analysis of variance; HLM: Hierarchical linear modeling; MANOVA: multivariate analysis of variance; NA: not applicable; NS: not statistically significant.

Table 15 (continued). The Relationship between Crime and Mental Health

Author	**Subject**	**Sample size**	**Finding**	**Theory**	**Analytic method**
Shumow (1998)	Community children	168	(+)	NA	Multiple regression
Stiffman (1999)	Community adolescents	792	(+)	Human development theory	SEM
Thompson (1992)	Community adults	681	(+)	Alienation theory	Multiple regression

Note: (+): positive association; SEM: structural equation modeling.

The Relationship between Stressors and Veterans with PTSD

The environmental stimuli that resemble the original traumatic events are able to arouse symptoms or flashbacks in PTSD patients. These stimuli can be from either auditory or visual cues. In the laboratory, detrimental effects of acoustic stimuli (Grillon et al., 1998; Paige et al., 1990; Shalev et al., 1992) and of visual stimuli (Attias et al., 1996; McFall et al., 1990) have been found. Metzger et al. (1997), however, found no significant effects of auditory stimuli on PTSD veterans. Combat imagery script (Keane et al., 1998; Orr et al., 1993; Pitman et al., 1990; Shalev et al., 1993) and media coverage (Elliott, 1997; Hilton, 1997; Long et al., 1994; Moyers, 1996) have also been found to evoke abnormal physiological responses and to aggravate PTSD symptoms, whether in or out of a laboratory.

In comparing 34 PTSD veterans and 31 controls, Grillon et al. (1998) found, using ANOVA, that acoustic stimuli reduced prepulse inhibition (PPI), the ability of a weak prepulse to reduce the startle response to the subsequent startle-eliciting stimuli, in PTSD subjects ($F = 6.4$, $p < 0.01$). Paige et al. (1990) showed that PTSD veterans had significantly higher heart rates ($F = 5.3$, $p < 0.05$), more autonomic arousal (anxiety and depression, both $p < 0.05$) and event-related brain potential reduction ($F = 4.74$, $p < 0.05$), in study of 12 PTSD veterans and 6 controls.

Using an autonomic conditioning model, McFall et al. (1990) showed combat and non-combat films to 10 PTSD veterans and 11 controls. The authors found that PTSD subjects had stronger responses than did controls, to the combat film. In the PTSD subjects, greater increases in pulse ($Z = -2.40$, $p < 0.01$), diastolic blood pressure ($Z = -2.96$, $p < 0.01$), and subjective distress ($Z = -3.14$, $p < 0.01$) were found during combat film showing. During the recovery period, PTSD patients still had significant differences in systolic blood pressure ($Z = -1.87$, $p < 0.05$), diastolic blood pressure ($Z = -1.62$, $p < 0.05$), plasma epinephrine ($Z = -2.72$, $p < 0.01$), and distress ($Z = 12.53$, $p < 0.01$).

Small-scale laboratory studies do not allow multivariate analysis. Keane et al. (1998), therefore, applied logistic regression to records of 1,168 help-seeking veterans subjected to audiovisual stimuli of combat and non-combat scenes, and combat imagery scripts. Among them, 771 to 773 had current PTSD, 181 had lifetime PTSD, and 368 to 369 had never had PTSD. The measures of heart rate, skin conductance, electromyogram (ECG), systolic blood pressure, and diastolic blood pressure were recorded for 6 waves of measurement.

The results of logistic regression illustrated that heart rate at baseline ($\beta = 0.0326$), heart rate for audiovisual cues ($\beta = 0.0641$), electromyography (EMG) to the scripts ($\beta =$

0.2050), and skin conductance to the scripts ($\beta = 0.4468$) were the best predictors in differentiating current PTSD groups. The model was validated with 200 PTSD veterans and 108 subjects who had never had PTSD. Although a large sample size was used in this study, the results may not be generalized to veterans at large or to the general public due to its feature of clinical experiment in a controlled environment.

Long et al. (1994) assessed the effects of media coverage of the Gulf War on 88 community Vietnam veterans. Two waves of questionnaires, before and after the war, collected information on demographics, military experience, combat exposure, PTSD, mental health, and reactions to the Gulf War. Correlation analysis indicated that attention to media coverage had no significant effect on PTSD, distress, or well-being. Revived memories of the war, however, positively correlated to PTSD ($r = 0.355$, $p < 0.001$) and to distress ($r = 0.434$, $p < 0.001$), and negatively correlated to well-being ($r = -0.328$, $p < 0.005$).

The results of regression analysis revealed that prior levels of PTSD ($R^2 = 0.732$, $p < 0.001$), distress ($R^2 = 0.526$, $p < 0.001$), and well-being ($R^2 = 0.622$, $p < 0.001$) were strongly associated with the respective variables at follow-up. Revived memories predicted PTSD ($R^2 = 0.018$, $p < 0.05$) and distress ($R^2 = 0.039$, $p < 0.01$), but not well-being. In other words, revival of Vietnam memories as a result of media coverage is predictive of increased psychological distress and PTSD symptoms. A similar conclusion has been reached by Elliott et al. (1997) from a study of 724 community individuals, but without multivariate analysis.

As summarized in Table 16, environmental cues resembling the original traumatic events are able to reactivate or aggravate PTSD symptoms. These stressors can be auditory and/or visual to arouse the memories of previous trauma. The process is not limited to laboratory situations, but occurs in normal community life, as well.

Table 16. The Relationship between Environmental Stressors and PTSD

Author	**Subject**	**Sample size**	**Stressor**	**Finding**	**Theory**	**Analytic method**
Attias (1996)	PTSD	40	Visual stimuli	(+)	NA	T test
Elliott (1997)	General public	505	Media coverage	(+)	Delay recall model	x^2
Grillon (1998)	PTSD	65	Acoustic stimuli	(+)	NA	T test, ANOVA
Hilton (1997)	PTSD	2	Media coverage	(+)	NA	Descriptive
Keane (1998)	Help-seeking veterans	1,168	Audio-visual stimuli, Combat imagery script	(+)	NA	Logistic regression
Long (1994)	veterans	88	Media coverage	(+)	NA	Multiple regression
McFall (1990)	PTSD	21	Visual stimuli	(+)	Autonomic conditioning model	Z test
Metzger (1997)	PTSD	44	Acoustic stimuli	NS	NA	ANOVAR, ANCOVA

Note: (+): positive association; ANCOVA: analysis of covariance; ANOVA: analysis of variance. ANOVAR: analysis of variance with repeated measures; NA: not applicable; NS: not statistically significant; PTSD: posttraumatic stress disorder; x^2: chi-square test.

Table 16 (continued). The Relationship between Environmental Stressors and PTSD

Author	Subject	Sample size	Stressor	Finding	Theory	Analytic method
Moyers (1996)	PTSD	15	Media coverage	(+)	Bioinfor-mational theory	Descriptive
Orr (1993)	PTSD	20	Combat imagery script	(+)	Bioinfor-mational theory	T test, MANOVA
Paige (1990)	PTSD	18	Acoustic stimuli	(+)	NA	ANOVA
Pitman (1990)	PTSD	14	Combat imagery script	(+)	NA	T test
Shalev (1992)	PTSD	62	Acoustic stimuli	(+)	NA	ANOVA, ANOVAR
Shalev (1993)	PTSD	26	Combat imagery script	(+)	Bioinfor-mational theory	T test, MANOVA

Note: (+): positive association; ANOVA: analysis of variance; ANOVAR: analysis of variance with repeated measures; MANOVA: multivariate analysis of variance; NA: not applicable; PTSD: posttraumatic stress disorder.

Health Resources

Several factors influence veterans' decisions when seeking medical care outside the VA health care system, including fee-based services, Medicare eligibility, Medicaid eligibility, private health insurance status, and the availability of community health resources. Eligible veterans are entitled to receive health care from fee-for-service private physicians, which is paid for by the VA (Kizer, 1995). The scope of these services, however, is much more restricted than those offered by the VA system. Veterans using "fee-basis" care are much more likely to have a service-connected condition than are their counterparts receiving care from the VA system (Gronvall, 1987).

Through age eligibility, veterans over 65 years old may obtain Medicare as their health insurance. In terms of income, veterans at the lowest levels may be eligible for Medicaid, and veterans at higher income levels may purchase their own private health insurance. However, unless the supply of other community health resources is sufficient, veterans may have no option for private health care but VAMCs.

Table 17 indicates that 0.5% to 83.33% of veterans have been documented as having used community health care services other than those provided by the VA system. Rabiner et al. (1998) found that 0.5% - 60.5% of veterans, with primary care sources of VAMCs or non-VA sources, used prevention services provided by non-VA facilities. Gilbert (1993) discovered that 11.65% of 1,049 veterans had used dental care services other than those services offered by the VA.

As for medical care, non-VA ambulatory and inpatient care utilization by the veteran population has been found range from 17.6% to 54.0% (Borowsky & Cowper, 1999; Fleming et al., 1992; Romm et al., 1984; Wright et al., 1997). Among veterans suffering from psychiatric problems, non-VA mental health utilization rates of 19.25% to 83.33% were found (Hoff & Rosenheck, 1998; Rosenheck & Fontana, 1995; Strauss et al., 1985).

Table 17. The Relationship between Non-VA Utilization and Veterans

Author	Condition	Sample size	Finding	Theory	Analytic method
Borowsky (1999)	Primary care	577	28.0% non-VA utilization	NA	Logistic regression
Fleming (1992)	Ambulatory and inpatient care	208,956	17.6% - 37.4% non-VA utilization	NA	Descriptive study
Gilbert (1993)	Dental care	1,049	11.65% current non-VA source	Health behavioral model	Logistic regression
Hoff (1998)	Mental health care	2,348	37.70% - 67.03% (male) & 74.88% - 83.33% (female) lifetime non-VA mental health utilization	NA	Logistic regression
Rabiner (1998)	Preventive services	1,094	0.5% - 60.5% non-VA utilization	NA	Descriptive study
Romm (1984)	Ambulatory care	274	35% non-VA utilization	NA	Descriptive study
Rosenheck (1995)	PTSD	1,676	36.5% (outpatient) & 18.8 (inpatient) non-VA utilization	Health behavioral model	Logistic regression

Note: NA: not applicable.

Table 17 (continued). The Relationship between Non-VA Utilization and Veterans

Author	**Condition**	**Sample size**	**Finding**	**Theory**	**Analytic method**
Strauss (1985)	Psychiatric diagnoses	644	19.25% non-VA utilization	NA	x^2
Wright (1997)	Acute myocardial infarction	25,312	54.0% non-VA utilization	NA	Logistic regression

Note: NA: not applicable; x^2: chi-square test.

Among 1,676 veterans with PTSD, Rosenheck & Fontana (1995) reported non-VA mental health utilization rates of 36.5% and 18.8% for outpatient and inpatient care, respectively. Hoff & Rosenheck (1998) found non-VA mental health utilization rates of 45.21% and 75.56%, respectively, for 365 male and 45 female PTSD veterans. The finding indicates that PTSD veterans use more outpatient non-VA mental health services, and female veterans use more non-VA inpatient mental health care. Although Hoff & Rosenheck (1998) included community health resources in the analysis, the results of logistic regression showed no effect on the utilization, for either gender. The finding may be due to faulty methodology, i.e., the lack of multi-level analysis.

Friss et al. (1989) used health service area (n = 205) and primary service area (n =102) as the unit of analysis for community hospitals and VAMCs, to investigate geographic differences in utilization. The number of physicians per 10,000 population, the proportion of non-surgeons, the number of nursing home beds per 1,000 population, and bed reserve capacity were included in the study. The results of multiple regression showed that physician-to-population ratio, negatively predicting VA utilization, was not a statistically significant predictor. The number of nursing home beds per 1,000 population and reserve capacity both were positively associated with bed days per 1,000 veterans.

Friss et al. (1989) did not include income, health insurance status, or service-connected condition as variables important to the study of veterans' health care utilization. All the information was aggregated at the area level, which prevents the investigation of variation within each of the geographic areas.

By using HLM in the context of the "health behavioral model", Rosenheck & Stolar (1998) discovered that intraclass correlation (ICC), the proportion that between-level (state) variation contributed to the total variation, was less than 0.5%. They proceeded with an individual-level multiple regression to investigate mental health service use in VAMCs for 27,183,662 veterans.

The results showed that state and county hospital expenditures were negatively associated with VAMC utilization for all veterans ($\beta = -0.11$, $p < 0.0001$), income eligible veterans ($\beta = -0.10$, $p < 0.0001$), and veterans with service-connected psychosis ($\beta = -0.25$, $p < 0.0001$), but not for veterans with service-connected non-psychosis conditions. The mental health expenditure for nonfederal general hospitals had a negative impact on utilization by veterans with service-connected non-psychosis conditions ($\beta = -0.11$, $p < 0.0001$). Multi-service mental health centers had no significant effect on any of the dependent variables, though the effects were in the expected direction (negative). The findings show that community mental health resources, especially the state and county hospitals, have a strong influence reducing the mental health utilization of patients in VAMCs. Non-VA utilization by service-connected veterans may indicate that the VA pays for services through "fee-basis" mechanism, whereas the income-eligible status (low incomes) may reveal that Medicaid pays for these services.

In summary, the utilization studies reveal that veterans' substantial use of non-VA health services, ranging from 0.5% to 83.33%, regardless of whether such services are paid for by the VA. Veterans with PTSD fall into the mid-range of non-VA utilization, in terms of service and gender (Hoff & Rosenheck, 1998; Rosenheck & Fontana, 1995). Friss et al. (1989) demonstrated that the physician-to-population ratio has a negative effect on VAMC utilization, though the fact that it was statistically insignificant that may be due to the flaw in methodology used in the analysis. Rosenheck & Stolar (1998) showed that community health resources did have a negative influence on VAMC utilization, especially for veterans with service-connected psychoses.

Summary

Although most of studies on PTSD stressed its etiology, symptomalogy, comorbidity, and treatment, very few focused on readmission (Bodewyns et al., 1991; Brown et al., 1995; Perconte et al., 1989; Williams et al., 1998). Even when PTSD readmission was studied, multivariate analysis was seldom applied. The factors that determine readmissions for PTSD and their effects were unclear. It is the purpose of this study to reveal these factors and their relative importance in affecting post-discharge utilization of care and readmission for PTSD.

In this chapter, the literature review points out the complexity of healthcare utilization and outcomes of mental disorders. The majority of the variation is explained by patient characteristics. The environmental effects nevertheless also contribute to the variance in utilization and outcomes.

Veterans, as a special group of the U.S. population, are encountering not only the health hazards regularly experienced by the civilians, but also the threats to their health from various wars. The detrimental effects of the wars are not limited to physical health conditions, but extended to mental disorders as well. PTSD, as a recently validated mental disorder, has disturbed the lives of more than 30% of male, and 25% of female Vietnam veterans (Kulka, 1990). PTSD has a long-term effect on veterans' health in that it is persistent and is accompanied by various comorbidities.

As indicated by the literature, post-discharge ambulatory care is able to reduce readmission, an adverse outcome. The factors influencing post-discharge ambulatory care may affect on readmissions. These factors must be examined by their origins, i.e., environmental or individual. At the individual level, the effects of age, social networks, access, comorbidity, and prior utilization of mental and physical healthcare were reviewed. At the environmental level, the effects of social disintegration and lack of health resources were reviewed.

Age was found to be inversely associated with post-discharge ambulatory care and with readmissions of psychiatric patients. That does not suggest that the elderly are less vulnerable to the menace of mental disorders. The finding can be the result of the cognition barriers in mental disorders, the functional disability of the aged, or of different coping mechanisms. The size of the social network encourages mentally ill patients seeking post-discharge ambulatory care and prevents their subsequent admissions. Access to the VA health care system for veterans is different from what is normally understood in that the VA serves as a public safety net. Low income and disability give veterans higher priority to acquire VA health care. Access to care was found to be positively related to both utilization and readmission.

Patients with comorbidities are supposed to use more healthcare services. However, the relationship between the two may not be straightforward. These patients seem to use less post-discharge ambulatory care and have higher readmission rates. It may be that they are too sick to obtain outpatient help, or that they have legal concerns (substance abuse patients) that prevent them from seeking professionals' help. They are often admitted as inpatients because of the increased severity of their disorders and their reduced use of post-discharge outpatient care. Prior utilization has been found to be positively associated with both post-discharge ambulatory care and readmission, especially for previous admissions. That signifies that mental disorders are persistent conditions and need prolonged medical attention.

Social disintegration may increase mental health disturbances and symptoms. PTSD patients are aroused by environmental cues that are similar to the initial traumatic events. These cues can be part of the social disintegration that triggers the utilization and readmission of PTSD patients. The availability of local health resources has been found to reduce the utilization of and readmission to VAMCs.

In conclusion, most of the findings reviewed here are empirical and are derived from studies of mental disorders other than PSTD. A theoretical framework for PTSD is therefore needed, in order to examine the complex relationships among the constructs. Hypotheses based on these relationships are developed in the next chapter.

CHAPTER 3
THEORETICAL FRAMEWORK

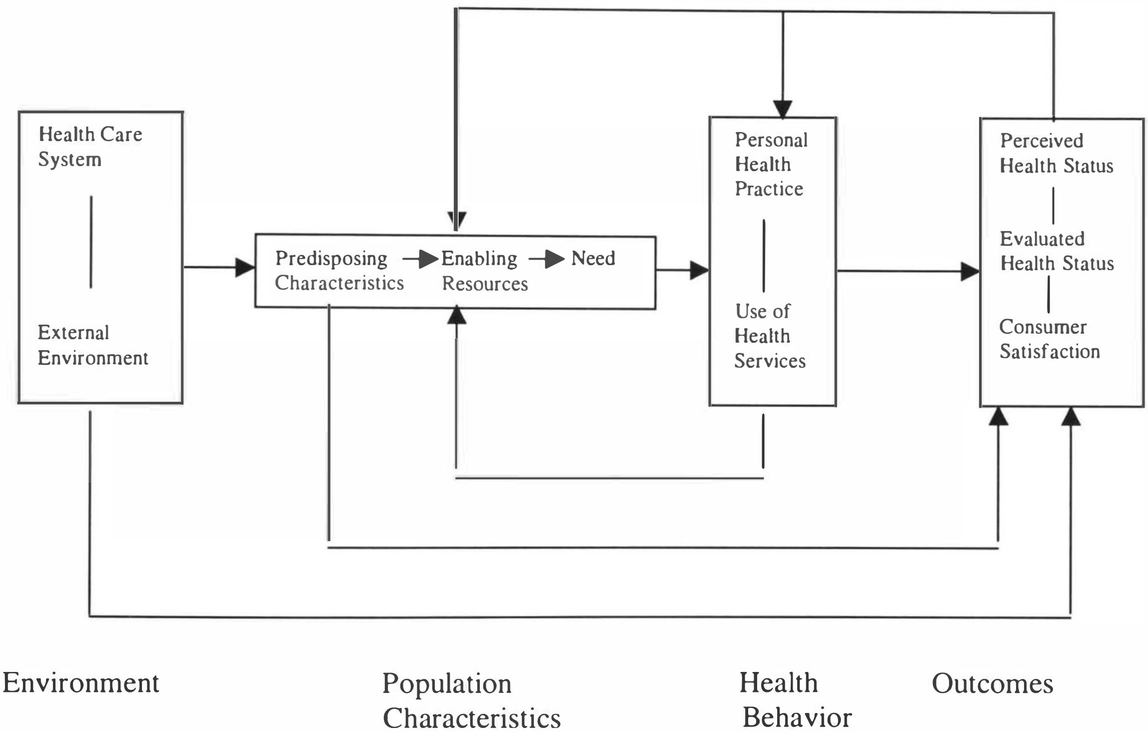
The determinants of health utilization and outcomes comprise multidimensional aspects: individual, health provider, community, and health policy (Andersen, 1995). Each dimension comprises different factors that influence health outcomes. The objective of this study is to explore the effect of individual and social factors on health service utilization and outcomes.

The "health behavioral model" proposed by Andersen (1995) guides this study's development of a conceptual framework. The first part of this chapter presents the original model. The second part discusses the constructs of the study. The last part presents the proposed conceptual framework, along with hypotheses derived from the model and based on the literature review.

Overview of the Health Behavioral Model

Originally, Andersen proposed three determinants of health behavior: predisposing, enabling, and need factors that influence the use of health services (Andersen, 1968). The primary focus was family, since the medical care received by an individual can be a function of the demographic, social, and economic characteristics of his/her family. The locus of the framework has since shifted from family to individual as the unit of analysis, and been revised under the elements of environment, population characteristics, health behavior, and outcomes (Figure 2).

Figure 2. An Expanded Health Behavioral Model



Source: Andersen, R. M. (1995). Revisiting the behavioral model and access to medical care: Does it matter? Journal of Health and Social Behavior, 36(March): 1-10.

Environment

The construct of environment is composed of the external environment and the health care system. The external environment is represented by macro-level factors that reflect the general condition of the social norm, and may influence individual health utilization behavior and outcomes. These factors include economic climate, politics, and the level of stress and crime (Phillips et al., 1998). For instance, it has been hypothesized that people living in an area with lower socioeconomic status may use more psychiatric services (Driessen et al., 1998; Harrison et al., 1995; Tansella et al., 1993). These authors found significant effects of social deprivation on mental health services utilization.

Exposure to stressful life events such as crimes and violence may have adverse effects on both physical and mental health. When a person is the victim of a violent crime, his/her physical health may be impaired. He/she may subsequently develop PTSD, especially after child abuse or sexual abuse (Epstein et al., 1997; Mulder et al., 1998; Widom, 1999). Even if not victimized, people who have been experiencing and/or witnessing community crimes and/or violent activities may suffer direct or indirect negative effects on their mental health, regardless of age (Aneshensel & Sucoff, 1996; Perkins & Taylor, 1996; Stiffman et al., 1999; Thompson & Norris, 1992).

The health care system can be categorized into policies, resources, and organizations that influence the accessibility and availability of health care services. The number of physicians in the community and the number of hospital beds are the measures of the availability of health resources. Without their presence in the community, patients with health needs may be forced to seek care elsewhere. The problem is one not only of availability, but of accessibility as well. A higher ratio of physicians to population has been found to be positively associated with office visits for both medical and mental health needs (Andersen & Aday, 1978; Rosenheck & Fontana, 1994). A community with an insufficient number of health care providers may have increased waiting times for patients. To reduce waiting time, physicians then may reduce the actual time spent treating patients, which may harm the quality of care. Patients' dissatisfaction would also increase (Meng et al., 1997). Neither outcome is welcomed by either physicians or their patients.

Population Characteristics

Population characteristics, as presented in the initial model, include predisposing, enabling, and need factors. The predisposing factor refers to those variables that describe the tendency of individuals to use health care services. Such characteristics exist before the onset of illness episodes (Aday & Andersen, 1974). Demographics, social structure, and health beliefs constitute predisposing factors. Gender and age are the demographics most often applied, and are referred to as "immutable" factors since they will not be changed by external environmental influences. Different genders present different health needs: for example, males will not use health services provided by obstetrics/gynecology. The differences in age result in different types of utilization: children and adolescents may use more preventive services such as immunizations and physical check-ups, whereas the elderly may need more services to manage chronic conditions.

Social structure includes ethnicity, education, and occupation, which have little mutability. These factors determine the status of an individual in the community. Hispanics and blacks have been found to use less dental care (Aday & Forthofer, 1992) and less mental care (Rosenheck & Fontana, 1994). Under-utilization of medical care in both inpatient and outpatient settings has also been found for Hispanics, and for American Indians (Andersen et al., 1981 & 1986; Cunningham & Cornelius, 1995). Blue-collar workers may have more surgical procedures, as a result of occupational hazards, than white-collar workers do. The risk of such occupational hazards may be correlated with education level, i.e., individuals with less education tend to have more labor-intense work, which may have a higher risk of occupational accident. On the other hand, better-educated people are more knowledgeable about the importance of preventive health services, so they tend to have more physical examinations, immunizations, and preventive procedures.

Health beliefs are the values a person holds concerning health and illness. Andersen (1995) defines health beliefs as:

> "Health beliefs are attitudes, values, and knowledge that people have about health and health services that might influence their subsequent perceptions of need and use of health services."

It can be seen that the values and beliefs of family and community members and educators have strong effects on an individual's health beliefs. An individual may take these values and beliefs for granted, since these social norms dominate the environment in which he/she grows up and interacts with other community members. He/she may pattern behavior on a familiar help-seeking model in pursuing health care services. For example, an individual will seek fewer health care services if such behavior is encouraged by social norms. Health beliefs, therefore, may have a high correlation with social structure and with the enabling factor, characteristics of the community, that is specified in the initial model.

The enabling factors are the means individuals have available that permit them to pursue health care services. Family resources and characteristics of the community are two key factors specified in the original model. The latter is illustrated mainly by community health personnel and facilities. They, however, represent a different level of conceptualization, that is, the environmental level rather than the individual level. Indeed, their presence does influence health care utilization, as described in the previous section. But since the unit of analysis would thus shift, this study will use personal resources rather than family resources as a factor.

Personal resources are income and health insurance coverage. Low income prevents people from seeking professionals' help, because it is too expensive for them. It has been documented that people with low incomes use fewer health services (Mentnech et al., 1995; Padgett et al., 1993; Page, 1995). Inadequate health insurance coverage, or none, limits their access to care (Aday et al., 1993; Andersen & Aday, 1978; Adersen et al., 1983; Mentnech et al., 1995).

Need refers to the level of illness and its effects on a person. Need can be divided into perceived need and evaluated need. Perceived need is what people actually feel: their experience of their general health and illness and its symptoms. From these feelings and experiences, a person decides whether to seek help. Perceived need includes attitudes, that may be strongly influenced by social structure and health beliefs mentioned above. For instance, a blue-collar worker who lacks information about the usefulness of preventive care and who believes that he/she is in good health may reduce visits for preventive care.

Evaluated need is health status as it is assessed by healthcare providers, and the decision that medical attention is needed based on diagnoses, laboratory tests, and the severity of symptoms (Aday, 1993; Andersen, 1995). Chronic diseases, diseases with higher severity, and diseases with complicated conditions may result in more outpatient visits, laboratory tests, and hospitalizations. It has been found that mental disorders with higher severity or comorbidities consume more health care resources (Jackson & Kroenke, 1999; Souetre et al., 1999; Vali & Walkup, 1998). Among medical conditions, Verbrugge & Patrick (1995) have confirmed that fatal chronic diseases, ischemic heart disease, chronic obstructive pulmonary disease, diabetes mellitus, and malignant neoplasms have higher health services utilization. Disease stage and the severity of disease have been found to be associated with longer length of hospital stays and more follow-up visits (Fleishman et al., 1994; Porter et al., 1986).

Health Behavior

In the initial model, health behavior is the final outcome that includes the use of health services. In the expanded model, two elements represent the construct of health behavior: personal health practices and use of health services. Personal health practices refers to the personal activities related to health, which can be either detrimental or beneficial.

Personal health practices may be expected to result from the influences of environment and population characteristics. Beneficial personal health practices include exercise, diet, and self-care. On the other hand, detrimental personal health practices are adverse life styles like smoking, alcohol abuse, and lack of physical activities. The association between environment, population characteristics and personal health practices has been established by several studies (Duncan et al., 1993; Karvonen & Rimpela, 1996; Pampalon et al., 1999). Smoking, drinking and physical inactivity have been found to be associated with higher consumption of health resource (Pope, 1982; Terry et al., 1998).

The utilization of health services is characterized by its type, site, purpose, and time interval. Aday & Andersen (1974) define these:

> "The type of utilization refers to the kind of service received and who provided it: hospital, physician, dentist, pharmacists, etc. The site of the medical care . . . physician's office, hospital outpatient department, emergency room, etc. The purpose of a visit means whether it was for preventive, illness-related, or custodial care . . . The time interval for a visit may be expressed in terms of contact, volume, or continuity measure . . ."

These measures intend, through either qualitative or quantitative means, to capture multiple predictors of health service utilization, which is influenced by environment, population characteristics, and personal health practices. From the above statement, it can be seen how the model was used to explain the variation in ambulatory care. Currently, it has been extended to inpatient care as well (Aday et al., 1993; Druss & Rosenheck, 1997;

Kashner et al., 1998; Moos et al., 1994; Rosenheck & Fontana, 1994 & 1995; Wan, 1989). However, utilization is not the final goal of health services. The outcomes of health services as defined in the model are both perceived and evaluated health status, and customer satisfaction.

Outcomes

Three factors are included in the construct of outcomes: perceived health status, evaluated health status, and customer satisfaction. These measures are the final products of the health behavioral model. Whether help-seeking behaviors of patients with healthcare needs result in satisfactory end-results is judged by the patient's own evaluation of his/her health conditions, professional evaluation of patients' improvement, and patient's evaluation of services received in comparison with the price paid.

From the measures of outcomes, it can be seen that health evaluation are personal as well as professional, and the professional evaluation may not coincide with the personal evaluation. For patients with persistent mental disorders, that means that without the help of a professional evaluation, a patient may not realize what improvements he/she has made.

Conceptualization of Theoretical Constructs

In using the Andersen's health behavioral model (1995), two sets of constructs will be discussed: individual and community. Using Andersen's terminology, these constructs are:

1. Outcome: readmission
2. Utilization: post-discharge ambulatory care
3. Environmental factor: social disintegration and adequacy of health resources
4. Predisposing factor: age
5. Enabling factor: access to care and social networks
6. Need factor: severity of comorbidities and prior use of health care services

Readmission

Patients with more than one hospitalization in a given period of time are the most expensive group in terms of health care cost (Anderson & Steinberg, 1985; Zook & Moore, 1980). Readmissions to hospitals have imposed a heavy financial burden to the insured, hospitals, and patients. Studies of Medicare data show that between 1974 and 1977, 22% of the readmission rate were within 60 days of discharge (Anderson & Steinberg, 1985; Reed et al., 1991). Medicare spent almost $2.5 billion annually for the readmitted patients, which accounts for 24% of the Medicare inpatient expenditure in those years.

Besides being financial burden, readmission may be an indicator of premature discharge or other shortfalls in the quality of care (Holloway et al., 1990; Peterson et al., 1994; Turner & Wan, 1993; Weissman et al., 1994). Moreover, repeated hospitalizations may delay treatment for other patients, and they increase both administrative and clinical liability for hospitals. It has been found that readmission rates are higher for veterans than for other groups of the population (Zook & Moore, 1980; Zook et al., 1980). That finding means that the effects on cost and quality imposed on the VA health care system by readmissions may be much more severe than those in the private sector.

For readmitted patients, multi-admissions represent added suffering for both patients and their families, in terms of time, finances, and emotional burden (Vogel & Huguelet, 1997). Readmission may be an indicator of terminal disease that is marginally responsive to medical treatment; however, it also may represent a breakdown in the overall coordination of care (Wray et al., 1999). For psychiatric patients, readmission may be the result of deinstitutionalization, inadequate rehabilitation, poor follow-up care, or inadequate continuity of outpatient treatment (Haywood et al., 1995; Shadish et al., 1989).

Readmission is viewed as an adverse indicator for outcome, cost, and utilization. Exploring the risk factors contributing to readmission can pinpoint the problematic areas and help health care providers and social service departments with discharge planning. From the research point of view, readmission data are readily available and easily identifiable from administrative data sources. It is therefore inexpensive to obtain such information for data collection, which facilitate research in a short period of time.

Post-discharge Ambulatory Care

The purposes of deinstitutionalization are to prevent subsequent hospitalization and to reduce the length of hospital stay (Pepper & Ryglewicz, 1982; Solomon & Gordon, 1988). Two aspects of the process of deinstitutionalization are: avoiding the placement of psychiatric patients in institutions, and expanding the community services that can enable those patients to remain in the community (Sands, 1984). It is hoped that psychiatric patients will live independently, assume responsibility for themselves, and try to adapt to the community (Mechanic, 1998).

After patients have been discharged from hospitals with reduced length of stay, they may need follow-up visits to monitor their recovery process. A proper discharge plan should be designed for them to prevent future hospitalization. The concept of "continuum of care" or "aftercare" is the key issue for deinstitutionalization (Foster, 1999; Wasylenki et al., 1985). Evashwick (1997) defines continuum of care as:

> "a client-oriented system composed of both services and integrating mechanisms that guides and tracks patients over time through a comprehensive array of health, mental health and social services spanning all levels of intensity of care."

Aftercare should be a comprehensive, coordinated system of care designed to meet the needs of patients with complex and/or ongoing problems efficiently and effectively. Based on continuum of care principles, aftercare services are programs that provide medical and/or therapeutic follow-up after discharge, as well as programs address housing, vocational/educational, financial and social needs (Wasylenki, 1985). Theses services include subsequent visits by outpatient providers or case managers as well as services received in intermediate settings, i.e., day hospitals or stepdown services, or services provided by residential centers (Foster, 1999; Ross et al., 1995).

The basic assumption of aftercare is that continuing assistance following discharge is able to remove or reduce post-discharge factors that are associated with relapse, strengthen patients' well-being in order to stay in the community, and prevent subsequent readmissions (Hawkins & Catalano, 1985). Among all the post-discharge needs, post-discharge ambulatory care is viewed as an extension of the previous hospitalization care, and associated with current health needs (Foster, 1999; Moos et al., 1995_b; Solomon et al., 1984). As defined by Evashwick (1997), post-discharge ambulatory care for psychiatric patients includes not only mental health visits, but also medical visits and related services. It can been seen that post-discharge ambulatory care is composed of various utilization elements to facilitate the patient's recovery and to prevent readmissions.

Social Disintegration

Among environmental factors, social disintegration or disorganization is believed to influence the utilization and outcomes of patients with PTSD, because of its power as a stressor. Increasing cultural problems, social problems, and structural problems constitute social disintegration. Leighton (1963) defines social disintegration as:

> "economic inadequacy, cultural confusion, widespread secularization, high frequency of broken homes, few and weak associations, few and weak leaders, few patterns of recreation, high frequency of crime and delinquency and a weak and fragmented network of communication."

Wandersman & Nation (1998) proposed a neighborhood disorder model to study the relationship between urban neighborhoods and mental health. The model specified that mental health is influenced by neighborhood characteristics, crime and juvenile delinquency, and fear of crime. Neighborhood characteristics are represented by social and physical incivilities. Social incivilities include public drunkenness, corner gangs, street harassment, and drug trade. Physical incivilities are illustrated by abandoned buildings, vandalism, litter, and dilapidated housing. Comparing to serious crime of murders, assaults, rapes, and robberies, both types of incivilities are referred to as "soft crime". Either "soft crime" or "hard crime" in the community is a stressor that can increase the fear of crime, and also induce mental health problems of anxiety, depression, and somatic symptoms.

From varying perspectives it is argued that environmental stressors can elevate the physiological reactions and symptoms of PTSD patients; including autonomic conditioned model (McFall et al., 1990), bioinformational theory (Moyers, 1996; Orr et al., 1993; Shalev et al., 1993) and the delayed recall model (Elliott, 1997). Stressors occur in auditory and/or visual forms that resemble the original traumatic events, e.g., the sound of gun/artillery firing, the scene of a battlefield, or the picture of a dead body.

Community crimes in various forms serve as environmental cues to PTSD patients. For their resemblance to the original trauma, they can have direct and/or indirect impacts on PTSD patients. Patients may recall previous traumatic events, which may arouse their abnormal reactions and aggravate their current symptoms. They may also experience secondary traumas that intensify and complicate their existing conditions. Without the needed medical attention, such patients may not able to calm their symptoms and stabilize the course of disorder.

Adequacy of Health Resources

The construct of adequacy of health resources is viewed as one characteristic of the healthcare delivery system in the external environment (Andersen, 1995; Phillips et al., 1998). Aday & Andersen (1974) argue that the healthcare delivery system consists of two factors, resources and organizations. The factor of organization is referred to as "what the system does with its resources." Entry and structure are two key points for organization. Entry is the process of gaining entrance to the system (characterized as "access" in the previous section). Structure is how the organization arranges medical care for patients after they enter the system.

Resources refers to the volume and distribution of medical resources in the area. The labor composition and capital investment devoted to health care are two dimensions of resources; included are health care providers, infrastructure used for rendering health care services, and equipment and materials applied during treatment. Health resources are an aggregated attribute in terms of human resources, health expenditures, facilities, and hospital beds in the community (Friss et al., 1989; Hoff & Rosenheck, 1998; Rosenheck & Stolar, 1998).

From the patients' point of view, the more health resources there are, the more alternatives there are for seeking help. Patients can thus decide which provider or facility is the right one for his/her health care need. From another point of view, the abundance of health resources in an area may pose heavy competition among health care facilities and/or providers. To maintain market share, health care providers and/or facilities may then improve the quality of their care, and customer satisfaction, or they may minimize their costs (Santerre & Neun, 1996, Sorkin, 1992). From this viewpoint, the VA system is subject to market competition as it provides health care to veterans with medical needs.

The Trend of Mental Health Resources in the U.S.

The number of inpatient and residential mental health organizations has ranged from 2,849 in 1984 to 3,319 in 1994, an increase of 16.5%. Among these facilities, state/county mental hospitals slightly decreased, from 277 to 256. Private psychiatric hospitals, however, have almost doubled, from 220 to 430, an increase of 95.5 %. In 1984, there were 1,259 non-federal general hospitals with psychiatric services. The number has increased to 1,531 in 1994, a 21.6 % growth rate. The VA system had 124 hospitals providing psychiatric services in 1984, and has had a slight growth of 11 more hospitals by 1994. In the entire nation, the number of residential treatment centers for emotionally disturbed children (RTCs) was 322 in 1984; and it was 459 in 1994, a 42.5 % growth (Pamuk et al., 1998). Excluding RTCs, the VA is facing increased challenges from non-federal general hospitals with psychiatric services and from private psychiatric hospitals, in attracting mental health patients.

The total number of psychiatric beds nationally is in a downward trend, from 262,673 in 1984 to 252,333 in 1994, including both state/county mental hospitals and VAMCs. Private hospitals have increased from 21,474 in 1984 to 41,195 in 1994, a 91.8

% growth. The number of non-federal general hospitals also has grown from 46,045 to 52,984, or 15.1 %. These growth data verify that the VA may face increasing community competition.

Among mental health human resources, psychiatrists, psychologists, social workers, and psychiatric nurses are the major players. An upward national trend for these health care providers is found; however, fluctuation occurs in a pattern similar to the numbers for facilities and beds (Pumak et al. 1998).

Except for registered nurses (RNs), the numbers of psychiatrists, psychologists, and social workers in state/county mental hospitals have decreased from 11.7 % to 22.6% in 10 years. The numbers of psychiatrists and psychologists at non-federal general hospitals with psychiatric services have been decreased in this period. However, social workers and RNs have had growth rates, respectively, of 9.3 % and 161.2 %. In private psychiatric hospitals, the growth rates in this period for psychiatrists, psychologists, social workers, and RNs were 50.9 %, 37.1 %, 151.2 %, and 133.8 %, respectively. The number of psychologists in the VA system decreased by 52.9 %. However, psychiatrists, social workers, and RNs had increases ranging from 14.8 % to 154.6 % in 10 years (Pumak et al. 1998).

The Function and Composition of Vet Centers.

For veterans with PTSD, the outreach program of Vet centers is a particular health resource for obtaining readjustment counseling. Vet centers, which are independent of the VA healthcare system, were established under Public Law 96 – 22 in 1972. Their purpose is to provide readjustment services to Vietnam veterans. The eligibility has now been extended as well, by Public Law 104 –275, to other war zone veterans. The PTSD-related services provided by Vet centers include psychotherapy and counseling for PTSD, crisis intervention for acute PTSD symptoms, referral and aftercare for substance abuse related to PTSD. Other services for war-zone veterans are employment counseling, educational counseling, assistance with upgrade of military discharge, and outreach, as well as consultations, education of community professionals, and referral interactions with other community agencies (Blank, 1993; Kulka et al., 1990).

The staff composition of a Vet center includes a mix of professional and paraprofessional counselors, social workers, psychologists, psychiatric nurses, and office managers (Blank, 1993; Sipprelle, 1992). In 1982, three years after the Vet centers began operation, they had seen 125,000 Vietnam era veterans. By 1990, over one million clients had been served by Vet centers (Blank, 1982 & 1993). Blank (1993) states that the success of Vet centers is evident in low return rates and high customer satisfaction. Thus, the influence of Vet centers should not be overlooked when studying veterans with PTSD.

Age

As indicated in the model, age is a predisposing factor that is immutable to environment. Age is a natural biological process, which may need different health care at different stages. In general, it has a curvilinear relationship with health service utilization - that is, people at both ends of the range consume relatively more health resources.

Infants and children use more routine physical examinations and immunization services (National Center for Health Statistics, 1991; Notzon et al., 1999). The elderly use more health care mainly because of biological degradation and chronic diseases (National Center for Health Statistics, 1991; Owings & Kozak, 1998).

The relationship between age and mental disorders presents a different pattern from that for physical diseases. Other than organic disorders, the trend of the distribution between age and mental disorders from 1975 to 1986 takes an inverted U shape, irrespective of what types of hospital patients were admitted to (Pamuk et al., 1998). Several authors have found that the elderly report fewer or less severe psychiatric symptoms than younger people do (Aldwin, 1991; Aldwin et al., 1989; Fontana & Rosenheck, 1994; Kessler et al., 1994; Myers et al., 1984; Regier et al., 1988, Robins et al., 1984). Among these studies, Aldwin (1991) and Fontana & Rosenheck (1994) indicate that the coping strategies of senior citizens may help them adapt better to later life and achieve a more satisfied mental well-being.

Coping is a multidimensional mediating operation that intends to reestablish psychological and/or social equilibrium (Kermis, 1986; Lomranz, 1990). When such a balance is broken, people may try to seek an effective way to restore it. The repairing technique may be the one the person is most familiar with, called by Kermis (1986) the habitual problem-solving mechanism. When such a technique is not be able to disentangle the current problems, a maladaptation may occur from improper management of psychological and/or social challenges. The final products of such a disequilibrium or maladaptation are various mental disorders. It leads us to the question of 'why the elderly adapt better than their younger counterparts?'

In developmental psychology, a shift from immature defensive styles in early adulthood to more mature defensive styles among the middle-aged is observed (Blazer, 1990; Siegler, 1980; Vaillant, 1977). Fantasy, projection, passive-aggressive behavior, and acting-out characterize immature mechanisms. Mature adaptive styles, however, are illustrated by more positive sublimation, altruism, anticipation, and humor. These authors' findings suggest that learning and experience may lead to better adaptation by the elderly to coping with daily events.

As people age, they are exposed to a variety of challenges and accumulate many strategies for dealing with them. They learn to distinguish whether a strategy is an effective countermeasure for a particular problem or not. Elderly people, through their experiences, can integrate different approaches to form a sophisticated plan to solve the problem in hand. Nevertheless, some elderly people may choose to restrict their activities to avoid challenges (Aldwin, 1991). In general, however, the accumulated experiences may increase an individual's coping ability and help him/her through the struggles.

Social Networks

The concept of social networks was found by Barnes (1954) through the study of a Norwegian fishing village. Barnes plotted the possible interactions that an individual would have with others, and applied concepts from mathematical graph theory to describe the individual's social field. Speck & Attneave (1973) described social networks as all human relationships that have a lasting effect on the life of the individual. The members in a social network mobilize their resources to help the focal person and ease his/her burdens (Caplan, 1974). In essence, network members render their support to the focal person in order to protect against disease and buffer the impact of stressors.

One dimension of social networks is size or range, referring to their structural characteristics (Mitchell & Trickett, 1980; Morin & Seidman, 1986). Size, or range, refers to the number of individuals with whom the focal person has direct contact. These network members can be families, relatives, friends, coworkers or people that the focal person feels to be "important" or "close to him/her" (Wellman 1979). According to the argument proposed by Caplan G. (1974) and Wellman (1979), irrespective of how many resources any network member has, the larger the network size the more advice and/or resources a focal member is expected to receive to encourage him/her to seek health care.

Access to Care

The concept of access to care is one of multiple properties. Donabedian (1973) proposes that access can be distinguished along two dimensions: socio-organizational accessibility and geographic accessibility. The former includes those attributes of the resources, other than spatial attributes, that either facilitate or hinder the efforts of the patient to obtain care. Gender and specialty of a provider, and fee schedule would be examples of such attributes. Geographic accessibility refers to the "friction of space" that is a function of the time and physical distance that must be traveled to obtain care.

Donabedian also argues that "the proof of access is the use of services, not simply the presence of a facility."

Along the same line, Beck (1973) conceptualizes access by using the term "medical iceberg." The iceberg represents the set of medical needs that might be treated by a physician. The proportion of the iceberg above water represents the needs that have been treated. The greater the proportion of the iceberg above water, the greater the access to medical care. Both Donabedian & Beck focus on the utilization of medical services as the proof of access to health services.

Aday & Andersen (1975) expand the notion of access to the following four dimensions: availability, finance, utilization, and the ratio of utilization to medical needs. The availability of health facilities and personnel can be exemplified by physician-to-population ratios. Finance represents all the costs of using those facilities and personnel: for example, out-of pocket cost, travel time to, and waiting time in a physician's office. Utilization is the actual use of health services, such as the number of visits or procedures per person in a given period of time. The use of health services in comparison to some measure of the population's apparent need for them is the fourth dimension - for example, physician visits in comparison to the symptoms or disability experienced.

Andersen et al. (1983) defines access as:

> "Those dimensions which describe the potential and actual entry of a given population group to the health care delivery system."

The attributes of the health care delivery system and the characteristics of individuals in the area characterize potential access. The availability of health care facilities and providers represent the former. The latter are age, health status, and insurance coverage. The actual access is the utilization of medical services and the degree of satisfaction with them. Before realized access, i.e., utilization of health services, can be obtained, entry to the health care system must be secured. The potential entry is influenced by structural characteristics of the delivery system and by the nature of the needs, wants, and resources, that potential customers have when they seek care.

The concepts of "access to care" described above could be distinguished into potential, and realized or actual access. We agree with the notion that realized access to care is utilization; however, potential access to care is the immediate concern for the general public who seek health care. Potential access is the means available to an individual for reaching health care providers or hospitals. Without such means, consumers cannot secure entry to the health care system; people fully equipped with means, can obtain health care without barriers. Patients with fewer means have fewer alternatives for health care. They do not have the luxury of pursuing the best care in terms of facilities, procedures, and health care providers. They have to settle for less than optimal care because of the barriers that result from their limited means. To achieve realized access, potential access is not only a necessary condition, but a sufficient one, since the foundation for utilization is those individual attributes that allow entry to the health care system.

Furthermore, the availability of health facilities and personnel should be treated as an environmental factor, rather than potential access to care for an individual, since it represents another level of conceptualization (Phillips, 1998). Conceptually, the availability of health facilities and health care providers does affect patients' access to care. Less availability means fewer options, which restricts patients' access. Those characteristics, however, are dominated by policy makers and/or market mechanisms and are beyond the individual patients' control. Methodologically, they represent a different level of unit of analysis, aggregated level. Hence they should be separated out from access to care for individual.

After having discarded realized access and the availability of health resources, individual patient attributes such as income, insurance coverage, and regular source of care are the focus. Income implies the ability to pay; lower income limits the ability to pay for health care and thus limits access to care (Aday et al., 1993; Andersen & Aday, 1978; Wan, 1989). The type and extent of insurance coverage refers to eligibility for obtaining health care from health care providers. The lack of insurance coverage, or insufficient coverage may restrict the scope of the health services received, which will reduce access to care (Ayanian et al., 1993; Bindman et al., 1995; Weissman et al., 1992).

Another dimension is the "friction of space" specified by Donabedian (1973), that is, the distance and time a patient must travel to obtain care. A long distance from residence to a physician's office or a hospital may prevent patients from seeking care for minor conditions, which may develop into severe ones (Druss et al., 1997; Piette & Moos, 1996;

Rosenheck & Stolar, 1998). Long traveling times on public transportation or because of traffic jams can have similar result (Andersen, et al., 1983; McGuirk & Porell, 1984).

Severity of Comorbidities

Comorbidity signifies that a patient needs more medical attention since more than one disorder or disease is contributing to the course of illness. The effects of comorbidities can be additive or synergistic, accelerating the original disorder or disease. Iezzoni (1997) defines comorbidity as:

> "comorbidities, or coexisiting diagnoses, are unrelated in etiology or causality to the principal diagnosis."

The definition shows that any disease that can be a comorbidity of another disease, as long as they are not related etiologically or causally. Such a perspective calls on clinical judgement, i.e., diagnosis, by implying that two diseases or disorders belonging to the same diagnosis-related group (DRG) should not be treated as comorbidities of each other. Elixhauser et al. (1998) assert that a secondary diagnosis under the same DRG is a further specification of the principal diagnosis and is not likely to be a separate and discrete coexisiting condition.

Clarkin & Kendall (1992) argue that a mental disorder should be defined by its essence and boundaries before proceeding to ascertain the comorbidities. A mental disorder, however, has neither a clear definition that is universally agreed upon, nor an uniform method for ascertaining the existence of a discrete mental disorder. Though mental disorders are viewed in the same way as other medical diseases, the existence of a comorbidity can be established by clinical description, epidemiology, premorbid personality, family history of the disorder, and laboratory findings (Kraemer, 1995; Winokur, 1991). Therefore, defining a mental disorder and establishing its comorbidities become central issues in studying a mental disorder and its healthcare outcomes. In the mental health field, the most acceptable diagnostic tool is the Diagnostic Statistical Manual of Mental Disorders (DSM), which is a hierarchical classification system for mental disorders that is operationalized by diagnostic exclusionary rules (First et al., 1990). It can be adopted as a foundation for defining mental disorder, along with the principle of diagnostic comorbidity proposed by Iezzoni (1997) and Elixhauser et al. (1998) to identify possible comorbidities. The remaining question is why we are concerned with comorbidity.

In health services research, comorbidity is pervasive and has confounding effects. Most clinical trail excludes patients with significant comorbidities in order to minimize their effects on treatment efficacy (Iezzoni, 1997). For instance, a patient with comorbid disorders or diseases may need more diagnostic procedures or laboratory tests to confirm the principal and secondary diagnoses. He/she may have a higher risk in developing complications and/or death. A patient with comorbidities may need a different treatment modality than those without comorbidities do. Such a patient may consume more health resources during the treatment process and without the guarantee of a better prognosis.

From a utilization point of view, a patient with comorbidities may have a longer LOS, higher resource consumption in both material and human resources, and worse outcomes in terms of readmission and survival (Iezzoni, 1997; Maser & Clonninger, 1990). Hence, comorbidity, either mental or medical, should be taken into consideration when conducting a health utilization and/or outcome study. Without properly controlling the effects of comorbidities, the results of a study will be severely biased and will underestimate the effects of treatment modalities and the efforts of health care providers.

Prior Use of Health Care Services

Mental disorders, similar to chronic medical conditions in terms of the treatment process, may not be healed with a single office visit or hospitalization. They may involve long term interactions with health care providers. More frequent contacts and/or longer duration of treatment symbolize the persistence or severity of the disorders.

Using Andersen's model (1995), need factors can be separated into perceived and evaluated need. An evaluated need is assessed by a professional whose decision that a patient needs medical attention is based on diagnoses, laboratory tests, and the severity of symptoms (Aday, 1993; Andersen, 1995). Prior utilization of health care services by a patient stands for his/her health needs having been evaluated by a health care provider and modalities having been prescribed according to the disorder diagnosed. These modalities can either be ambulatory or inpatient, depending on the complexity and/or severity of the disorder.

Prior utilization, therefore, can have been either outpatient or inpatient treatment, according to the patient's condition and the judgment of the health care provider. Patients with prior hospitalizations, however, seem to have had more severe and/or complicated conditions than did those with ambulatory care only. Hospitalized patients may also consume more resources during treatment. For patients with mental disorders, prior medical utilization should also be included, because of their medical comorbidities (Moos et al., 1994, 1995a&b). As mentioned in the previous section, comorbidities complicate diagnostic and treatment procedures, without the guarantee of a better prognosis. These patients may have had frequent contacts with physicians and hospitals in the past or have them in the future, to meet their needs for health care.

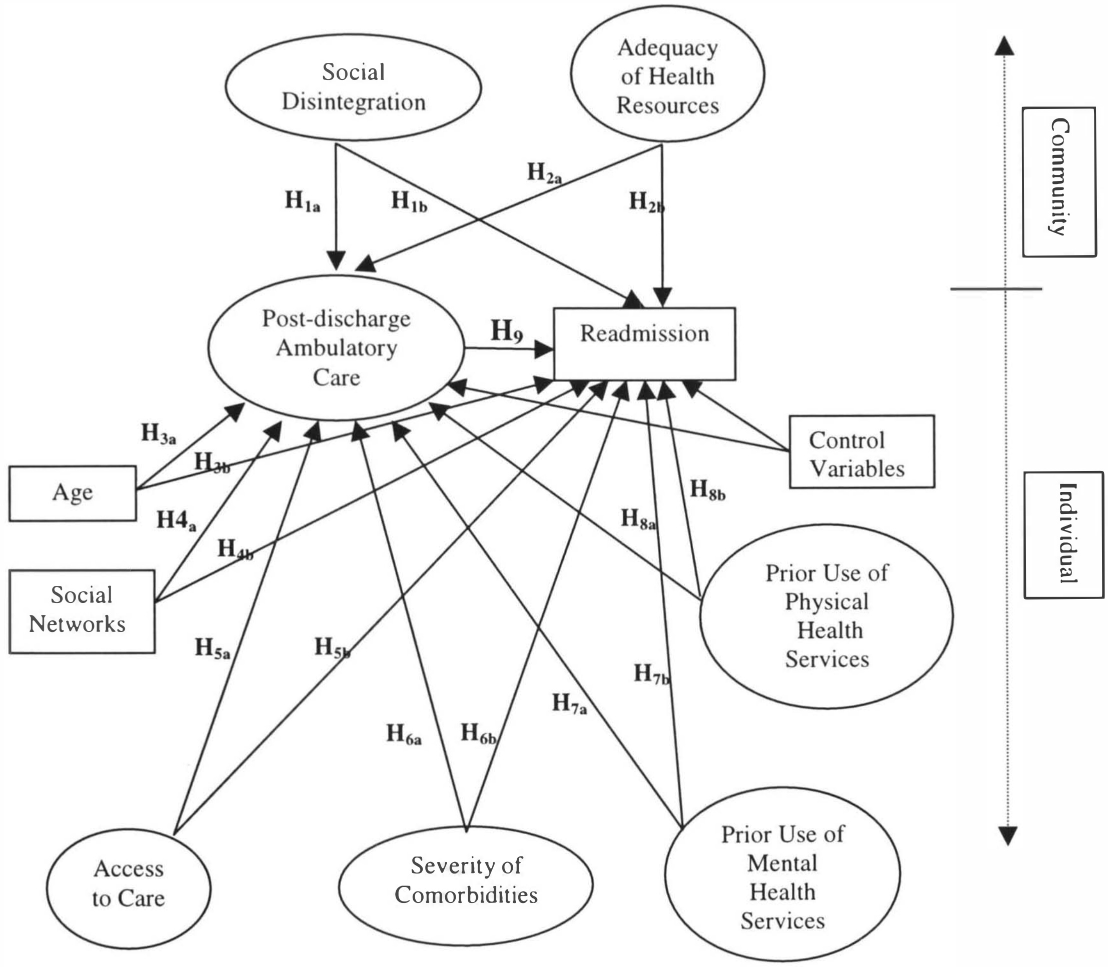
Conceptual Model and Hypotheses

The conceptual model (Figure 3) is based on the "health behavioral model'" proposed by Andersen (1995) to examine the effects of external environmental factors and population characteristics on utilization and outcome for veterans with PTSD. External environmental factors include social disintegration and the adequacy of health resources. Population characteristics comprise age (predisposing); social network and access to care (enabling); and severity of comorbidities, and prior use of mental and physical health services (need). Utilization is conceptualized as post-discharge ambulatory care, and outcome is represented by readmission.

The Effect of Social Disintegration on Post-discharge Ambulatory Care and Readmission

Social disintegration is viewed as a community enabling factor with a negative effect on patients with mental disorders. One dimension of social disintegration is

Figure 3. Conceptual Model of Healthcare Utilization and Outcomes in Veterans with Posttraumatic Stress Disorder



characterized by the level of crimes (Leighton, 1963; Phillips et al., 1998). Higher crime rates aggravate the stress level, the fear of crime, and mental health problems (Perkins & Taylor, 1996; Thompson & Norris, 1992; Wandersman & Nation, 1998).

Neuro-psychological models (Elliott, 1997; McFall et al., 1990 Moyers, 1996; Orr et al., 1993; Shalev et al., 1993) indicate that the symptoms of PTSD patients are aroused by environmental cues similar to the original traumatic events, i.e., auditory or visual stimuli. These stressors may trigger patients' memories of initial traumatic events, or may cause a secondary trauma for PTSD patients. They may need more medical attention as the consequence of such arousals. It is expected that PTSD veterans living in a county with higher crime rates are more likely to have post-discharge ambulatory care and higher readmission rates. The first set of hypotheses is exemplified as follows:

H1a: There is a positive relationship between social disintegration and use of post-discharge ambulatory care by veterans with PTSD.

H1b: There is a positive relationship between social disintegration and readmission to VAMCs for veterans with PTSD.

The Effect of the Adequacy of Health Resources on Post-discharge Ambulatory Care and Readmission

Community health resources serve as environmental factors in the health behavioral model (Adersen, 1995; Phillips et al., 1998). These resources can be in the form of healthcare providers or facilities that compete with the VA health care system for patients

(Aday & Andersen, 1974; Santerre & Neun, 1996; Sorkin, 1992). A higher number of healthcare providers and organizations in the community signifies the options that patients have for health care.

It is estimated that 0.5% to 83.33% of veterans have used community health care services for both medical and mental health conditions (Borowsky, 1999; Fleming, 1992; Gilbert, 1993; Hoff, 1998; Rabiner, 1998; Romm, 1984; Rosenheck & Fontana, 1995; Strauss, 1985; Wright, 1997). Friss (1989) and Rosenheck & Stolar (1998) found that community health resources have a negative effect on VA utilization by veterans. It is expected that PTSD veterans living in a community with relative more health resources are less likely to use VA post-discharge ambulatory care and are less likely to be readmitted to VAMCs. We hypothesize the second set of propositions as follows:

H2a: There is an inverse relationship between community health resources and use of post-discharge ambulatory care by veterans with PTSD.

H2b: There is an inverse relationship between community health resources and readmission to VAMCs for veterans with PTSD.

The Effect of Age on Post-discharge Ambulatory Care and Readmission

Both Aldwin (1991) and Fontana & Rosenheck (1994) indicate that the coping strategies adopted by senior citizens may help them adapt better to later life and achieve more satisfactory mental well-being. Psychologists and psychiatrists (Blazer, 1990;

Siegler, 1980; Vaillant, 1977) point out that elderly people adopt a more mature defensive style than their younger counterparts do. The accumulated experiences, coping mechanisms and adaptation may help the elderly manage the symptoms posed by mental disorders.

Most studies indicate that age has no effect on post-discharge ambulatory care (Axelrod & Wetzler, 1989; Del Gaudio et al., 1977; Fink & Heckerman, 1981; Hershorn, 1993; Kirk, 1977; Matas et al., 1992; Winston et al., 1977). An inverse relationship between age and the symptoms of mental disorders, including PTSD, has been found by Engdahl et al., (1991), Fontana et al., (1994), Taft et al., (1999), and Tennant et al., (1997). Three studies point out that advanced age is associated with readmission (Labbate et al., 1997; Rabinowitz et al., 1994; Snowden et al., 1992). The rest of the studies show that younger age is at higher risk of readmission. It is expected that elderly veterans with PTSD may use less post-discharge ambulatory care and have fewer readmissions. The third set of hypotheses is as follows:

H3a: There is an inverse relationship between age and use of post-discharge ambulatory care by veterans with PTSD.

H3b: There is an inverse relationship between age and readmission to VAMCs for veterans with PTSD.

The Effect of Social Networks on Post-discharge Ambulatory Care and Readmission

In the health behavioral model, social networks are an enabling factor that can facilitate or impede the utilization of health care. Social network theory proposes that every member in a social network can mobilize his/her resources to encourage the focal person to gain access to health care. Caplan (1974) and Wellman (1979) argue that regardless of the amount of resources a network member has, the larger the network size, the more advice and/or resources a focal member is expected to receive in order to urge him/her to seek health care.

The empirical studies indicate that the presence of a social network can ease the symptoms of PTSD (Boscarino, 1995; Fontana & Rosenheck, 1994 & 1998; Keane et al., 1985; King et al., 1998). The studies conducted by Klinkenberg & Calsyn (1998) and Johnsen & Herringer (1993) indicate that patients with a social network may have a higher probability of obtaining post-discharge ambulatory care. Several authors show that a larger social network can offer protective effects for psychiatric patients from being readmitted (Caton et al., 1985; Cohen & Sokolovsky, 1978; Dayson et al., 1992; Lipton et al., 1981). The proxy of social network, living with others, is also found able to prevent readmission (Sands, 1984). It is expected that a patient with a larger social network is more likely to have post-discharge ambulatory care and is less likely to be readmitted. The fourth set of hypotheses is as follows:

H4a: There is a positive relationship between the size of the social network and use of post-discharge ambulatory care by veterans with PTSD.

H4b: There is a negative relationship between the size of the social network and readmission to VAMCs for veterans with PTSD.

The Effect of Access to Care on Post-discharge Ambulatory Care and Readmission

Personal attributes of income, insurance coverage, and regular sources of care compose potential access to care. Patients with lower income may have limited ability to pay for health care and are therefore prevented from access to care (Aday et al., 1993; Andersen & Aday, 1978; Wan, 1989). The lack of insurance coverage, or insufficient coverage may restrict the scope of health services received, and hence reduce access to care (Ayanian et al., 1993; Bindman et al., 1995; Weissman et al., 1992). Similarly, lack of regular sources of care indicates inadequate access to care. These conditions may not be applicable to veterans, since the VA health care system serves as a public safety net for disadvantaged veterans (Wilson & Kizer, 1997).

The priority of eligibility for receiving VA health care is based on the following criteria (Beattie et al., 1996; Fonseca et al., 1996; Kosloski et al., 1987; Page et al., 1982; Romm et al., 1984; Rosenheck 1993; Rosenheck & Stolar 1998):

1) service-connected disability;
2) special categories of veterans predetermined by the VA; and
3) low income.

The criteria mean that more vulnerable veterans are provided with better access to VA health care facilities. It is expected that veterans with better access to care will have more post-discharge ambulatory care and more readmissions, since they may not have other alternatives. The fifth set of hypotheses is stated as follows:

H5a: There is a positive relationship between access to care and use of post-discharge ambulatory care by veterans with PTSD.

H5b: There is a positive relationship between access to care and readmission to VAMCs for veterans with PTSD.

The Effect of the Severity of Comorbidities on Post-discharge Ambulatory Care and Readmission

Comorbidity is an evaluated need factor in the health behavioral model, reflecting need as diagnosed by professionals. The more comorbidities a patient has, the more diagnostic procedures, laboratory tests, and treatment modalities are needed (Iezzoni, 1997, Maser & Clonninger, 1990). Patients with relative more comorbidities may have worse outcomes in terms of prognosis, readmission, and survival.

Both Bullman et al. (1994) and Skodol et al. (1996) show that the number of comorbidities is positively associated with the severity of PTSD, service-seeking behavior, and mortality risk. Most empirical studies, however, except for Dixon et al. (1997) and Moos et al. (1994), have shown a downward trend in post-discharge ambulatory care for psychiatric patients with comorbidities. The mechanism of non-compliance with post-discharge outpatient service is not clear for these patients. The possible explanations could relate to legal issues (Killeen et al., 1995; Wolpe et al., 1993), mobility restriction due to medical comorbidities, or the recognition problems and/or avoidance behavior associated with mental comorbidities.

In terms of readmission, both mental and physical comorbidities are positively related to readmission for patients with PTSD or other mental disorders (Blow et al., 1998; Boudewyns et al., 1991; Brown et al., 1995; Haywood et al., 1995; Moos & Moss, 1995_a; Kales et al., 1995; Sullivan et al., 1995; Tomasson & Vaglum, 1998; Vogel & Huguelet, 1997; Williams et al., 1998). This association may result from the severity of the commorbidities, the complicated treatments needed, sub-optimal prognosis, or less post-discharge ambulatory care. It is expected that PTSD patients with more comorbidities are less likely to use post-discharge ambulatory care and more likely to be readmitted. The sixth set of hypotheses is as follows:

H6a: There is a negative relationship between severity of comorbidities and use of post-discharge ambulatory care by veterans with PTSD.

H6b: There is a positive relationship between severity of comorbidities and readmission to VAMCs for veterans with PTSD.

The Effect of Prior Use of Health Services on Post-discharge Ambulatory Care and Readmission

Prior use of health services is also an evaluated need according to the health behavioral model. Prior utilization includes both ambulatory and inpatient care, depending upon the severity and complexity of the disorder. Hospitalized patients may have more severe conditions, consume more resources, and have worse outcomes than ambulatory patients do. Patients with mental disorders may also have physical health needs that increase their consumption of healthcare resources.

A positive association between prior utilization and post-discharge outpatient care has been found for patients with mental disorders (Axelrod & Wetzler, 1989; Blouin et al., 1985; Carpenter et al., 1981; Keane et al., 1982; Kirk, 1977). The majority of the studies indicate that prior utilization is a strong predictor of subsequent hospitalization (Appleby et al. 1993; Daniels et al., 1998; Gooch & Leff, 1996; Moos et al., 1994 & 1995_b; Moos & Moos, 1995_a; Peterson et al., 1994; Postrado et al. 1995; Ross et al., 1995; Snowden & Holschuh, 1992; Solomon et al., 1984; Walker et al., 1996). It can be postulated that previous mental or medical care is positively related to post-discharge ambulatory care and readmission. The next two sets of hypotheses are:

H7a: There is a positive relationship between prior mental health services utilization and use of post-discharge ambulatory care by veterans with PTSD.

H7b: There is a positive relationship between prior mental health services utilization and readmission to VAMCs for veterans with PTSD.

H8a: There is a positive relationship between prior physical health services utilization and use of post-discharge ambulatory care by veterans with PTSD.

H8b: There is a positive relationship between prior physical health services utilization and readmission to VAMCs for veterans with PTSD.

The Effect of Post-discharge Ambulatory Care on Readmission

Post-discharge ambulatory care extends the treatment process of inpatient care to improve the well-being of a patient. As indicated by Evashwick (1997), post-discharge ambulatory care is a part of "continuum of care' that provides physical, mental health and social services at all levels of intensity of care. With regular ambulatory visits after discharge from the hospitals, a patient may recover steadily and be aware of his/her improvement. He/she may also obtain referrals for other health and social needs.

The protective effects of post-discharge ambulatory care is found to reduce readmission for patients with mental disorders (Byers et al., 1978; McCranie & Mizell, 1978; Moos et al., 1995 $_{a \& b}$; Peterson et al., 1994; Soloman et al., 1984; Walker et al., 1996; Winston et al., 1977). It is believed that more post-discharge ambulatory care can prevent the readmissions for veterans with PTSD. The last hypothesis is presented as follows:

Hypothesis 9:

There is an inverse relationship between use of post-discharge ambulatory care use and readmission to VAMCs for veterans with PTSD.

In summary, hypotheses 1 through 9 have specified the postulated relationship between the exogenous and endogenous constructs. The focus of this study is to test not only each single hypothesis, but also the model as a whole, in order to verify the utility of the present conceptual model.

Summary

The health behavioral model (Andersen, 1995) states that health outcomes and utilization are influenced by factors from the environment and by population characteristics. The factors from the environment are composed of external environment and the health care system. External environment factors include economic climate, politics, and the levels of stress and crime (Phillips et al., 1998). The health care system can be categorized into policies, resources, and organization that influence the accessibility and availability of health care services.

Population characteristics are represented by predisposing, enabling, and need factors. Predisposing factors are age, gender, and ethnicity that are immutable to health policy. The enabling factors are the means individuals have available to them that permit them to seek health care services. Income, insurance coverage, and regular sources of care are the examples of enabling factors. Need factors are felt needs as perceived by patients, and evaluated needs as confirmed by professionals.

Using the framework of the health behavioral model, this study examines the effects of community as well as individual factors on the healthcare utilization and outcomes of veterans with PTSD. Outcome is represented by readmission to VAMCs, and utilization is characterized by post-discharge ambulatory care at VAMCs. Social disintegration and adequacy of health resources form the construct of environment. The former is hypothesized to have a positive impact on both utilization and outcome; the latter, in contrast, has a negative influence on both.

The predisposing factor is age, which is hypothesized to have a negative effect on both utilization and outcome. The enabling factor is illustrated by social networks and access to care, both of which are surmised to have a positive influence on utilization and outcome. The need factor is conceptualized by severity of comorbidities and prior mental and physical health utilization. Severity of comorbidities is hypothesized to have a negative relationship with utilization and a positive relationship with outcome. Prior utilization of both mental and physical health services is expected to have a positive effect on post-discharge ambulatory care and on readmission. Post-discharge ambulatory care is postulated to prevent subsequent readmissions.

CHAPTER 4

METHODOLOGY

In this chapter, the proposed conceptual model based on the health behavioral model (Andersen, 1995) is used to guide the analysis. Each hypothesis will be tested; the overall model fit also will be tested to verify the utility of the conceptual model. The methodological discussion is presented in terms of: research design, unit of analysis, sample selection, data sources, measurement of variables, analysis plan, and the limitation of the study.

Research Design

This study is a quasi-experiment without manipulation of subjects and with no contemporary control groups (Cook and Campbell, 1979). It is composed of two cross-sectional studies. Data are collected before and after the implementation of service lines. The major weakness of a cross-sectional study is that the causality among the study variables cannot be ascertained. However, through the analysis of the inter-relationships among variables, the effects of the social ecological correlates of PTSD will be clarified.

A pretest – posttest design is applied in this study (Cook & Campbell, 1979). The design can be diagrammed as follows:

$$O_1 \quad X \quad O_2$$

X is interdisciplinary care established by each service line and received by veterans with PTSD. O_1 and O_2 are variables of interest collected before and after the implementation of service lines. Not only can the healthcare outcomes be compared, but also the plausible causal relations can be established by examining the stability of each measurement variable (Hays et al., 1994; Ho et al., 1993).

Unit of Analysis

The unit of analysis is individual veterans with PTSD who have received care from eight VAMCs in the states of Virginia, North Carolina, and West Virginia, located in VISN 6, during fiscal year (FY) 1994 and FY1998.

Sample Selection

The VA uses ‘primary diagnosis’ instead of principal diagnosis (Iezzoni, 1997). Both primary diagnosis and secondary diagnosis for patients with the International Classification of Disease, ninth version (ICD-9) code of 309.81 will be used to extract patient attributes. In this study, readmission is defined as the first subsequent admission with ICD-9 code of 309.81(PTSD) when a veteran has been admitted to any VAMC in VISN 6, within one year after the discharge of index admission. An index admission is defined as either primary or secondary diagnoses with the ICD-9 code of 309.81 for admission to any VAMC in VISN 6.

A veteran whose discharge status for an index admission was ‘death’ is excluded from the sample since death precludes readmission, the main outcome in this study. Another exclusion is the patients who receive health care from VAMCs without qualifying as veterans, i.e., active duty military personnel or dependents of veterans.

Preliminary data management indicates that the total number of admitted PTSD patients was 1,431 in 1994. There were 5 non-veterans and 6 patients who died during the index admission. The final sample was 1,420 PTSD veterans. In the 1998 sample, there were 1,517 PTSD patients after deletion of 2 non-veterans and 5 veterans who died during the index admission.

Data Sources

Four data sets are compiled for this study. The first data set is the Patient Treatment File (PTF) and the Outpatient Care File (OPT) generated by the Department of Veterans Affairs (VA). Both the PTF and the OPT for FY 1994 and 1998 are used for this study. The second data set is the Area Resource File (ARF). The versions of ARF for1996 and 1998 ARF are used. The third data set is American Hospital Association data sets (AHA). 1994 and 1996 AHA files are used in the study. The fourth data set is the Uniform Crime Report (UCR) generated by the Department of Justice - Federal Bureau of Investigation. Both 1994 and 1997 UCRs are employed in this study.

Both PTF and OPC files in FY1994 and FY1998 contain patient identifiers that can be used to construct person-specific records for those veterans who are VAMC users. The PTF file records basic demographics and diagnostic, surgical and treatment procedures received, as well as the discharging bed section. The 1994 OPT file does not include diagnoses, and Current Procedural Terminology (CPT) codes were also incompletely captured (Beatti et al., 1996). Patient encounters can be classified as PTSD, other mental health, or physical health visits through their “clinic stops” (Ashton, 1998). Visits made only for prescription filling are not counted as stops in the OPC file and were excluded from this study.

ARF is a county-based data file that summarizes secondary data from a variety of sources used for health care planning. Factors included in the ARF file are health manpower data, health facility data, population and economic data, vital statistics and environmental data. The present study used data on the numbers of non-federal psychiatrists, psychologists, social workers other than those in VAMCs and children’s hospitals, and physicians other than psychiatrists and pediatricians, in measuring the construct, adequacy of health resources. The number of psychiatric nurses is not included, since ARF does not record it.

The AHA file provides aggregated information on hospital structure, ownership, services provided, human resources, beds, and utilization. In this study, the number of total beds in the counties, except for beds in VAMCs and children’s hospitals, will be extracted to represent the local beds available to veterans.

UCR will be used to extract data to measure the construct of social disintegration. It has four county-level data files. The first three files list arrests for Part I offenses such as murder, rape, robbery, burglary, auto theft, and arson; and Part II offenses such as forgery, fraud, vandalism, weapon violations, and drug and alcohol violations. The fourth file lists reported for Part I offenses, only.

For this study, reported crimes of murders, rapes, robberies, aggravated assaults, and arsons; and arrested crimes of weapons violations, drug abuse violations, and alcohol violations are extracted.

The outreach program for veterans, Vet centers, plays a significant role in providing consultation to veterans with PTSD (Kulka et al., 1990). However, they are not a part of VAMCs. In measuring health resources, the number of full time equivalent (FTE) employees in Vet centers is included as an indicator.

All information extracted from ARF and UCR, as well as the FTEs in each Vet center are merged with information obtained from PTF and OPC files for the state and county/city that a veteran resides in.

Measurement of the Variables

There are three types of variables: endogenous variables, exogenous variables, and control variables. Endogenous variables are those variables influenced by other variables in the model. Exogenous variables are variables that influence an endogenous variable in the model. Control variables are those variables that have effects on the variables of interest, but are not the focus of this study. In order to minimize their confounding effects, they are included in the study.

Endogenous Construct

Post-discharge ambulatory care and readmission signify the utilization and the healthcare outcomes for veterans with PTSD in this study. Post-discharge ambulatory care is defined as the outpatient visits made to VAMCs between the discharge of the index admission and readmission for the readmitted. For non-readmitted patients, the dateline will be the end of fiscal year, i.e., September 30th. The numbers of visits for medical, mental, PTSD clinic, and social work services made after the index admission measure post-discharge ambulatory care. Readmission is defined as the first admission to a VAMC with either a primary or a secondary diagnosis code of 309.81 (PTSD) after the discharge of the index admission. It is measured by the length of time from the discharge of the index admission to readmission, within one-year timeframe. The operational definition, measurement, and data source for each variable are provided in Table 18.

Exogenous Construct

Table 19 presents two community-level latent variables: social disintegration and adequacy of health resources. Social disintegration is measured by the violent crime rate that is the total of the number of weapons violation arrests, the number of murders reported, the number of aggressive assaults reported, and the number of rapes reported per 1,000 county/city population. The second composite indicator is the substance abuse rate, including the number of drug violation arrests and the number of alcohol violation arrests per 1,000 county/city population. The third indicator of property crime rate is the

Table 18. Operational Definitions, Measurements, and Data Sources of the Variables in the Endogenous Construct

Construct/ Variables	**Operational Definition**	**Measurement**	**Data Source**
Readmission	The length of time from the discharge of index admission to readmission, within one year.	Continuous variable	PTF (1994 & 1998) <DISDAY, ADMITDAY>*
Post-discharge Ambulatory care			
AFMED94 & AFMED98	Number of medical visits made after the index admission	Continuous variable	OPC(FY94 & FY98) <CL1-CL15>
AFMEN94 & AFMEN98	Number of mental visits made after the index admission	Continuous variable	OPC(FY94 & FY98) <CL1-CL15>
AFPTSD94 & AFPTSD98	Number of PTSD visits made after the index admission	Continuous variable	OPC(FY94 & FY98) <CL1-CL15>
AFSOC94 & AFSOC98	Number of social work service visits made after the index admission	Continuous variable	OPC(FY94 & FY98) <CL1-CL15>

Note: *: < > indicates the variable name used in VA database; OPC: Outpatient Care File; PTF: Patient Treatment File.

Table 19. Operational Definitions, Measurements, and Data Sources of the Variables in the Exogenous Construct, at the Community Level

Construct/ Variable	**Operational Definition**	**Measurement**	**Data Source**
Social Disintegration			
VIO94 & VIO98	Number of violent crimes per 1,000 county/city population	Continuous variable	UCR (1994 &1997)
PROP94 & PROP98	Number of property crimes per 1,000 county/city population	Continuous variable	UCR (1994 &1997)
SA94 & SA98	Number of substance abuse arrests per 1,000 county/city population	Continuous variable	UCR (1994 &1997)
Health Resources			
PSYMD94 & PSYMD98	Number of non-federal practicing psychiatrists per 1,000 county/city population	Continuous variable	ARF (1996 & 1998)
PCHO94 & PCHO98	Number of hospital-based psychologists per 1,000 county/city population	Continuous variable	ARF (1996 & 1998)
SOC94 & SOC98	Total number of hospital-based social workers per 1,000 county/city population	Continuous variable	ARF (1996 & 1998)

Note: ARF: Area Resource File; UCR: Uniform Crime Report.

Table 19 (continued). Operational Definitions, Measurements, and Data Sources of the Variables in the Exogenous Construct, at the Community Level

Construct/ Variable	**Operational Definition**	**Measurement**	**Data Source**
Health Resources (continued)			
OTHMD94 & OTHMD98	Number of non-federal practicing physicians other than pediatricians and psychiatrists per 1,000 county/city population	Continuous variable	ARF (1996 & 1998)
BED94 & BED98	Number of hospital beds less VAMC and children's hospital beds per 1,000 county/city population	Continuous variable	AHA(1994 & 1996)
FTE_V94 & FTE_V98	Number of FTEs in Vet centers per 1,000 county/city veteran population.	Continuous variable	Informant interview

Note: AHA: American Hospital Association data sets; ARF: Area Resource File.

total of the number of robberies reported and the number of arsons reported per 1,000 county/city population.

"Adequacy of health resources" is measured by the number of non-federal practicing psychiatrists per 1,000 county/city population, the number of hospital-based psychologists per 1,000 county/city population other than those in VAMCs and children's hospitals, the number of hospital-based social workers per 1,000 county/city population other than those in VAMCs and children's hospitals, the number of non-federal practicing physicians other than pediatricians and psychiatrists per 1,000 county/city population, the number of hospital beds per 1,000 county/city population other than in VAMCs and children's hospital beds, and the number of full-time equivalent employees in Vet centers per 1,000 county/city veteran population.

Table 20 illustrates exogenous variables at the individual level. There are two observed variables: age and social network. Age is measured by a patient's real age rather than age group. The number of dependents a patient represents social networks. The latent variables are access to care, severity of comorbidities, prior use of mental health services, and prior use of physical health services. Access to care is measured by the means test category to indicate low- income status, percent of service-connected disabilities, and the reciprocal of distance from the residence of a veteran to the VAMC that she or he has been admitted to, by the zip code. Severity of comorbidity is measured by the number of medical and mental health comorbidities and their severity indices (Appendix 1). Prior use of mental health services is measured by the number of PTSD outpatient encounters in the last year, the number of other mental health outpatient encounters in the last year, LOS of PTSD in the last year, and LOS for other mental health disorders in the last year. Prior use of medical health services is measured by the number of encounters and the LOS for medical problems in the last year.

Table 20. Operational Definitions, Measurements, and Data Sources of the Variables in the Exogenous Construct, at the Individual Level

Construct/ Variable	**Operational Definition**	**Measurement**	**Data Source**
Age	Biological age of a patient	Continuous variable	PTF(FY94 & FY98) <AGE>
Social Network	Number of dependents of a patient	Continuous variable	OPC(FY94 &FY98) <NODEPS>
Access to Care			
DIS94 & DIS98	The reciprocal of distance from the residence of a veteran to the admitted VAMC	Continuous variable (0 – 1)	PTF(FY94 & FY98) <ZIP>
MEANS94 & MEANS98	Low income status of a veteran	Ordinal variable: 1= low (Cat. C) 2= medium (Cat. B) 3= high (Cat. A)	PTF(FY94 & FY98) <MEANS>
SCPER94 & SCPER98	Percent of service-connected disabilities of a veteran	Continuous variable	PTF(FY94 & FY98) <SCPER>
Severity of Comorbidity			
NMHCO94 & NMHCO98	Number of mental health comorbidities	Continuous variable	PTF(FY94 & FY98) <DXLSF, DXF2-DXF10>
MHCOS94 & MHCOS98	Mental health comorbidity severity index	Continuous variable	PTF(FY94 & FY98) <DXLSF, DXF2-DXF10>
NPHCO94 & NPHCO98	Number of physical health comorbidities	Continuous variable	PTF(FY94 & FY98) <DXLSF, DXF2-DXF10>
PHCOS94 & PHCOS98	Medical comorbidity severity index	Continuous variable	PTF(FY94 & FY98) <DXLSF, DXF2-DXF10>

Note: *: <> indicates variable name used in VA database; OPC: Outpatient Care File; PTF: Patient Treatment File.

Table 20 (continued). Operational Definitions, Measurements, and Data Source of the Variables in the Exogenous Construct, at the Individual Level

Construct/ Variable	**Operational Definition**	**Measurement**	**Data source**
Prior Use of Mental Health Service			
PTSDE93 & PTSDE97	Number of PTSD outpatient encounters in the last year	Continuous variable	OPC(FY93 & FY97) <CL1-CL15>
OMHE93 & OMHE97	Number of other mental health outpatient encounters in the last year	Continuous variable	OPC(FY93 & FY97) <CL1-CL15>
PDLOS93 & PDLOS97	LOS of PTSD in the last year	Continuous variable	PTF(FY93 & FY97) <LS>
OMHLOS93 & OMHLOS97	LOS of other mental health problems in the last year	Continuous variable	PTF(FY93 & FY97) <LS>
Prior Use of Physical Health Service			
PHE93 & PHE97	Number of encounters for medical problems in the last year	Continuous variable	OPC(FY93 & FY97) <CL1-CL15>
PHLOS93 & PHLOS97	LOS of medical problems in the last year	Continuous variable	PTF (FY93 & FY97) <LS>

Note: *: <> indicates variable name used in VA database; OPC: Outpatient Care File; PTF: Patient Treatment File.

Table 21 presents four control variables: the number of outpatient visits pre- and post-discharge of the index admission made by patients for non-VA care, and LOS at non-VA facilities pre- and post-discharge of the index admission.

Table 21. Operational Definition, Measurements, and Data Sources of the Control Variables

Variable	Operational Definition	Measurement	Data Source
Control Variable			
PNVAO94 & PNVAO98	Total number of visits patients made to non-VA for outpatient care prior to the index admission	Continuous variable	PTF(FY94, FY95, FY96, FY97, FY98)
LNVAO94 & LNVAO98	Total number of visits patients made to non-VA for outpatient care after the index discharge	Continuous variable	PTF(FY94, FY95, FY96, FY97, FY98)
PNVAI94 & PNVAI98	Non-VA LOS prior to the index admission	Continuous variable	PTF(FY94, FY95, FY96, FY97, FY98)
LNVAI94 & LNVAI98	Non-VA LOS after the index discharge	Continuous variable	PTF(FY94, FY95, FY96, FY97, FY98)

Note: OPC: Outpatient Care File; PTF: Patient Treatment File.

Data Analysis

Univariate analysis was performed to determine the distribution of a variable. Data transformation for variables that are highly skewed was performed before conducting multivariate analysis.

Prior to multivariate analysis of the study variables, a bivariate analysis was performed. A correlation matrix was generated to reveal the relationships and the extent of correlation existing between the two variables.

Two multivariate analyses were performed in this study. The first analysis was uni-level SEM, since intraclass correlation (ICC) analysis indicated that none of ICC for the outcome variables exceeded 0.15. The second multivariate analysis was a survival analysis, which is a time-to-event analysis.

The software package of SPSS 9.0 was used for univariate analysis, bivariate analysis, and the second multivariate analysis, survival analysis. Amos package was adopted for uni-level SEM.

Univariate Analysis

The distribution and normality of each variable was verified. Descriptive statistics for continuous variables such as means and standard deviations were explored to examine the trend from 1994 to 1998. Means represent the central tendency of a variable, whereas standard deviation measures the dispersion of the variable. Dichotomous variables were examined by their frequency distributions (Canavos & Miller, 1995; SPSS, 1998).

Normality test was to detect the maldistribution of the variable, in order to perform subsequent data transformation. Three diagnostic statistics were used for this purpose: kurtosis, skewness, and the Kolmogorov-Smirnov statistics (Sharma, 1996; SPSS, 1998). Kurtosis and skewness are statistics that characterize the shape and symmetry of the distribution. A univariate-normal distribution has zero skewness and a kurtosis of three. For large sample size, the standard errors of skewness and kurtosis can be used to calculate the Z-value. Under an alpha level of 0.05, the critical value is 1.96 as a cut-off point.

Kolmogorov-Smirnov test is used to test the hypothesis that a sample comes from a particular distribution, either uniform, normal, or Poisson. The value of the Kolmogorov-Smirnov Z is based on the largest absolute difference between the observed and the theoretical cumulative distributions. The hypothesis is rejected if the p-value is less than 0.05.

Bivariate Analysis

Correlation matrix was calculated for all variables in order to verify their linear relationships. Correlation analysis serves as a road map for multivariate analysis. It indicates the relationship between observable variables. The value for the correlation coefficient is between –1 and + 1. A correlation coefficient of zero indicates that there is no relationship between two variables. The further away from zero of a correlation coefficient, the stronger the relationship between the two variables (Canavos & Miller, 1995; SPSS, 1998).

Multivariate Analysis

Two multivariate analyses were conducted: SEM analysis of covariance structure for post-discharge use of ambulatory services, and survival analysis for readmission.

Intraclass Correlation Analysis

An ICC is defined as the degree to which individuals share common experience due to closeness in space and/or time (Commenges & Jacqmin, 1994; Kreft & Deleeuw, 1998; Koch, 1982). In the multi-level data structure, ICC referrs to the amount of between-group variation in an outcome variable, divided by the total amount of variation (Bryk & Raudenbush, 1992; Duncan et al., 1998; Kreft & Deleeuw, 1998).

In multi-level covariance structure analysis, the total population covariance matrix (Σ_T) is decomposed into two independent components, a between-group population covariance matrix (Σ_B) and a within-group population covariance matrix (Σ_W), i.e., $\Sigma_T = \Sigma_B + \Sigma_W$ (Kaplan & Elliot, 1997; Muthen, 1994). Conventional structure analysis assumes that all observations are independent, i.e., $\Sigma_B = 0$. If ICC deviates from zero, which implies that a multi-level effect does exist, we should proceed with multi-level analysis. Otherwise, a conventional structure analysis should be adopted (Duncan et al., 1997; Muthen 1991).

In an educational achievement study (Muthen, 1994), ICCs were found vary from 0.52 to 0.64 for pretest and from 0.53 to 0.64 for posttest. Kaplan & Elliot (1997) found ICCs to be from 0.08 to 0.64, in another science achievement study. In mental health studies, ICCs were found ranging from 0.18 to 0.294 for sibling antisocial behaviors

(Duncan et al., 1998) and from 0.12 to 0.34 for substance use (Duncan et al, 1997). Hoffman & Stetzer (1996) found ICCs for an occupational safety study ranging from 0.08 to 0.18. Rosenheck & Stolar (1998) investigated access to public mental health service for veterans and found an ICC less than 0.5%, which indicates very little between-group variation; therefore, multi-level analysis was abandoned. There is no established cutoff point for ICC. Kaplan (1998) suggests a rough rule of thumb that ICC should be greater than 0.15 for conducting multi-level SEM. An ICC of 0.15 is selected as a cutoff point, i.e., conventional structure analysis will be applied if ICC of an outcome variable is less then 15%.

Conventional Covariance Structure Analysis

The rationale for using a covariance structure is that the maximum likelihood procedure for confirmatory factor analysis (CFA) is derived for covariance matrices instead of correlation matrices. Besides, correlations measure covariations among variables for standardized data, which are not the case in this study. The conventional covariance structure analysis is composed of two components: a measurement model for each latent construct and a structural equation model that specifies the causal relationships among study variables, whether observable or unobservable (Long, 1983; Bollen, 1989; Wan, 1997). The measurement model for each latent construct will be validated; confirmation of the structural equation model follows.

Measurement Model. An abstract concept or latent construct can be represented by several observable measures or variables; these are the two essential components of a measurement model. A CFA will be carried out to verify the relationships between observable variables and latent constructs, including measurement errors whether correlated or uncorrelated. The general equation for exogenous latent and observable variables can be expressed as $X = \Lambda_x \xi + \delta$ (Bollen, 1989; Long, 1983),

where

X is a (q x 1) vector of the observable variables,

Λ_x is a (q x s) matrix of factor loadings, relating observed x's to the latent variables ξ's,

ξ is a (s x 1) vector of latent variables, and

δ is a (q x 1) vector of residuals or unique factors, based on the assumption of $q > s$.

Similar to the matrix of exogenous latent variables, the general equation for endogenous latent and observable variables can be expressed as $Y = \Lambda_y \eta + \varepsilon$,

where

Y is a (p x 1) vector of the observable variables,

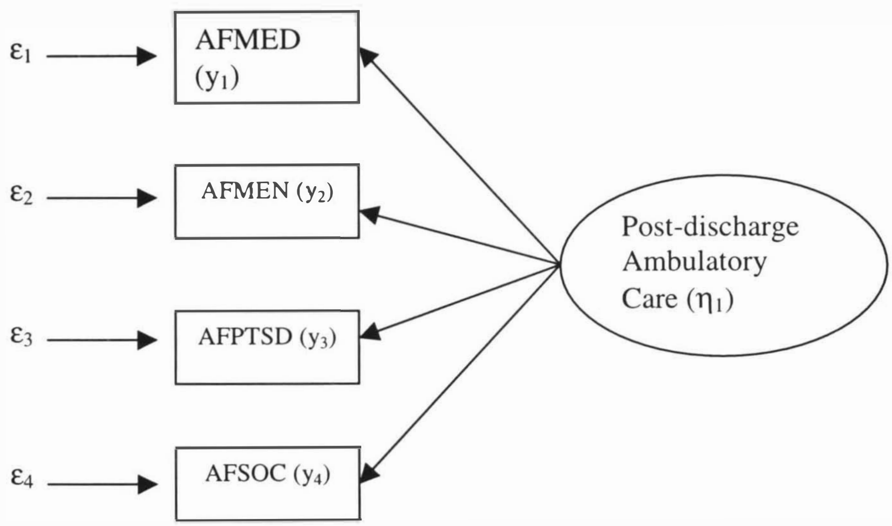
Λ_y is a (p x r) matrix of factor loadings, relating observed y's to the latent variables η's,

η is a (r x 1) vector of latent variables, and

ε is a (p x 1) vector of residuals or unique factors, based on the assumption of $p > r$.

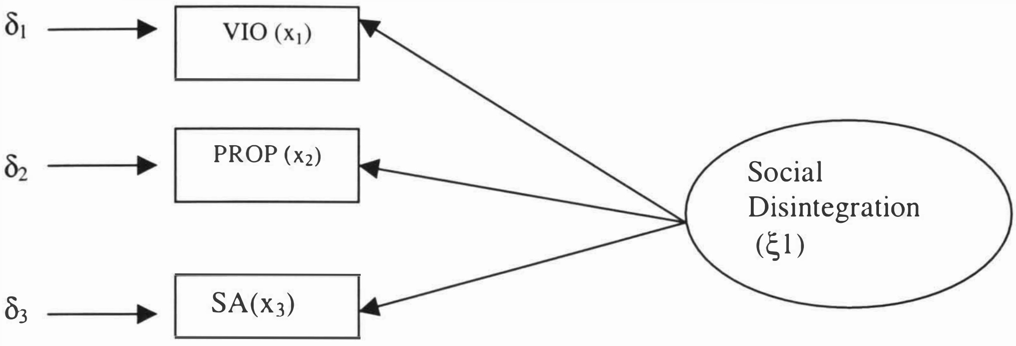
There is only one endogenous latent variable: η_1 (post-discharge ambulatory care). It is measured by four observable variables or indicators (y_1-y_4). There are two exogenous observable variables, x_{10} (age) and x_{11} (social networks), both of which serve as perfect measurements. There are six exogenous latent variables: ξ_1 (social disintegration), ξ_2 (adequacy of health resources), ξ_3 (access), ξ_4 (severity of comorbidities), ξ_5 (prior use of mental health services), and ξ_6 (prior use of physical health service), each measured by a set of observable variables (x_i– x_j). The measurement models for each latent variable and its indicators (observable variables) are presented in Figure 4 through Figure 10.

Figure 4. A Proposed Measurement Model for Post-discharge Ambulatory Care



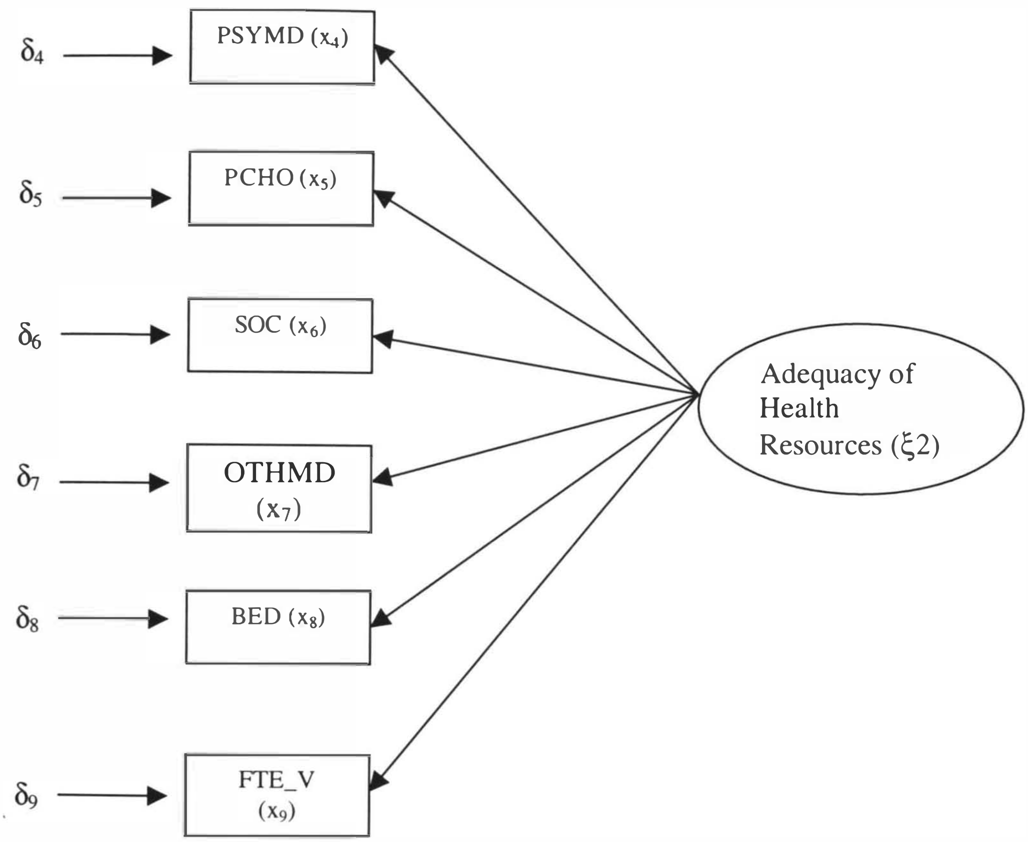
AFMED: Number of medical visits made after the index admission
AFMEN: Number of mental health visits made after the index admission
AFPTSD: Number of PTSD visits made after the index admission
AFSOC: Number of social work service visits made after the index admission

Figure 5. A Proposed Measurement Model for Social Disintegration



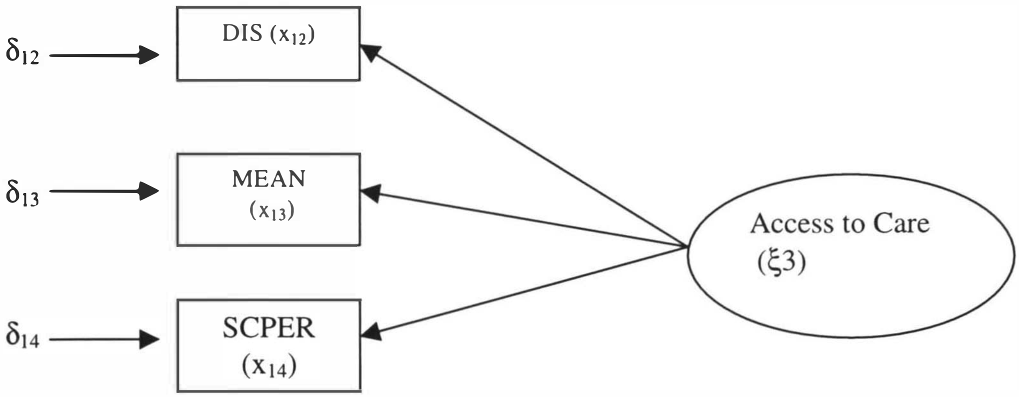
VIO: Number of violent crimes per 1,000 county/city population
PROP: Number of property crimes per 1,000 county/city population
SA: Number of substance abuse arrests per 1,000 county/city population

Figure 6. A Proposed Measurement Model for Adequacy of Health Resources



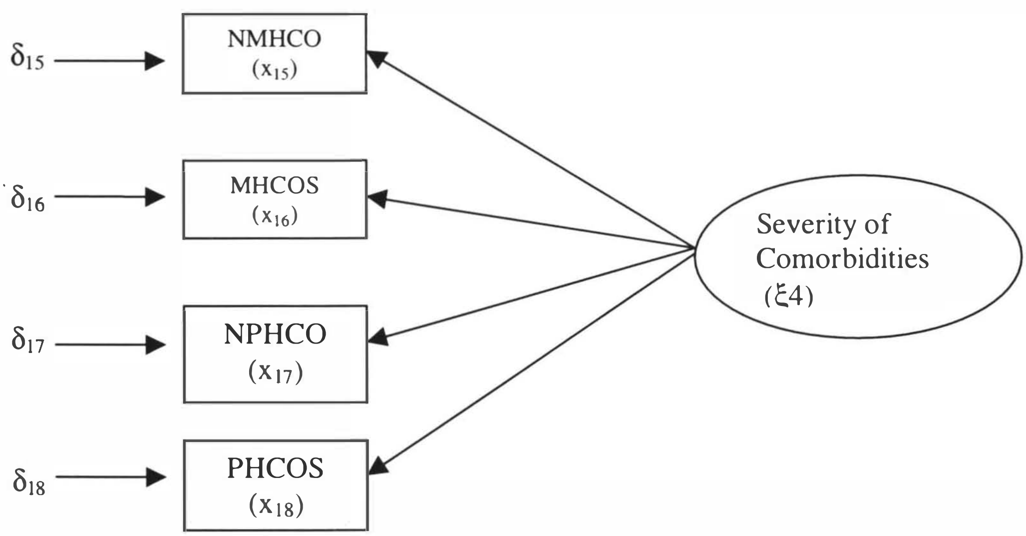
PSYMD: Number of non-federal practicing psychiatrists per 1,000 county/city population
PCHO: Total number of hospital-based psychologists per 1,000 county/city population
SOC: Total number of hospital-based social workers per 1,000 county/city population
OTHMD: Total number of non-federal practicing physicians other than pediatricians and psychiatrists per 1,000 county/city population
BED: Total number of hospital beds, less VAMC and children's hospital beds, per 1,000 county/city population
FTE_V: FTEs in Vet center per 1,000 county/city veteran population

Figure 7. A Proposed Measurement Model for Access to Care



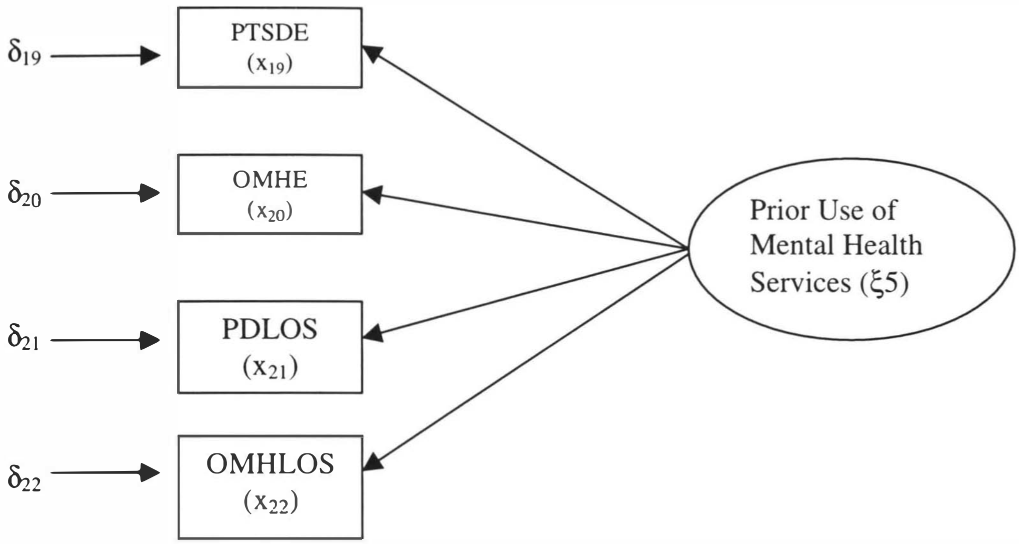
DIS: The reciprocal of the distance from the residence of a veteran to the admitted VAMC
MEAN: Low-income status of a veteran
SCPER: Percentage of a veteran's disabilities that are service-connected

Figure 8. A Proposed Measurement Model for Severity of Comorbidities



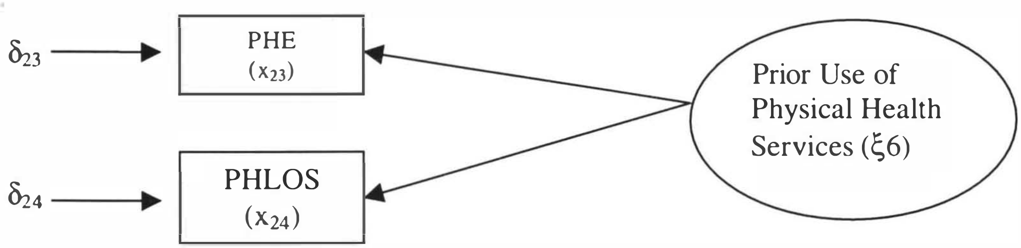
NMHCO: Number of mental health comorbidities
MHCOS: Mental health comorbidity severity index
NPHCO: Number of physical health comorbidities
PHCOS: Medical comorbidity severity index

Figure 9. A Proposed Measurement Model for Prior Use of Mental Health Services



PTSDE: Number of PTSD outpatient encounters in the last year
OMHE: Number of other mental health outpatient encounters in the last year
PDLOS: LOS for PTSD in the last year
OMHLOS: LOS for other mental health problems in the last year

Figure 10. A Proposed Measurement Model for Prior Use of Physical Health Service



PHE: Number of encounters for medical problems in the last year
PHLOS: LOS for medical problems in the last year

The evaluation criteria for the indicators in a measurement model lie upon the values of critical ratio (C.R.) and square multiple correlations (SMC). C.R. is the parameter estimate divided by an estimate of its standard error. If the appropriate distributional assumptions are met, this statistic has a standard normal distribution under the null hypothesis that the parameter has a population value of zero. For example, if an estimate has a critical ratio greater than 1.96 (in absolute value), the estimate is significantly different from zero at the 0.05 level.

SMC is the proportion of the variance of an indicator that is in common with the construct; it is also labeled as communality. The higher the SMC, the larger the proportion of variance in an indicator that is shared with the construct, which means it measures what it supposes to measure and it is a reliable measure for this construct. A rule of thumb is that SMC should be greater than 0.5, i.e., it shares at least 50% of its variance with its construct (Sharma, 1996). The above rules are the guidelines for removing those statistically insignificant indicators that are not measuring the corresponding construct.

Structural Equation Model. The structural equation model is designed to specify the causal relationships among the exogenous variables and endogenous variables. The covariance structure equation modeling technique simultaneously estimates latent variables from observed variables, and estimates the structural relations among the latent variables (Long, 1983; Wan, 1997). The assumptions underlying the covariance structure model are: the variables are measured from their means; common and unique factors are uncorrelated; unique factors and errors in equations are uncorrelated across equations;

exogenous variables and errors in equations are uncorrelated; and none of the structural equations is redundant (Wan, 1997). The general equation for the covariance structural model can be expressed as $\eta = B\eta + \Gamma\xi + \zeta$,

where

η is a (r x 1) vector of latent, endogenous variables,

ξ is a (s x 1) vector of latent exogenous variables measured without errors,

ζ is a (r x 1) vector of errors in the equation,

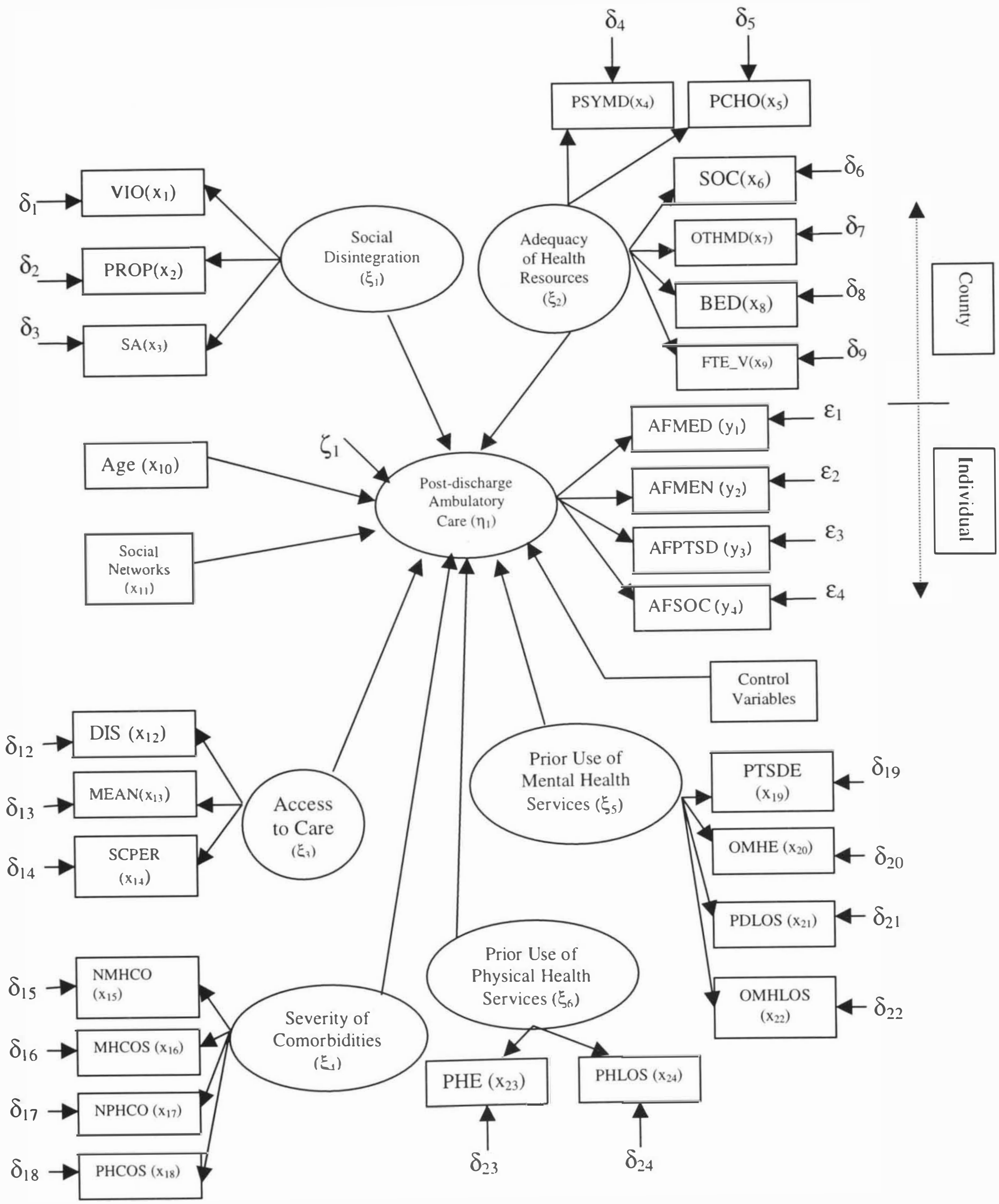
B is a (r x r) matrix of coefficients relating the endogenous variables to one another, and

Γ is a (r x s) matrix of coefficients relating the exogenous variables to the endogenous variables.

The structural equation model is presented in Figure 11. It can be stated as a function equation:

Post-discharge ambulatory care = *f* (social disintegration, adequacy of health resources, age, social networks, access to care, severity of comorbidities, prior use of mental health service, prior use of physical health services, and control variables) + ζ_1.

Figure 11. A Proposed Structural Equation Model of Post-discharge Ambulatory Care for Veterans with PTSD



In the uni-level SEM, a two-stage analysis was performed by fitting the county-level constructs first, followed by the individual-level constructs. The variance, i.e., R^2, contributed by constructs from different levels was examined.

The test of overall model fit is to determine whether the covariance structure implied by the conceptual model is equal to the actual covariance structure of the sample data (Bollen, 1989). The following guidelines were used to test the model fit:

1. The chi-square test (x^2) is used to test the proposed model against the alternative model. The p-value should be larger than 0.05, which indicates that the proposed model fits the data statistically. However, the sample size has substantial influence on chi-square statistics; for instance, the larger the sample size, the higher likelihood of rejecting proposed model. Hence, the chi-square statistic should be examined in conjunction with other indices.
2. A likelihood ratio of chi-square statistic to degrees of freedom can reduce the problems of possibly excessive statistical power of the usual chi-square test when the sample size is large. A likelihood ratio less than five suggests that the model is reasonable and acceptable (Bollen, 1989).
3. The goodness-of-fit (GOF) measures the amount of the variances and covariances jointly accounted for by the model. It ranges from zero to one; normally, it should be higher than 0.90.
4. Adjusted goodness-of-fit (AGOF) index is a measure of goodness-of-fit that takes account of degrees of freedom. It also varies from 0 to 1. The rule of thumb is that it should be greater than 0.80.

5. Root mean square error of approximation (RMSEA) is an absolute fit index, which takes degrees of freedom into account in assessing model parsimony with a discrepancy function that is a measure on weighted square discrepancy. It should be less than 0.05. However, 0.08 is also acceptable.
6. The Hoelter's Critical N indicates the largest sample size for which we are willing to accept that the model is correct. It should be greater than 200.

The statistical significance of each parameter will be assessed by its t-value. The parameter estimates should be statistically significant at an alpha level of 0.05. Modification Indices (MI) were another source for model respecification. Without altering the underlying theory of the model, the correlation among measurement errors can be set free according to the result of each respecification. The largest one can be set free first, followed by the second largest MI for measurement errors, and so on.

Multiple Group Analysis. By using the stacked modeling technique with equality constraint, we assumed that two or more samples will have the same covariance structure in terms of both the measurement model and the structural equation model (Bollen, 1989; Sharma, 1996). In reality, they mmay not have the same structural relationships as those among the study variables. A multiple group analysis can reveal such a difference.

It is of interest to investigate the following questions:

1. The effect of different discharge placements in terms of community and institution settings on post-discharge ambulatory care.
2. The effect of gender on post-discharge ambulatory care. However, a concern is that the study sample size for females may be too small for this investigation.

3. The effect of race, in terms of white and non-white patients, on post-discharge ambulatory care.

The status of discharge placement was coded as 1 for those patients discharged to institutions and 0 for those discharged to communities. Gender was a dummy variable coded as 1 for male patients and 0 for female. Race was coded as 1 if white and 0 if non-white.

Survival Analysis

In studying hospital readmissions, both logistic regression (Craig et al., 1985; Moos et al., $1995_{a\&b}$; Peterson, 1994; Vogel & Huguelet, 1997) and survival analysis (Angermeyer et al., 1989; Appleby et al., 1993; Gooch & Leff, 1996; Walker et al., 1996) have been adopted. Logistic regression codes readmission as a dummy variable and reveals the relative effect of independent variables that contribute to readmission. Survival analysis, however, takes account of time. In this study, readmission is measured by time to readmission. It is defined as the time from the discharge for the index admission to the first VAMC readmission for PTSD, within one year. That is termed survival time. The relative effects of the independent variables are not limited to the indication of readmission, but extend to apply to the speed of readmission. Of the two analytic approaches, survival analysis is a better alternative.

The distribution of survival times is often skewed or far from normal, because of PTSD patients may not have readmissions or, therefore, the difference attributed to the speed of readmission (Elston & Johnson, 1994; Norman & Streiner, 1994). It is necessary to make a proper transformation to deal with the skewness.

Transformation of the Dependent Variable. The distribution of readmission time is often skewed to the right (Angermeyer et al., 1989; Appleby et al., 1993; Gooch & Leff, 1996; Mojtabai et al., 1997). That means that the number of readmitted patients accumulates in a short time after the index discharge and then tapers off. Therefore, it is not a normal distribution. Using a log transformation for readmission time, the problem of skewness was corrected with a mean of μ and variance of δ^2 that is lognormally distributed (Lee, 1980).

Addition of Control Variables. The variables that have been validated in previous measurement models along with obserable variables were used as independent variables in survival analysis. In readmission studies, discharge placement (Byers et al., 1978; Thornicroft et al, 1992; Moos et al.1995 $_{a\ \&\ b}$; Moos & Moos, 1994; Ross et al. 1995), gender (Daniels et al., 1998; Dayson et al., 1992; Vogel & Huguelet, 1997), and race (Munley et al., 1978; Sanguineti et al., 1996) are the factors influencing the readmission of psychiatric patients. These three variables were included as control variables in order to prevent their confounding effects on subsequent admission.

Assumptions for Survival Analysis. There are four assumptions in survival analysis (Norman & Streiner, 1994):

1. An identifiable starting point. In this study, the starting point is the discharge of the index admission, which should not cause identification problems for PTSD veterans, since the starting point is not referring to the starting time of PTSD.

2. The ending point. The ending point is either the first readmission within one year after the discharge of the index admission, or the ending time of the study, i.e., September 30th 1994 or 1998. Some of the patients may not be readmitted, and their survival times are termed censored (Elston & Johnson, 1994; Rosner, 1990).
3. Loss to follow-up study should not be related to the outcome. It is assumed that the reason patients are lost to follow-up study is that they dropped out of the study, which has no relationship to the outcome. If the reasons are related, the estimation of survival function will be severely biased. The nature of this study is observational, and the outcome is readmission. There is no reason to believe that the loss to follow-up is related to readmission for PTSD.
4. There is no secular trend. It is assumed that nothing has happened over the study period that would affect patient eligibility, treatment process, or the outcome. If changes have occurred in this time period, outcomes may be different for patients who entered early in the study and patients seeking help near the end of the study. In this study, the systematic change of implementation of service line has been separated by two years, FY 1994 and FY 1998, to observe its effect. If a pooled-time-series study were conducted, it would be a severe violation of the assumption, because there might be patients who had readmission in both years.

<u>The Functions of Survival Times</u>. Survival times can be characterized by three functions: the survivorship function, the probability density function, and the hazard function. The survivorship function is defined as the probability that an individual survives longer then t:

$S(t) = P(T > t)$,

where

P is the probability,

T is the survival time, and

t is the predetermined time point.

The probability density function is defined as the limit of the probability that an individual fails in a small interval per unit time:

$$f(t) = \lim_{\Delta t \to 0} \frac{P\{\text{an individual fails in the interval } (t, t + \Delta)\}}{\Delta t}$$

where

P is the probability,

t is the predetermined time point, and

Δt is the increase of time.

The hazard function is defined as the limit of the probability that an individual fails in a very short interval, t to t + Δt, given that the individual has survived to time t:

$$h(t) = \lim_{\Delta t \to 0} \frac{P\{\text{an individual of age t fails in the time interval } (t, t + \Delta)\}}{\Delta t}$$

where

P is the probability,

t is the predetermined time point, and

Δt is the increase of time.

The hazard function is also known as the instantaneous failure rate, conditional mortality rate, or age-specific failure rate. It is a measure of the proneness to failure as a function of the age of the individual (Lee, 1980). If any one of the three functions is given, the other two can be derived, i.e., they are mathematically equivalent.

<u>The Proportional Hazard Model</u>. The proportional hazard model is also referred to as Cox regression. In 1972, David Cox proposed a model that hazard function of survival time could be examined by the contribution of each of the independent variables:

$$h(t) = ho(t)\, e^{\beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_p x_p}$$

where

ho(t) is the hazard when all the independent variables, x's, equal zero, and

β is regression coefficient.

The regression coefficients of β_1 to β_p are estimated by a maximum likelihood method that does not depend on the shape of $h(t)$ or ho(t), and the estimates measure the effect of each factor on the hazard function.

There are two assumptions for the Cox regression, in that they specify a multiplicative relationship between the underlying hazard function and the log-linear function of the covariates. This assumption is also called the proportionality assumption. It is assumed that, given two observations with different values for the independent variables, the ratio of the hazard functions for those two observations does not depend on time. The second assumption is that there is a log-linear relationship between the independent variables and the underlying hazard function (Mojtabai et al., 1997).

In carrying out Cox regression, a stepwise method with forward selection was performed. Independent variables were entered sequentially: the first one is the most highly associated with readmission and is followed by the second highest, based on the value of maximum log-likelihood. After each variable is entered, the remaining variables are assessed for statistical significance, $p < 0.05$, and deleted if they have no contribution to the model-fit (Mojtabai et al., 1997; Walker et al., 1996). There were 2 blocks of variables to be entered, in the order of environmental factors and then population characteristics. In this fashion, we not only could distinguish the importance of the independent variables in predicting readmission, but also could verify the contributions from different levels. The change of model-fit were assessed by x^2 and its associated p value.

Summary

In this chapter, methodology in terms of research design, unit of analysis, sample selection, data sources, measurement of variables, and data analysis have been discussed. In data analysis section, three analyses of post-discharge ambulatory care and readmission for veterans with PTSD have been conducted: univariate, bivariate, and multivariate analyses.

The purpose of univariate analysis is to provide a descriptive analysis of the variables for further transformation if the distribution is found to deviate from the normal distribution. The bivariate analysis is to facilitate the understanding of the relationship between the two variables and to serve as a preliminary analysis for multivariate analysis.

Two multivariate analyses of SEM, and survival analysis have been conducted, for the analyses of post-discharge ambulatory care and readmission, respectively.

CHAPTER 5
RESULTS

The results of univariate analysis, bivariate analysis, and multivariate analysis are presented in the following sections. Univariate analysis provides the profiling of each study variable. Bivariate analysis illustrates the relationship between the study variables. Multivariate analysis offers the results of structural equation modeling (SEM) and survival analysis.

In 1994, the total number of admitted PTSD patients was 1,431. There were 5 non-veterans, and 6 patients who died on index admission. The final sample was 1,420 PTSD veterans, from 253 counties. Among these patients, 532 were readmitted, for a readmission rate of 37.46%. In 1998, there were 1,517 PTSD patients after deletion of 2 non-veterans and of 5 veterans who died on index admission. These patients were spread over 272 counties. Four hundred and sixty-four patients were readmitted, resulting in a readmission rate of 30.59%. There was a significant statistical difference in readmission ($x^2 = 15.482$, $p = 0.000$). The variable "the number of FTE in Vet centers" was not available at the time of the data analysis; therefore, the construct of adequacy of health resources could not include this variable.

The preliminary analysis of the correlation matrix (Appendix 2) indicates that two indicators of social disintegration, violent crime rates (VIO) and property crime rates

(PROP) in 1994, were highly correlated ($r = 0.820$, $p < 0.01$). Therefore, the variable of violent crime rates was disaggregated into rates of murders, rapes, aggressive assaults, and weapons violations.

The correlation coefficients for three indicators of access to care in 1994 were 0.019 for distance (DIST) and low-income status (MEAN), --0.049 for distance (DIST) and percentage of service-connected disability (SCPER), and 0.144 ($p < 0.01$) for low-income status (MEAN) and percentage of service-connected disability (SCPER). In order to prevent wash-off effect, the variable of resource sharing index was developed by using the ratio of the number of PTSD patients divided by the number of veterans in the county. The higher the ratio, the more resources are available to PTSD veterans, indicating better access to care.

Appendix 3 shows the correlation matrix for 1998 data. The correlation coefficient between violent crime rates and property crime rates was 0.734 ($p < 0.01$). The correlation coefficients for distance (DIST) and low-income status (MEAN), distance (DIST) and percentage of service-connected disability (SCPER), and low-income status (MEAN) and percentage of service-connected disability (SCPER) were 0.016, -0.071 ($p < 0.01$), and 0.195 ($p < 0.01$), respectively. The variable of violent crime rates was then disaggregated. The variable of resource sharing index was developed.

Univariate Analysis

As shown in Table 22, the crime rates decreased from 1994 to 1998, except for rapes. Statistical significance in the rates between 1994 and 1998 was observed for murders

Table 22. Descriptive Statistics of the County-level Data: Differences Between 1994 (N=253) and 1998 (N=272)

Construct (Variable)	Label	Year	Minimum	Maximum	Mean	Std. Deviation	T test	
							Statistic	p
Social Disintegration								
Rape Rate (x_1)	RAPE	94	.00	.86	.2631	.1900	-.025	.980
		98	.00	.90	.2635	.1741		
Murder Rate (x_2)	MUR	94	.00	.70	.0824	.0862	**3.239**	**.001****
		98	.00	.57	.0606	.0655		
Aggressive Assault Rate (x_3)	ASLT	94	.00	15.05	3.0512	2.9262	.606	.545
		98	.00	15.17	2.9081	2.4475		
Weapon Violation Rate (x_4)	WEP	94	.00	12.58	1.1661	.9680	**5.318**	**.000****
		98	.00	3.05	.7998	.5324		
Property Crime Rates (x_5)	PROP	94	.00	16.14	1.4220	1.9860	1.321	.187
		98	.00	9.89	1.2265	1.3702		
Substance-Abuse-Related Crime Rates (x_6)	SA	94	2.72	71.98	19.0178	9.5970	**5.445**	**.000****
		98	.00	59.20	14.9871	7.2774		

Note: ** $p < .01$.

Table 22 (continued). Descriptive Statistics of the County-level Data: Differences Between 1994 (N=253) and 1998 (N=272)

Construct (Variable)	Label	Year	Minimum	Maximum	Mean	Std. Deviation	T test	
							Statistic	p
Adequacy of Health Resources								
Psychiatrist-population Ratio (x_7)	PSYMD	94	.00	1.39	7.822E-02	.1477	-.632	.528
		98	.00	1.30	8.662E-02	.1563		
Psychologist-population Ratio (x_8)	PCHO	94	.00	.84	2.346E-02	7.222E-02	-.314	.754
		98	.00	.79	2.544E-02	7.198E-02		
Social Worker-population Ratio (x_9)	SOC	94	.00	1.08	.1126	.1549	-.749	.454
		98	.00	2.42	.1248	.2128		

Table 22 (continued). Descriptive Statistics of the County-level Data: Differences Between 1994 (N=253) and 1998 (N=272)

Construct (Variable)	Label	Year	Minimum	Maximum	Mean	Std. Deviation	T test	
							Statistic	p
Other MD-population Ratio (x_{10})	OTHMD	94	.00	8.42	1.2254	1.1762	-1.213	.226
		98	.00	8.10	1.3533	1.2363		
BED-population Ratio(x_{11})	BED	94	.00	36.74	4.2935	4.0742	.309	.758
		98	.00	36.74	4.1854	3.9476		

($t = 3.239$, $p < 0.01$), weapon violations ($t = 5.318$, $p < 0.01$), and substance-abuse-related crime rates ($t = 5.445$, $p < 0.01$).

Inspection of the indicators for adequacy of health resources in 1994 and 1998 shows that most of them increased. The number of psychiatrists (per 1,000 population) increased from 0.078 to 0.087; psychologists increased from 0.023 to 0.054, social workers increased from 0.11 to 0.12, and other medical physician increased from 1.23 to 1.35. The number of beds decreased from 4.29 to 4.18 per 1,000 population. However, none of those changes reached statistical significance.

Table 23 gives descriptive analysis for the individual-level data. Survival time increased from 140.16 days in 1994 to 150.22 days in 1998. All the indicators for post-discharge ambulatory care reveal an upward trend from 1994 to 1998. The number of medical visits increased from 6.12 to 11.12 ($t = -8.734$, $p < 0.01$); mental health visits increased from 4.27 to 5.27 ($t = -2.118$, $p < 0.05$); PTSD visits increased from 1.06 to 1.10; and social work visits increased from 0.4 to 1.33 ($t = -4.404$, $p < 0.01$). Those results indicate that in 1998, PTSD veterans had prolonged time to be readmitted and used more post-discharge ambulatory care.

PTSD veterans had an average age of 47.17 in 1994 and 50.58 in 1998 ($t = -10.717$, $p < 0.05$). The average size of social network was 0.18 in 1994 and 0.19 in 1998. The average distance from the residence to the admitted VAMC was 67.44 miles in 1994 and 67.74 miles in 1998. No significant change was found in either the size of social networks or the distance. Low-income status indicates that most of PTSD veterans were in category A: 1,392 (98%) in 1994 and 1,472 (97%) in 1998; no statistically significant

Table 23. Descriptive Statistics of Individual-level Data: Differences Between 1994 (n = 1420) and 1998 (n =1517)

Construct (Variable)	**Label**	**Year**	**Min.**	**Max**	**Mean**	**Std. Deviation**	**T test or x^2 test**	
							Statistic	p
Readmission								
Survival Time (y5)	GAP	94	.00	364.00	140.163	110.680	**-2.519**	**.012***
		98	.00	364.00	150.225	105.852		
Post-discharge Ambulatory Care								
Number of Medical Visits (y1)	AFMED	94	.00	187.00	6.123	11.847	**-8.734**	**.000****
		98	.00	186.00	11.122	18.274		
Number of Mental Health Visits (y2)	AFMEN	94	.00	171.00	4.270	12.622	**-2.188**	**.034***
		98	.00	229.00	5.274	13.048		
Number of PTSD Visits (y3)	AFPTSD	94	.00	79.00	1.058	4.563	-0.241	.810
		98	.00	49.00	1.096	3.956		
Number of Social Work Visits (y4)	AFSOC	94	.00	31.00	0.401	1.862	**-4.404**	**.000****
		98	.00	160.00	1.327	7.719		
Age (x12)	AGE	94	20.00	82.00	47.170	8.297	**-10.717**	**.000****
		98	20.00	86.00	50.580	8.905		

Note: *: $p < 0.05$; **: $p < 0.01$.

Table 23 (continued). Descriptive Statistics of Individual-level Data: Differences Between 1994 (n = 1420) and 1998 (n =1517)

Construct (Variable)	**Label**	**Year**	**Min.**	**Max**	**Mean**	**Std. Deviation**	**T test or x^2 test**	
							Statistic	p
Social Networks (x13)	SOCCW	94	.00	7.00	0.177	0.649	-.460	.646
		98	.00	4.00	0.187	0.583		
Access to Care								
Distance (x14)	DIST	94	0.100	2022.000	67.444	112.350	-.744	.457
		98	0.100	1648.000	67.737	98.646		
Resource Sharing Index (x15)	AC_INX	94	0.001	0.611	0.186	0.145	**45.956**	**.000****
		98	0.000	0.005	0.001	0.001		
Low-income Status (x16)	MEAN	94	Frequency	Percentage			2.993	.084
			A 1,392	98.0				
			B 0	0.0				
			C 28	2.0				
		98						
			A 1,472	97.0				
			B 0	0.0				
			C 45	3.0				
Percentage of Service-connected Disability (x17)	SCPER	94	.00	100.000	38.711	38.143	**-3.684**	**.000****
		98	.00	100.000	43.988	39.392		

Note: **: p< 0.01.

Table 23 (continued). Descriptive Statistics of Individual-level Data: Differences Between 1994 (n = 1420) and 1998 (n =1517)

Construct (Variable)	Label	Year	Min.	Max	Mean	Std. Deviation	T test or x^2 test	
							Statistic	p
Severity of Comorbidity								
Number of Mental Cormobidities (x18)	NMHCO	94	.00	4.00	0.351	0.584	**3.946**	**.000****
		98	.00	3.00	0.270	0.521		
Severity of Mental Comorbidity (x19)	MHCOS	94	.00	1.190	0.120	0.232	**5.839**	**.000****
		98	.00	0.870	0.076	0.174		
Number of Medical Comorbidity (x20)	NPHCO	94	.00	5.00	0.888	1.065	**-4.831**	**.000****
		98	.00	6.00	1.094	1.235		
Severity of Medical Comordity (x21)	PHCOS	94	.00	5.00	2.147	2.135	**-3.804**	**.000****
		98	.00	5.00	2.449	2.158		
Prior Use of Mental Health Services								
Number of PTSD Visits (x22)	PTSDE	94	.00	110.00	2.356	8.265	.706	.480
		98	.00	91.00	2.164	6.670		

Note: **: p< 0.01.

Table 23 (continued). Descriptive Statistics of Individual-level Data: Differences Between 1994 (n = 1420) and 1998 (n =1517)

Construct (Variable)	**Label**	**Year**	**Min.**	**Max**	**Mean**	**Std. Deviation**	**T test or x^2 test**	
							Statistic	p
Number of Other Mental Health Visits (x23)	OMHE	94	.00	174.00	7.191	16.693	-1.923	.055
		98	.00	208.00	8.424	17.977		
LOS of PTSD (x24)	PDLOS	94	.00	184.00	1.205	8.350	**-9.305**	**.000****
		98	.00	316.00	6.124	18.209		
LOS of Other Mental Health Disorders (x25)	OMHLOS	94	.00	220.00	3.205	14.908	**-2.394**	**.000****
		98	.00	262.00	4.532	15.110		
Prior Use of Medical Health Services								
Number of Medical Visits (x26)	PHE	94	.00	163.00	11.187	15.712	**-7.097**	**.000****
		98	.00	249.00	16.019	20.667		
LOS of Medical Conditions (x27)	PHLOS	94	.00	71.00	0.947	5.249	**-2.614**	**.008****
		98	.00	303.00	1.790	11.054		

Note: **: p <0.0.

Table 23 (continued). Descriptive Statistics of Individual-level Data: Differences Between 1994 (n = 1420) and 1998 (n =1517)

Construct (Variable)	Label	Year	Min.	Max	Mean	Std. Deviation	T test or x^2 test	
							Statistic	p
Control Variables								
@	PNVAO	94	.00	62.00	0.365	3.255	-.867	.386
		98	.00	54.00	0.461	2.738		
#	LNVAO	94	.00	31.00	0.080	1.112	-.190	.849
		98	.00	61.00	0.090	1.674		
$	PNVAI	94	.00	248.00	0.211	6.597	-1.845	.065
		98	.00	321.00	1.047	15.842		
%	LNVAI	94	.00	.00	.00	.00	NA	
		98	.00	.00	.00	.00		

Note: @: The number of non-VA outpatient visits before the index admission; #: The number of outpatient visits after the index discharge; $: Non-VA LOS before the index admission; %: LOS after the index discharge.

Table 23 (continued). Descriptive Statistics of Individual-level Data: Differences Between 1994 (n = 1420) and 1998 (n =1517)

Construct (Variable)	**Label**	**Year**	**Min.**	**Max**	**Mean**	**Std. Deviation**	**T test or x^2 test**	
							Statistic	p
Multiple Group Variables								
Sex	SEX		Frequency	Percentage			**10.214**	**.001****
		94	Female 29	2.0				
			Male	98.0				
			1,391					
		98		4.1				
			Female 62	95.9				
			Male 1,455					
Race	RACE		Frequency	Percentage			**6.525**	**.011***
		94	Non-white 445	31.3				
			White 975	68.7				
		98	Non-white 543	35.8				
			White 974	64.2				
Discharge Placement	DISTO		Frequency	Percentage			**134.501**	**.000****
		94	Community 1,246	87.7				
			Institution 104	7.3				
			AMA 70	4.9				
		98	Community 1,101	72.6				
			Institution 344	22.7				
			AMA 72	4.7				

Note: *: p < 0.05; **: p <0.01; AMA: Against medical advice.

difference was found. The average percentage of service-connected disability was 38.71% in 1994 and 43.99% in 1998 ($t = -3.684$, $p <0.01$). The mean resource sharing index was 0.1875 in 1994 and 0.001 in 1998 ($t = 45.956$, $p < 0.01$). These results indicate that in 1998 PTSD veterans were older, with more service-connected disabilities, and with fewer VA resources available to them, as compared to those in 1994.

On average, PTSD veterans in 1994 had more mental comorbidities (0.35) than did those in 1998 (0.27), a difference statistically significant at the 0.01 level ($t = 3.946$). The index for severity of mental comorbidity was 0.12 in 1994 and 0.08 in 1998, yielding a t-score of 5.839 ($p < 0.01$). However, the opposite trend was found for medical comorbidities. The average number of medical comorbidities was 0.888 in 1994 and 1.094 in 1998 ($t = -4.831$, $p <0.01$). The severity index of medical comorbidity was 2.15 in 1994 and 2.45 in 1998 ($t = -3.804$, $p < 0.001$). These results indicate that PTSD veterans in 1994 had more severe mental comorbidities and less severe medical comorbidities than did their counterparts in 1998.

Neither the number of previous PTSD visits nor the number of other previous mental health visits was statistically significant in trend analysis. PTSD veterans had more PTSD visits in 1993 (2.36) than did those in1997 (2.16). However, they had fewer other mental health visits in 1993 (7.19) than did those in 1997 (8.42). The length of stay for PTSD was 1.2 days in 1993 and 6.12 days in 1997 ($t =-9.305$, $p < 0.01$). The length of stay for other mental disorders was 3.20 in 1993 and 4.53 days in 1997 ($t = -2.394$, $p < 0.05$). These results suggest that there were no between the two groups in previous use of mental health outpatient care, but that the 1998 sample had longer stays for mental health problems.

The difference between the indicators for prior use of medical health services reached the statistically significant level of 0.01. The average number of prior medical visits was 11.19 in 1993 and 16.02 in 1997 ($t = -7.097$). The length of stay for medical problems was 0.95 days in 1993 and 1.79 days in 1997 ($t = -2.614$). The results indicate that the 1998 sample had more outpatient medical visits and longer average length of stay for medical problems.

Among the control variables, non-VA length of stay after the index discharge (LNVAI) was zero for both years; therefore, it was deleted from further analysis. The rest of the control variables failed to reach statistical significance in the trend analysis. The average number of non-VA outpatient visits before the index admission (PNVAO) was 0.36 in 1994 and 0.46 in 1998. The average number of non-VA outpatient visits after the index discharge (LNVAO) was 0.08 in 1994 and 0.09 in 1998. Non-VA length of stay before the index admission (PNVAI) was 0.21 days in 1994 and 1.05 days in 1998. These results indicate that the 1998 sample had more non-VA utilization than the1994 sample did.

Table 23 also shows the number of male veterans as 1,391 (98%) in the 1994 sample and 1,455 (95.9%) in 1998. The number of whites was 975 (68.7%) in 1994 and 974 (64.2%) in the 1998 sample ($x^2 = 6.525$, $p < 0.05$). In 1994, there were 1,246 PTSD veterans discharged to the community (87.7%), 104 discharged to institutions (7.3%), and 70 who left VAMCs against medical advice (4.9%). In 1998, there were 1,101 patients discharged to the community (72.6%), 344 discharged to institutions (22.7%), and 72 who left against medical advice (4.7%). The x^2 results show a statistically significant difference in discharge placement between 1994 and 1998 ($x^2 = 134.501$, $p < 0.01$).

Normality Tests

The results of normality tests for county-level data (Appendix 4) indicate that, for 1994, the skewness of indicators for both social disintegration and adequacy of health resources ranged from 0.753 for rape crime rates to 7.105 for the psychologist-to-population ratio. In 1998, the skewness statistics varied from 0.842 for rape crime rates to 6.041 for the psychologist-to-population ratio. Except for rape crime rates, the rest of indicators for social disintegration and adequacy of health resources were log transformed.

Appendix 5 shows the results of normality tests for individual-level data in both years. In 1994, the skewness index ranged from 0.135 for the severity of medical comorbidity to 37.404 for non-VA length of stay before the index admission. Skewness varied from –0.102 for the severity of medical comorbidity to 32.499 for non-VA outpatient visits after the index discharge in 1998. With the exception of three variables--low-income status (MEAN), a categorical variable, percentage of service-connected disability (SCPER), and the severity of medical comorbidity (PHCOS) -- variables deviating from zero were transformed by using either natural log or square root transformation.

Correlation Analysis

Table 24 shows the intercorrelations among the study variables in 1994. Four indicators represent the construct of post-discharge ambulatory care: post-discharge medical visits (AFMED), post-discharge mental health visits (AFMEN), post-discharge PTSD visits (AFPTSD), and post-discharge social work visits (AFSOC). The correlation coefficients among these indicators reveal that they correlated satisfactorily with each other. Thus those four indicators sufficiently represent the construct of post-discharge ambulatory care.

The construct of social disintegration is represented by six indicators: rape rates (RAPE), murder rates (MUR), aggressive assault rates (ASLT), weapons violation rates (WEP), property crime rates (PROP), and substance-abuse-related crime rates (SA).

PROP was found to be redundant because of its high correlation with other indicators, but it also contributes less information to the outcome variables of AFPTSD ($r = 0.086$, $p < 0.01$) and AFSOC ($r = 0.092$, $p < 0.01$). Both type of information could be captured by other indicators; therefore PROP was deleted.

SA had lower correlation coefficients with other indicators except for WEP. That indicates that SA may represent another dimension of social disintegration; therefore, SA was separated from the construct and treated as a stand-alone observable variable.

The construct of adequacy of health resources is characterized by five indicators: the number of psychiatrists (PSYMD), the number of hospital-based psychologists (PCHO), the number of hospital-based social workers (SOC), the number of other physicians in the county (OTHMD), and the number of hospital beds less those in VAMCs and children's

Table 24. Intercorrelations among 1994 Study Variables (Pearson's Correlation)

Label	AFMED	AFMEN	AFPTSD	AFSOC	RAPE	MUR	ASLT	WEP	PROP	SA	PSYMD	PCHO	SOC
AFMED	1.000												
AFMEN	0.550**	1.000											
AFPTSD	0.293**	0.385**	1.000										
AFSOC	0.279**	0.269**	0.276**	1.000									
RAPES	-0.023	-0.009	0.040	0.078**	1.000								
MUR	0.059*	0.063*	0.022	0.105**	0.567**	1.000							
ASLT	-0.004	-0.033	-0.007	0.030	0.670**	0.597**	1.000						
WEP	0.120**	0.133**	0.092**	0.104**	0.470**	0.562**	0.493**	1.000					
PROP	0.001	-0.001	0.086**	0.092**	0.823**	0.722**	0.738**	0.664**	1.000				
SA	0.156**	0.116**	0.091**	0.044	0.213**	0.120**	0.299**	0.462**	0.274**	1.000			
PSYMD	0.025	0.027	0.053*	0.067**	0.411**	0.359**	0.303**	0.400**	0.569**	0.239**	1.000		
PCHO	-0.005	0.047	0.022	0.026	0.393**	0.308**	0.275**	0.407**	0.451**	0.180**	0.530**	1.000	
SOC	0.006	0.028	-0.027	0.034	0.393**	0.376**	0.356**	0.407**	0.510**	0.203**	0.680**	0.775**	1.000
OTHMD	0.016	0.019	-0.002	0.034	0.407**	0.380**	0.347**	0.378**	0.554**	0.253**	0.876**	0.445**	0.644**
BED	0.004	0.010	-0.080**	-0.005	0.315**	0.351**	0.319**	0.354**	0.405**	0.247**	0.555**	0.602**	0.800**
AGE	0.183**	0.000	-0.009	0.037	-0.088**	-0.061*	-0.032	-0.028	-0.094**	0.019	-0.047	-0.018	-0.056*
SOCNW	0.030	0.083**	0.013	-0.016	-0.023	0.016	0.006	0.016	-0.028	0.018	-0.036	-0.029	-0.026
DIST	0.171**	0.174**	0.134**	0.119**	0.151**	0.203**	0.007	0.282**	0.208**	0.178**	0.280**	0.184**	0.273**
MEAN	0.006	-0.013	-0.042	0.022	-0.009	-0.005	-0.001	0.010	-0.008	-0.035	-0.017	0.005	0.021
SCPER	0.065*	0.050	0.005	-0.034	-0.009	0.010	-0.005	0.000	0.006	-0.021	0.001	-0.007	-0.009
AC_INX	0.114**	0.168**	-0.057*	0.028	-0.166**	-0.016	-0.193**	0.174**	-0.119**	0.086**	-0.009	0.124**	0.159**
NMHCO	0.019	0.069**	0.001	0.051	0.002	0.030	-0.004	-0.001	-0.024	0.001	0.038	0.004	0.029
MHCOS	0.016	0.080**	0.009	0.031	0.021	0.063*	0.036	0.033	0.001	0.051	0.041	0.008	0.021
NPHCO	0.213**	0.026	-0.001	0.009	-0.052	-0.009	0.016	0.012	-0.050	0.035	-0.041	-0.021	-0.014
PHCOS	0.181**	0.029	-0.007	0.012	-0.053*	-0.017	0.006	0.004	-0.051	0.027	-0.024	-0.021	-0.004
PTSDE	0.134**	0.154**	0.435**	0.167**	0.026	0.042	-0.018	0.081**	0.100**	0.067*	0.050	-0.026	-0.034
OMHE	0.235**	0.393**	0.183**	0.086**	-0.023	0.049	-0.030	0.122**	0.013	0.091**	0.020	0.031	0.027
PDLOS	0.006	0.021	0.084**	-0.044	0.010	0.015	0.073**	0.020	0.003	0.111**	-0.013	-0.024	-0.026
OMHLOS	0.020	0.036	0.043	-0.016	0.024	0.031	0.135**	0.052*	0.048	0.180**	0.028	-0.030	0.009

Note: *: $p < 0.05$; **: $p < 0.01$.

Table 24. Intercorrelations among 1994 Study Variables (Pearson's Correlation)

Label	AFMED	AFMEN	AFPTSD	AFSOC	RAPE	MUR	ASLT	WEP	PROP	SA	PSYMD	PCHO	SOC
PHE	0.434**	0.260**	0.138**	0.130**	-0.028	0.031	-0.048	0.131**	0.000	0.142**	0.023	0.028	0.012
PHLOS	0.121**	0.008	0.038	-0.042	-0.020	0.007	0.052	0.034	-0.024	0.160**	-0.048	-0.066*	-0.092**
PNVAO	-0.017	-0.051	-0.057**	0.000	-0.052	-0.053*	-0.092**	-0.113**	-0.064*	-0.172**	-0.009	-0.050	-0.026
LNVAO	0.012	0.038	-0.026	0.006	-0.041	-0.042	-0.047	-0.050	-0.033	-0.061*	0.020	-0.011	-0.012
PNVAI	0.059*	0.012	0.011	0.055*	0.023	-0.013	-0.038	-0.035	0.019	-0.063*	0.038	0.051	0.024

Note: *: $p < 0.05$; **: $p < 0.01$.

Table 24 (continued). Intercorrelations among 1994 Study Variables (Pearson's Correlation)

Label	OTHMD	BED	AGE	SOCNW	DIST	MEAN	SCPER	AC_INX	NMHCO	MHCOS	NPHCO	PHCOS	PTSDE
OTHMD	1.000												
BED	0.644**	1.000											
AGE	-0.077**	-0.058*	1.000										
SOCNW	-0.040	-0.028	-0.079**	1.000									
DIST	0.254**	0.168**	-0.017	0.010	1.000								
MEAN	-0.021	0.021	0.033	-0.291**	0.019	1.000							
SCPER	-0.010	-0.001	0.178**	-0.319**	-0.049	0.144**	1.000						
AC_INX	0.090**	0.202**	0.028	-0.013	0.364**	0.045	-0.029	1.000					
NMHCO	0.057*	0.030	-0.049	0.058*	0.109**	-0.018	-0.047	0.039	1.000				
MHCOS	0.054*	0.024	-0.070	0.096**	0.123**	-0.031	-0.064*	-0.006	0.887**	1.000			
NPHCO	-0.046	-0.022	0.268**	-0.060*	0.015	0.031	0.133**	0.043	-0.026	-0.012	1.000		
PHCOS	-0.035	-0.016	0.230**	-0.048	0.000	0.014	0.129**	0.038	-0.014	-0.001	0.926**	1.000	
PTSDE	-0.001	-0.076**	0.067*	-0.078**	0.129**	0.058*	0.182**	-0.058*	-0.031	-0.046	0.027	0.025	1.000
OMHE	0.013	-0.004	0.125**	-0.105**	0.151**	0.087**	0.273**	0.171**	0.027	0.004	0.078**	0.078**	0.496**
PDLOS	-0.021	-0.032	-0.041	-0.016	0.022	0.004	0.124**	-0.080**	0.028	0.065*	0.023	0.040	0.095**
OMHLOS	0.013	-0.020	-0.048	-0.021	0.018	0.011	0.039	-0.101**	-0.022	0.009	0.011	0.001	0.001
PHE	0.021	-0.003	0.240**	-0.122**	0.188**	0.088**	0.255**	0.202**	0.003	-0.029	0.222**	0.208**	0.335**
PHLOS	-0.069**	-0.080**	0.120**	-0.002	0.021	0.019	0.056*	-0.079**	-0.060*	-0.038	0.129**	0.091**	0.056*
PNVAO	-0.011	-0.036	-0.064*	-0.083**	-0.064**	0.037	0.107**	0.023	0.028	0.018	-0.044	-0.045	0.019
LNVAO	0.010	-0.004	0.002	-0.029	-0.042	-0.014	0.051	0.001	0.015	-0.001	-0.001	0.015	0.027
PNVAI	0.012	-0.004	0.014	-0.005	0.029	0.014	0.087**	0.020	0.012	0.011	0.011	0.018	0.031

Note: *: p < 0.05; **: p <0.01.

Table 24 (continued). Intercorrelations among 1994 Study Variables (Pearson's Correlation)

Label	PTSDE	OMHE	PDLOS	OMHLOS	PHE	PHLOS	PNVAO	LNVAO	PNVAI
PTSDE	1.000								
OMHE	0.496**	1.000							
PDLOS	0.095**	0.115**	1.000						
OMHLOS	0.001	0.142**	0.162**	1.000					
PHE	0.335**	0.584**	0.099**	0.127**	1.000				
PHLOS	0.056*	0.056*	0.123**	0.193**	0.290**	1.000			
PNVAO	0.019	0.002	-0.054*	-0.085*	0.015	-0.061*	1.000		
LNVAO	0.027	0.025	-0.031	-0.031	0.033	-0.040	0.084**	1.000	
PNVAI	0.031	0.013	-0.020	-0.031	0.098**	-0.026	0.067*	0.089**	1.000

Note: *: $p < 0.05$; **: $p < 0.01$.

hospitals (BED); the indicators are expressed in the form of per 1,000 population. Both SOC and OTHMD were deleted, since they provided redundant information which could be supplied by other indicators.

The construct of access to care is represented by four indicators: the distance from residence to the admitted VAMC (DIST), low-income status (MEAN), the percentage of service-connected disabilities (SCPER), and the resource sharing index (AC_INX). Correlation coefficients were, respectively, 0.019, -0.049, and 0.364 ($p < 0.01$) for DIST and MEAN, DIST and SCPER, and DIST and AC_INX. MEAN correlated with SCPER at 0.01 level ($r = 0.144$). It did not reach a significant level in correlating with AC_INX ($r = 0.045$). SCPER was negatively correlated with AC_INX ($r = -0.029$). The results indicate that these four indicators characterized two dimensions of access to care. The first one is enhancement of access to care, as signified by DIST and AC_INX. The second is the barriers of access to care, as represented by MEAN and SCPER. Therefore, two separate measurement models were developed for confirmatory factor analysis.

Four indicators-- the number of mental comorbidities (NMHCO), the severity index of mental comorbidity (MHCOS), the number of medical comorbities (NPHCO), and the severity index of medical comorbidity (PHCOS)-- represent the construct of the severity of comorbidity. Correlation coefficients of 0.887 ($p < 0.01$), -0.026, and -0.014, respectively, were found between NMHCO and MHCOS, NMHCO and NPHCO, and NMHCO and PHCOS. MHCOS was negatively correlated with both NPHCO ($r = -0.012$) and PHCOS ($r = -0.001$). NPHCO was highly correlated with PHCOS ($r = 0.926$, $p < 0.01$). In order to prevent wash-off effects and multicollinearity, NMHCO and

PHCOS were deleted. MHCOS and NPHCO were treated as two stand-alone observable variables in further analyses.

The construct of prior use of metal health services is represented by four indicators: the number of PTSD outpatient encounters in the last year (PTSDE), the number of other mental health outpatient encounters in the last year (OMHE), the length of stay for PTSD in the last year (PDLOS), and the length of stay for other mental health conditions in the last year (OMHLOS). Two indicators signify the construct of prior use of physical health services: the number of outpatient encounters for medical problems in the last year and the length of stay for medical problems in the last year (PHLOS). However, modification of the constructs is needed, as suggested by the results of correlation analysis.

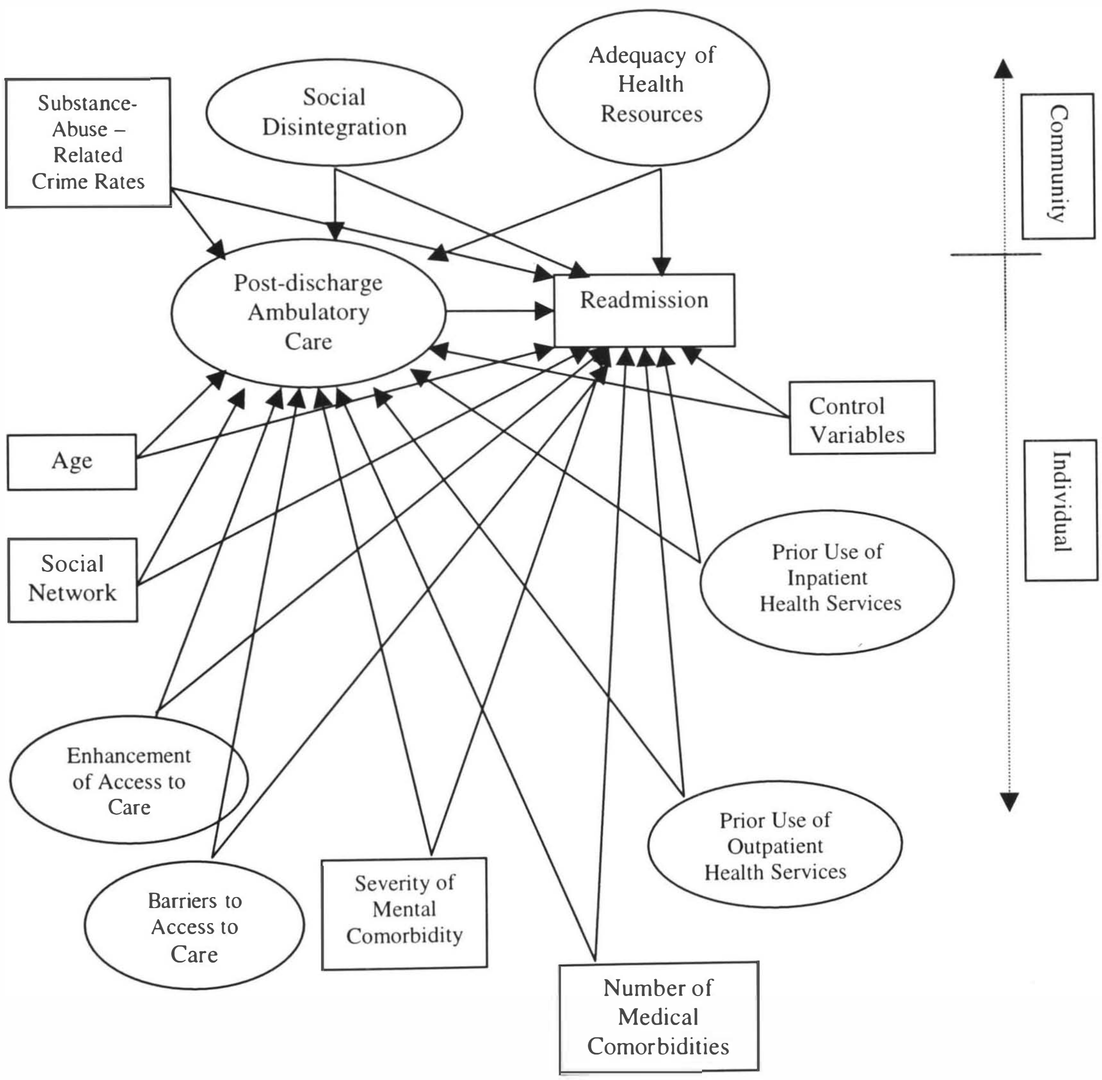
PTSDE, OMHE, and PHE correlated with each other very well. PDLOS, OMHLOS, and PHLOS correlated with each other. Two measurement models -- prior use of outpatient services and prior use of inpatient services -- were developed for confirmatory factor analysis.

All three control variables -- non-VA outpatient visits before the index admission (PNVAO), non-VA outpatient visits after the index discharge (LNVAO), and non-VA length of stay before the index admission -- were statistically significantly correlated with each other. In a comparison of the correlation coefficients to the rest of the indicators, those three control variables had a relatively weak relationship to the outcome variables.

A similar correlation pattern was found in the 1998 study variables (Appendix 6). Property crime rates (PROP), the number of hospital-based social workers per 1,000 population (SOC), the number of other physicians in the county per 1,000 population, the number of mental comorbidities (NMHCO), and the severity index of medical comorbidity (PHCOS) were deleted from the model because of they provide redundant information. Substance-abuse-related crime rates (SA), the number of medical comorbidities (NPHCO), and the severity index of mental comorbidity (MHCOS) are treated as three stand-alone exogenous variables. Two measurement models for access to care were developed: the enhancement of access to care and the barriers to access to care. Modification on prior utilization was made for prior use of outpatient services and prior use of inpatient services. However, PDLOS had no statistically significant correlation with PHLOS. The correlation coefficient between PDLOS and OMHLOS was 0.057 ($p < 0.05$). OMHLOS correlated statistically significantly with PHLOS at the 0.05 level ($r = 0.064$). These results suggested that the measurement model for prior use of inpatient services in 1998 was poor.

In summary, correlation analysis revealed that the measurement model for the proposed model needed to be modified. Based on the results of correlation analysis, the revised model is presented in Figure 12. The correlation matrices for male (sample sizes for female are too small), race, and discharge placement for 1994 and 1998 are in Appendices 7-16.

Figure 12. Revised Conceptual Model of Healthcare Utilization and Outcomes of Veterans with Posttraumatic Stress Disorder



Intraclass Correlation Analysis

The intraclass correlation coefficients (ICCs) were calculated for four outcome indicators. The purpose of intraclass correlation analysis is to verify the need for multi-level SEM if the coefficient exceeds 0.15. The ICCs for outcome variables in 1994 were 0.039 for AFMED, 0.052 for AFMEN, 0.091 for AFPTSD, and 0.007 for AFSOC. In 1998, they were 0.082 for AFMED, 0.013 for AFMEN, 0.042 for AFPTSD, and 0.032 for AFSOC. None of the ICCs reached 0.15 level, therefore, a uni-level SEM was carried out for the analysis of post-discharge ambulatory care.

Confirmatory Factor analysis

AMOS software version 3.6 (Analysis of Moment Structure) was used in validating the measurement model of each latent construct and of the structural equation model. The correlation matrices for 1994 and 1998 (Table 24 and Appendix 6) were used in conjunction with the standard deviation of each variable. Each indicator was evaluated by factor loading (λ), critical ratio (C. R.), and square multiple correlation (SMC). The factor loading indicates the relationship between an indicator and its latent construct. Critical ratio is the ratio between a parameter estimate and its standard error. Under a normal distribution condition, a critical ratio that is greater than 1.96 (in absolute value) indicates a parameter estimate is significantly different from zero at the 0.05 level. SMC is the proportion of the variance of an indicator that is in common with the construct; it is also termed as communality. The higher the SMC, the larger the proportion of variance in an indicator that is shared with the construct. The model fit is assessed by goodness-of-fit indices that explain how well the data fit the model.

Results of the Confirmatory Factor Analysis

The construct of post-discharge ambulatory care, the endogenous construct, is represented by four indicators: post-discharge medical visits (AFMED), post-discharge mental health visits (AFMEN), post-discharge PTSD visits (AFPTSD), and post-discharge social work visits (AFSOC). Table 25 specifies the relationships between the four indicators and their corresponding latent construct, in both 1994 and 1998. AFMEN loaded the highest among the four indicators in both years. The critical ratios exceeded 1.96 for all four. Though SMCs for AFPTSD and AFSOC were relatively low, those indicators were retained for theoretical reasons. The model fit indices point out that both measurement models fitted the data very well. Furthermore, the fit has been improved form 1994 to 1998, as indicated by the improved indices.

The construct of social disintegration is measured by four indicators: rape rates (RAPE), murder rates (MUR), aggressive assault rates (ASLT), and weapons violation rates (WEP). Table 26 shows the results from validating the measurement models in both years. The highest factor loading was ASLT. Other than the constrained one, the critical ratios were way above 1.96. All four indicators shared over 20% of the variance with the construct. The model fit for 1994 was good, as indicated by the model fit indices. The model for 1998 was a just-identified model.

Table 25. Maximum Likelihood Estimates for the Measurement Model of Post-discharge Ambulatory Care Use in 1994 (n =1420) and 1998 (n =1517)

Indicator	Factor Loading	Critical Ratio	Square Multiple Correlation
1994			
AFMED	0.682	Constrained	0.465
AFMEN	0.806	**15.093***	0.650
AFPTSD	0.462	**13.981***	0.214
AFSOC	0.358	**11.086***	0.128
			Chi-square: 9.113 Degrees of freedom (d.f.): 1 Chi-square/ d.f.: 9.113 GOF: 0.997 AGOF: 0.968 RMSEA: 0.076 HOELTER: 599
1998			
AFMED	0.693	Constrained	0.480
AFMEN	0.793	**17.693***	0.629
AFPTSD	0.407	**13.093***	0.165
AFSOC	0.494	**15.519***	0.244
			Chi-square: 3.233 Degrees of freedom (d.f.): 2 Chi-square/ d.f.: 1.616 GOF: 0.999 AGOF: 0.995 RMSEA: 0.020 HOELTER: 2810

Note: *: $p < 0.05$; AFMED: Post-discharge medical visits; AFMEN: Post-discharge mental health visits; AFPTSD: Post-discharge PTSD visits; AFSOC: Post-discharge social work visits; AGOF: Adjusted goodness-of-fit; GOF: Goodness-of-fit; HOELTER: Hoelter's critical N; RMSEA: Root mean square error of approximation.

Table 26. Maximum Likelihood Estimates for the Measurement Model of Social Disintegration in 1994 (n =1420) and 1998 (n =1517)

Indicator	**Factor Loading**	**Critical Ratio**	**Square Multiple Correlation**
1994			
RAPE	0.798	**28.277***	0.637
MUR	0.711	**25.786***	0.505
ASLT	0.839	Constrained	0.705
WEP	0.588	**20.836***	0.346
			Chi-square: 0.009 Degrees of freedom (d.f.): 1 Chi-square/ d.f.: 0.009 GOF: 1.000 AGOF: 1.000 RMSEA: 0.000 HOELTER: 579666
1998			
RAPE	0.760	**19.639***	0.578
MUR	0.576	**18.402***	0.332
ASLT	0.797	Constrained	0.635
WEP	0.472	**13.742***	0.223
			Just-identified model Chi-square: 0.000 GOF: 1.000

Note: *: $p < 0.05$; AGOF: Adjusted goodness-of-fit; ASLT: Aggressive assault crime rates; GOF: Goodness-of-fit; HOELTER: Hoelter's critical N; MUR: Murder crime rates; RMSEA: Root mean square error of approximation; WEP: Weapon violation crime rates.

Table 27 illustrates the results of the measurement model for adequacy of health resources. It is represented by three indicators: the number of psychiatrists in the county per 1,000 population (PSYMD), the number of hospital-based psychologists per 1,000 population (PCHO), and the number of hospital beds less those in VAMCs and children's hospitals per 1,000 population (BED). The highest factor loading was found in BED in both years. The critical ratios were beyond 1.96. Over 35% of the variance was shared with the construct. However, both models were just-identified models, with chi-square statistics of zero and a GOF of one.

Table 27. Maximum Likelihood Estimates for the Measurement Model of Adequacy of Health Resources in 1994 (n = 1420) and 1998 (n =1517)

Indicator	Factor Loading	Critical Ratio	Square Multiple Correlation
1994			
PSYMD	0.699	**22.351***	0.489
PCHO	0.758	**22.896***	0.575
BED	0.794	Constrained	0.630
			Just-identified model Chi-square: 0.000 GOF: 1.000
1998			
PSYMD	0.593	**17.137***	0.351
PCHO	0.646	**17.683***	0.418
BED	0.874	Constrained	0.764
			Just-identified model Chi-square: 0.000 GOF: 1.000

Note: *: $p < 0.05$; BED: The number of hospital beds less those in VAMCs and children hospitals per 1,000 population; GOF: Goodness-of-fit; PCHO: The number of hospital-based psychologists in the county per 1,000 population; PSYMD: The number of psychiatrists in the county per 1,000 population.

Table 28 presents the results of the measurement model for enhancement of access to care. Two indicators were used in the model: the distance from a veteran's residence to the admitting VAMC (DIST) and the resource sharing index (AC_INX). The factor loading was 1.000 for DIST (constrained as a perfect measurement) in both years. The critical ratios for AC_INX exceeded 1.96. Although SMCs were relative low for

AC_INX, it was kept in the model for theoretical considerations. Both measurement models were just-identified models, with a GOF of 1.000.

Table 28. Maximum Likelihood Estimates for the Measurement Model of Enhancement of Access to Care in 1994

Indicator	Factor Loading	Critical Ratio	Square Multiple Correlation
1994			
DIST	1.000	Constrained	Constrained
AC_INX	0.364	**14.722***	0.132
			Just-identified model Chi-square: 0.000 GOF: 1.000
1998			
DIST	1.000	Constrained	Constrained
AC_INX	0.510	**23.085***	0.260
			Just-identified model Chi-square: 0.000 GOF: 1.000

Note: *: $p < 0.05$; AC_INX: Resource sharing index; DIST: The distance of residence to an admitting VAMC; GOF:Goodness-of-fit.

The results of measurement model validation for barriers to access to care, as shown in Table 29, indicated that low-income status (MEAN) had a factor loading of 1.000 in both years. Although SMCs were less than 0.05 for SCPER in both years, it was retained in the model for theoretical reasons.

Table 29. Maximum Likelihood Estimates for the Measurement Model of Barriers to Access to Care in 1994 (n =1420) and 1998 (n = 1517)

Indicator	Factor Loading	Critical Ratio	Square Multiple Correlation
1994			
MEAN	1.000	Constrained	Constrained
SCPER	0.144	**5.482***	0.021
			Just-identified model Chi-square: 0.000 GOF: 1.000
1998			
MEAN	1.000	Constrained	Constrained
SCPER	0.195	**7.741***	0.038
			Just-identified model Chi-square: 0.000 GOF: 1.000

Note: *: $p < 0.05$; GOF: Goodness-of-fit; MEAN: Low-income status; SCPER: the percentage of service-connected disability.

Three indicators -- the number of PTSD encounters in the last year (PTSDE), the number of mental health encounters in the last year (OMHE), and the number of medical encounters in the last year (PHE) -- characterized prior use of outpatient services. Table 30 indicates that OMHE had the highest factor loadings and SMCs in both years. The critical ratios were above 1.96. Both measurement models were just-identified models, with a GOF of 1.000.

Table 30. Maximum Likelihood Estimates for the Measurement Model of Prior Use of Outpatient Services in 1994 (n =1420) and 1998 (n = 1517)

Indicator	Factor Loading	Critical Ratio	Square Multiple Correlation
1994			
PTSDE	0.533	**17.406***	0.285
OMHE	0.930	**15.448***	0.865
PHE	0.628	Constrained	0.394
			Just-identified model Chi-square: 0.000 GOF: 1.000
1998			
PTSDE	0.394	**13.246***	0.156
OMHE	0.875	**12.583***	0.765
PHE	0.677	Constrained	0.458
			Just-identified model Chi-square: 0.000 GOF: 1.000

Note: *: $p < 0.05$; GOF: Goodness-of-fit; OMHE: the number of mental health encounters in the last year; PHE: the number of medical encounters in the last year; PTSDE: the number of PTSD encounters in the last year.

The length of stay for PTSD in the last year (PDLOS), the length of stay for other mental conditions in the last year (OMHLOS), and the length of stay for medical conditions in the last year (PHLOS) form the measurement model for prior use of inpatient service. Because the critical ratios had not reached statistical significance, at the 0.05 level and low SMC, the indicators for this model were disaggregated into three stand-alone observable variables (Table 31). The measurement model for 1994 was retained for theoretical reasons.

Table 31. Maximum Likelihood Estimates for the Measurement Model of Prior Use of Inpatient Services in 1994 (n =1420) and 1998 (n = 1517)

Indicator	Factor Loading	Critical Ratio	Square Multiple Correlation
1994			
PDLOS	0.321	**4.230***	0.103
OMHLOS	0.504	Constrained	0.254
PHLOS	0.383	**4.090***	0.147
			Just-identified model Chi-square: 0.000 GOF: 1.000
1998			
PDLOS	0.103	0.464	0.011
OMHLOS	0.551	Constrained	0.304
PHLOS	0.116	0.463	0.013
			Just-identified model Chi-square: 0.00 GOF: 1.000

Note: *: $p < 0.05$; GOF: Goodness-of-fit; OMHLOS: the length of stay of other mental health conditions in the last year; PDLOS: the length of PTSD in the last year; PHLOS: the length of stay for medical conditions in the last year.

In summary, for 1994 PTSD veterans, seven measurement models were developed. There is one measurement model for endogenous construct of post-discharge ambulatory care, and there are six measurement models for the exogenous constructs of social disintegration, adequacy of health resources, enhancement of access to care, barriers to access to care, prior use of outpatient services, and prior use of inpatient services. Except for the measurement model for social disintegration, the measurement models for exogenous constructs were just-identified models.

In 1998, six measurement models were developed. The measurement model of prior use of inpatient services was disaggregated into three stand-alone variables. These measurement models were used in structural equation modeling in conjunction with other observable variables.

Structural Equation Modeling

In the structural equation model, both the validated measurement models and observable variables were used to form structural models to verify their causal relationships. Although the results of intraclass analysis indicated that there was no need to perform a multi-level SEM, it is of interest to verify the contributions of the county-level variables to the outcome, post-discharge ambulatory care, along with the contributions of the control variables.

Other than performing structural equation modeling for the samples in both 1994 and 1998, there were three multiple group analyses of gender, race, and discharge placement. In order to perform SEM, the necessary ratio of parameter to sample is 1:5. The number of parameters for a full model is 180. The multiple group analysis for gender was reduced to male group only, since in both years the number of females was too small to perform SEM (n =29, 1994; n =64, 1998).

Structural Equation Modeling for the County-level Data

As shown in Appendices 17 to 22, the variance explained by the county-level data varied from 0.8% to 9.9%. In 1994, SD and SA were the main influential factors at the county level. In 1998, SD was the most prominent factor among three county-level factors.

Structural Equation Modeling for the Full Model

Both county-level and individual-level data were included in the analysis to examine their effects on post-discharge ambulatory care (PDAC).

Structural Equation Modeling for All Veterans

Table 32 reveals the determinants for post-discharge ambulatory care (PDAC) and Figure 13 and 14 present the path diagram for PDAC in 1994 and 1998. In 1994, PDAC was strongly influenced by prior use of outpatient services (POU, $\Upsilon_{POU, PDAC} = 0.410$, $p < 0.01$). Substance-abuse-related crime rates (SA, $\Upsilon_{SA, PDAC} = 0.138$, $p < 0.01$) was the second determinant; followed by enhancement of access to care (AC1, $\Upsilon_{AC1, PDAC} = 0.132$, $p < 0.01$); the size of social networks (SOCNW, $\Upsilon_{SOCNW, PDAC} = 0.121$, $p < 0.01$); and the number of medical comorbidities (NPHCO, $\Upsilon_{NPHCO, PDAC} = 0.065$, $p < 0.05$). Prior use of inpatient services (PIU, $\Upsilon_{PIU, PDAC} = -0.126$, $p < 0.05$) in 1994 impeded the utilization of post-discharge ambulatory care (PDAC).

NPHCO was influenced by AGE ($B_{AGE, NPHCO} = 0.247$, $p < 0.01$) and POU ($B_{POU, NPHCO} = 0.106$, $p < 0.01$). SOCNW was negatively affected by POU ($B_{POU, SOCNW} = -0.141$, $p < 0.01$).

Table 32. Standardized Path Coefficients for Post-discharge Ambulatory care, All Sample Veterans in 1994 (n = 1420) and 1998 (n =1517)

Exogenous Construct (Variable)	**Endogenous Construct (Variable)**		
	SOCNW	NPHCO	PDAC
1994			
SA			0.138**
AGE		0.247**	
SOCNW			0.121**
AC1			0.132**
NPHCO			0.065*
POU	-0.141**	0.106**	0.410**
PIU			-0.126*
R^2		**0.231**	
			Chi-square: 277.435 Degrees of freedom (d.f.): 75 Chi-square/d.f.: 3.699 GOF: 0.977 AGOF: 0.957 RMSEA: 0.044 HOELTER: 493
1998			
SD			0.081**
AC1			0.109**
AC2			-0.093**
POU			0.311**
OMHLOS			-0.111**
R^2		**0.132**	
			Chi-square: 417.974 Degrees of freedom (d.f.): 84 Chi-square/d.f.: 4.976 GOF: 0.967 AGOF: 0.947 RMSEA: 0.051 HOELTER: 386

Note: *: $p < 0.05$; **: $p < 0.01$; AC1: Enhancement of access to care; AC2: Barriers of access to care; AGE: Age; AGOF: Adjusted goodness-of-fit index; GOF: Goodnes-of-fit index; HOELTER: Hoelter's critical N; NPHCO: The number of medical comorbidities; OMHLOS: LOS of other mental disorders in the last year; PDAC: Post-discharge ambulatory care; PIU: Prior use of inpatient services; POU: Prior use of outpatient services; RMSEA: Root mean square error of approximation; SOCNW: Social network.

Figure 13. Path Diagram of Post-discharge Healthcare Utilization for Veterans with Posttraumatic Stress Disorder, 1994

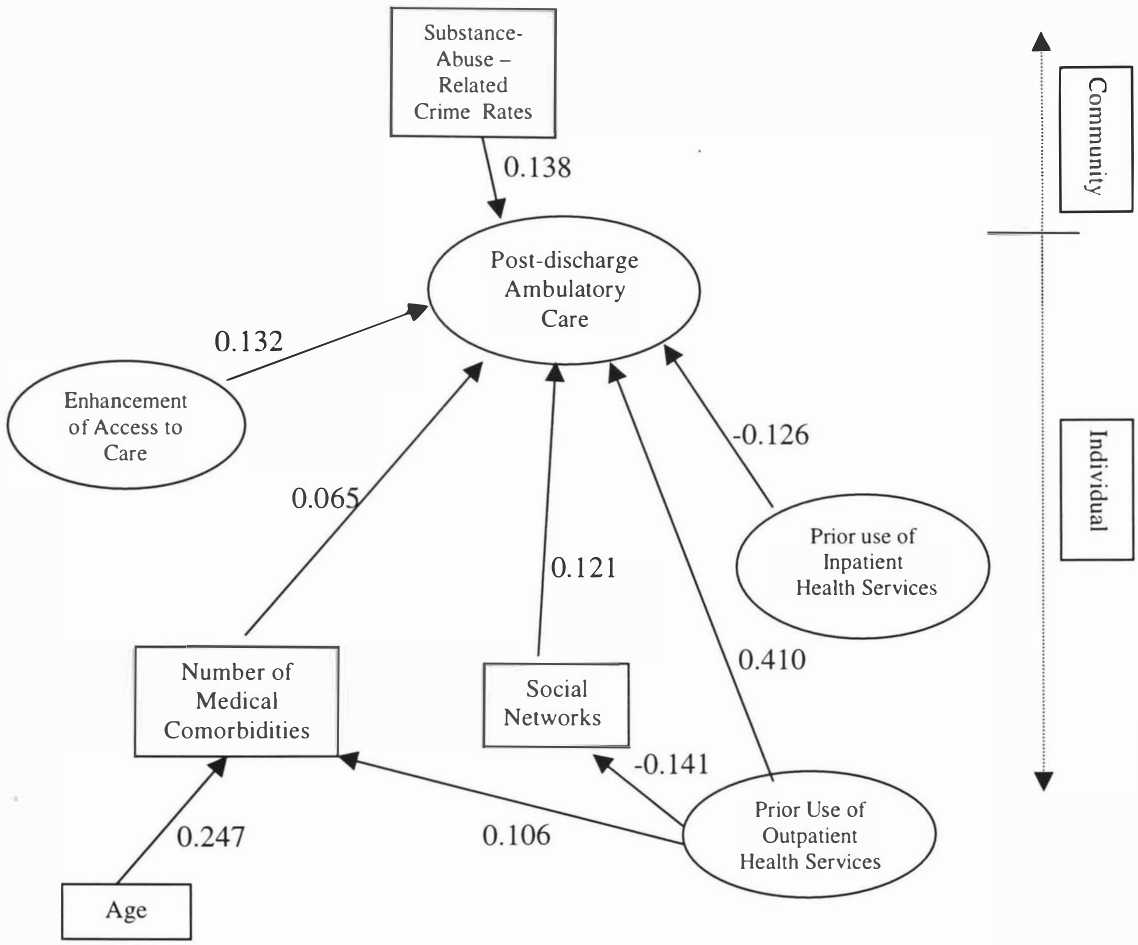
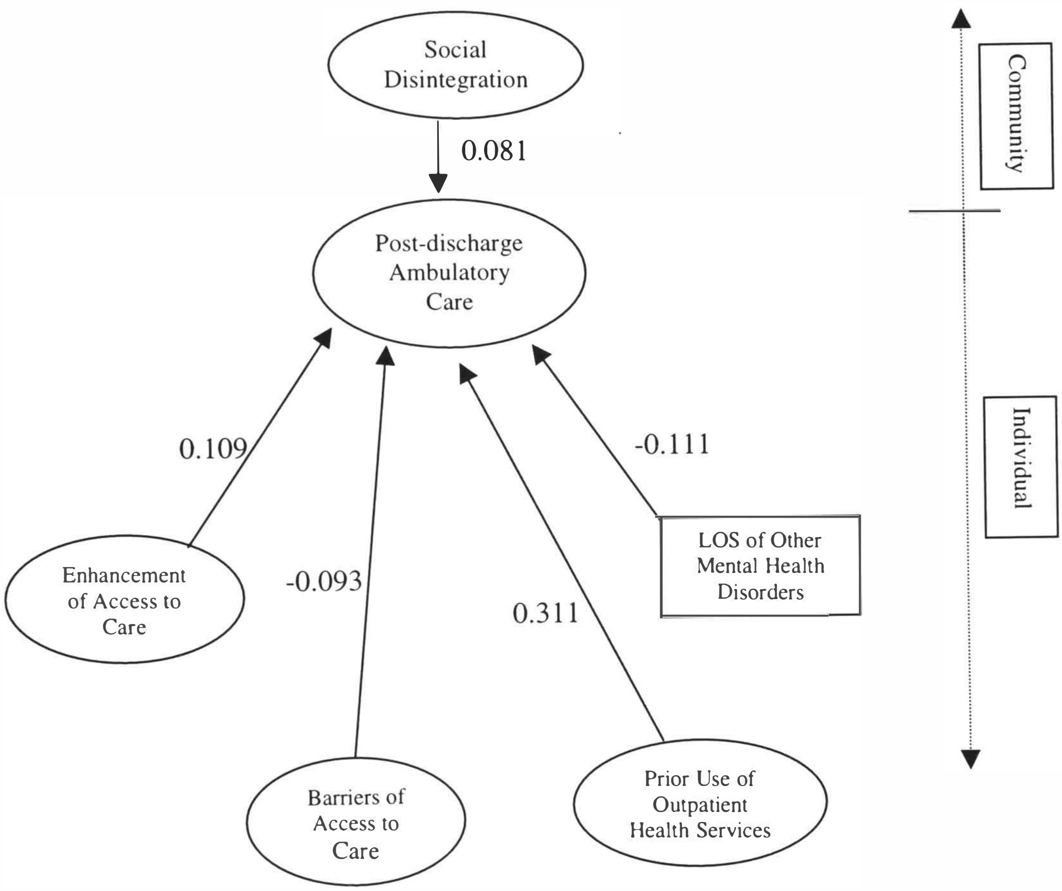


Figure 14. Path Diagram of Post-discharge Healthcare Utilization for Veterans with Posttraumatic Stress Disorder, 1998



In 1998, POU ($\Upsilon_{POU, PDAC} = 0.311$, $p < 0.01$) was the most important predictor of PDAC and was followed by AC1 ($\Upsilon_{AC1, PDAC} = 0.109$, $p < 0.01$) and social disintegration (SD, $\Upsilon_{SD, PDAC} = 0.081$, $p < 0.01$).

Barriers to access to care (AC2, $\Upsilon_{AC2, PDAC} = -0.093$, $p < 0.01$) and the length of stay for other mental health disorders in the last year (OMHLOS, $\Upsilon_{OMHLOS, PDAC} = -0.111$, $p < 0.01$) reduced the utilization of post-discharge ambulatory care.

A substitution effect was found between PIU, OMHLOS and PDAC. In 1994, the model explained 23.1% of the variation in PDAC. However, 13.2% of variance was explained in 1998. The model fit indices indicate that the data fitted the model very well.

The results of multiple group analysis (Appendix 23) indicate that PTSD veterans of different races and with different discharge placements performed differently in seeking post-discharge ambulatory care services.

In sum, prior use of outpatient services (POU) was the most predictive factor in the full model. Prior use of inpatient services (PIU) had a substitution effect for PDAC. The variance explained by the model varied from 10.2% for non-white veterans in 1998 to 29.6% for veterans discharged to community settings in 1994. The results of the multiple group analyses show that race and discharge placement did affect the use of post-discharge ambulatory care differently.

Survival Analysis of Readmission

Cox regression with forward selection in SPSS 9.0 was used to perform survival analysis, using readmission of PTSD veterans as a dummy dependent variable. The rationale for adopting Cox regression with forward selection is to verify the relative importance of the independent variables in influencing readmission, taking the time elapsed before being readmitted into account. The indicator variables that had been validated in the measurement model, in conjunction with selected observable variables, were used in the survival analysis.

Among 1,420 discharged PTSD veterans in 1994, 532 were readmitted, for a readmission rate of 37.46%. There were 1,517 discharged veterans in 1998. Four hundred and sixty-six were readmitted, for a readmission rate of 30.59%.

Table 33 presents the variables that contributed to readmission for PTSD patients, in the order of entering sequence. In 1994, none of the county-level variables affected readmission of PTSD patients. Both AFMED ($\beta = -0.573$, $p < 0.01$) and AFMEN ($\beta = -0.350$, $p < 0.01$), two indicators for post-discharge ambulatory care, were able to reduce the likelihood of readmission. SCPER ($\beta = 0.002$, $p < 0.05$), a indicator of barriers to access to care, entered the model at the last step. OMHE ($\beta = 0.285$, $p < 0.01$) and PHE ($\beta = 0.142$, $p < 0.01$), two indicators of prior use of outpatient services, increased readmissions. Using patients discharged to institutions as the reference group, PTSD veterans discharged to the community ($\beta = -0.627$, $p < 0.01$) were able to reduce readmissions. Patients who left VAMCs against medical advice ($\beta = -0.524$, $p < 0.05$)

Table 33. Factors for Readmission of PTSD Veterans

Variable	β	Standard Error	Wald statistics	Entered step
1994				
AFMED	-0.573**	0.053	118.658	1
PHE	0.142**	0.027	27.468	2
LNVAO	1.208**	0.190	40.529	3
OMHE	0.285**	0.045	39.795	4
AFMEN	-0.350**	0.085	16.865	5
DISTO				6
Community	-0.627**	0.154	16.500	
AMA	-0.524*	0.240	4.479	
SCPER	0.002*	0.001	3.872	7
1998				
RAPE	0.676*	0.293	5.321	1-1
AFMED	-0.508**	0.047	117.479	2-1
PHE	0.081**	0.254	10.278	2-2
LNVAO	1.330**	0.221	36.318	2-3
DIST	0.439**	0.146	9.087	2-4
MHCOS	0.468**	0.124	14.210	2-5
PDLOS	0.273**	0.092	8.805	2-6
AFMEN	-0.257**	0.059	18.931	2-7
OMHE	0.198**	0.049	16.602	2-8
AC_INX	0.324**	0.125	6.718	2-9

Note: *: p <0.05; **: p <0.01; AC_INX: Resource sharing index; AFMED: The number of medical visits after discharge; AFMEN: The number of mental health visits after discharge; AMA: Against medical advice; DIST: The distance between the residence of a veteran and the admitted VAMC; DISTO: Discharge placement; LNVAO: The number of non-VA outpatient visits after discharge; MHCOS: The severity index of mental comorbidities; OMHE: The number of mental health encounters in the last year; PDLOS: LOS for PTSD in the last year; PHE: The number of medical encounters in the last year; RAPE: Rape rates; SCPER: The percentage of service-connected disability.

also reduced the probability of readmission with a lower rate. The number of non-VA outpatient visits after discharge (β =1.208, $p < 0.01$) increased readmissions.

The model fit is assessed by the statistics of –2 log likelihood; the smaller the statistics, the better the fit. However, with 1,420 veterans and 32 variables in the model, a large –2 log likelihood is expected. The –2 log likelihood was 7205.782 for the initial model and reduced to 6885.840 at the final step, with a change of 319.942. That indicates that the model fit has improved.

In 1998, rape rates (RAPE) was the only significant county-level variable in contributing to readmission, with a coefficient of 0.676 ($p < 0.05$).

At the individual level, AFMED ($\beta = -0.508$, $p <0.01$) and AFMEN ($\beta = -0.257$, $p <0.01$) were able to reduce readmissions. Both DIST ($\beta = 0.439$, $p < 0.01$) and AC_INX ($\beta = 0.324$, $p < 0.01$), two indicators of enhancement of access to care, increased readmissions. MHCOS ($\beta = 0.468$, $p <0.001$) increased readmissions for PTSD veterans. OMHE ($\beta = 0.198$, $p <0.01$) and PHE ($\beta = 0.081$, $p < 0.01$), two indicators of prior use of outpatient services, elevated the probability of readmission. PDLOS (β = 0.273, $p < 0.01$) also increased readmissions. The control variable of the number of non-VA outpatient visits after index discharge (LNVAO) increased readmissions, with a coefficient of 1.330 ($p < 0.01$).

The number of discharged PTSD veterans in 1998 was 1517, therefore, a large –2 log likelihood was anticipated. The –2 log likelihood was 6,384.827 for the initial model and reduces to 6033.819, with a change of 338.492. That indicates that the model fit has improved.

In summary, different factors may have affected the readmission of PTSD patients in 1994 and in 1998. In 1994, none of the county-level factors influenced the readmission of PTSD veterans. At the individual level, discharge to the community was the most important contributing factor in reducing the likelihood of readmission. AFMED, AFMEN, patients discharged to community, and patient who left against medical advice were factors able to reduce readmissions. OMHE, PHE, SCPER, and LNVAO increase the probability of readmission for PTSD veterans in 1994. The influence of LNVAO was unexpected, which suggests that contracted, non-VA healthcare providers did not take good care of PTSD veterans.

In 1998, RAPE was the only significant county-level factor that influenced readmissions. At the individual level, LNVAO was the most significant predictor of readmission. AFMED and AFMEN were able to reduce readmissions for PTSD veterans. DIST, AC_INX, MHCOS, OMHE, PHE, PDLOS, and LNVAO increased the likelihood of readmission for PTSD veterans.

Comparison of Post-discharge Ambulatory Care Use and Readmission Pre- and Post-Service Lines Implementation

Table 34 presents the results, for both years, of crude means and rates, to verify the effects of service lines implementation on PTSD veterans.

For post-discharge ambulatory care, the results of crude means comparison indicate only post-discharge PTSD visits (AFPTSD) was insignificant. Post-discharge medical

(AFMED), mental (AFMEN), and social work (AFSOC) visits all revealed a significant improvement. After adjustment, AFMED, AFMEN, and AFSOC still showed a significant positive improvement, but not for AFPTSD. This finding indicates that that the implementation of service lines did improve the utilization of post-discharge services for PTSD veterans.

Table 34. Results of Comparison of Post-discharge Ambulatory Care Use and Readmission Pre- and Post- Service Lines Implementation

Factor	Crude Mean (Std. Dev.)	T or Z Score	Adjusted Mean (Std. Dev.)	T or Z Score
AFMED		**8.852****		**21.556****
94	6.12 (11.847)		6.15 (5.196)	
98	11.12 (18.274)		11.16 (7.296)	
AFMEN		**2.120***		**7.186****
94	4.27 (12.622)		4.31 (4.646)	
98	5.27 (13.048)		5.36 (3.105)	
AFPTSD		0.239		**-2.170***
94	1.06 (4.536)		1.06 (2.012)	
98	1.10 (3.956)		0.91 (1.792)	
AFSOC		**4.535****		**69.924****
94	0.40 (1.862)		0.39 (0.124)	
98	1.33 (7.719)		1.32 (0.501)	
Readmission Rate		**-3.93****		**-3.34****
94	37.46		37.79	
98	30.59		31.92	

Note: *: p <0.05; **: p <0.01; AFMED: Post-discharge medical visits; AFMEN: post-discharge mental health visits; AFPTSD: Post-discharge PTSD visits; AFSOC: Post-discharge social work visits.

For readmissions, the results of crude rates comparison revealed that readmission rate decreased significantly ($z = -3.93$, $p < 0.05$). After adjustment, a significant reduction of readmission rate ($z = -3.34$) was found. This result indicates the implementation of service lines reduced readmission rate for PTSD veterans.

Summary

The relationships between exogenous and endogenous constructs were examined through structural equation modeling. Prior to SEM, the variables of property crime rates, the number of hospital-based social workers, the number of other physicians in the county, the number of mental comorbidities, and the severity of medical comorbidity were deleted for statistical reasons as indicated by the weak correlations.

Based on the results of the confirmatory factor analysis of 1994 data, seven measurement models were developed: post-discharge ambulatory care, social disintegration, adequacy of health resources, enhancement of access to care, barriers to access to care, prior use of outpatient services, and prior use of inpatient services. The indicators for the severity of comorbidity were separated into the severity index of mental comorbidity and the number of medical comorbidities. For 1998, the construct of prior use of inpatient services was disaggregated into the number of medical encounters in the last year, the number of mental health encounters in the last year, and the number of PTSD encounters in the last year.

For 1994, the full model explained, on average, 25.9% of the variance in PTSD veterans' seeking of post-discharge ambulatory care (PDAC). The results of multiple analysis reveal that different groups were influenced by different factors in seeking PDAC services. The most influential factor was prior use of outpatient services (POU). Substances-abused-related crime rates had a substantial effect on PDAC seeking. The control variable of non-VA length of stay before the index admission (PNVAI) was found to influence PDAC seeking for the non-white group and for the group of veterans discharged to non-community settings.

For 1998, POU was also found to be the most significant factor influencing PDAC for PTSD veterans. Social disintegration (SD) was the most influential county-level factor on PDAC, except for the non-white group and the PTSD veterans discharged to community settings. The adequacy of health resources was a significant factor for patients discharged to non-community settings. As with the results for 1994, multiple group analyses revealed different factors affecting PTSD veterans in seeking PDAC.

The results of Cox regression for 1994 reveal that none of the county-level variables had any effect on readmissions. AFMED and AFMEN were able to reduce the likelihood of readmission for PTSD veterans. Patients discharged to community settings and patients who left against medical advice (AMA), in comparison to patients discharged to institutions, were less likely to be readmitted. The percentage of service-connected disabilities (SCPER), the number of other mental health encounters in the last year (OMHE), the number of medical encounters in the last year (PHE), and the number of non-VA outpatient visits after index discharge (LNVAO) were positively associated with readmission for PTSD veterans. Among these factors, LNVAO was the most powerful contributing factor to the readmission of PTSD veterans.

In 1998, rape rates (RAPE) were the only county-level variable affecting readmission. AFMED and AFMEN reduced readmissions for PTSD veterans. DIST, AC_INX, MHCOS, OMHE, PHE, PDLOS, and LNVAO increased the likelihood of the readmission for PTSD veterans. As with the results for 1994, LNVAO emerged as the most influential factor.

The common factors contributing to readmission in both years were AFMED, AFMEN, OMHE, PHE, and LNVAO. The first two reduced readmissions whereas the others increased the likelihood of readmission. Different factors appeared to influence the readmission of PTSD veterans in the periods studied. The implementation of service lines has improved both the utilization of post-discharge ambulatory care and reduced readmissions.

CHAPER 6

FINDINGS, DISCUSSIONS, AND CONCLUSIONS

This chapter summarizes important findings, discusses their implications, and draws conclusions pertaining to theory and policy. The limitations of the study are also presented. The recommendations for future research are proposed in the conclusions.

Major Findings

By using two cross-sectional data sets, the factors affecting post-discharge ambulatory care and the readmissions for PTSD veterans were examined before and after the implementation of service lines in VAMCs, VISN 6. The factors investigated in the study include social disintegration, adequacy of health resources, enhancement of access to care, barriers to access to care, prior use of outpatient services, and prior use of inpatient services. Age, the size of social networks, severity index of mental comorbidity, and the number of medical comorbidities are also included in the study. Control variables are non-VA length of stay before the index admission, the number of non-VA outpatient visits before the index admission, and the number of non-VA outpatient visits after the index discharge.

Results of Hypothesis Testing

Tables 35 and 36 present the results of hypothesis testing in terms of two dependent variables: post-discharge ambulatory care and readmissions for PTSD veterans, in 1994 and 1998.

Hypothesis 1a:

There is a positive relationship between social disintegration and use of post-discharge ambulatory care by veterans with PTSD.

The proposed effects of social disintegration, measured by the crime rates of aggressive assaults, murders, rapes, and weapon violations as well as by substance-abuse-related crime rates (a stand-alone variable) were expected to be positively associated with post-discharge ambulatory care. These adverse social conditions were expected to aggravate PTSD symptoms and precipitate help-seeking behavior for veterans (Perkins & Taylor, 1996; Thompson & Norris, 1992; Wandersman & Nation, 1998).

Hypothesis test results for 1994 (see Table 35) indicate that the "hard crimes" of social disintegration had no effect on post-discharge ambulatory care. The crime rates related to substance abuse, however, were positively associated with increased post-discharge ambulatory care for all veterans, as well as for male veterans, white veterans, and veterans discharged to community setting, but not for non-white and veterans discharged to non-community settings. This finding indicates that differences in race and discharge placement did exist.

Hypothesis testing for 1998 (see Table 35) presents an opposite result. The "hard crimes" of social disintegration was positively associated with the use of post-discharge ambulatory care for all veterans as a group, and for male veterans, white veterans, and veterans discharged to non-community settings, but not for non-white veterans and those discharged to community settings. Substance-abuse-related crime rates had no effect on post-discharge ambulatory care.

Table 35. Summary of Hypothesis Testing of Post-discharge Ambulatory Care for PTSD Veterans in 1994 and 1998

Construct	**Expected Direction**	**Actual Direction**	
	1994 & 1998	**1994**	**1998**
Social Disintegration	(+)	(+)	(+)
Adequacy of Health Resources	(-)	NS	NS
Age	(-)	NS	NS
Social Networks	(+)	(+)	NS
Access to Care	(+)	(+)	Mixed
Severity of Comorbidity	(-)	(+)	NS
Prior Use of Outpatient Services	(+)	(+)	(+)
Prior Use of Inpatient Services	(+)	(-)	(-)

Note: NS: Not significant.

Table 36. Summary of Hypothesis Testing of Readmissions for PTSD Veterans, 1994 and 1998

Construct (Variable)	**Expected Direction 1994 & 1998**	**Actual Direction 1994**	**1998**
Social Disintegration	(+)	NS	(+)
Adequacy of Health Resources	(-)	NS	NS
Post-discharge Ambulatory Care	(-)	(-)	(-)
Age	(-)	NS	NS
Social Network	(-)	NS	NS
Access to Care	(+)	(+)	(+)
Severity of Comorbidity	(+)	NS	(+)
Prior Use of Outpatient Services	(+)	(+)	(+)
Prior Use of Inpatient Services	(+)	NS	(+)

Note: NS: Not significant.

Group differences in race and discharge placement were found. Not only were group differences found between the two years, but also differences between the years in veterans as a whole were revealed, in terms of the effects of social disintegration and substance-related crime rates on post-discharge ambulatory care.

Hypothesis 1b:

There is a positive relationship between social disintegration and readmission to VAMCs for veterans with PTSD.

After controlling the effect of post-discharge ambulatory care, neither social integration nor substance-related crimes had effects on readmissions in 1994 (see Table 36). However, the results of Cox regression for 1998 reveal that the variable "rape crime rates" was the only significant factor affecting readmission. That finding reveals that PTSD veterans may be adversely affected by rape crime rates, a variable representing a domain of social disintegration, but not by other crime rates. PSTD veterans living in a county with higher rates of rape may link media coverage of rapes, witnessing rape, or being a victim of rape to previous traumatic war experiences related to rape (Attias et al., 1996; Elliott, 1997; Hilton, 1997; McFall et al., 1990). These findings illustrate difference that did exist between 1994 and 1998 PTSD veterans.

Hypothesis 2a:

There is an inverse relationship between community health resources and use of post-discharge ambulatory care by veterans with PTSD.

Hypothesis 2b:

There is an inverse relationship between community health resources and readmission to VAMCs for veterans with PTSD.

The negative effect of community health resources on VA post-discharge ambulatory care was found only in veterans discharged to non-community settings in 1994. The effect was insignificant for all other groups and for veterans as a whole (see Table 35). The adequacy of health resources was not found to be an influencing factor for readmission of PTSD veterans in either 1994 or 1998.

Community health resources, such as the number of psychiatrists, psychologists, and hospital beds, are not only convenient local health resources, but also competitors for Medicaid-, or Medicare-eligible veterans, and veterans who are eligible for "fee-basis" services (Kizer, 1995). The adequacy of health resources at the county level is expected to have a negative effect on post-discharge ambulatory care.

Rosenheck & Stolar (1998) found that state and county hospitals can reduce VA mental health care utilization among veterans with service-connected non-psychosis. Friss et al. (1989) found the physician-to-population ratio to be negatively associated with VA health service utilization; however, the finding is not statistically significant.

It is important to note that the group, veterans discharged to non-community settings is the combination of veterans discharged to non-community settings (n = 104) and veterans who left VAMCs against medical advice (n = 70). The underlying factors in local health resources reducing of VA post-discharge ambulatory care in this group of veterans could be "fee-basis" eligibility, contractual behavior between non-community settings and local healthcare providers, veterans' choice, or any combination among the three.

Hypothesis 3a:

There is an inverse relationship between age and use of post-discharge ambulatory care by veterans with PTSD.

Age was expected to be negatively associated with VA post-discharge ambulatory care. Carpenter et al. (1981) pointed out that younger age was associated with fewer post-discharge outpatient visits. Older age was found to be associated with more post-discharge ambulatory care, day care attendance, and participation in social case work (Keane & Fahy, 1982; Raynes & Warren, 1971). However, our findings show no association between age and the use of VA post-discharge ambulatory care in either 1994 or 1998. This finding has been substantiated by several authors who studied post-discharge ambulatory care (Axelrod & Wetzler, 1989; Del Gaudio et al., 1977; Fink & Heckerman, 1981; Hershorn, 1993; Kirk, 1977; Matas et al., 1992; Winston et al., 1977).

Hypothesis 3b:

There is an inverse relationship between age and readmission to VAMCs for veterans with PTSD.

Age was expected to be negatively associated with readmission. Several researchers have found younger age to be correlated with readmission for psychiatric patients (Appleby et al., 1993; Blow et al., 1998; Daniels et al., 1998; Gooch & Leef, 1996; Green, 1988; Mojtabai et al., 1997; Sands, 1984; Solomon et al., 1984; Stack et al., 1983;

Thornicroft et al.; 1992 Vogel & Huguelet, 1997). In this study, however, age was not associated with readmission in either 1994 or 1998 (see Table 36). This finding lends support to other psychiatric readmission studies (Bene-Koclemba et al., 1979; Boydell et al., 1991; Byers et al., 1979; Craig et al., 1985; Peterson et al., 1994; Tomasson et al., 1998).

Hypothesis 4a:

There is a positive relationship between the size of the social network and use of post-discharge ambulatory care by veterans with PTSD.

The size of social networks was expected to be positively associated with post-discharge ambulatory care. For 1994, this factor did show a positive relationship with all veterans (see Table 35), and with male veterans, white veterans, and veterans with different discharge placements; but for non-whites it was insignificant. Previous studies have indicated that social isolation reduces post-discharge ambulatory care use and the social network is able to increase post-discharge ambulatory care (Appleby et al., 1997; Johnsen & Herringer, 1993; Matas et al., 1992). This study's findings for 1994 support the results of the other studies, but also found difference between the racial groups.

For 1998, the association between social networks and VA post-discharge ambulatory care was insignificant in all the analyses. Though no direct relationship was found between these two variables, the multiple-group analyses performed for race and discharge placement indicate that social networks had an indirect effect on use of post-discharge ambulatory care, through barriers to access to care. The findings for both years studied indicate that a difference existed the PTSD veterans in the 1994 sample and those in the 1998 sample.

Hypothesis 4b:

There is a negative relationship between the size of the social network and readmission to VAMCs for veterans with PTSD.

We hypothesized that the size of social networks is negatively associated with readmission. The size of the social network is referred to as structural social support. Fontana & Rosenheck (1994) and King et al. (1998) suggested that structural social support should be examined along with functional social support. The protective effect of a larger network size has been found by several authors (Caton et al., 1985; Cohen & Sokolovsky, 1978; Dayson et al., 1992; Lipton et al., 1981). Functional social support also has been found to reduce readmissions (Booth et al., 1992; Caton et al., 1985; Postrado & Lehman, 1995). We did not find a significant association between social network size and readmission in 1994 or in 1998. The failure to include functional social support in the study may have contributed to this result. Another explanation could be that social network size increases through interactions with other people in healthcare settings. However, we failed to capture this important dimension of social support (Holmes-Eber & Riger, 1990).

Hypothesis 5a:

There is a positive relationship between access to care and use of post-discharge ambulatory care by veterans with PTSD.

We hypothesized that both enhancers of and barriers to care are positively associated with the use of post-discharge ambulatory care (the direction of low-income status for barriers to access to care has been reversed). The enhancement of access to care has a positive significant association with post-discharge ambulatory care (Druss et al., 1997; Fortney et al., 1995; Piette et al., 1996). Barriers to access to care have also been found to be positively associated with post-discharge ambulatory care (Druss et al., 1997; Piette et al., 1996).

The analyses in this study show that enhancement of access to care was positively associated with post-discharge ambulatory care in 1994. For the same year, a negative relationship was found between barriers to access to care and post-discharge ambulatory care for non-white veterans. For veterans as a whole, male veterans, white veterans, and discharge placement, no associations between barriers to access to care and the use of post-discharge ambulatory care were found for 1994.

In 1998, enhancement of access to care was significantly positive associated with use of VA post-discharge ambulatory care for veterans as a whole, male veterans, non-white veterans, and veterans discharged to community settings. However, for white veterans and veterans discharged to non-community settings, no association was found between enhancement of access to care and use of VA post-discharge ambulatory care. Another group difference is thus revealed.

There was no association found for 1998 between barriers to access to care and VA post-discharge ambulatory care use by veterans discharged to community settings. A negative effect of barriers to access to care was found for 1998, for veterans as a whole, male veterans, veterans of different races, and veterans discharged to non-community settings. Thus, differences in the effects of both enhancement of and barriers to access to care were found for PTSD veterans in both the 1994 and the 1998 groups.

Hypothesis 5b:

There is a positive relationship between access to care and readmission to VAMCs for veterans with PTSD.

It was expected that both enhancers of and barriers to care are positively associated with readmission. Peterson et al. (1994) demonstrated that two measures for barriers to access to care increased readmissions among 40,747 substance abuse veterans. This study's findings for 1994 indicate that enhancement of access to care had no association with readmission. The percentage of service-connected disability was significantly positive associated with readmission. Low income had no influence on readmission.

In 1998, both measures for enhancement of access to care, distance and resource sharing index, were significantly positive associated with readmission. Barriers to access to care were not related to readmission. A difference was found between the 1994 and the 1998 PTSD veterans in terms of the effects of access to care on readmission.

Hypothesis 6a:

There is a negative relationship between severity of comorbidities and use of post-discharge ambulatory care by veterans with PTSD.

Severity of comorbidity was expected to be negatively associated with use of VA post-discharge ambulatory care. Severity of mental comorbidity and the number of medical comorbidities were used as two separate measures for severity of comorbidity.

In 1994, severity of mental health comorbidity had a statistically significant effect on use of post-discharge ambulatory care for veterans discharged to non-community settings. However, no association between severity of mental comorbidity and use of post-discharge ambulatory care was found among veterans as a whole, male veterans, veterans of both races, or veterans discharged to community settings.

In the 1994 sample, a significantly positive effect was found for the number of physical medical comorbidities, on the use of post-discharge ambulatory care services by all veterans and by male veterans. Race and discharge placement were found to be insignificant, a finding that suggests that the effects of race and discharge placement were confounded. After stratifying the number of medical severities, the confounding effects were removed.

In 1998, severity of mental comorbidity was significantly negative associated with use of VA post-discharge ambulatory care by veterans discharged to non-community settings. An insignificant result was found for veterans as a whole, male veterans, and veterans of different races. The number of medical comorbidities had a positive effect on use of post-discharge ambulatory care by veterans discharged to the community. No relationship between the number of medical comorbidities and post-discharge ambulatory care use was found for veterans as a whole, male veterans, veterans of both races, or veterans discharged to non-community settings.

Hypothesis 6b:

There is a positive relationship between severity of comorbidities and readmission to VAMCs for veterans with PTSD.

Severity of comorbidity was expected to be positively associated with readmission. Neither measure severity of mental comorbidity nor number of medical comorbidities was significant in 1994. In 1998, only severity of mental comorbidity was positively and significantly associated with readmission. The number of medical comorbidities yielded an insignificant result. This finding indicates that mental comorbidities have a much stronger influence on readmission than do medical comorbiditites. This finding reveals the importance of mental comorbidities in contributing to readmission (Boudewyns et al., 1991; Brown et al., 1995; Williams et al., 1998).

Hypothesis 7a:

There is a positive relationship between prior mental health services utilization and use of post-discharge ambulatory care by veterans with PTSD.

Hypothesis 8a:

There is a positive relationship between prior physical health services utilization and use of post-discharge ambulatory care by veterans with PTSD.

Hypotheses 7a and 8a both postulate that prior mental and physical health utilization are positively associated with post-discharge ambulatory care. In this study, the measurement models for these were developed as prior use of outpatient and inpatient services.

For 1994, this association showed an insignificant result for veterans discharged to non-community settings had an insignificant result. The rest of the analyses confirmed that prior use of outpatient services is positively associated with use of VA post-discharge ambulatory care.

However, a contradictory finding appeared for prior use of inpatient services by veterans as whole, male veterans, and veterans discharged to community settings. Prior use of inpatient services was not associated with use of VA post-discharge ambulatory care by the two different racial groups or by veterans discharged to non-community settings. This result reveals that there is a substitution effect of inpatient services use on the use of VA post-discharge ambulatory care.

In 1998, prior use of outpatient services was associated with use of VA post-discharge ambulatory care. This finding gives credence to the specificity of the measurement that was speculated in the correlation analysis. Prior use of inpatient services was broken down into three separate measures: length of stay for other mental health conditions in the last year (OMHLOS), length of stay for PTSD in the last year (PDLOS), and length of stay for medical conditions in the last year (PHLOS), based on the results of validation of measurement model.

For non-white veterans, in the 1998 group, OMHLOS was found to be insignificant in terms of its relationship with post-discharge ambulatory care. A negative association was found for veterans as whole, male veterans, white veterans, and veterans discharged to both community and non-community settings. PDLOS was able to reduce VA post-discharge ambulatory care for non-white veterans and veterans discharged to community settings, but it was insignificant for the other groups and for veterans as whole. PHLOS was able to reduce VA post-discharge ambulatory care for white veterans. A negative relationship was found between use of post-discharge ambulatory care and each of the three variables. Of the three, OMHLOS has the strongest substitution effect. The race effect was also found for all three measures of length of stay for other mental disorders in the last years, length of stay of PTSD in the last year, and length of stay for medical problems in the last year.

Hypothesis 7b:

There is a positive relationship between prior mental health services utilization and readmission to VAMCs for veterans with PTSD.

Hypothesis 8b:

There is a positive relationship between prior physical health services use and readmission to VAMCs for veterans with PTSD.

Prior use of mental and physical health services were expected to have a positive association with readmissions. Both hypotheses are supported for 1994, as indicated by positive and significant findings in the number of other mental health encounters in the last year (OMHE) and the number of medical encounters in the last year (PHE).

For 1998, the same finding appeared with the difference that PDLSO was positively associated with readmission. This finding indicates a difference between the two samples. It also reveals that for the 1998 group of veterans, length of stay of PTSD in the last year had stronger influence than it did for the 1994 veterans in contributing to readmission.

Hypothesis 9:

There is an inverse relationship between use of post-discharge ambulatory care and readmission to VAMCs for veterans with PTSD.

The last hypothesis states that VA post-discharge ambulatory care is able to reduce readmission. For both 1994 and 1998, the hypothesis is supported for both medical and mental post-discharge care visits. However, neither post-discharge PTSD nor social work visits influenced readmission. This finding supports previous studies (Byers et al., 1978; McCranie & Mizell, 1978; Moos et al., 1995 $_{a\ \&\ b}$; Peterson et al., 1994; Soloman et al., 1984; Walker et al., 1996; Winston et al., 1977).

The Effects of Control Variables

In this study, three control variables were examined: the number of non-VA outpatient visits before index admission (PNVAO), the number of non-VA outpatient visits after index discharge (LNVAO), and non-VA length of stay before index admission (PNVAI). In 1994, PNVAI had a significantly positive association with post-discharge ambulatory care for both the non-white veterans group and the veterans discharged to non-community settings. LNVAO had a positive association with readmission for all veterans.

These findings indicate that non-VA healthcare utilization has a negative impact on both veterans' health and VAMCs' operation. These non-VA health services are "fee-basis," i.e., VA pays for these services. However, the facts that veterans with longer non-VA length of stay before the index admission (PNVAI) had more VA post-discharge ambulatory care, and that veterans with more non-VA outpatient visits after the index discharge (LNVAO) had higher readmission rates indicate that non-VA healthcare facilities did not provide optimal care to these veterans. That can be explained by non-

VA healthcare facilities lacking expertise in treating PTSD. Another explanation could be patient dumping by non-VA facilities. The possible cause could be veterans' self-selection of VAMCs for post-discharge ambulatory care or readmission. It could be also attributed to this group of veterans is a different group of veterans in terms of living in remote areas or complicated health status.

The control variable of discharge placement showed that patients discharged to a community setting had a significantly negative effect on readmission. This finding suggests the protective effect of family or community for readmission (Fethke et al., 1986; Moos et al., 1995; Moos and Moos, 1995).

Veterans who had left VAMCs against medical advice (AMA) were also found to be negatively associated with readmission. The mechanism that reduces readmissions for AMA is not clear. It may be veterans' self-selection in not returning to VAMCs for readmission, or family/community may provide protective effects on readmission.

For 1998, an opposite phenomenon was identified for VA post-discharge ambulatory care. Longer non-VA length of stay before the index admission (PNVAI) in males and more non-VA outpatient visits before the index admission (PNVAO) each had a negative effect on VA post-discharge ambulatory care. This finding indicates that the quality of non-VA healthcare has improved in providing care to PTSD veterans. However, this improvement did not prevent veterans from being readmitted, as indicated by the fact that non-VA outpatient visits after the index discharge (LNVAO) had a positive effect on readmission.

Summary of Findings

Figure 15 and 16 summarize the results in hypothesis testing for all PTSD veterans in 1994 and 1998, respectively. Some differences exist between PTSD veterans in 1994 and those in 1998, in terms of hypothesis testing. The results of hypothesis testing for male veterans, veterans' racial groups, and discharge placements are in Appendix 24.

The findings of hypothesis testing for all veterans in 1994 and 1998 are highlighted as follows:

- Hypothesis 1a (SD → PDAC): It is supported for all veterans in both 1994 and 1998.
- Hypothesis 1b (SD → readmission): It is not supported in either year.
- Hypothesis 2a (HR → PDAC): It is not supported in either year.
- Hypothesis 2b (HR → readmission): It is not supported in either year.
- Hypothesis 3a (Age → PDAC): It is not supported in either years.
- Hypothesis 3b (Age → readmission): It is not supported in either year.
- Hypothesis 4a (SOCNW → PDAC): It is supported for all veterans in 1994, but is not supported for all veterans in 1998.
- Hypothesis 4b (SOCNW → readmission): It is not supported in either year.
- Hypothesis 5a (access to care → PDAC): It is supported for all veterans in 1994. It has a mixed result for the 1998 veterans: enhancers support the hypothesis, but barriers contradict it.
- Hypothesis 5b (access to care → readmission): It is supported in both years.

Figure 15. Results of Hypothesis Testing of Healthcare Utilization and Outcomes for Veterans with Posttraumatic Stress Disorder, 1994

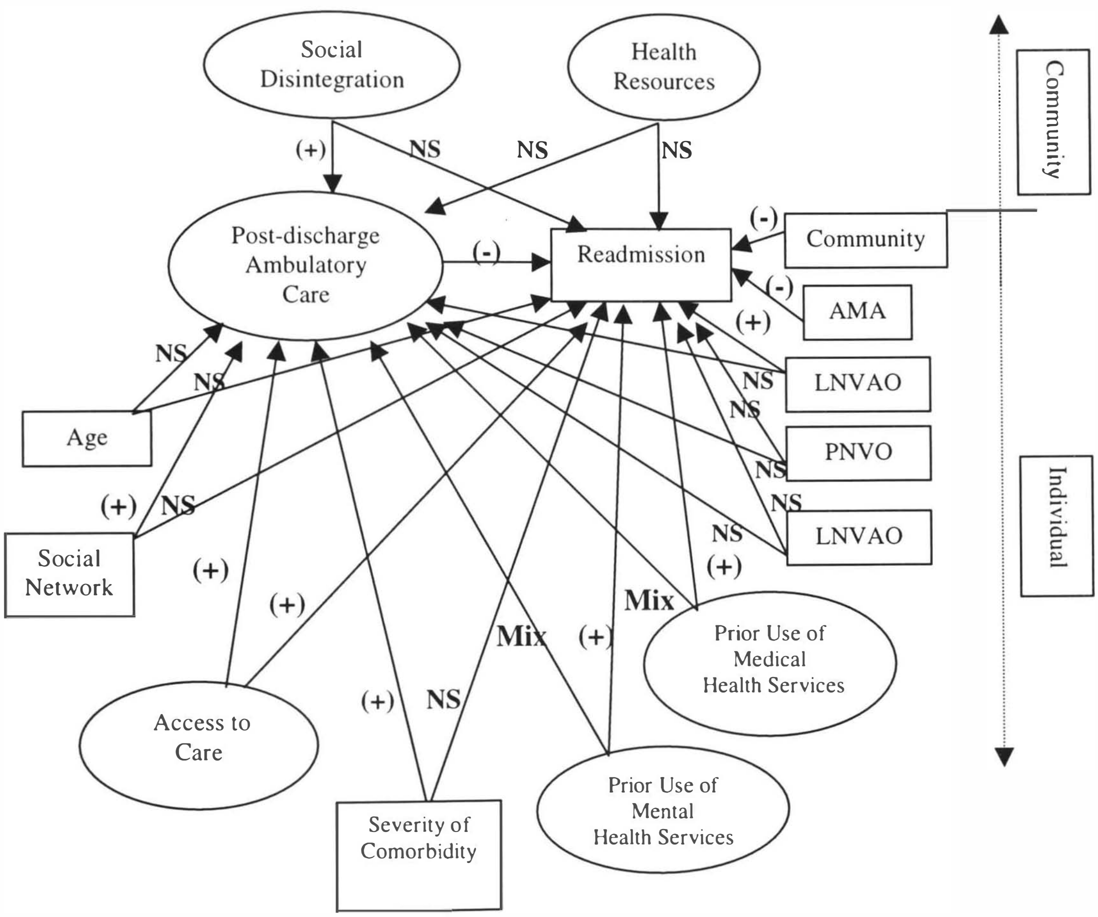
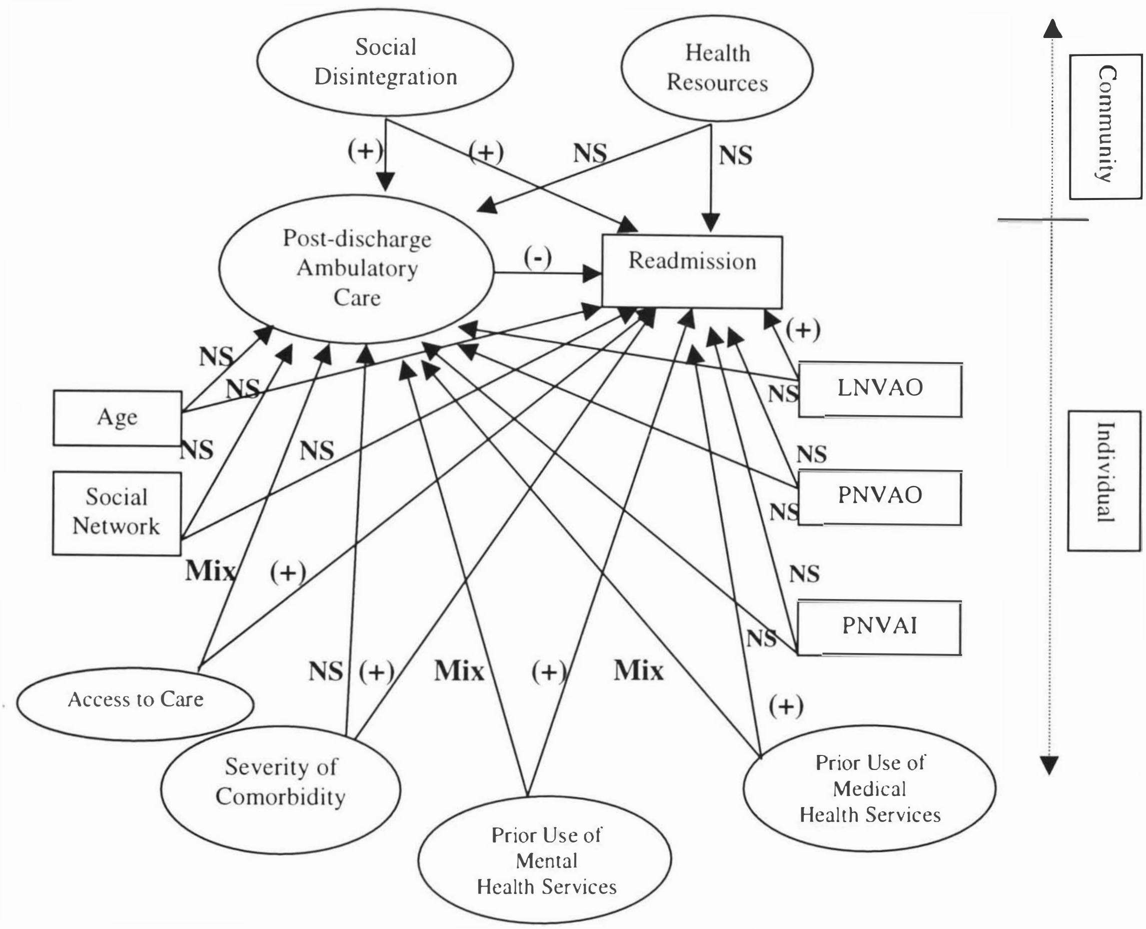


Figure 16. Results of Hypothesis Testing of Healthcare Utilization and Outcomes for Veterans with Posttraumatic Stress Disorder, 1998



- Hypothesis 6a (severity of comorbidity → PDAC): It is supported for the 1994 veterans, but is not supported for the 1998 veterans.
- Hypothesis 6b (severity of comorbidity → readmission): It is not supported for the 1994 veterans, but is supported for the 1998 veterans.
- Hypothesis 7a (prior mental health services utilization → PDAC): It has a mixed result in both years, i.e., it is supported by prior use of outpatient services, but contradicted by prior use of inpatient services.
- Hypothesis 7b (prior mental health services utilization → readmission): It is supported in both years.
- Hypothesis 8a (prior medical health services utilization → PDAC): It has a mixed result in both years, i.e., it is supported by prior use of outpatient services, but contradicted by prior use of inpatient services.
- Hypothesis 8b (prior medical health services utilization → readmission): It is supported in both years.
- Hypothesis 9 (PDAC → readmission): It is supported for all veterans in both years.

Discussion

The utility of the "health behavior model" is discussed in conjunction with the effects of external environmental factors, predisposing factors, and enabling factors on utilization and outcomes, as well as the effects of utilization on outcomes.

External Environmental Factors

In this study, both social disintegration and the adequacy of health resources are treated as external environmental factors. Substance-abuse-related crime rates were separated from social disintegration as a stand-alone factor. Community crimes and violence have adverse effects on mental health of children and adolescents (Aneshensel & Sucoff, 1996; Hughes, 1988; Kliewer & Kung, 1998; Miller et al., 1999; Shumow et al., 1998; Stiffman et al. 1999), and that of community adults (Perkins & Taylor, 1996; Thompson & Norris, 1992). Those findings imply that veterans are also affected by such a negative force, and especially veterans with PTSD.

We found that in the study sample, social disintegration or "hard crimes," had no effect on either utilization (post-discharge ambulatory care) or outcome (readmission) for the 1994 veterans, but did affect utilization and outcome for the 1998 veterans. On the other hand, substance-abuse-related crime rates or "soft crimes," had a positive effect on utilization but not on outcome, for the 1994 veterans. For the 1998 veterans, it had no have any effect on utilization or on outcome.

As indicated by Table 22, substance-abuse-related crime rates were higher in 1994, as well the rates for murders and weapon violations. That suggests that the difference between the two samples in terms of utilization and outcome was not caused by crime rates. It might have been due to the differing susceptibilities of the veterans to social disintegration and substance-abuse-related crime rates. In fact, there were only a total of 131 subjects who were both-year receivers of VA post-discharge ambulatory care. The number of veterans who were readmitted to VAMCs in both years was 65. This finding reveals two different groups with differential susceptibilities to environmental stress. Adverse external environmental factors have been proven to influence veterans' health behavior.

Another external environmental factor, adequacy of health resources, had a negative effect on utilization for veterans discharged to non-community settings in 1998. Despite the facts of small sample size (n = 174), the mixed composition (104 veterans discharged to non-community settings and 70 veterans who had left VAMCs against medical advice), and possible confounding factors ('fee-basis' eligibility, contractual behavior between non-community settings and local healthcare providers, and veterans' choice), the availability of local health resources does reduce the utilization of VAMCs' services.

The findings of this study along with previous studies (Aneshensel & Sucoff, 1996; Hughes, 1988; Kliewer & Kung, 1998; Miller et al., 1999; Perkins & Taylor, 1996; Shumow et al., 1998; Stiffman et al. 1999; Thompson & Norris, 1992) confirm the fact that external environmental factors may influence veterans' well-being and their health behavior.

Predisposing Factors

Age is treated as a predisposing factor in this study. Unfortunately, it makes no contribution to explaining the variation in either service utilization or outcomes. However, it may indirectly affect them through: the number of medical comobidities (veterans as a whole, 1994; male veterans, 1994; veterans discharged to community settings, 1998), barriers to access to care (non-whites, 1994; non-whites and whites, 1998), and severity of mental comorbidity (veterans discharged to non-community settings) to influence utilization. The finding of indirect effects of age on utilization indicates that age may serve as a predisposing factor in explaining utilization.

Enabling Factors

Social networks and access to care are viewed as enabling factors in this study. Access to care is broken down to enhancement of access to care and barriers to care. Social network is found to have direct positive effects on utilization (veterans as a whole, 1994; male veterans, 1994; white veterans, 1994; veterans discharged to different placement, 1994). It also exerts a negative effect on barriers to access to care (non-white veterans, 1994; non-white and white veterans, 1998; veterans discharged to non-community settings, 1998) and on utilization. However, social networks is not a factor that affects outcomes.

Functional social support was not included in the study, because of the limitation of the administrative data. Otherwise, the effects of social support might be accentuated. Despite the data limitation, the utility of social networks has been demonstrated in this study (Appleby et al., 1997; Klinkenberg & Calsyn, 1998; Matas et al., 1992).

Enhancement of access to care has a positive effect on utilization of VA post-discharge ambulatory services in all the analyses, except for white veterans in the 1998 group and veterans discharged to non-community settings in 1998. The findings indicate that the closer the residences to VAMCs, the higher the utilization. They also reveal that less the competition there is with veteran peers for VAMCs' resources, the higher the utilization. The enhancement of access to care is positively influenced by severity of mental comorbidity and prior outpatient utilization. That finding illustrates that need factors influence veterans to move to residences closer to VAMCs or to places with less peer competition for VAMCs' resources. However, prior inpatient utilization has mixed effects on enhancement of access to care, in that length of stay for PTSD in the last year (PDLOS) had a negative effect (non-whites, 1998); and prior use of inpatient services (PIU, whites, 1994) and length of stay for other mental disorders in the last year (OMHLOS, non-whites, 1998) had positive effects. The negative effect of PDLOS could be attributed to the avoidance nature of PTSD (Kulka et al., 1990; Mellman et al., 1992; Orsillo et al., 1996; O'Toole et al., 1998; Roszell et al., 1991), prompting moves away from city to rural areas.

Even though barriers to access is a factor that negatively and directly affects enhancement of access (non-whites and whites, 1994; veterans discharged to both settings, 1994), it does not reduce the effects of enhancement of access on utilization.

Enhancement of access to care also exerts a positive influence on outcome for the 1994 group. This finding implies that enhancers facilitated the use of post-discharge ambulatory care and, in turn, hospital readmission was mediated by enhancement of access to care.

Although we reversed the direction of barriers to access to care for low-income status, an unexpected result of barriers to access to care on the use of VA post-discharge ambulatory care was found (non-whites, 1994; veterans as a whole, 1998; male veterans, 1998; non-white and white veterans, 1998; veterans discharged to non-community settings, 1998). This finding is contradictory to findings in other studies (Druss & Rosenheck, 1997; Peterson et al., 1994; Piette & Moos, 1996). However, other studies had different samples, none of which used PTSD patients. PTSD may aggravate barriers to access to care, since length of stay for PTSD in the last year (PDLOS) had a positive effect on the barriers (non-whites and whites, 1998).

Barriers to access to care also have a positive association with readmission. Previous studies support that the percentage of service-connected disability increases the possibility of readmission (Holloway et al., 1990; Peterson et al., 1994).

The effects of enabling factors demonstrate that they do enhance the utilization and outcomes of PTSD veterans. The regulators' redirections do not help the veterans with PTSD, as barriers to care do not facilitate the use of VA post-discharge ambulatory care. This study's findings imply that VAMCs or the Department of Veterans Affairs should develop better strategies to meet the health needs of PTSD veterans.

Need Factors

Severity of comorbidity and the use of prior medical and mental health services serve as need for care factors in the study. For severity of comorbidity, two indicators had influences in different directions on the utilization of VA post-discharge ambulatory care; severity index of mental comorbidity (MHCOS) had a negative effect, as expected, but the number of medical comorbidities (NPHCO) had a positive effect. Previous studies have shown that PTSD veterans have more physical diseases and poorer physical health status than do PTSD-free veterans (Hovens et al., 1998; Kulka et al., 1990; Zatzick et al., 1997). Both Elder et al. (1997) and Stretch et al. (1995) indicate that combat experiences and overseas deployment deteriorate physical health. These may be the reasons that NPHCO has a positive effect on utilization for PTSD veterans. Unfortunately, the data on combat experiences and overseas deployment were not available for this study. If we had had these data, the stratification of combat involvement and overseas deployment would yield a much clearer picture.

When utilization and outcome variables are examined, MHCOS yields a negative effect on the use of post-discharge ambulatory care and a positive effect on readmission. This finding reveals that PTSD veterans with higher MHCOS use less post-discharge ambulatory care, which leads to higher readmission rates. Therefore, both VAMCs and family members should pay more attention to PTSD veterans with higher MHCOS, in order to encourage them to receive post-discharge ambulatory care and thus help to prevent readmission.

Prior outpatient services utilization emerges as the most predictive factor for PTSD veterans in the use of post-discharge ambulatory care. However, it also has a positive effect on readmission, with less influence in comparison to other contributing factors. These two findings suggest that PTSD is a persistent mental disorder that needs continued care. However, it is not clear whether the convenience of the outpatient services or the restrictive nature of VA policies in providing inpatient care to veterans affects the utilization behavior.

Prior inpatient utilization has a negative effect on post-discharge ambulatory care. The longer the inpatient stay in the last year, the less use of post-discharge ambulatory care. Kales et al. (1999) reached the same conclusion when studying veterans with dementia, depression, or both conditions. In terms of readmission, this study found PDLOS to be a contributing factor, among use of three prior inpatient services in 1998. Again, the persistence nature of PTSD is demonstrated. This finding also illustrates that the need for inpatient care is diagnosis-specific.

Utilization

Use post-discharge ambulatory care through medical, mental, PTSD, and social work visits are viewed as utilization behaviors. In both years of the study, the protective effects of post-discharge ambulatory care (medical and mental visits) for reducing readmission were shown. PTSD veterans may have more medical and other mental health problems that need care. This finding raises the question of whether or not PTSD outpatient treatment is effective enough to help PTSD veterans who have multiple needs for care. When PTSD veterans go to VAMCs for medical or mental health visits, PTSD is taken care of along with mental or medical health needs. It is not clear how post-discharge PTSD visits may substitute routine medical and mental visits to reduce the risk of readmission. The interaction terms among post-discharge ambulatory care should be included in future study.

In sum, the utility of the "health behavioral model" as a theoretical framework has been demonstrated in this study. External environmental factors influence both utilization and outcome, though to a lesser degree as compared to predisposing, enabling, and need for care factors. Predisposing factors have indirect effects on utilization, but no effects on outcome. Enabling factors have effects on both utilization and outcome. Need for care factors strongly dominate utilization. They also affect outcome. The risk of readmission can be reduced by post-discharge utilization. The study findings suggest that not only is utilization affected by environmental, predisposing, enabling, and need for care factors, but also outcome is affected by these factors. This study illustrates that the "health behavioral model" can be applied to outcome research.

Implications

The Veteran Integrated Service Network 6 (VISN 6) has 8 medical centers, in the states of North Carolina, Virginia, and West Virginia. The total of operating beds in 1997 was 2,003; it was 2,394 in 1996, a decrease of 391. The number of bed days for care per 1,000 veterans in 1997 was 2,152, which included "fee-basis" inpatient days. Both measures are expected to be reduced. The number of Category A (low-income) veterans was estimated at 194,553 in 1995-1997 (VISN 6, 1998). This number was expected to increase.

Using Short Form-36 for veterans (SF-36V), the Department of Veterans Affairs (DVA, 1998) found that veterans in VISN 6 had a physical component summary score of 28.7 in 1996. The US national average was 50.0, and the VA national average was 31.3. The mental component summary score for VISN 6 was 39.2, which was lower than both the US and the VA national averages' of 50.0 and 40.7, respectively. It can be seen that veterans in VISN 6 are sicker than the general US public and than US veterans as a whole. However, in view of decreasing bed days of care and decreasing operating beds, yet increasing numbers of Category A veterans as performance measures, the VAMCs in VISN 6 need to improve the healthcare for veterans.

Several policy and managerial implications have been borne out by the findings of the study. These implications apply not only to PTSD veterans and VAMCs, but also to the family members of PTSD veterans and to the community. The implications are presented in this order: community, VAMCs, and PTSD veterans and their families.

Community

The "hard crimes" of social disintegration and the "soft crimes" of substance-abuse-related crimes all exercise their influence on both post-discharge ambulatory care and readmission in PTSD veterans. However, crime prevention is out of the jurisdiction of the VA. A useful step, though, would be to make relevant information available to public safety agencies and local communities to raise the awareness of how unsafe environments harm the well-being of both veterans and the general public. VAMCs also should pay attention to the rate of adverse incidents in the community, to prepare themselves for a possible increase in patients and arrange for appropriate treatment.

Local health resources also affect the use of post-discharge ambulatory care; more importantly, use of "fee-basis" services strongly influences readmissions of PTSD patients. That effect can be caused by lack of expertise in treating PTSD. Local healthcare providers or facilities, especially those contracting with the VA on "fee-basis," should acquire suitable treatment protocols for taking care of PTSD veterans.

VAMC

In the study, group differences are found in terms of races, discharge placement, and cohorts. Those findings indicate that VAMCs should modify their treatment modalities to meet the specific health needs of different cohorts. In terms of internal operation, interdisciplinary cooperation should be strengthened across both inpatient and outpatient services to establish a continuum of care for PTSD veterans.

Another point is that attention should be paid to the discharge placement. According to the findings of this study, the PTSD veterans discharged to institutions had higher rates of readmission in 1994. If the institutions were under the jurisdiction of the VA, frequent communications with them about the well-being of PTSD veterans could establish an early warning system to avoid readmissions. VAMCs should provide essential information or make suggestions to such institutions about the special health and functional needs of the PTSD veterans.

In contracting with local healthcare providers for "fee-basis" care, VAMCs or the VA should make their decisions according to the providers' expertise and credentials. VAMCs should also improve their information systems on "fee-basis" outpatient services, and should identify the content of the visits and the ICD-9 codes for the visits.

Close liaison between local communities and public safety agencies, as mentioned in previous section, should be established. In fact, the scope of patient education should not be limited to patients, but should be extended to patients' family members and should help them understand the symptoms, comorbidities, and prognosis of PTSD. To family members, VAMCs should point out the importance of family support and should encourage them to offer continuing instrumental and emotional support. VAMCs can establish multiple mechanisms for communication, such as hot lines, seminars for patients and their families, and educational fliers. PTSD patients and their family members should be encouraged to use the professional help available in VAMCs when they need it.

PTSD Veterans and Family Members

Both PTSD veterans and their family members should be aware of the contributing factors of post-discharge ambulatory care, readmission, and other relevant information regarding PTSD. They should be encouraged to communicate with VAMC in order to make better use of the health services available in VAMCs and the contracted local healthcare providers. PTSD veterans and their families should exchange information and extend social networks to obtain more support by organizing self-help groups.

Family members should pay attention to the social order in their communities. If social order is deteriorating and not conducive to the well-being of the people, the condition of PTSD veterans will be adversely affected. Developing a peaceful and healthy community could reduce the agitation of PTSD symptoms and help veterans to recovery from PTSD.

Study Limitations

Limitation of Generalizablity

The study sample is composed solely of veterans with PTSD who have sought care from VAMCs in VISN 6. The generalizability of the study findings is, therefore, limited to the specific patient subgroup contacted in the mid-Atlantic region. As indicated by the DVA (1998), veterans in VISN 6 have lower scores on both physical and mental measures, and veterans in VISN 6 are sicker. The sample did not cover the veterans with PTSD who had not come to VAMCs for care. The results of this study, therefore, can be generalized only to veterans with PTSD who sought care in the VISN6.

Limitation of Lack of Control Groups

The second limitation is the lack of a contemporary control group in the study years. Although the sample in 1994 may serve as a comparison group for the 1998 sample, we can compare only the effects pre- and post- intervention of the implementation of service lines to veterans with PTSD. Without a contemporary control group, it is hard to examine the effects of service lines implementation in VAMCs.

Limitation of Research Design

The third limitation is the cross-sectional study design. A longitudinal study design is preferable when assessing the effects of predisposing, enabling, and need factors on post-discharge ambulatory care and readmission. Because only 131 veterans were post-discharge ambulatory care users and 65 veterans were readmitted over both years, panel analysis of a small sample size is not feasible.

Limitation of Administrative Data

The fourth limitation is related to the nature of the administrative data. There are no identifiable individual functional status measurements at either admission or discharge; therefore, we are unable to measure functional health outcomes.

Another pitfall is the lack of information on etiologies, such as combat exposure, length of service period, and branch of the Armed Forces, which prevents us from identifying the underlying causes of poor healthcare outcomes. Furthermore, the information gathered to measure social networks is limited to the number of dependents. Other social support networks and functional social support are not identified. This further limits the study in examining the effect of social support on health care outcomes.

Limitation of Severity of Comorbidity

The fifth limitation is the severity scores assigned to comorbidities, which are derived from the administration data. No severity indicators or measurements for PTSD were available in either PTF or OPC. The study has to rely on the experts' opinions. These scores serve as proxy measures of the severity of comorbidities.

Limitation of the Variable of Low Income

The sixth limitation is the use of the ordinal variable of "means test" as a rough continuous variable. This may have caused underestimation of the standard error introduced in the model. If income or other comparable measures were available, the predictive power of income would be accentuated.

Limitation of Lack of Interaction

The last limitation is the lack of detection of the effects of the statistical interactions among independent variables on the dependent variable. In this study, the main effect of each independent variable on the dependent variable is the primary concern. The effects of statistical interactions should be assessed in the future.

Recommendation for Future Research on PTSD

PTSD is a newly validated mental disorder; very few studies discuss readmission of veterans with PTSD and its determinants (Bodewyns et al., 1991; Brown et al., 1995; Perconte et al., 1989; Williams et al., 1998). This study has attempted to use the "health behavioral model" to organize a theoretical framework. Structural equation modeling was undertaken to evaluate the effects of exogenous constructs/variables on post-discharge ambulatory care. At the same time, survival analysis was performed to assess the influence of independent variables on a binary dependent variable, readmission. Several recommendations are proposed in term of theoretical specification, research design, and data collection.

Theoretical Model

The "health behavioral model" proposed by Andersen (1995) was used to guide the development of a theoretical model for this study. We have demonstrated the utility of this theoretical model in studying healthcare outcome (readmission). Future research should develop a more comprehensive theoretical framework that should extend Andersen's "health behavioral model" to include interaction terms among the predictor variables of health services use and outcomes.

Research Design

A longitudinal research design is preferable when assessing pre- and post-intervention. However, the sample size must be large enough to conduct such a study. Because PTSD is not highly prevalent among veterans in VISN 6, future studies of this kind should use national samples. If the sample size is large, multiple group analysis can be more effectively performed to tease out the confounding effects of many control variables. A control group should also be used in the study to detect the true intervention effect.

Data Collection

Although the VA has a sophisticated database, data on military services are not included in the VA database. A link to the DOD database to extract health records during service periods may help to obtain more details on the etiological, predisposing, and enabling factors.

In this study, the results of intraclass correlation analysis suggest that there is no need to conduct multi-level analysis. The results of SEM and survival analysis indicate that the attributes of social disintegration, substance-abuse-related crime rates, and adequacy of health resources measured at the county-level do influence both post-discharge ambulatory care and readmission. If the analysis were performed at the neighborhood level, the results of intraclass correlation analysis might make more sense. Primary data collection should focus on neighborhoods.

The variables of VAMC structure and process are not included in the study. For instance, the availability of special PTSD treatment programs, the number of operating beds, and the ratio of registered nurses to licensed practicing nurses may influence the utilization and outcome of PTSD veterans. Future studies should include these variables to examine their effects.

Also, the social network variable was limited to the number of dependents, and functional outcomes were not available to the study. Income status is a proxy of the continuous variable in this study. A primary data collection on the subjects and their family members would facilitate the precision, accuracy, and predictive power of the health behavioral model.

Conclusions

In this study, we found that contextual variables measured at the county level alone explain around 4% of the variation in the use of VA post-discharge ambulatory care. The full model, including both county- and individual-level predictor variables, explains 13.2% to 29.6% of the variation in use of post-discharge ambulatory care. The majority of the variation is explained by the individual-level variables, especially need for care factors in the model.

Readmission is mainly influenced by the individual-level variables. The variable "rape crime" is the only significant county-level variable for 1998. Among individual-level variables, post-discharge ambulatory care in medical and mental visits is able to reduce the risk of readmission for both years. Two variables, discharge to community and left VAMCs against medical advice, also reduce the risk of being readmitted in 1994. Those findings show the protective function of community care.

The improvement of the use of post-discharge ambulatory care and reduction of readmission rates from 1994 to 1998 indicate that the implementation of service lines did enhance veterans' use of post-discharge ambulatory care and reduce readmission rate for PTSD veterans in VISN 6.

The differences in racial groups and in discharge placement are revealed, but not those in gender (the sample size for female is too small). VAMCs should modify treatment modalities for PTSD veterans to achieve a better outcome.

An inverse relationship between prior use of inpatient services and use of post-discharge ambulatory care was uncovered. It suggests that early discharge may increase post-discharge ambulatory care. VAMCs should review the discharge policy to seek a balance point between reducing the length of inpatient stay and using post-discharge ambulatory care efficiently. Their aim should be to reduce social cost as well as the operating costs of VAMCs, and to improve their quality of care and patient satisfaction.

Non-VA outpatient visits after index discharge emerges as a significant and powerful contributing factor to readmission. VAMCs or the VA should reevaluate the expertise of their contracted healthcare providers and facilities, to provide better healthcare to PTSD veterans as well as to contain costs.

The county-level variables explain less variation than do the individual-level variables. Further specification of the neighborhoods and the VAMCs' structure and process variables in the behavioral model studied is needed to examine those variables' effects on utilization of ambulatory care.

Given the fact that veterans in VISN 6 are sicker than veterans nationally, the risk factors in use of post-discharge ambulatory care and readmission can be pinpointed to develop better healthcare policies in the VA. VAMCs in VISN 6 have demonstrated that the implementation of service lines benefits the well-being of PTSD veterans. The management strategies of service lines should be extended to the national level, to help more veterans.

The essence of structural equation modeling is not only finding the potential causal paths among the studied variables, but also simplifying the proposed model.

Confirmatory analysis offers measurement models for abstract concepts with appropriate indicators. Structural equation modeling provides causal paths among exogenous constructs and endogenous constructs. The deletion of insignificant paths reduces the complexity of the proposed model and the confounding effects generated from irrelevant variables.

The utility of the "health behavioral model" has been demonstrated in this study. The model identified factors contributing to post-discharge ambulatory care and readmission. The findings show that appropriate health promotion policies or strategies should stress, in order of importance: need for care, enabling, environmental, and predisposing factors. A risk adjustment system can be developed based on the findings to improve the use of VA post-discharge ambulatory care and reduce readmission for veterans with PTSD. The "health behavioral model" can effectively extend its application to studying the determinants of utilization as well as outcomes.

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APPENDICIES

Appendix 1. Severity Index for PTSD

The literature shows that PTSD has associated comorbidities from among both mental and physical disorders. Mental comorbidities for PTSD include affective disorder, agoraphobia, antisocial personality disorder, alcohol abuse or dependence, anxiety disorders, conduct disorders, depressive disorders, dysthymia, mania, obsessive-compulsive disorder, panic disorders, phobic disorders, schizophrenia, sleeping disorder, and somatization. Physical comorbidities include cardiovascular, circulatory, gastrointestinal, respiratory, and musculoskeletal and neurological symptoms. Infectious diseases and reproductive system complaints are also found among PTSD patients.

The experts from a local vet center have been consulted to confirm the comorbidities that were found the literature. The following are identified as common mental comorbidities for PTSD veterans:

1. Affective disorder
2. Alcohol abuse or dependence
3. Antisocial personality disorder
4. Anxiety disorders
5. Depressive disorders
6. Dysthymia
7. Panic disorders
8. Substance abuse or dependence.

The confirmed physical comorbidities are as follows:

1. Cardiovascular system

2. Gastrointestinal system
3. Musculoskeletal system
4. Reproductive system
5. Infectious diseases.

A mental comorbidity severity measure can be developed by the following steps:

1. The diagnoses that belong to DRG 427 (PTSD) are excluded, since they can be further specifications of PTSD (Elixhauser et al. 1998).
2. The LOS and the number of mental outpatient visits for each confirmed mental comorbidity are searched for on the VA database, on VISN 6, both FY1994 and FY 1998. LOS for each confirmed comorbidity (ICD-9 code) / total LOS for each confirmed comorbidity is a primary weight. The number of mental outpatient visits for each confirmed comorbidity / total number of mental outpatient visits for each confirmed comorbidity is the secondary weight. The severity of a confirmed comorbidity = primary weight (PW)* 0.75 + secondary weight (SW)* 0.25. If a veteran has more one confirmed comorbidity, the primary weight will be composed by ($PW1 + \ldots + PW_i$)* 0.75.

Severity for physical comorbidity is illustrated follows:

All physical comorbidities are ranked according to the vital organ or system affected: cardiovascular = 5, gastrointestinal = 4, musculoskeletal = 3, infectious diseases = 2, and reproductive = 1. If a patient has more than one physical comorbidities, the average will be used for the severity of physical cormorbidity.

Appendix 2. Intercorrelation among 1994 Study Variables (Pearson's Correlation)

Label	AFMED	AFMEN	AFPTSD	AFSOC	VIO	PROP	SA	PSYMD
GAP								
AFMED	1.000							
AFMEN	0.535**	1.000						
AFPTSD	0.332**	0.482**	1.000					
AFSOC	0.251**	0.309**	0.305**	1.000				
VIO	0.022	0.008	0.015	0.082**	1.000			
PROP	0.001	0.028	0.090**	0.113**	0.820**	1.000		
SA	0.156**	0.105**	0.068*	0.040	0.361**	0.274**	1.000	
PSYMD	0.028	0.063*	0.033	0.045	0.319**	0.491**	0.158**	1.000
PCHO	-0.008	0.048	0.012	0.008	0.255**	0.278**	0.101**	0.306**
SOC	-0.005	0.052*	-0.022	0.026	0.354**	0.436**	0.128**	0.605**
OTHMD	0.016	0.049	0.003	0.023	0.407**	0.554**	0.253**	0.852**
BED	0.004	0.022	-0.066*	-0.014	0.369**	0.405**	0.247**	0.464**
AGE	0.183**	-0.002	-0.011	0.028	-0.036	-0.094**	0.019	-0.040
SOCNW	0.024	0.076**	0.013	0.003	0.000	-0.026	0.016	-0.027
DIST	0.171**	0.188**	0.133**	0.089**	0.097**	0.208**	0.178**	0.227**
MEAN	0.006	-0.023	-0.029	0.012	0.003	-0.008	-0.035	-0.006
SCPER	0.065*	0.021	-0.007	-0.051	-0.003	0.006	-0.021	0.012
NMHCO	0.019	0.079**	0.009	0.036	0.000	-0.024	0.001	0.029
MHCOS	0.016	0.086**	0.007	0.023	0.040	0.001	0.051	0.036
NPHCO	0.213**	0.006	-0.014	0.013	0.013	-0.050	0.035	-0.014
PHCOS	0.181**	0.008	-0.017	0.022	0.004	-0.051	0.027	-0.006
PTSDE	0.125**	0.187**	0.454**	0.121**	-0.003	0.092**	0.054*	0.043
OMHE	0.235**	0.381**	0.180**	0.073**	0.003	0.013	0.091**	0.033
PDLOS	0.022	0.023	0.079**	-0.030	0.058*	0.013	0.105**	0.009
OMHLOS	0.026	0.022	0.025	0.010	0.094**	0.043	0.177**	0.060*
PHE	0.434**	0.231**	0.128**	0.108**	-0.009	0.000	0.142**	0.014
PHLOS	0.117**	-0.018	0.036	-0.038	0.031	-0.032	0.138**	-0.030
PNVAO	-0.034	-0.075**	-0.056*	-0.020	-0.091**	-0.062*	-0.168**	0.023
LNVAO	0.014	0.008	0.002	0.013	-0.031	-0.027	-0.049	0.003
PNVAI	0.055*	0.009	-0.002	0.024	-0.038	0.008	-0.047	0.012

Note: AFMED: Numbers of post-discharge medical visit; AFMEN: Numbers of post-discharge mental health visit; AFPTSD: Numbers of post-discharge PTSD visit; AFSOC: Numbers of post-discharge social work visit; AGE: Age; BED: Hospital bed to population ratio; DIST: Reciprocal of the distance to admitted VAMC; GAP: Survival time; LNVAO: Numbers of non-VA outpatient visit after index admission; MEAN: Low-income status; MHCOS: Severity of mental comorbidity; NMHCO: Numbers of mental comorbidities; NPHCO: Numbers of physical comorbidities; OMHE: Numbers of mental health visit in the last year; OMHLOS: LOS of othe mental disorders in the last year; OTHMD: Other physician to population ratio; PCHO: Psychologist to population ratio; PDLOS: LOS of PTSD in the last year; PHCOS: Severity of physical comorbidity; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PROP: Property crime rates; PSYMD: Psychiatrist to population ratio; SA: Substance-abuse-related crime rates; PTSDE: Numbers of PTSD visit in the last year; SCPER: Percentage of service-connected disability; SOC: Social worker to population ratio; SOCNW: Size of a social network; VIO: Violent crime rates.

Appendix 2 (continued). Intercorrelation among 1994 Study Variables (Pearson's Correlation)

Label	PCHO	SOC	OTHMD	BED	AGE	SOCNW	DIST	MEAN
PCHO	1.000							
SOC	0.783**	1.000						
OTHMD	0.272**	0.589**	1.000					
BED	0.525**	0.732**	0.644**	1.000				
AGE	0.007	-0.032	-0.077**	-0.058*	1.000			
SOCNW	-0.015	-0.026	-0.038	-0.028	-0.091**	1.000		
DIST	0.064*	0.230**	0.254**	0.168**	-0.017	0.017	1.000	
MEAN	0.012	0.028	-0.021	0.021	0.033	-0.294**	0.019	1.000
SCPER	0.017	0.009	-0.010	-0.001	0.178**	-0.307**	-0.049	0.144**
NMHCO	-0.010	0.030	0.057*	0.030	-0.049	0.057*	0.109**	-0.018
MHCOS	-0.011	0.019	0.054*	0.024	-0.070**	0.092**	0.123**	-0.031
NPHCO	0.010	0.000	-0.046	-0.022	0.268**	-0.067*	0.015	0.031
PHCOS	0.004	0.012	-0.035	-0.016	0.230**	-0.059*	0.000	0.014
PTSDE	-0.030	-0.030	-0.005	-0.071**	0.054*	-0.074**	0.127**	0.055*
OMHE	0.021	0.030	0.013	-0.004	0.125**	-0.104**	0.151**	0.087**
PDLOS	-0.015	-0.031	-0.009	-0.032	-0.027	-0.018	0.036	0.002
OMHLOS	-0.005	-0.007	0.029	-0.016	-0.044	-0.015	0.022	0.009
PHE	0.020	0.013	0.021	-0.003	0.240**	-0.123**	0.188**	0.088**
PHLOS	-0.043	-0.094**	-0.069**	-0.081**	0.144**	-0.014	0.035	0.006
PNVAO	-0.043	-0.009	-0.001	-0.020	-0.039	-0.065*	-0.103**	0.030
LNVAO	-0.003	-0.008	-0.008	-0.021	0.002	-0.024	-0.061*	0.000
PNVAI	0.038	0.026	0.007	-0.014	0.016	-0.012	0.016	0.011

Note: AGE: Age; BED: Hospital bed to population ratio; DIST: Reciprocal of the distance to admitted VAMC; LNVAO: Numbers of non-VA outpatient visit after index admission; MEAN: Low-income status; MHCOS: Severity of mental comorbidity; NMHCO: Numbers of mental comorbidities; NPHCO: Numbers of physical comorbidities; OMHE: Numbers of mental health visit in the last year; OMHLOS: LOS of othe mental disorders in the last year; OTHMD: Other physician to population ratio; PCHO: Psychologist to population ratio; PDLOS: LOS of PTSD in the last year; PHCOS: Severity of physical comorbidity; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PSYMD: Psychiatrist to population ratio; PTSDE: Numbers of PTSD visit in the last year; SCPER: Percentage of service-connected disability; SOCNW: Size of a social network.

Appendix 2 (continued). Intercorrelation among 1994 Study Variables (Pearson's Correlation)

Label	SCPER	NMHCO	MHCOS	NPHCO	PHCOS	PTSDE	OMHE	PDLOS
SCPER	1.000							
NMHCO	-0.047	1.000						
MHCOS	-0.064*	0.887**	1.000					
NPHCO	0.133**	-0.026	-0.012	1.000				
PHCOS	0.129**	-0.014	-0.001	0.926**	1.000			
PTSDE	0.171**	-0.033	-0.047	0.024	0.021	1.000		
OMHE	0.273**	0.027	0.004	0.078*	0.078*	0.508**	1.000	
PDLOS	0.118**	0.033	0.069**	0.027	0.044	0.102**	0.122**	1.000
OMHLOS	0.031	-0.023	0.007	0.007	-0.004	-0.010	0.138**	0.155**
PHE	0.255**	0.003	-0.029	0.222**	0.208**	0.322**	0.584**	0.094**
PHLOS	0.064*	-0.057*	-0.035	0.123**	0.096**	0.035	0.045	0.111**
PNVAO	0.125**	-0.005	-0.014	-0.018	-0.022	-0.002	-0.036	-0.042
LNVAO	0.053*	0.007	-0.001	-0.012	0.003	0.008	0.015	-0.024
PNVAI	0.090**	0.001	-0.004	0.030	0.036	0.008	-0.008	-0.016

Note: LNVAO: Numbers of non-VA outpatient visit after index admission; MEAN: Low-income status; MHCOS: Severity of mental comorbidity; NMHCO: Numbers of mental comorbidities; NPHCO: Numbers of physical comorbidities; OMHE: Numbers of mental health visit in the last year; OMHLOS: LOS of othe mental disorders in the last year; PDLOS: LOS of PTSD in the last year; PHCOS: Severity of physical comorbidity; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PTSDE: Numbers of PTSD visit in the last year; SCPER: Percentage of service-connected disability.

Appendix 2 (continued). Intercorrelation among 1994 Study Variables (Pearson's Correlation)

Label	OMHLOS	PHE	PHLOS	PNVAO	LNVAO	PNVAI
OMHLOS	1.000					
PHE	0.127**	1.000				
PHLOS	0.188**	0.274**	1.000			
PNVAO	-0.065*	-0.016	-0.051	1.000		
LNVAO	-0.025	0.027	-0.031	0.229**	1.000	
PNVAI	-0.025	0.091**	-0.020	0.104**	0.132**	1.000

Note: LNVAO: Numbers of non-VA outpatient visit after index admission; OMHLOS: LOS of other mental disorders in the last year; PDLOS: LOS of PTSD in the last year; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission.

Appendix 3. Intercorrelation among 1998 Study Variables (Pearson's Correlation)

Label	AFMED	AFMEN	AFPTSD	AFSOC	VIO	PROP	SA	PSYMD
GAP								
AFMED	1.000							
AFMEN	0.553**	1.000						
AFPTSD	0.278**	0.369**	1.000					
AFSOC	0.353**	0.465**	0.304**	1.000				
VIO	-0.010	0.023	-0.014	-0.007	1.000			
PROP	0.016	0.055*	-0.020	0.059*	0.734**	1.000		
SA	0.068**	0.064*	0.030	0.073**	0.241**	0.294**	1.000	
PSYMD	-0.008	0.031	0.021	0.083**	0.260**	0.430**	0.158**	1.000
PCHO	-0.019	-0.022	-0.087**	-0.040	0.184**	0.166**	0.080**	0.200**
SOC	-0.004	-0.010	-0.076**	-0.011	0.220**	0.262**	0.122**	0.504**
OTHMD	-0.008	0.031	-0.001	0.077**	0.415**	0.556**	0.308**	0.848**
BED	0.016	-0.003	-0.062*	0.007	0.385**	0.345**	0.311**	0.418**
AGE	0.105**	-0.058*	0.006	0.009	-0.050	-0.095**	-0.088**	-0.050
SOCNW	-0.023	0.062*	-0.031	-0.005	0.003	-0.017	-0.009	-0.033
DIST	0.158**	0.136**	0.005	0.109**	0.049	0.277**	0.201**	0.181**
MEAN	0.057*	-0.014	-0.033	0.032	-0.011	0.000	-0.028	-0.022
SCPER	0.037	-0.092**	0.038	-0.057*	-0.061*	-0.077**	-0.095**	-0.020
NMHCO	0.001	0.016	-0.083**	-0.018	0.009	0.038	0.042	-0.067**
MHCOS	-0.009	0.035	-0.084**	-0.002	0.013	0.033	0.034	-0.063*
NPHCO	0.178**	-0.023	0.034	-0.020	-0.035	-0.080**	-0.094**	-0.038
PHCOS	0.156**	-0.015	0.039	-0.007	-0.012	-0.045	-0.077**	-0.015
PTSDE	0.119**	0.080**	0.468**	0.073**	0.022	0.039	0.051*	-0.006
OMHE	0.233**	0.339**	0.157**	0.107**	0.008	0.055*	0.094**	0.003
PDLOS	-0.036	0.023	0.122**	0.000	0.055*	0.057*	0.030	-0.030
OMHLOS	-0.017	0.025	-0.068**	-0.020	0.064*	0.087**	0.074**	0.024
PHE	0.382**	0.142**	0.105**	0.068**	-0.068**	-0.006	0.057*	-0.023
PHLOS	0.115**	-0.036	-0.032	-0.019	-0.031	-0.016	0.000	0.005
PNVAO	-0.031	-0.062*	-0.046	-0.016	-0.057*	-0.050	-0.084**	-0.014
LNVAO	0.003	-0.018	0.000	-0.007	-0.028	-0.036	-0.041	-0.027
PNVAI	-0.022	-0.038	-0.052*	0.003	0.002	-0.015	-0.006	-0.008

Note: AFMED: Numbers of post-discharge medical visit; AFMEN: Numbers of post-discharge mental health visit; AFPTSD: Numbers of post-discharge PTSD visit; AFSOC: Numbers of post-discharge social work visit; AGE: Age; BED: Hospital bed to population ratio; DIST: Reciprocal of the distance to admitted VAMC; GAP: Survival time; LNVAO: Numbers of non-VA outpatient visit after index admission; MEAN: Low-income status; MHCOS: Severity of mental comorbidity; NMHCO: Numbers of mental comorbidities; NPHCO: Numbers of physical comorbidities; OMHE: Numbers of mental health visit in the last year; OMHLOS: LOS of othe mental disorders in the last year; OTHMD: Other physician to population ratio; PCHO: Psychologist to population ratio; PDLOS: LOS of PTSD in the last year; PHCOS: Severity of physical comorbidity; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PROP: Property crime rates; PSYMD: Psychiatrist to population ratio; SA: Substance-abuse-related crime rates; PTSDE: Numbers of PTSD visit in the last year; SCPER: Percentage of service-connected disability; SOC: Social worker to population ratio; SOCNW: Size of a social network; VIO: Violent crime rates.

Appendix 3 (continued). Intercorrelation among 1998 Study Variables (Pearson's Correlation)

Label	PCHO	SOC	OTHMD	BED	AGE	SOCNW	DIST	MEAN
PCHO	1.000							
SOC	0.790**	1.000						
OTHMD	0.163**	0.465**	1.000					
BED	0.498**	0.617**	0.607**	1.000				
AGE	0.011	0.018	-0.053*	0.012	1.000			
SOCNW	-0.017	-0.025	-0.029	-0.046	-0.072**	1.000		
DIST	0.022	0.122**	0.211**	0.094**	-0.038	0.022	1.000	
MEAN	0.017	-0.012	-0.032	0.022	0.043	-0.186**	0.016	1.000
SCPER	-0.034	-0.044	-0.040	-0.028	0.144**	-0.357**	-0.071**	0.195**
NMHCO	-0.028	-0.046	-0.040	-0.023	-0.036	0.011	0.125**	-0.030
MHCOS	-0.027	-0.041	-0.037	-0.008	-0.057*	0.009	0.110**	-0.030
NPHCO	0.018	0.003	-0.042	-0.010	0.330**	-0.042	-0.041	0.032
PHCOS	0.025	0.017	-0.028	0.001	0.280**	-0.039	-0.021	0.030
PTSDE	-0.056**	-0.068**	-0.024	-0.063*	0.024	-0.038	0.038	0.062*
OMHE	0.006	0.019	0.016	0.012	0.007	-0.020	0.177**	0.103**
PDLOS	-0.041	-0.052*	0.016	-0.018	-0.053*	-0.065*	-0.027	0.068**
OMHLOS	0.030	0.023	0.031	0.025	-0.048	-0.005	0.097**	0.012
PHE	-0.017	-0.011	-0.034	-0.027	0.176**	-0.089**	0.155**	0.134**
PHLOS	-0.038	-0.035	-0.002	-0.028	0.122**	-0.062*	0.048	0.054*
PNVAO	-0.035	-0.040	-0.021	0.008	0.045	-0.057*	-0.074**	0.039
LNVAO	-0.029	-0.044	-0.036	-0.024	-0.014	-0.031	-0.044	-0.009
PNVAI	0.042	0.025	-0.027	0.001	0.136**	-0.023	-0.007	0.019

Note: AGE: Age; BED: Hospital bed to population ratio; DIST: Reciprocal of the distance to admitted VAMC; LNVAO: Numbers of non-VA outpatient visit after index admission; MEAN: Low-income status; MHCOS: Severity of mental comorbidity; NMHCO: Numbers of mental comorbidities; NPHCO: Numbers of physical comorbidities; OMHE: Numbers of mental health visit in the last year; OMHLOS: LOS of othe mental disorders in the last year; OTHMD: Other physician to population ratio; PCHO: Psychologist to population ratio; PDLOS: LOS of PTSD in the last year; PHCOS: Severity of physical comorbidity; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PSYMD: Psychiatrist to population ratio; PTSDE: Numbers of PTSD visit in the last year; SCPER: Percentage of service-connected disability; SOCNW: Size of a social network.

Appendix 3 (continued). Intercorrelation among 1998 Study Variables (Pearson's Correlation)

Label	SCPER	NMHCO	MHCOS	NPHCO	PHCOS	PTSDE	OMHE	PDLOS
SCPER	1.000							
NMHCO	-0.038	1.000						
MHCOS	-0.049	0.870**	1.000					
NPHCO	0.105**	-0.062*	-0.086**	1.000				
PHCOS	0.090**	-0.057*	-0.073**	0.905**	1.000			
PTSDE	0.135**	-0.084**	-0.077**	0.061*	0.056*	1.000		
OMHE	0.099**	0.031	0.023	0.029	0.035	0.360**	1.000	
PDLOS	0.166**	-0.044	-0.063*	-0.015	-0.002	0.264**	0.227**	1.000
OMHLOS	-0.073**	0.085**	0.078**	-0.071**	-0.029	-0.032	0.272**	0.060*
PHE	0.203**	0.001	-0.010	0.204**	0.186**	0.279**	0.592**	0.178**
PHLOS	0.045	-0.023	-0.027	0.139**	0.123**	0.031	0.062*	-0.004
PNVAO	0.146**	0.040	0.007	0.091**	0.079**	-0.019	-0.004	-0.013
LNVAO	0.085**	0.007	0.010	-0.008	-0.009	-0.024	-0.015	-0.001
PNVAI	0.057**	0.010	0.019	0.014	0.016	-0.051*	-0.008	-0.020

Note: LNVAO: Numbers of non-VA outpatient visit after index admission; MEAN: Low-income status; MHCOS: Severity of mental comorbidity; NMHCO: Numbers of mental comorbidities; NPHCO: Numbers of physical comorbidities; OMHE: Numbers of mental health visit in the last year; OMHLOS: LOS of othe mental disorders in the last year; PDLOS: LOS of PTSD in the last year; PHCOS: Severity of physical comorbidity; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PTSDE: Numbers of PTSD visit in the last year; SCPER: Percentage of service-connected disability.

Appendix 3 (continued). Intercorrelation among 1998 Study Variables (Pearson's Correlation)

Label	OMHLOS	PHE	PHLOS	PNVAO	LNVAO	PNVAI
OMHLOS	1.000					
PHE	0.159**	1.000				
PHLOS	0.044	0.318**	1.000			
PNVAO	-0.017	0.080**	0.027	1.000		
LNVAO	-0.020	-0.001	0.025	0.172**	1.000	
PNVAI	0.019	0.045	0.016	0.017	-0.011	1.000

Note: LNVAO: Numbers of non-VA outpatient visit after index admission; OMHLOS: LOS of other mental disorders in the last year; PDLOS: LOS of PTSD in the last year; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission.

Appendix 4. Results of Normality Test of the County-level Data in 1994 (n=253) and 1998 (n=272)

Construct (Variable)	Label	Year	Skewness		Kurtosis		Kolmogorov-Smirnov		Violation of Normality	Transfor-mation Methods
			Statistic	Std. Error	Statistic	Std. Error	Statistic	p		
Social Disintegration										
Rape Rate (x_1)	RAPE	94	.753	.153	-.001	.305	**1.533**	**.018***	X	NA
		98	.842	.148	.788	.294	**1.473**	**.026***	X	NA
Murder Rate (x_2)	MUR	94	2.349	.153	10.976	.305	**2.699**	**.000****	X	Log(1+var.)
		98	2.811	.148	14.817	.294	**2.929**	**.000****	X	Log(1+var.)
Aggressive Assault Rate (x_3)	ASLT	94	1.709	.153	3.013	.305	**2.544**	**.000****	X	Log(1+var.)
		98	1.655	.148	3.460	.294	**2.416**	**.000****	X	Log(1+var.)
Weapons Violation Rate (x_4)	WEP	94	6.742	.153	76.314	.305	**2.066**	**.000****	X	Log(1+var.)
		98	1.102	.148	1.463	.294	**2.084**	**.000****	X	Log(1+var.)
Property Crime Rate (x_5)	PROP	94	3.615	.153	18.174	.305	**3.770**	**.000****	X	Log(1+var.)
		98	2.723	.148	10.480	.294	**3.057**	**.000****	X	Log(1+var.)

Note: *: $p < .05$; **: $p < .01$.

Appendix 4 (continued). Results of Normality Test of the County-level Data in 1994 (n=253) and 1998 (n=272)

Construct (Variable)	**Label**	**Year**	**Skewness**		**Kurtosis**		**Kolmogorov-Smirnov**		**Violation of Normality**	**Transfor-mation Methods**
			Statistic	Std. Error	Statistic	Std. Error	Statistic	p		
Substance-Abuse-Related Crime Rate (x_6)	SA	94	1.002	.153	3.306	.305	.848	.469	X	Log(1+var.)
		98	1.446	.148	5.051	.294	**1.595**	**.012***	X	Log(1+var.)
Adequacy of Health Resources										
Psychiatrist-population Ratio (x_7)	PSYMD	94	4.641	.153	30.371	.305	**4.743**	**.000****	X	Log(1+var.)
		98	4.613	.148	28.148	.294	**4.779**	**.000****	X	Log(1+var.)
Psychologist-population Ratio (x_8)	PCHO	94	7.105	.153	68.538	.305	**5.928**	**.000****	X	Log(1+var.)
		98	6.041	.148	51.376	.294	**5.969**	**.000****	X	Log(1+var.)
Social Worker-population Ratio (x_9)	SOC	94	2.738	.153	9.865	.305	**3.716**	**.000****	X	Log(1+var.)
		98	5.755	.148	51.790	.294	**4.597**	**.000****	X	Log(1+var.)

Note: *: p< .05; **: p < .01.

Appendix 4 (continued). Results of Normality Test of the County-level Data in 1994 (n=253) and 1998 (n=272)

Construct (Variable)	**Label**	**Year**	**Skewness**		**Kurtosis**		**Kolmogorov-Smirnov**		**Violation of Normality**	**Transfor-mation Methods**
			Statistic	Std. Error	Statistic	Std. Error	Statistic	p		
Other MD-population Ratio (x_{10})	OTHMD	94	2.845	.153	11.088	.305	**2.810**	**.000****	X	Log(1+var.)
		98	2.697	.148	9.460	.294	**3.190**	**.000****	X	Log(1+var.)
BED-population Ratio(x_{11})	BED	94	2.791	.153	16.100	.305	**2.322**	**.000****	X	Log(1+var.)
		98	3.059	.148	18.137	.294	**2.383**	**.000****	X	Log(1+var.)

Note: **: $p < .01$.

Appendix 5. Normality Tests of the Veteran-level Data in 1994 (n=1,420) and 1998 (n=1,517)

Construct (variable)	**Label**	**Year**	**Skewness**		**Kurtosis**		**Kolmogorov-Smirnov**		**Violation of Normality**	**Transformation Methods**
			Statistic	Std. Error	Statistic	Std. Error	Statistic	p		
Readmission										
Survival Time	GAP	94	.504	.065	-1.08	.130	**4.158**	**.000****	x	Log
		98	.337	.063	-1.016	.126	**3.035**	**.000****	x	Log
Post-discharge Ambulatory Care										
Number of Medical Health Visits (y1)	AFMED	94	5.279	.065	50.781	.130	**11.404**	**.000****	x	Log(1+Var)
		98	3.581	.063	19.139	.126	**10.570**	**.000****	x	Log(1+Var)
Number of Mental Health Visits (y2)	AFMEN	94	6.436	.065	53.507	.130	**13.851**	**.000****	x	Log(1+Var)
		98	6.781	.063	75.540	.126	**13.360**	**.000****	x	Log(1+Var)
Number of PTSD Visits (y3)	AFPTSD	94	8.549	.065	99.377	.130	**15.926**	**.000****	x	Log(1+Var)
		98	7.117	.063	62.779	.126	**15.225**	**.000****	x	Log(1+Var)

Note: **: $p < .01$.

Appendix 5 (continued). Normality Tests of the Veteran-level Data in 1994 (n=1,420) and 1998 (n=1,517)

Construct (variable)	**Label**	**Year**	**Skewness**		**Kurtosis**		**Kolmogorov-Smirnov**		**Violation of Normality**	**Transfor-mation Methods**
			Statistic	Std. Error	Statistic	Std. Error	Statistic	p		
Number of Social Work Visits (y4)	AFSOC	94	8.364	.065	90.576	.130	**17.488**	**.000****	x	Log(1+Var)
		98	14.875	.063	270.432	.126	**16.816**	**.000****	x	Log(1+Var)
Age										
Age (x12)	AGE	94	1.252	.065	3.502	.130	**8.610**	**.000****	x	Log
		98	.942	.063	2.785	.126	**8.072**	**.000****	x	Log
Social Networks										
Social Network size (x13)	SOCNW	94	4.738	.065	28.331	.130	**19.406**	**.000****	x	SQRT
		98	3.754	.063	15.321	.126	**19.657**	**.000****	x	SQRT
Access to Care										
Distance (x14)	DIST	94	7.515	.065	91.854	.130	**10.342**	**.000****	x	Log
		98	5.677	.063	59.602	.126	**9.600**	**.000****	x	Log

Note: **: $p < .01$; NA: Not applicable.

Appendix 5 (continued). Normality Tests of the Veteran-level Data in 1994 (n=1,420) and 1998 (n=1,517)

Construct (variable)	Label	Year	Skewness		Kurtosis		Kolmogorov-Smirnov		Violation of Normality	Transformation Methods
			Statistic	Std. Error	Statistic	Std. Error	Statistic	p		
Low-income Status@ (x15)	MEAN	94	-6.916	.065	45.900	.130	**20.223**	**.000****	x	NA
		98	-5.550	.063	28.841	.126	**17.778**	**.000****	x	NA
Percentage of Service-connected Disability (x16)	SCPER	94	.533	.065	-1.203	.130	**6.670**	**.000****	x	NA
		98	.294	.063	-1.451	.126	**6.660**	**.000****	x	NA
Resource Sharing Index (x17)	AC_INX	94	1.414	.065	1.830	.130	**4.863**	**.000****	x	Log(1+Var)
		98	1.627	.063	3.428	.126	**5.493**	**.000****	x	Log(1+Var)
Severity of Comorbidities										
Number of Mental Comorbidities (x18)	NMHCO	94	1.769	.065	3.880	.130	**15.922**	**.000****	x	SQRT
		98	1.986	.063	4.183	.126	**17.922**	**.000****	x	SQRT

Note: **: p < .01; NA: Not applicable.

Appendix 5 (continued). Normality Tests of the Veteran-level Data in 1994 (n=1,420) and 1998 (n=1,517)

Construct (variable)	**Label**	**Year**	**Skewness**		**Kurtosis**		**Kolmogorov-Smirnov**		**Violation of Normality**	**Transfor-mation Methods**
			Statistic	Std. Error	Statistic	Std. Error	Statistic	p		
Severity of Mental Comorbidity (x19)	MHCOS	94	1.909	.065	2.652	.130	**14.983**	**.000****	x	SQRT
		98	2.317	.063	4.303	.126	**17.033**	**.000****	x	SQRT
Number of Medical Comorbidities (x20)	NPHCO	94	1.265	.065	1.387	.130	**10.055**	**.000****	x	SQRT
		98	1.235	.063	1.232	.126	**9.388**	**.000****	x	SQRT
Severity of Medical Comordity (x21)	PHCOS	94	.135	.065	-1.768	.130	**11.744**	**.000****	x	NA
		98	-.102	.063	-1.775	.126	**10.848**	**.000****	x	NA
Prior Use of Mental Health Services										
Number of PTSD Visits (x22)	PTSDE	94	5.683	.065	42.109	.130	**15.484**	**.000****	x	Log(1+Var)
		98	5.606	.063	43.540	.126	**14.620**	**.000****	x	Log(1+Var)

Note: *: p < .5; **: p < .01; NA: Not applicable.

Appendix 5 (continued). Normality Tests of the Veteran-level Data in 1994 (n=1,420) and 1998 (n=1,517)

Construct (variable)	**Label**	**Year**	**Skewness**		**Kurtosis**		**Kolmogorov-Smirnov**		**Violation of Normality**	**Transfor-mation Methods**
			Statistic	Std. Error	Statistic	Std. Error	Statistic	p		
LOS of PTSD (x24)	PDLOS	94	11.709	.065	192.695	.130	**19.438**	**.000****	x	Log(1+Var)
		98	6.217	.063	70.114	.126	**15.540**	**.000****	x	Log(1+Var)
Number of Other Mental Health Visits (x23)	OMHE	94	4.854	.065	30.974	.130	**12.560**	**.000****	x	Log(1+Var)
		98	4.567	.063	28.544	.126	**12.451**	**.000****	x	Log(1+Var)
LOS of Other Mental disorders (x25)	OMHLOS	94	7.553	.065	74.966	.130	**18.413**	**.000****	x	Log(1+Var)
		98	7.566	.063	90.520	.126	**15.927**	**.000****	x	Log(1+Var)
Prior Use of Physical Health Services										
Number of Medical Health Visits (X26)	PHE	94	2.912	.065	15.227	.130	**8.977**	**.000****	x	SQRT
		98	2.770	.063	15.845	.126	**8.535**	**.000**	x	SQRT
LOS of Medical Problems (x27)	PHLOS	94	8.058	.065	77.946	.130	**18.910**	**.000****	x	Log(1+Var)
		98	18.223	.063	435.698	.126	**16.969**	**.000****	x	Log(1+Var)

Note: **: p < .01.

Appendix 5 (continued). Normality Tests of the Veteran-level Data in 1994 (n=1,420) and 1998 (n=1,517)

Construct (variable)	**Label**	**Year**	**Skewness**		**Kurtosis**		**Kolmogorov-Smirnov**		**Violation of Normality**	**Transfor-mation Methods**
			Statistic	Std. Error	Statistic	Std. Error	Statistic	p		
Control Variables										
@	PNVAO	94	14.589	.065	237.790	.130	**18.108**	**.000****	x	Log(1+Var)
		98	10.571	.063	148.792	.126	**18.996**	**.000****	x	Log(1+Var)
#	LNVAO	94	22.813	.065	574.978	.130	**19.130**	**.000****	x	Log(1+Var)
		98	32.499	.063	1161.795	.126	**19.747**	**.000****	x	Log(1+Var)
$	PNVAI	94	37.404	.065	1405.703	.130	**18.976**	**.000****	x	Log(1+Var)
		98	17.174	.063	302.466	.126	**19.807**	**.000****	x	Log(1+Var)

Note: **: $p < .01$; @: The number of non-VA outpatient visits before the index admission; #: The number of non-VA outpatient visits after the index discharge; $: Non-VA length of stay before the index admission.

Appendix 6. Intercorrelations among 1998 Study Variables (Pearson's Correlation)

Label	AFMED	AFMEN	AFPTSD	AFSOC	RAPE	MUR	ASLT	WEP	PROP	SA	PSYMD
AFMED	1.000										
AFMEN	0.553**	1.000									
AFPTSD	0.278**	0.315**	1.000								
AFSOC	0.333**	0.390**	0.233**	1.000							
RAPE	-0.058*	0.001	-0.061*	-0.011	1.000						
MUR	0.015	0.068**	-0.032	0.046	0.438**	1.000					
ASLT	-0.062*	-0.014	-0.033	-0.072**	0.606**	0.459**	1.000				
WEP	0.124**	0.121**	0.033	0.093**	0.359**	0.426**	0.267**	1.000			
PROP	0.016	0.055*	-0.021	0.033	0.724**	0.660**	0.623**	0.550**	1.000		
SA	0.068**	0.064*	0.019	0.048	0.252**	0.119**	0.079**	0.566**	0.294**	1.000	
PSYMD	-0.009	0.028	-0.016	0.048	0.367**	0.264**	0.300**	0.262**	0.522**	0.290**	1.000
PCHO	-0.011	-0.014	-0.118**	-0.013	0.359**	0.173**	0.228**	0.298**	0.345**	0.202**	0.383**
SOC	0.003	0.011	-0.100**	-0.006	0.350**	0.274**	0.280**	0.268**	0.400**	0.190**	0.614**
OTHMD	-0.008	0.031	-0.018	0.049	0.426**	0.258**	0.362**	0.289**	0.556**	0.308**	0.879**
BED	0.016	-0.003	-0.070**	0.008	0.329**	0.283**	0.315**	0.346**	0.345**	0.311**	0.518**
AGE	0.105**	-0.058*	-0.007	0.010	-0.074**	-0.025	-0.022	-0.083**	-0.095**	-0.088**	-0.084**
SOCNW	-0.019	0.065*	-0.034	-0.016	0.014	0.029	0.017	-0.004	-0.003	-0.008	-0.036
DIST	0.175**	0.145**	0.024	0.119**	0.128**	0.163**	-0.085**	0.337**	0.276**	0.215**	0.212**
AC_INX	0.219**	0.155**	0.072**	0.154**	-0.096**	-0.008	-0.252**	0.296**	0.004	0.174**	0.021
MEAN	0.057*	-0.014	-0.024	0.011	0.003	-0.016	-0.012	-0.022	0.000	-0.028	-0.018
SCPER	0.037	-0.092**	0.043	-0.034	-0.056*	-0.056*	-0.034	-0.077**	-0.077**	-0.095**	-0.036
NMHCO	0.006	0.019	-0.077**	0.015	0.016	0.036	-0.018	0.083**	0.038	0.040	-0.043
MHCOS	0.004	0.026	-0.086**	0.024	0.014	0.041	-0.020	0.077**	0.039	0.039	-0.039
NPHCO	0.178**	-0.023	0.028	-0.017	-0.018	-0.041	-0.009	-0.080**	-0.080**	-0.094**	-0.059*
PHCOS	0.156**	-0.015	0.042	-0.012	0.010	-0.011	0.006	-0.051*	-0.045	-0.077**	-0.040
OMHE	0.233**	0.339**	0.121	0.087**	-0.001	0.019	-0.042	0.131**	0.055*	0.094**	0.015
PHE	0.382**	0.142**	0.107**	0.107**	-0.052*	-0.030	-0.119**	0.091**	-0.006	0.057*	-0.020
PTSDE	0.098**	0.049	0.406**	0.048	0.005	0.018	0.005	0.054*	0.060*	0.051*	-0.005
PDLOS	-0.030	0.026	0.119**	0.006	0.048	-0.010	0.035	0.005	0.037	0.027	0.011
OMHLOS	-0.017	0.033	-0.069**	-0.002	0.048	0.045	0.015	0.104**	0.073**	0.072**	0.040
PHLOS	0.129**	-0.022	-0.027	-0.007	-0.066**	0.000	-0.045	-0.009	-0.004	-0.008	0.005
PNVAO	-0.022	-0.042	-0.052*	-0.014	-0.076**	-0.032	-0.073**	-0.003	-0.068**	-0.075**	-0.036
LNVAO	0.005	-0.009	0.012	-0.006	-0.049	-0.023	-0.024	-0.023	-0.053*	-0.021	-0.019
PNVAI	-0.029	-0.053*	-0.074**	0.019	-0.016	0.002	-0.014	0.004	-0.039	-0.009	-0.036

Note: AC_INX: Resource sharing index; AFMED: Numbers of post-discharge medical visit; AFMEN: Numbers of post-discharge mental health visit; AFPTSD: Numbers of post-discharge PTSD visit; AFSOC: Numbers of post-discharge social work visit; AGE: Age; ASLT: Aggressive assault crime rate; BED: Hospital bed to population ratio; DIST: Distance to admitted VAMC; LNVAO: Numbers of non-VA outpatient visit after index admission; MEAN: Low-income status; MHCOS: Severity of mental comorbidity; MUR: Murder crime rates; NMHCO: Numbers of mental comorbidities; NPHCO: Numbers of physical comorbidities; OMHE: Numbers of mental health visit in the last year; OMHLOS: LOS of other mental disorders in the last year; OTHMD: Other physician to population ratio; PCHO: Psychologist to population ratio; PDLOS: LOS of PTSD in the last year; PHCOS: Severity of physical comorbidity; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PROP: Property crime rates; PSYMD: Psychiatrist to population ratio; SA: Substance-abuse-related crime rates; PTSDE: Numbers of PTSD visit in the last year; RAPE: Rape crime rates; SCPER: Percentage of service-connected disability; SOC: Social worker to population ratio; SOCNW: Size of a social network; WEP: Weapon violation crime rates.

Appendix 6 (continued). Intercorrelations among 1998 Study Variables (Pearson's Correlation)

Label	PCHO	SOC	OTHMD	BED	AGE	SOCNW	DIST	AC_INX	MEAN	SCPER
PCHO	1.000									
SOC	0.746**	1.000								
OTHMD	0.310**	0.598**	1.000							
BED	0.565**	0.746**	0.607**	1.000						
AGE	-0.022	0.000	-0.053	0.012	1.000					
SOCNW	-0.010	-0.026	-0.016	-0.032	-0.046	1.000				
DIST	0.120**	0.178**	0.202**	0.089**	-0.039	0.031	1.000			
AC_INX	-0.024	0.062*	0.056*	0.126**	0.010	-0.001	0.510**	1.000		
MEAN	0.022	0.009	-0.032	0.022	0.043	-0.209**	0.012	0.021	1.000	
SCPER	-0.070**	-0.063*	-0.040	-0.028	0.144**	-0.368**	-0.072**	-0.029	0.195**	1.000
NMHCO	-0.010	-0.031	-0.039	-0.020	-0.030	0.012	0.135**	0.049	-0.030	-0.038
MHCOS	-0.011	-0.026	-0.036	-0.010	-0.039	0.013	0.137**	0.048	-0.033	-0.048
NPHCO	-0.005	-0.019	-0.042	-0.010	0.330**	-0.045	-0.039	0.008	0.032	0.105**
PHCOS	0.001	0.000	-0.028	0.001	0.280**	-0.043	-0.018	0.023	0.030	0.090**
OMHE	0.025	0.035	0.016	0.012	0.007	-0.016	0.192**	0.228**	0.103**	0.099**
PHE	-0.023	-0.009	-0.034	-0.027	0.176**	-0.085**	0.176**	0.248**	0.134**	0.203**
PTSDE	-0.084**	-0.088**	-0.021	-0.068**	0.012	-0.027	0.041	0.057*	0.058*	0.112**
PDLOS	-0.017	-0.015	0.019	0.000	-0.055*	-0.067**	-0.060*	-0.035	0.070**	0.166**
OMHLOS	0.046	0.037	0.037	0.031	-0.052*	0.003	0.112**	0.079**	0.023	-0.067**
PHLOS	-0.039	-0.021	-0.001	-0.022	0.126**	-0.061*	0.086**	0.104**	0.057*	0.051*
PNVAO	-0.039	-0.028	-0.035	0.013	0.022	-0.034	-0.070**	0.056*	0.037	0.110**
LNVAO	-0.025	-0.040	-0.033	-0.010	-0.031	-0.028	-0.040	-0.003	-0.044	0.047
PNVAI	0.000	-0.006	-0.033	-0.006	0.072**	-0.035	-0.022	0.016	0.024	0.043

Note: AC_INX: Resource sharing index; AGE: Age; BED: Hospital bed to population ratio; DIST: Distance to admitted VAMC; LNVAO: Numbers of non-VA outpatient visit after index admission; MEAN: Low-income status; MHCOS: Severity of mental comorbidity; NMHCO: Numbers of mental comorbidities; NPHCO: Numbers of physical comorbidities; OMHE: Numbers of mental health visit in the last year; OMHLOS: LOS of other mental disorders in the last year; OTHMD: Other physician to population ratio; PCHO: Psychologist to population ratio; PDLOS: LOS of PTSD in the last year; PHCOS: Severity of physical comorbidity; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PTSDE: Numbers of PTSD visit in the last year; SCPER: Percentage of service-connected disability; SOC: Social worker to population ratio; SOCNW: Size of a social network.

Appendix 6 (continued). Intercorrelations among 1998 Study Variables (Pearson's Correlation)

Label	NMHCO	MHCOS	NPHCO	PHCOS	OMHE	PHE	PTSDE	PDLOS	OMHLOS	PHLOS
NMHCO	1.000									
MHCOS	0.968**	1.000								
NPHCO	-0.057*	-0.069**	1.000							
PHCOS	-0.052*	-0.060*	0.905**	1.000						
OMHE	0.035	0.032	0.029	0.035	1.000					
PHE	0.005	0.001	0.204**	0.186**	0.592**	1.000				
PTSDE	-0.087**	-0.090**	0.055*	0.056*	0.345**	0.267**	1.000			
PDLOS	-0.065*	-0.077**	-0.021	-0.004	0.224**	0.180**	0.273**	1.000		
OMHLOS	0.081**	0.079**	-0.078**	-0.035	0.282**	0.165**	0.005	0.057*	1.000	
PHLOS	-0.022	-0.016	0.145**	0.130**	0.110**	0.364**	0.020	0.012	0.064*	1.000
PNVAO	0.031	0.020	0.060*	0.052*	0.012	0.085**	-0.019	0.016	-0.001	0.016
LNVAO	0.014	0.016	-0.029	-0.025	0.000	0.002	-0.032	0.035	-0.008	0.018
PNVAI	0.005	0.007	0.033	0.027	-0.021	0.028	-0.057*	-0.006	-0.008	0.051*

Note: LNVAO: Numbers of non-VA outpatient visit after index admission; MHCOS: Severity of mental comorbidity; NMHCO: Numbers of mental comorbidities; NPHCO: Numbers of physical comorbidities; OMHE: Numbers of mental health visit in the last year; OMHLOS: LOS of other mental disorders in the last year; PDLOS: LOS of PTSD in the last year; PHCOS: Severity of physical comorbidity; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PTSDE: Numbers of PTSD visit in the last year.

Appendix 6 (continued). Intercorrelations among 1998 Study Variables (Pearson's Correlation)

Label	PNVAO	LNVAO	PNVAI
PNVAO	1.000		
LNVAO	0.107**	1.000	
PNVAI	0.016	-0.016	1.000

Note: LNVAO: Numbers of non-VA outpatient visit after index admission; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission

Appendix 7. Intercorrelations among 1994 Study Variables, Male (Pearson's Correlation)

Label	AFMED	AFMEN	AFPTSD	AFSOC	RAPE	MUR	ASLT	WEP	SA	PSYMD
AFMED	1.000									
AFMEN	0.549**	1.000								
AFPTSD	0.290**	0.383**	1.000							
AFSOC	0.277**	0.275**	0.282**	1.000						
RAPE	-0.026	-0.010	0.043	0.076**	1.000					
MUR	0.062*	0.067*	0.026	0.104**	0.566**	1.000				
ASLT	-0.001	-0.027	-0.003	0.026	0.668**	0.595**	1.000			
WEP	0.123**	0.138**	0.100**	0.105**	0.469**	0.558**	0.490**	1.000		
SA	0.152**	0.114**	0.093**	0.042	0.214**	0.127**	0.305**	0.472**	1.000	
PSYMD	0.023	0.029	0.057*	0.068*	0.411**	0.357**	0.300**	0.395**	0.244**	1.000
PCHO	-0.007	0.050	0.028	0.023	0.388**	0.303**	0.268**	0.400**	0.183**	0.525**
BED	0.009	0.012	-0.077**	-0.006	0.315**	0.350**	0.316**	0.351**	0.250**	0.554**
AGE	0.205**	0.019	-0.001	0.040	-0.072	-0.051	-0.023	-0.017	0.021	-0.047
SOCNW	0.032	0.086**	0.018	-0.013	-0.025	0.010	0.001	0.010	0.027	-0.039
DIST	0.175**	0.175**	0.143**	0.128**	0.145**	0.205**	0.006	0.286**	0.177**	0.285**
MEAN	0.004	-0.015	-0.043	0.022	-0.010	-0.006	-0.002	0.009	-0.035	-0.018
SCPER	0.064*	0.047	0.003	-0.034	-0.005	0.011	-0.004	0.003	-0.024	0.001
AC_INX	0.115**	0.168**	-0.052	0.034	-0.168**	-0.012	-0.191**	0.177**	0.082**	-0.012
MHCOS	0.016	0.077**	0.008	0.028	0.022	0.061*	0.036	0.027	0.055*	0.040
NPHCO	0.216**	0.031	0.000	0.002	-0.051	-0.010	0.014	0.011	0.035	-0.045
PTSDE	0.135**	0.154**	0.437**	0.172**	0.035	0.047	-0.012	0.085**	0.066*	0.055*
OMHE	0.236**	0.393**	0.179**	0.091**	-0.019	0.056*	-0.024	0.128**	0.088**	0.022
PHE	0.434**	0.262**	0.133**	0.134**	-0.022	0.037	-0.041	0.138**	0.138**	0.027
PDLOS	0.008	0.024	0.086**	-0.045	0.012	0.017	0.075**	0.022	0.113**	-0.013
OMHLOS	0.024	0.039	0.043	-0.014	0.024	0.031	0.135**	0.053	0.181**	0.031
PHLOS	0.126**	0.010	0.031	-0.039	-0.020	0.001	0.051	0.037	0.160**	-0.042
PNVAO	-0.018	-0.052	-0.056**	0.001	-0.050	-0.051	-0.090**	-0.115**	-0.177**	-0.011
LNVAO	0.013	0.041	-0.025	0.006	-0.040	-0.041	-0.047	-0.049	-0.061*	0.020
PNVAI	0.061*	0.013	0.012	0.056*	0.025	-0.012	-0.038	-0.035	-0.063*	0.038

Note: AC_INX: Resource sharing index; AFMED: Numbers of post-discharge medical visit; AFMEN: Numbers of post-discharge mental health visit; AFPTSD: Numbers of post-discharge PTSD visit; AFSOC: Numbers of post-discharge social work visit; AGE: Age; ASLT: Aggressive assault crime rate; BED: Hospital bed to population ratio; DIST: Reciprocal of the distance to admitted VAMC; LNVAO: Numbers of non-VA outpatient visit after index admission; MEAN: Low-income status; MHCOS: Severity of mental comorbidity; MUR: Murder crime rates; NMHCO: Numbers of mental comorbidities; NPHCO: Numbers of physical comorbidities; OMHE: Numbers of mental health visit in the last year; OMHLOS: LOS of other mental disorders in the last year; OTHMD: Other physician to population ratio; PCHO: Psychologist to population ratio; PDLOS: LOS of PTSD in the last year; PHCOS: Severity of physical comorbidity; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PROP: Property crime rates; PSYMD: Psychiatrist to population ratio; SA: Substance-abuse-related crime rates; PTSDE: Numbers of PTSD visit in the last year; RAPE: Rape crime rates; SCPER: Percentage of service-connected disability; SOC: Social worker to population ratio; SOCNW: Size of a social network; WEP: Weapon violation crime rates.

Appendix 7 (continued). Intercorrelations among 1994 Study Variables, Male (Pearson's Correlation)

Label	PSYMD	PCHO	BED	AGE	SOCNW	DIST	MEAN	SCPER	AC_INX
PSYMD	1.000								
PCHO	0.525**	1.000							
BED	0.554**	0.601**	1.000						
AGE	-0.047	-0.012	-0.061*	1.000					
SOCNW	-0.039	-0.035	-0.024	-0.074**	1.000				
DIST	0.285**	0.184**	0.170**	-0.006	0.007	1.000			
MEAN	-0.018	0.005	0.021	0.039	-0.295**	0.019	1.000		
SCPER	0.001	-0.005	-0.006	0.173**	-0.319**	-0.051	0.146**	1.000	
AC_INX	-0.012	0.123**	0.199**	0.025	-0.009	0.364**	0.045	-0.033	1.000
MHCOS	0.040	0.003	0.023	-0.069*	0.083**	0.125**	-0.031	-0.063*	-0.008
NPHCO	-0.045	-0.022	-0.024	0.279**	-0.057*	0.023	0.031	0.136**	0.052
PTSDE	0.055*	-0.022	-0.077**	0.066*	-0.077**	0.134**	0.059*	0.179**	-0.061*
OMHE	0.022	0.031	-0.009	0.126**	-0.100**	0.155**	0.088**	0.270**	0.167**
PHE	0.027	0.033	-0.001	0.246**	-0.115**	0.191**	0.089**	0.253**	0.198**
PDLOS	-0.013	-0.024	-0.032	-0.049	-0.016	0.023	0.005	0.124**	-0.081**
OMHLOS	0.031	-0.027	-0.019	-0.056*	-0.019	0.023	0.011	0.039	-0.105**
PHLOS	-0.042	-0.061*	-0.078**	0.128**	0.001	0.022	0.018	0.056*	-0.080**
PNVAO	-0.011	-0.054*	-0.039	-0.074**	-0.084**	-0.066*	0.038	0.108**	0.015
LNVAO	0.020	-0.010	-0.004	-0.002	-0.030	-0.042	-0.014	0.051	0.001
PNVAI	0.038	0.052	-0.004	0.011	-0.005	0.030	0.014	0.087**	0.020

Note: AC_INX: Resource sharing index; AGE: Age; BED: Hospital bed to population ratio; DIST: Distance to admitted VAMC; LNVAO: Numbers of non-VA outpatient visit after index admission; MEAN: Low-income status; MHCOS: Severity of mental comorbidity; NMHCO: Numbers of mental comorbidities; NPHCO: Numbers of physical comorbidities; OMHE: Numbers of mental health visit in the last year; OMHLOS: LOS of other mental disorders in the last year; PCHO: Psychologist to population ratio; PDLOS: LOS of PTSD in the last year; PHCOS: Severity of physical comorbidity; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PSYMD: Psychiatrist to population ratio; PTSDE: Numbers of PTSD visit in the last year; SCPER: Percentage of service-connected disability; SOCNW: Size of a social network.

Appendix 7 (continued). Intercorrelations among 1994 Study Variables, Male (Pearson's Correlation)

Label	MHCOS	NPHCO	PTSDE	OMHE	PHE	PDLOS	OMHLOS	PHLOS
MHCOS	1.000							
NPHCO	-0.009	1.000						
PTSDE	-0.053*	0.032	1.000					
OMHE	0.003	0.086**	0.497**	1.000				
PHE	-0.028	0.232**	0.331**	0.580**	1.000			
PDLOS	0.065*	0.023	0.096**	0.118**	0.101**	1.000		
OMHLOS	0.014	0.014	0.000	0.141**	0.125**	0.164**	1.000	
PHLOS	-0.032	0.138**	0.054*	0.049	0.286**	0.127**	0.184**	1.000
PNVAO	0.012	-0.042	0.013	-0.003	0.011	-0.055	-0.086**	-0.060*
LNVAO	-0.001	-0.001	0.027	0.026	0.034	-0.031	-0.031	-0.040
PNVAI	0.011	0.011	0.031	0.014	0.100**	-0.020	-0.032	-0.026

Note: LNVAO: Numbers of non-VA outpatient visit after index admission; MHCOS: Severity of mental comorbidity; NMHCO: Numbers of mental comorbidities; NPHCO: Numbers of physical comorbidities; OMHE: Numbers of mental health visit in the last year; OMHLOS: LOS of other mental disorders in the last year; PDLOS: LOS of PTSD in the last year; PHCOS: Severity of physical comorbidity; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PTSDE: Numbers of PTSD visit in the last year.

Appendix 7 (continued). Intercorrelations among 1994 Study Variables, Male (Pearson's Correlation)

Label	PNVAO	LNVAO	PNVAI
PNVAO	1.000		
LNVAO	0.084**	1.000	
PNVAI	0.067*	0.089**	1.000

Note: LNVAO: Numbers of non-VA outpatient visit after index admission; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission

Appendix 8. Intercorrelations among 1994 Study Variables, Non-white (Pearson's Correlation)

Label	AFMED	AFMEN	AFPTSD	AFSOC	RAPE	MUR	ASLT	WEP	SA	PSYMD
AFMED	1.000									
AFMEN	0.562**	1.000								
AFPTSD	0.354**	0.388**	1.000							
AFSOC	0.316**	0.316**	0.279**	1.000						
RAPE	-0.093	-0.015	-0.025	-0.049	1.000					
MUR	0.008	0.045	-0.091	0.017	0.550**	1.000				
ASLT	-0.108*	-0.127**	-0.168**	-0.104*	0.650**	0.545**	1.000			
WEP	-0.020	0.052	0.016	-0.002	0.399**	0.597**	0.425**	1.000		
SA	0.046	0.044	-0.018	0.007	0.027	-0.163**	0.077	0.054	1.000	
PSYMD	-0.002	0.029	0.058	0.023	0.347**	0.415**	0.267**	0.441**	0.061	1.000
PCHO	-0.097*	0.007	0.031	0.000	0.429**	0.389**	0.342**	0.523**	-0.027	0.419**
BED	-0.072	-0.003	-0.081	-0.062	0.437**	0.532**	0.406**	0.493**	0.135**	0.569**
AGE	0.112*	-0.015	0.022	0.039	-0.085	-0.005	0.003	0.014	-0.057	-0.028
SOCNW	0.034	0.086	0.009	0.018	-0.027	0.038	0.003	0.011	0.054	-0.064
DIST	0.137**	0.185**	0.126**	0.090	0.175**	0.160**	-0.134**	0.207**	0.113*	0.263**
MEAN	-0.054	-0.004	-0.088	-0.047	-0.028	-0.052	-0.020	0.000	0.015	0.017
SCPER	-0.073	-0.029	-0.045	-0.094*	0.025	0.079	0.045	0.051	-0.086	0.097*
AC_INX	0.047	0.121**	-0.051	0.023	-0.183**	-0.054	-0.333**	0.122*	0.095*	-0.065
MHCOS	0.023	0.094*	-0.013	0.065	0.005	0.062	-0.023	0.031	0.071	0.021
NPHCO	0.196**	-0.002	-0.054	-0.007	-0.046	-0.034	0.023	0.005	0.032	-0.031
PTSDE	0.090	0.094*	0.416**	0.174**	-0.034	-0.067	-0.129**	-0.028	-0.021	0.079
OMHE	0.128**	0.296**	0.120*	0.081	-0.029	0.003	-0.087	0.005	0.066	0.059
PHE	0.358**	0.223**	0.147**	0.192**	-0.025	-0.026	-0.151**	-0.016	0.036	0.012
PDLOS	-0.057	-0.074	-0.039	-0.071	-0.053	-0.019	0.027	0.006	0.118*	0.090
OMHLOS	0.052	0.050	-0.050	0.007	-0.016	-0.052	0.113*	-0.003	0.252**	0.104*
PHLOS	0.151**	0.034	-0.042	-0.007	-0.036	0.001	0.065	0.032	0.159**	-0.020
PNVAO	0.040	-0.014	-0.024	0.065	-0.115*	-0.119*	-0.169**	-0.119*	-0.126**	-0.047
LNVAO	0.022	0.048	-0.028	-0.026	-0.055	-0.002	-0.028	-0.035	-0.178**	-0.024
PNVAI	0.133**	0.114**	0.045	-0.031	0.048	0.058	0.018	0.048	-0.008	0.033

Note: AC_INX: Resource sharing index; AFMED: Numbers of post-discharge medical visit; AFMEN: Numbers of post-discharge mental health visit; AFPTSD: Numbers of post-discharge PTSD visit; AFSOC: Numbers of post-discharge social work visit; AGE: Age; ASLT: Aggressive assault crime rate; BED: Hospital bed to population ratio; DIST: Reciprocal of the distance to admitted VAMC; LNVAO: Numbers of non-VA outpatient visit after index admission; MEAN: Low-income status; MHCOS: Severity of mental comorbidity; MUR: Murder crime rates; NMHCO: Numbers of mental comorbidities; NPHCO: Numbers of physical comorbidities; OMHE: Numbers of mental health visit in the last year; OMHLOS: LOS of other mental disorders in the last year; OTHMD: Other physician to population ratio; PCHO: Psychologist to population ratio; PDLOS: LOS of PTSD in the last year; PHCOS: Severity of physical comorbidity; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PROP: Property crime rates; PSYMD: Psychiatrist to population ratio; SA: Substance-abuse-related crime rates; PTSDE: Numbers of PTSD visit in the last year; RAPE: Rape crime rates; SCPER: Percentage of service-connected disability; SOC: Social worker to population ratio; SOCNW: Size of a social network; WEP: Weapon violation crime rates.

Appendix 8 (continued). Intercorrelations among 1994 Study Variables, Non-white (Pearson's Correlation)

Label	PCHO	BED	AGE	SOCNW	DIST	MEAN	SCPER	AC_INX	MHCOS	NPHCO
PCHO	1.000									
BED	0.638**	1.000								
AGE	-0.043	-0.042	1.000							
SOCNW	-0.029	0.036	-0.049	1.000						
DIST	0.116*	0.158**	-0.064	0.010	1.000					
MEAN	0.027	0.067	-0.032	-0.172**	0.036	1.000				
SCPER	0.040	0.008	0.236**	-0.301**	-0.103*	0.114*	1.000			
AC_INX	0.141**	0.215**	0.054	0.042	0.366**	0.039	-0.049	1.000		
MHCOS	0.016	0.064	-0.027	0.091	0.107*	-0.006	-0.071	0.013	1.000	
NPHCO	-0.051	-0.067	0.204**	-0.093	-0.050	0.104*	0.205**	0.005	0.034	1.000
PTSDE	-0.043	-0.073	0.077	-0.099*	0.129**	0.062	0.234**	-0.023	-0.082	0.036
OMHE	-0.051	-0.018	0.102*	-0.095*	0.105*	0.097*	0.259**	0.102*	0.002	0.146**
PHE	-0.048	-0.053	0.162**	-0.147**	0.115*	0.128**	0.187**	0.098*	-0.045	0.216**
PDLOS	-0.031	0.000	0.035	-0.047	0.009	0.018	0.034	-0.128**	0.007	0.003
OMHLOS	-0.132**	-0.027	-0.047	-0.020	-0.038	0.038	0.057	-0.127**	-0.042	0.099*
PHLOS	-0.068	-0.038	0.087	0.015	-0.037	0.024	0.011	-0.081	-0.096*	0.171**
PNVAO	-0.099*	-0.166**	-0.066	-0.075	-0.020	0.029	0.072	0.027	0.055	0.004
LNVAO	-0.034	-0.062	0.033	-0.044	-0.102*	0.017	0.055	-0.087	0.019	0.032
PNVAI	0.117**	0.089	-0.026	-0.021	0.006	0.008	0.023	0.062	0.061	0.089

Note: AC_INX: Resource sharing index; AGE: Age; BED: Hospital bed to population ratio; DIST: Distance to admitted VAMC; LNVAO: Numbers of non-VA outpatient visit after index admission; MEAN: Low-income status; MHCOS: Severity of mental comorbidity; NMHCO: Numbers of mental comorbidities; NPHCO: Numbers of physical comorbidities; OMHE: Numbers of mental health visit in the last year; OMHLOS: LOS of other mental disorders in the last year; PCHO: Psychologist to population ratio; PDLOS: LOS of PTSD in the last year; PHCOS: Severity of physical comorbidity; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PTSDE: Numbers of PTSD visit in the last year; SCPER: Percentage of service-connected disability; SOCNW: Size of a social network.

Appendix 8 (continued). Intercorrelations among 1994 Study Variables, Non-white (Pearson's Correlation)

Label	PTSDE	OMHE	PHE	PDLOS	OMHLOS	PHLOS	PNVAO	LNVAO	PNVAI
PTSDE	1.000								
OMHE	0.523**	1.000							
PHE	0.440**	0.588**	1.000						
PDLOS	0.055	0.087	0.053	1.000					
OMHLOS	-0.048	0.159**	0.064	0.157**	1.000				
PHLOS	0.012	0.050	0.243**	0.124**	0.285**	1.000			
PNVAO	0.058	0.040	0.133**	-0.037	-0.080	-0.050	1.000		
LNVAO	-0.007	0.044	0.041	-0.022	0.007	-0.029	0.108*	1.000	
PNVAI	-0.036	0.143**	0.130**	-0.010	-0.022	-0.014	-0.016	-0.010	1.000

Note: LNVAO: Numbers of non-VA outpatient visit after index admission; OMHE: Numbers of mental health visit in the last year; OMHLOS: LOS of other mental disorders in the last year; PDLOS: LOS of PTSD in the last year; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PTSDE: Numbers of PTSD visit in the last year.

Appendix 9. Intercorrelations among 1994 Study Variables, White (Pearson's Correlation)

Label	AFMED	AFMEN	AFPTSD	AFSOC	RAPE	MUR	ASLT	WEP	SA	PSYMD
AFMED	1.000									
AFMEN	0.545**	1.000								
AFPTSD	0.269**	0.385**	1.000							
AFSOC	0.274**	0.248**	0.270**	1.000						
RAPE	0.032	-0.001	0.051	0.094**	1.000					
MUR	0.111**	0.082**	0.056	0.104**	0.499**	1.000				
ASLT	0.054	0.010	0.048	0.056	0.643**	0.575**	1.000			
WEP	0.198**	0.179**	0.109**	0.111**	0.421**	0.493**	0.466**	1.000		
SA	0.200**	0.144**	0.128**	0.050	0.260**	0.192**	0.355**	0.569**	1.000	
PSYMD	0.054	0.029	0.039	0.063*	0.398**	0.278**	0.278**	0.349**	0.302**	1.000
PCHO	0.046	0.069*	0.007	0.013	0.341**	0.227**	0.212**	0.337**	0.238**	0.571**
BED	0.046	0.018	-0.088**	0.009	0.237**	0.250**	0.264**	0.289**	0.280**	0.539**
AGE	0.204**	0.004	-0.013	0.066*	-0.026	-0.020	0.004	0.016	0.055	-0.020
SOCNW	0.027	0.082*	0.015	-0.034	-0.018	0.012	0.011	0.023	0.008	-0.020
DIST	0.201**	0.174**	0.130**	0.114**	0.082*	0.174**	0.019	0.276**	0.193**	0.262**
MEAN	0.028	-0.015	-0.027	0.049	-0.018	-0.002	-0.006	0.002	-0.051	-0.040
SCPER	0.123**	0.086**	0.032	0.007	-0.008	-0.004	-0.014	-0.004	0.003	-0.040
AC_INX	0.139**	0.188**	-0.060	0.032	-0.174**	-0.001	-0.152**	0.201**	0.084**	0.017
MHCOS	0.012	0.073*	0.020	0.016	0.040	0.078*	0.068*	0.044	0.047	0.057
NPHCO	0.215**	0.037	0.031	0.036	-0.010	0.048	0.048	0.054	0.046	-0.022
PTSDE	0.160**	0.188**	0.444**	0.155**	0.028	0.071*	0.010	0.106**	0.094**	0.019
OMHE	0.285**	0.441**	0.218**	0.095**	-0.009	0.088**	0.003	0.186**	0.105**	0.005
PHE	0.463**	0.277**	0.140**	0.112**	0.000	0.087**	0.010	0.214**	0.183**	0.046
PDLOS	0.021	0.052	0.133**	-0.025	0.062	0.057	0.110**	0.049	0.117**	-0.035
OMHLOS	0.006	0.029	0.090**	-0.032	0.043	0.070*	0.148**	0.075*	0.158**	-0.014
PHLOS	0.108**	-0.002	0.073**	-0.046	0.021	0.045	0.076*	0.066*	0.168**	-0.042
PNVAO	-0.042	-0.067*	-0.071*	-0.031	-0.019	-0.019	-0.059	-0.108**	-0.185**	0.015
LNVAO	0.007	0.034	-0.024	0.025	-0.036	-0.061	-0.056	-0.057	-0.024	0.044
PNVAI	0.038	-0.019	0.003	0.098**	0.034	-0.020	-0.045	-0.044	-0.072	0.050

Note: AC_INX: Resource sharing index; AFMED: Numbers of post-discharge medical visit; AFMEN: Numbers of post-discharge mental health visit; AFPTSD: Numbers of post-discharge PTSD visit; AFSOC: Numbers of post-discharge social work visit; AGE: Age; ASLT: Aggressive assault crime rate; BED: Hospital bed to population ratio; DIST: Reciprocal of the distance to admitted VAMC; LNVAO: Numbers of non-VA outpatient visit after index admission; MEAN: Low-income status; MHCOS: Severity of mental comorbidity; MUR: Murder crime rates; NMHCO: Numbers of mental comorbidities; NPHCO: Numbers of physical comorbidities; OMHE: Numbers of mental health visit in the last year; OMHLOS: LOS of other mental disorders in the last year; OTHMD: Other physician to population ratio; PCHO: Psychologist to population ratio; PDLOS: LOS of PTSD in the last year; PHCOS: Severity of physical comorbidity; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PROP: Property crime rates; PSYMD: Psychiatrist to population ratio; SA: Substance-abuse-related crime rates; PTSDE: Numbers of PTSD visit in the last year; RAPE: Rape crime rates; SCPER: Percentage of service-connected disability; SOC: Social worker to population ratio; SOCNW: Size of a social network; WEP: Weapon violation crime rates.

Appendix 9 (continued). Intercorrelations among 1994 Study Variables, White (Pearson's Correlation)

Label	PCHO	BED	AGE	SOCNW	DIST	MEAN	SCPER	AC_INX	MHCOS	NPHCO
PCHO	1.000									
BED	0.579**	1.000								
AGE	0.020	-0.046	1.000							
SOCNW	-0.028	-0.055	-0.094**	1.000						
DIST	0.192**	0.156**	0.031	0.013	1.000					
MEAN	-0.009	0.001	0.059	-0.334**	0.008	1.000				
SCPER	-0.020	0.000	0.153**	-0.328**	-0.017	0.157**	1.000			
AC_INX	0.120**	0.199**	0.019	-0.034	0.371**	0.047	-0.021	1.000		
MHCOS	0.009	0.010	-0.091**	0.098**	0.137**	-0.039	-0.062	-0.013	1.000	
NPHCO	0.012	0.011	0.278**	-0.047	0.066*	0.011	0.098**	0.057	-0.033	1.000
PTSDE	-0.031	-0.087**	0.076*	-0.068*	0.120**	0.055	0.160**	-0.073*	-0.027	0.031
OMHE	0.076*	0.006	0.133**	-0.111**	0.182**	0.086**	0.279**	0.201**	0.005	0.044
PHE	0.073*	0.026	0.259**	-0.113**	0.236**	0.079*	0.281**	0.240**	-0.024	0.218**
PDLOS	-0.010	-0.035	-0.074*	-0.008	0.040	0.003	0.151**	-0.068*	0.081*	0.022
OMHLOS	0.016	-0.017	-0.049	-0.021	0.046	0.002	0.030	-0.091**	0.032	-0.028
PHLOS	-0.052	-0.086**	0.117**	-0.009	0.057	0.020	0.068*	-0.079*	-0.022	0.109**
PNVAO	-0.027	0.021	-0.068*	-0.087*	-0.080*	0.041	0.120**	0.022	0.003	-0.067*
LNVAO	0.000	0.023	-0.010	-0.023	-0.014	-0.025	0.050	0.035	-0.009	-0.016
PNVAI	0.041	-0.027	0.017	-0.001	0.044	0.016	0.105**	0.009	-0.004	-0.014

Note: AC_INX: Resource sharing index; AGE: Age; BED: Hospital bed to population ratio; DIST: Distance to admitted VAMC; LNVAO: Numbers of non-VA outpatient visit after index admission; MEAN: Low-income status; MHCOS: Severity of mental comorbidity; NMHCO: Numbers of mental comorbidities; NPHCO: Numbers of physical comorbidities; OMHE: Numbers of mental health visit in the last year; OMHLOS: LOS of other mental disorders in the last year; PCHO: Psychologist to population ratio; PDLOS: LOS of PTSD in the last year; PHCOS: Severity of physical comorbidity; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PTSDE: Numbers of PTSD visit in the last year; SCPER: Percentage of service-connected disability; SOCNW: Size of a social network.

Appendix 9 (continued). Intercorrelations among 1994 Study Variables, White (Pearson's Correlation)

Label	PTSDE	OMHE	PHE	PDLOS	OMHLOS	PHLOS	PNVAO	LNVAO	PNVAI
PTSDE	1.000								
OMHE	0.486**	1.000							
PHE	0.295**	0.584**	1.000						
PDLOS	0.117**	0.125**	0.109**	1.000					
OMHLOS	0.026	0.133**	0.155**	0.167**	1.000				
PHLOS	0.080*	0.056	0.301**	0.117**	0.167**	1.000			
PNVAO	0.003	-0.016	-0.031	-0.062	-0.088**	-0.067*	1.000		
LNVAO	0.044	0.017	0.029	-0.034	-0.048	-0.045	0.075*	1.000	
PNVAI	0.056	-0.027	0.089**	-0.025	-0.035	-0.032	0.089**	0.119**	1.000

Note: LNVAO: Numbers of non-VA outpatient visit after index admission; OMHE: Numbers of mental health visit in the last year; OMHLOS: LOS of other mental disorders in the last year; PDLOS: LOS of PTSD in the last year; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PTSDE: Numbers of PTSD visit in the last year.

Appendix 10. Intercorrelations among 1994 Study Variables, Non-community (Pearson's Correlation)

Label	AFMED	AFMEN	AFPTSD	AFSOC	RAPE	MUR	ASLT	WEP	SA	PSYMD
AFMED	1.000									
AFMEN	0.766**	1.000								
AFPTSD	0.684**	0.726**	1.000							
AFSOC	0.404**	0.360**	0.420**	1.000						
RAPE	0.087	0.111	0.191*	0.079	1.000					
MUR	0.101	0.082	0.174*	0.064	0.592**	1.000				
ASLT	-0.016	-0.101	-0.013	-0.042	0.625**	0.657**	1.000			
WEP	0.172*	0.175*	0.217**	0.121	0.474**	0.682**	0.541**	1.000		
SA	0.143	0.041	0.062	0.026	0.159*	-0.126	0.128	0.147	1.000	
PSYMD	0.055	0.072	0.096	0.111	0.377**	0.480**	0.416**	0.570**	0.121	1.000
PCHO	0.072	0.138	0.082	0.053	0.503**	0.538**	0.412**	0.545**	0.001	0.575**
BED	0.021	0.069	0.043	0.032	0.406**	0.508**	0.497**	0.346**	0.142	0.526**
AGE	0.110	0.052	0.090	0.125	-0.231**	-0.075	-0.106	-0.051	-0.064	-0.056
SOCNW	0.176*	0.224**	0.155*	0.118	0.122	-0.001	0.069	-0.006	0.104	-0.072
DIST	0.302**	0.258**	0.291**	0.282**	0.075	0.024	-0.141	0.247**	0.153*	0.136
MEAN	-0.139	-0.141	-0.166*	-0.100	-0.141	0.053	-0.006	0.025	-0.051	0.058
SCPER	-0.147	-0.132	-0.130	-0.085	-0.140	0.031	-0.032	-0.071	-0.155*	-0.052
AC_INX	0.131	0.127	0.022	0.027	-0.296**	-0.180*	-0.338**	0.025	0.055	-0.169*
MHCOS	-0.072	-0.067	-0.090	-0.049	0.063	0.040	0.003	-0.094	-0.035	-0.019
NPHCO	0.064	-0.086	-0.056	-0.093	-0.117	-0.080	-0.086	-0.094	-0.016	-0.065
PTSDE	0.035	0.081	0.185*	0.132	0.018	-0.065	-0.102	0.030	-0.025	-0.021
OMHE	0.046	0.079	0.098	0.051	-0.040	-0.085	-0.127	-0.038	-0.012	-0.078
PHE	0.252**	0.142	0.196**	0.164*	0.001	-0.011	-0.065	0.035	0.097	-0.036
PDLOS	-0.019	-0.041	0.066	-0.064	-0.112	-0.014	-0.004	-0.107	0.113	-0.159*
OMHLOS	0.062	-0.049	0.035	-0.045	-0.060	-0.011	0.089	-0.047	0.244**	0.016
PHLOS	-0.005	-0.130	0.004	-0.058	-0.155*	-0.129	-0.081	-0.060	0.111	-0.063
PNVAO	-0.156*	-0.122	-0.099	0.026	-0.091	-0.044	-0.105	-0.084	-0.070	-0.025
LNVAO	0.057	0.137	-0.052	-0.037	-0.119	-0.174*	-0.166*	-0.102	-0.048	-0.041
PNVAI	0.249**	0.153*	0.137	-0.026	0.098	0.085	0.038	0.054	-0.002	0.041

Note: AC_INX: Resource sharing index; AFMED: Numbers of post-discharge medical visit; AFMEN: Numbers of post-discharge mental health visit; AFPTSD: Numbers of post-discharge PTSD visit; AFSOC: Numbers of post-discharge social work visit; AGE: Age; ASLT: Aggressive assault crime rate; BED: Hospital bed to population ratio; DIST: Reciprocal of the distance to admitted VAMC; LNVAO: Numbers of non-VA outpatient visit after index admission; MEAN: Low-income status; MHCOS: Severity of mental comorbidity; MUR: Murder crime rates; NMHCO: Numbers of mental comorbidities; NPHCO: Numbers of physical comorbidities; OMHE: Numbers of mental health visit in the last year; OMHLOS: LOS of other mental disorders in the last year; OTHMD: Other physician to population ratio; PCHO: Psychologist to population ratio; PDLOS: LOS of PTSD in the last year; PHCOS: Severity of physical comorbidity; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PROP: Property crime rates; PSYMD: Psychiatrist to population ratio; SA: Substance-abuse-related crime rates; PTSDE: Numbers of PTSD visit in the last year; RAPE: Rape crime rates; SCPER: Percentage of service-connected disability; SOC: Social worker to population ratio; SOCNW: Size of a social network; WEP: Weapon violation crime rates.

Appendix 10 (continued). Intercorrelations among 1994 Study Variables, Non-community (Pearson's Correlation)

Label	PCHO	BED	AGE	SOCNW	DIST	MEAN	SCPER	AC_INX	MHCOS	NPHCO
PCHO	1.000									
BED	0.650**	1.000								
AGE	-0.061	0.005	1.000	-0.056						
SOCNW	-0.034	-0.011	-0.056	1.000						
DIST	0.085	-0.037	0.077	-0.117	1.000					
MEAN	0.048	-0.052	0.037	-0.449**	0.125	1.000				
SCPER	-0.136	-0.055	0.252*	-0.247**	-0.132	0.115	1.000			
AC_INX	-0.043	0.029	0.152	-0.157*	0.394**	0.082	-0.100	1.000		
MHCOS	0.045	0.007	-0.026	0.068	-0.017	0.075	-0.043	-0.097	1.000	
NPHCO	-0.062	0.028	0.270**	-0.140	0.037	0.113	0.107	0.147	-0.078	1.000
PTSDE	0.033	-0.044	0.061	-0.118	0.212**	0.055	0.161*	0.001	-0.110	-0.014
OMHE	-0.053	-0.055	0.126	-0.165*	0.141	0.100	0.247**	0.123	-0.001	0.066
PHE	-0.044	0.020	0.102	-0.157*	0.124	0.141	0.173*	0.187**	-0.036	0.101
PDLOS	-0.133	-0.031	-0.128	-0.054	-0.118	0.025	0.207**	-0.116	0.071	0.007
OMHLOS	-0.075	-0.047	0.041	-0.021	-0.030	0.043	0.158*	-0.133	0.031	0.107
PHLOS	-0.031	-0.133	0.135	-0.049	-0.023	0.023	-0.030	-0.023	0.079	0.129
PNVAO	-0.071	-0.085	-0.193*	-0.058	-0.072	0.027	0.008	0.103	0.017	-0.045
LNVAO	0.007	-0.090	0.014	-0.031	-0.052	0.014	0.135	0.155*	-0.061	-0.009
PNVAI	0.079	0.065	-0.055	-0.022	0.009	0.010	-0.066	-0.014	0.186*	0.102

Note: AC_INX: Resource sharing index; AGE: Age; BED: Hospital bed to population ratio; DIST: Distance to admitted VAMC; LNVAO: Numbers of non-VA outpatient visit after index admission; MEAN: Low-income status; MHCOS: Severity of mental comorbidity; NMHCO: Numbers of mental comorbidities; NPHCO: Numbers of physical comorbidities; OMHE: Numbers of mental health visit in the last year; OMHLOS: LOS of other mental disorders in the last year; PCHO: Psychologist to population ratio; PDLOS: LOS of PTSD in the last year; PHCOS: Severity of physical comorbidity; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PTSDE: Numbers of PTSD visit in the last year; SCPER: Percentage of service-connected disability; SOCNW: Size of a social network.

Appendix 10 (continued). Intercorrelations among 1994 Study Variables, Non-community (Pearson's Correlation)

Label	PTSDE	OMHE	PHE	PDLOS	OMHLOS	PHLOS	PNVAO	LNVAO	PNVAI
PTSDE	1.000								
OMHE	0.702**	1.000							
PHE	0.555**	0.730**	1.000						
PDLOS	0.075	0.019	0.082	1.000					
OMHLOS	0.047	0.129	0.130	0.365**	1.000				
PHLOS	-0.004	0.018	0.129	0.167*	0.315**	1.000			
PNVAO	0.006	0.025	0.095	-0.039	-0.067	-0.035	1.000		
LNVAO	0.138	0.168*	0.117	-0.020	-0.035	-0.019	-0.022	1.000	
PNVAI	-0.032	0.178*	0.198**	-0.014	-0.025	-0.013	-0.016	-0.008	1.000

Note: LNVAO: Numbers of non-VA outpatient visit after index admission; OMHE: Numbers of mental health visit in the last year; OMHLOS: LOS of other mental disorders in the last year; PDLOS: LOS of PTSD in the last year; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PTSDE: Numbers of PTSD visit in the last year.

Appendix 11. Intercorrelations among 1994 Study Variables, Community (Pearson's Correlation)

Label	AFMED	AFMEN	AFPTSD	AFSOC	RAPE	MUR	ASLT	WEP	SA	PSYMD
AFMED	1.000									
AFMEN	0.512**	1.000								
AFPTSD	0.230**	0.328**	1.000							
AFSOC	0.261**	0.256**	0.256**	1.000						
RAPE	-0.037	-0.026	0.013	0.080**	1.000					
MUR	0.056*	0.063*	-0.001	0.111**	0.561**	1.000				
ASLT	-0.002	-0.021	-0.006	0.040	0.678**	0.590**	1.000			
WEP	0.114**	0.129**	0.070*	0.104**	0.466**	0.544**	0.485**	1.000		
SA	0.157**	0.125**	0.096**	0.045	0.227**	0.153**	0.323**	0.511**	1.000	
PSYMD	0.023	0.021	0.046	0.062*	0.415**	0.343**	0.287**	0.375**	0.256**	1.000
PCHO	-0.014	0.035	0.012	0.024	0.375**	0.277**	0.255**	0.385**	0.205**	0.523**
BED	0.003	0.003	-0.098**	-0.009	0.302**	0.332**	0.295**	0.355**	0.261**	0.558**
AGE	0.192**	-0.012	-0.022	0.022	-0.055	-0.052	-0.017	-0.017	0.024	-0.042
SOCNW	0.009	0.063*	-0.006	-0.032	-0.040	0.020	-0.002	0.021	0.008	-0.031
DIST	0.157**	0.168**	0.100**	0.099**	0.150**	0.227**	0.031	0.282**	0.200**	0.306**
MEAN	0.026	0.006	-0.025	0.036	0.008	-0.012	-0.001	0.008	-0.032	-0.027
SCPER	0.094**	0.076**	0.027	-0.029	0.017	0.011	0.000	0.015	-0.009	0.011
AC_INX	0.113**	0.176**	-0.070*	0.029	-0.153**	0.002	-0.175**	0.193**	0.092**	0.009
MHCOS	0.028	0.102**	0.023	0.040	0.017	0.067*	0.041	0.053	0.060*	0.049
NPHCO	0.233**	0.041	0.009	0.020	-0.036	0.005	0.032	0.032	0.037	-0.036
PTSDE	0.147**	0.164**	0.473**	0.171**	0.031	0.058*	-0.006	0.091**	0.076**	0.061*
OMHE	0.263**	0.443**	0.198**	0.089**	-0.015	0.071*	-0.014	0.151**	0.102**	0.035
PHE	0.460**	0.278**	0.131**	0.125**	-0.028	0.039	-0.045	0.148**	0.146**	0.032
PDLOS	0.009	0.029	0.087**	-0.043	0.028	0.020	0.083**	0.038	0.111**	0.005
OMHLOS	0.014	0.049	0.044	-0.013	0.036	0.036	0.141**	0.067*	0.172**	0.029
PHLOS	0.132**	0.020	0.044	-0.042	-0.001	0.022	0.066*	0.048	0.161**	-0.045
PNVAO	-0.002	-0.044	-0.052	-0.004	-0.044	-0.052	-0.090**	-0.114**	-0.185**	-0.005
LNVAO	0.006	0.027	-0.022	0.009	-0.030	-0.028	-0.035	-0.043	-0.064	0.027
PNVAI	0.037	-0.006	-0.003	0.063*	0.017	-0.022	-0.047	-0.045	-0.070	0.038

Note: AC_INX: Resource sharing index; AFMED: Numbers of post-discharge medical visit; AFMEN: Numbers of post-discharge mental health visit; AFPTSD: Numbers of post-discharge PTSD visit; AFSOC: Numbers of post-discharge social work visit; AGE: Age; ASLT: Aggressive assault crime rate; BED: Hospital bed to population ratio; DIST: Reciprocal of the distance to admitted VAMC; LNVAO: Numbers of non-VA outpatient visit after index admission; MEAN: Low-income status; MHCOS: Severity of mental comorbidity; MUR: Murder crime rates; NMHCO: Numbers of mental comorbidities; NPHCO: Numbers of physical comorbidities; OMHE: Numbers of mental health visit in the last year; OMHLOS: LOS of other mental disorders in the last year; OTHMD: Other physician to population ratio; PCHO: Psychologist to population ratio; PDLOS: LOS of PTSD in the last year; PHCOS: Severity of physical comorbidity; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PROP: Property crime rates; PSYMD: Psychiatrist to population ratio; SA: Substance-abuse-related crime rates; PTSDE: Numbers of PTSD visit in the last year; RAPE: Rape crime rates; SCPER: Percentage of service-connected disability; SOC: Social worker to population ratio; SOCNW: Size of a social network; WEP: Weapon violation crime rates.

Appendix 11(continued). Intercorrelations among 1994 Study Variables, Community (Pearson's Correlation)

Label	PCHO	BED	AGE	SOCNW	DIST	MEAN	SCPER	AC_INX	MHCOS	NPHCO
PCHO	1.000									
BED	0.596**	1.000								
AGE	-0.007	-0.064*	1.000							
SOCNW	-0.028	-0.029	-0.086**	1.000						
DIST	0.196**	0.202**	-0.014	0.037	1.000					
MEAN	-0.001	0.029	0.034	-0.273**	0.000	1.000				
SCPER	0.013	0.008	0.162**	-0.330**	-0.022	0.148**	1.000			
AC_INX	0.143**	0.222**	0.014	0.004	0.362**	0.040	-0.018	1.000		
MHCOS	0.004	0.027	-0.079**	0.099**	0.156**	-0.044	-0.068*	0.006	1.000	
NPHCO	-0.012	-0.026	0.262**	-0.052	0.026	0.021	0.132**	0.032	-0.005	1.000
PTSDE	-0.032	-0.079**	0.064*	-0.075**	0.126**	0.058*	0.183**	-0.064*	-0.038	0.030
OMHE	0.045	0.004	0.121**	-0.099**	0.168**	0.086**	0.274**	0.180**	0.004	0.077**
PHE	0.039	-0.005	0.257**	-0.119**	0.213**	0.082**	0.264**	0.206**	-0.029	0.235**
PDLOS	-0.011	-0.032	-0.031	-0.012	0.049	0.002	0.113**	-0.075**	0.064*	0.024
OMHLOS	-0.024	-0.017	-0.062*	-0.021	0.028	0.007	0.022	-0.097**	0.006	-0.002
PHLOS	-0.066*	-0.075**	0.114**	0.000	0.040	0.019	0.060*	-0.082**	-0.049	0.126**
PNVAO	-0.046	-0.030	-0.053	-0.087**	-0.058*	0.038	0.116**	0.017	0.018	-0.047
LNVAO	-0.011	0.005	-0.002	-0.030	-0.037	-0.017	0.042	-0.012	0.004	-0.002
PNVAI	0.049	-0.011	0.020	-0.003	0.036	0.014	0.103	0.024	-0.007	0.001

Note: AC_INX: Resource sharing index; AGE: Age; BED: Hospital bed to population ratio; DIST: Distance to admitted VAMC; LNVAO: Numbers of non-VA outpatient visit after index admission; MEAN: Low-income status; MHCOS: Severity of mental comorbidity; NMHCO: Numbers of mental comorbidities; NPHCO: Numbers of physical comorbidities; OMHE: Numbers of mental health visit in the last year; OMHLOS: LOS of other mental disorders in the last year; PCHO: Psychologist to population ratio; PDLOS: LOS of PTSD in the last year; PHCOS: Severity of physical comorbidity; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PTSDE: Numbers of PTSD visit in the last year; SCPER: Percentage of service-connected disability; SOCNW: Size of a social network.

Appendix 11 (continued). Intercorrelations among 1994 Study Variables, Community (Pearson's Correlation)

Label	PTSDE	OMHE	PHE	PDLOS	OMHLOS	PHLOS	PNVAO	LNVAO	PNVAI
PTSDE	1.000								
OMHE	0.468**	1.000							
PHE	0.307**	0.563**	1.000						
PDLOS	0.097**	0.127**	0.101**	1.000					
OMHLOS	-0.005	0.144**	0.127**	0.136**	1.000				
PHLOS	0.060*	0.057*	0.303**	0.119**	0.185**	1.000			
PNVAO	0.019	-0.003	0.006	-0.057*	-0.088**	-0.065*	1.000		
LNVAO	0.016	0.010	0.024	-0.032	-0.031	-0.043	0.092**	1.000	
PNVAI	0.037	-0.005	0.088**	-0.021	-0.032	-0.028	0.074**	0.097**	1.000

Note: LNVAO: Numbers of non-VA outpatient visit after index admission; OMHE: Numbers of mental health visit in the last year; OMHLOS: LOS of other mental disorders in the last year; PDLOS: LOS of PTSD in the last year; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PTSDE: Numbers of PTSD visit in the last year.

Appendix 12. Intercorrelations among 1998 Study Variables, Male (Pearson's Correlation)

Label	AFMED	AFMEN	AFPTSD	AFSOC	RAPE	MUR	ASLT	WEP	SA	PSYMD
AFMED	1.000									
AFMEN	0.543**	1.000								
AFPTSD	0.288**	0.337**	1.000							
AFSOC	0.331**	0.398**	0.235**	1.000						
RAPE	-0.062*	-0.006	-0.056*	-0.015	1.000					
MUR	0.017	0.071	-0.032	0.044	0.437**	1.000				
ASLT	-0.059*	-0.008	-0.033	-0.074**	0.607**	0.461**	1.000			
WEP	0.128**	0.122**	0.041	0.094**	0.351**	0.429**	0.274**	1.000		
SA	0.064*	0.058*	0.025	0.052*	0.256**	0.120**	0.089**	0.564**	1.000	
PSYMD	-0.020	0.023	-0.017	0.047	0.366**	0.270**	0.301**	0.262**	0.292**	1.000
PCHO	-0.006	-0.006	-0.120**	-0.014	0.361**	0.180**	0.234**	0.300**	0.206**	0.385**
BED	0.019	0.002	-0.074**	0.007	0.325**	0.280**	0.315**	0.348**	0.315**	0.515**
AGE	0.119**	-0.042	-0.042	0.007	-0.061*	-0.027	-0.017	-0.070**	-0.082**	-0.078**
SOCNW	-0.029	0.058*	-0.030	-0.022	0.007	0.031	0.015	-0.004	-0.010	-0.042
DIST	0.174**	0.144**	0.029	0.117**	0.127**	0.167**	-0.080**	0.332**	0.210**	0.210**
AC_INX	0.220**	0.150**	0.078**	0.149**	-0.097**	-0.011	-0.244**	0.292**	0.166**	0.021
MEAN	0.060*	-0.018	-0.023	0.019	0.009	-0.018	-0.008	-0.019	-0.025	-0.015
SCPER	0.035	-0.098**	0.034	-0.036	-0.050	-0.060*	-0.038	-0.071**	-0.086**	-0.034
MHCOS	-0.007	0.005	-0.077**	0.015	0.007	0.044	-0.013	0.078**	0.036	-0.037
NPHCO	0.176**	-0.025	0.021	-0.023	-0.011	-0.038	-0.006	-0.076**	-0.100**	-0.056*
OMHE	0.214**	0.321**	0.130**	0.090**	0.001	0.028	-0.035	0.138**	0.090**	0.013
PHE	0.376**	0.127**	0.112**	0.109**	-0.045	-0.022	-0.115**	0.100**	0.055*	-0.022
PTSDE	0.104**	0.063*	0.406**	0.053*	0.013	0.019	0.005	0.061*	0.056*	-0.002
PDLOS	-0.030	0.022	0.119**	0.010	0.057*	-0.010	0.035	0.011	0.032	0.014
OMHLOS	-0.011	0.038	-0.065*	0.005	0.053*	0.052*	0.022	0.109**	0.070**	0.045
PHLOS	0.131**	-0.030	-0.027	-0.015	-0.067*	-0.003	-0.049	-0.007	-0.006	-0.001
PNVAO	-0.023	-0.051	-0.054*	-0.010	-0.079**	-0.030	-0.069**	-0.001	-0.081**	-0.040
LNVAO	0.014	-0.006	0.021	0.002	-0.063*	-0.014	-0.031	-0.012	0.021	-0.015
PNVAI	-0.032	-0.068**	-0.075**	0.026	-0.017	0.004	-0.020	0.002	-0.009	-0.037

Note: AC_INX: Resource sharing index; AFMED: Numbers of post-discharge medical visit; AFMEN: Numbers of post-discharge mental health visit; AFPTSD: Numbers of post-discharge PTSD visit; AFSOC: Numbers of post-discharge social work visit; AGE: Age; ASLT: Aggressive assault crime rate; BED: Hospital bed to population ratio; DIST: Reciprocal of the distance to admitted VAMC; LNVAO: Numbers of non-VA outpatient visit after index admission; MEAN: Low-income status; MHCOS: Severity of mental comorbidity; MUR: Murder crime rates; NMHCO: Numbers of mental comorbidities; NPHCO: Numbers of physical comorbidities; OMHE: Numbers of mental health visit in the last year; OMHLOS: LOS of other mental disorders in the last year; OTHMD: Other physician to population ratio; PCHO: Psychologist to population ratio; PDLOS: LOS of PTSD in the last year; PHCOS: Severity of physical comorbidity; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PROP: Property crime rates; PSYMD: Psychiatrist to population ratio; SA: Substance-abuse-related crime rates; PTSDE: Numbers of PTSD visit in the last year; RAPE: Rape crime rates; SCPER: Percentage of service-connected disability; SOC: Social worker to population ratio; SOCNW: Size of a social network; WEP: Weapon violation crime rates.

Appendix 12 (continued). Intercorrelations among 1998 Study Variables, Male (Pearson's Correlation)

Label	PCHO	BED	AGE	SOCNW	DIST	AC_INX	MEAN	SCPER	MHCOS	NPHCO
PCHO	1.000									
BED	0.567**	1.000								
AGE	-0.016	0.012	1.000							
SOCNW	-0.007	-0.026	-0.040	1.000						
DIST	0.115**	0.090**	-0.010	0.024	1.000					
AC_INX	-0.027	0.129**	0.026	0.001	0.510**	1.000				
MEAN	0.024	0.025	0.054*	-0.219**	0.008	0.017	1.000			
SCPER	-0.061*	-0.030	0.135**	-0.368**	-0.070**	-0.026	0.200**	1.000		
MHCOS	-0.011	-0.010	0.008	0.007	0.123**	0.034	-0.042	-0.039	1.000	
NPHCO	0.004	-0.004	0.328**	-0.051	-0.038	0.007	0.031	0.097**	-0.059*	1.000
OMHE	0.029	0.018	0.016	-0.021	0.190**	0.224**	0.101**	0.103**	0.024	0.021
PHE	-0.021	-0.025	0.198**	-0.088**	0.181**	0.249**	0.132**	0.210**	0.002	0.204**
PTSDE	-0.084**	-0.068**	-0.022	-0.023	0.049	0.065*	0.061*	0.108**	-0.080**	0.049
PDLOS	-0.012	0.004	-0.076**	-0.072**	-0.060*	-0.032	0.071**	0.162**	-0.069**	-0.024
OMHLOS	0.046	0.039	-0.053	0.006	0.115**	0.080**	0.020	-0.066*	0.085**	-0.080**
PHLOS	-0.040	-0.025	0.152**	-0.060*	0.084**	0.104**	0.056*	0.053*	-0.020	0.153**
PNVAO	-0.052*	0.009	0.032	-0.035	-0.074**	0.052*	0.036	0.124**	0.003	0.064*
LNVAO	-0.032	-0.007	-0.020	-0.024	-0.036	0.011	-0.050	0.051	-0.001	-0.022
PNVAI	0.001	-0.007	0.105**	-0.032	-0.030	0.018	0.023	0.046	0.003	0.045

Note: AC_INX: Resource sharing index; AGE: Age; BED: Hospital bed to population ratio; DIST: Distance to admitted VAMC; LNVAO: Numbers of non-VA outpatient visit after index admission; MEAN: Low-income status; MHCOS: Severity of mental comorbidity; NMHCO: Numbers of mental comorbidities; NPHCO: Numbers of physical comorbidities; OMHLOS: LOS of other mental disorders in the last year; PCHO: Psychologist to population ratio; PDLOS: LOS of PTSD in the last year; PHCOS: Severity of physical comorbidity; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PTSDE: Numbers of PTSD visit in the last year; SCPER: Percentage of service-connected disability; SOCNW: Size of a social network.

Appendix 12 (continued). Intercorrelations among 1998 Study Variables, Male (Pearson's Correlation)

Label	OMHE	PHE	PTSDE	PDLOS	OMHLOS	PHLOS	PNVAO	LNVAO	PNVAI
OMHE	1.000								
PHE	0.583**	1.000							
PTSDE	0.360**	0.278**	1.000						
PDLOS	0.233**	0.186**	0.271**	1.000					
OMHLOS	0.287**	0.169**	0.002	0.062*	1.000				
PHLOS	0.104**	0.360**	0.028	0.012	0.067*	1.000			
PNVAO	0.003	0.087**	-0.013	0.025	-0.007	0.004	1.000		
LNVAO	-0.004	0.005	-0.026	0.047	-0.013	0.028	0.080**	1.000	
PNVAI	-0.021	0.031	-0.056*	-0.015	-0.002	0.044	0.021	-0.015	1.000

Note: LNVAO: Numbers of non-VA outpatient visit after index admission; OMHE: Numbers of mental health visit in the last year; OMHLOS: LOS of other mental disorders in the last year; PDLOS: LOS of PTSD in the last year; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PTSDE: Numbers of PTSD visit in the last year.

Appendix 13. Intercorrelations among 1998 Study Variables, Non-white (Pearson's Correlation)

Label	AFMED	AFMEN	AFPTSD	AFSOC	RAPE	MUR	ASLT	WEP	SA	PSYMD
AFMED	1.000									
AFMEN	0.601**	1.000								
AFPTSD	0.312**	0.314**	1.000							
AFSOC	0.422**	0.433**	0.154**	1.000						
RAPE	-0.089*	0.002	-0.041	-0.027	1.000					
MUR	-0.004	0.055	-0.067	0.089*	0.351**	1.000				
ASLT	-0.129**	-0.055	-0.085*	-0.129**	0.534**	0.448**	1.000			
WEP	0.128**	0.088*	0.004	0.091*	0.278**	0.380**	0.069	1.000		
SA	0.089*	0.081	0.035	0.059	0.206**	0.015	-0.112**	0.633**	1.000	
PSYMD	0.001	0.043	0.037	0.043	0.303**	0.293**	0.263**	0.135**	0.137**	1.000
PCHO	-0.057	-0.069	-0.137**	-0.067	0.377**	0.151**	0.313**	0.307**	0.082	0.265**
BED	0.017	-0.014	-0.077	0.010	0.386**	0.392**	0.317**	0.397**	0.217**	0.497**
AGE	0.066	-0.024	0.057	0.022	0.031	0.089*	0.121**	-0.046	-0.066	-0.007
SOCNW	-0.014	0.061	-0.043	0.008	0.026	0.100*	0.025	-0.047	-0.040	-0.029
DIST	0.202**	0.183**	0.051	0.149**	0.098*	0.159**	-0.276**	0.339**	0.237**	0.145**
AC_INX	0.185**	0.132**	0.046	0.142**	-0.089*	-0.008	-0.407**	0.285**	0.243**	-0.018
MEAN	0.046	0.021	-0.043	0.058	0.055	-0.015	0.013	-0.020	-0.007	-0.052
SCPER	-0.028	-0.123**	-0.011	-0.089*	-0.017	-0.051	0.015	-0.027	-0.059	0.024
MHCOS	-0.008	-0.006	-0.075	0.082	0.009	0.025	-0.100*	0.136**	0.055	-0.032
NPHCO	0.094*	-0.024	0.052	-0.068	0.073	0.001	0.073	-0.089*	-0.089*	0.106*
OMHE	0.166**	0.252**	0.074	0.050	0.021	-0.002	-0.081	0.110*	0.156**	0.044
PHE	0.271**	0.107*	0.099*	0.068	-0.016	-0.041	-0.141**	0.064	0.101*	-0.003
PTSDE	0.069	0.003	0.329**	-0.033	-0.036	-0.028	-0.074	0.062	0.079	-0.020
PDLOS	-0.046	-0.060	0.059	-0.052	0.080	-0.028	-0.023	0.035	0.133**	-0.033
OMHLOS	0.020	0.037	-0.059	-0.044	0.018	0.017	-0.040	0.062	0.045	-0.024
PHLOS	0.131**	-0.009	-0.029	0.028	-0.056	0.053	-0.006	-0.043	-0.032	0.012
PNVAO	0.002	-0.031	-0.020	0.008	-0.070	-0.048	-0.043	-0.003	-0.065	-0.015
LNVAO	-0.057	-0.052	0.015	-0.042	0.008	-0.019	0.051	-0.035	-0.150**	-0.017
PNVAI	-0.036	-0.005	-0.047	-0.049	-0.037	0.026	0.032	0.017	-0.028	-0.018

Note: AC_INX: Resource sharing index; AFMED: Numbers of post-discharge medical visit; AFMEN: Numbers of post-discharge mental health visit; AFPTSD: Numbers of post-discharge PTSD visit; AFSOC: Numbers of post-discharge social work visit; AGE: Age; ASLT: Aggressive assault crime rate; BED: Hospital bed to population ratio; DIST: Reciprocal of the distance to admitted VAMC; LNVAO: Numbers of non-VA outpatient visit after index admission; MEAN: Low-income status; MHCOS: Severity of mental comorbidity; MUR: Murder crime rates; NMHCO: Numbers of mental comorbidities; NPHCO: Numbers of physical comorbidities; OMHE: Numbers of mental health visit in the last year; OMHLOS: LOS of other mental disorders in the last year; OTHMD: Other physician to population ratio; PCHO: Psychologist to population ratio; PDLOS: LOS of PTSD in the last year; PHCOS: Severity of physical comorbidity; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PROP: Property crime rates; PSYMD: Psychiatrist to population ratio; SA: Substance-abuse-related crime rates; PTSDE: Numbers of PTSD visit in the last year; RAPE: Rape crime rates; SCPER: Percentage of service-connected disability; SOC: Social worker to population ratio; SOCNW: Size of a social network; WEP: Weapon violation crime rates.

Appendix 13 (continued). Intercorrelations among 1998 Study Variables, Non-white (Pearson's Correlation)

Label	PCHO	BED	AGE	SOCNW	DIST	AC_INX	MEAN	SCPER	MHCOS	NPHCO
PCHO	1.000									
BED	0.611**	1.000								
AGE	0.023	0.063	1.000							
SOCNW	-0.064	-0.036	-0.023	1.000						
DIST	-0.023	0.049	-0.089*	0.014	1.000					
AC_INX	-0.155**	0.090*	-0.072	0.028	0.578**	1.000				
MEAN	0.079	0.040	0.032	-0.224**	0.016	-0.005	1.000			
SCPER	0.025	0.036	0.148**	-0.369**	-0.061	-0.032	0.190**	1.000		
MHCOS	0.013	-0.020	-0.080	0.000	0.174**	0.072	0.020	-0.030	1.000	
NPHCO	0.063	0.084	0.249**	-0.029	-0.149**	-0.146**	-0.017	0.062	-0.129**	1.000
OMHE	0.019	0.032	-0.050	0.028	0.216**	0.222**	0.103*	0.037	0.064	-0.044
PHE	-0.048	0.025	0.014	-0.068	0.191**	0.225**	0.100*	0.154**	0.062	0.077
PTSDE	-0.103*	-0.045	0.089*	-0.055	0.058	0.143**	0.074	0.069	-0.085	0.098*
PDLOS	-0.027	-0.028	0.023	-0.043	-0.013	0.040	0.067	0.174**	-0.082	0.044
OMHLOS	0.059	0.022	-0.026	0.004	0.177**	0.140**	0.005	0.009	0.052	-0.057
PHLOS	-0.083	-0.022	0.100*	-0.092*	0.052	0.020	0.033	0.062	-0.040	0.107*
PNVAO	-0.041	-0.008	0.012	-0.018	-0.046	0.002	-0.005	0.100*	0.052	0.008
LNVAO	0.035	0.037	-0.018	-0.030	-0.073	-0.074	-0.125**	0.038	-0.039	-0.041
PNVAI	-0.024	-0.002	-0.020	-0.034	-0.007	-0.038	0.016	0.005	0.013	0.023

Note: AC_INX: Resource sharing index; AGE: Age; BED: Hospital bed to population ratio; DIST: Distance to admitted VAMC; LNVAO: Numbers of non-VA outpatient visit after index admission; MEAN: Low-income status; MHCOS: Severity of mental comorbidity; NMHCO: Numbers of mental comorbidities; NPHCO: Numbers of physical comorbidities; OMHLOS: LOS of other mental disorders in the last year; PCHO: Psychologist to population ratio; PDLOS: LOS of PTSD in the last year; PHCOS: Severity of physical comorbidity; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PTSDE: Numbers of PTSD visit in the last year; SCPER: Percentage of service-connected disability; SOCNW: Size of a social network.

Appendix 13(continued). Intercorrelations among 1999 Study Variables, Non-white (Pearson's Correlation)

Label	OMHE	PHE	PTSDE	PDLOS	OMHLOS	PHLOS	PNVAO	LNVAO	PNVAI
OMHE	1.000								
PHE	0.621**	1.000							
PTSDE	0.379**	0.337**	1.000						
PDLOS	0.260**	0.277**	0.338**	1.000					
OMHLOS	0.285**	0.244**	-0.029	0.038	1.000				
PHLOS	0.067	0.306**	0.022	0.006	0.106*	1.000			
PNVAO	-0.014	0.049	-0.008	-0.009	-0.007	-0.055	1.000		
LNVAO	-0.042	-0.065	0.006	0.013	0.017	-0.027	0.097*	1.000	
PNVAI	0.003	0.033	0.035	0.048	0.003	0.106*	-0.020	-0.006	1.000

Note: LNVAO: Numbers of non-VA outpatient visit after index admission; OMHE: Numbers of mental health visit in the last year; OMHLOS: LOS of other mental disorders in the last year; PDLOS: LOS of PTSD in the last year; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PTSDE: Numbers of PTSD visit in the last year.

Appendix 14. Intercorrelations among 1998 Study Variables, White (Pearson's Correlation)

Label	AFMED	AFMEN	AFPTSD	AFSOC	RAPE	MUR	ASLT	WEP	SA	PSYMD
AFMED	1.000									
AFMEN	0.529**	1.000								
AFPTSD	0.260**	0.318**	1.000							
AFSOC	0.285**	0.357**	0.285**	1.000						
RAPE	-0.029	-0.020	-0.073*	-0.045	1.000					
MUR	0.040	0.064*	-0.009	-0.016	0.410**	1.000				
ASLT	-0.018	-0.004	-0.004	-0.072*	0.605**	0.411**	1.000			
WEP	0.140**	0.132**	0.054	0.067*	0.323**	0.388**	0.299**	1.000		
SA	0.062	0.047	0.011	0.027	0.249**	0.145**	0.153**	0.521**	1.000	
PSYMD	-0.006	0.008	-0.044	0.027	0.346**	0.184**	0.270**	0.276**	0.363**	1.000
PCHO	0.020	0.010	-0.107**	0.000	0.305**	0.133**	0.141**	0.253**	0.253**	0.422**
BED	0.021	-0.004	-0.065*	-0.008	0.269**	0.193**	0.288**	0.296**	0.352**	0.515**
AGE	0.120**	-0.069*	-0.045	0.029	-0.037	-0.002	-0.024	-0.029	-0.069*	-0.070*
SOCNW	-0.020	0.066**	-0.028	-0.038	-0.013	-0.032	-0.001	0.005	0.006	-0.054
DIST	0.169**	0.112**	0.010	0.081*	0.083**	0.113**	-0.029	0.302**	0.179**	0.221**
AC_INX	0.239**	0.167**	0.086**	0.157**	-0.131**	-0.028	-0.199**	0.300**	0.128**	0.030
MEAN	0.062	-0.037	-0.012	-0.019	-0.022	-0.011	-0.021	-0.019	-0.039	0.008
SCPER	0.069*	-0.069*	0.072*	0.008	-0.047	-0.030	-0.036	-0.080*	-0.105**	-0.050
MHCOS	0.009	0.046	-0.092**	-0.008	0.030	0.063*	0.027	0.059	0.034	-0.037
NPHCO	0.215**	-0.018	0.016	0.023	-0.016	-0.022	-0.012	-0.042	-0.082*	-0.115**
OMHE	0.276**	0.399**	0.150**	0.112**	-0.028	0.024	-0.029	0.143**	0.049	-0.009
PHE	0.439**	0.168**	0.110**	0.140**	-0.046	0.000	-0.090**	0.133**	0.043	-0.012
PTSDE	0.117**	0.076*	0.452**	0.094**	0.006	0.025	0.031	0.033	0.025	-0.011
PDLOS	-0.017	0.081*	0.157**	0.037	-0.007	-0.033	0.043	-0.042	-0.056	0.016
OMHLOS	-0.036	0.027	-0.074*	0.020	0.046	0.044	0.028	0.114**	0.082*	0.065*
PHLOS	0.126**	-0.027	-0.027	-0.022	-0.056	-0.009	-0.051	0.023	0.012	0.015
PNVAO	-0.035	-0.044	-0.067*	-0.015	-0.047	0.006	-0.062	0.026	-0.070*	-0.024
LNVAO	0.021	0.007	0.011	0.012	-0.048	-0.005	-0.029	-0.002	0.028	-0.006
PNVAI	-0.030	-0.070*	-0.087**	0.051	0.016	0.017	-0.010	0.021	0.005	-0.028

Note: AC_INX: Resource sharing index; AFMED: Numbers of post-discharge medical visit; AFMEN: Numbers of post-discharge mental health visit; AFPTSD: Numbers of post-discharge PTSD visit; AFSOC: Numbers of post-discharge social work visit; AGE: Age; ASLT: Aggressive assault crime rate; BED: Hospital bed to population ratio; DIST: Reciprocal of the distance to admitted VAMC; LNVAO: Numbers of non-VA outpatient visit after index admission; MEAN: Low-income status; MHCOS: Severity of mental comorbidity; MUR: Murder crime rates; NMHCO: Numbers of mental comorbidities; NPHCO: Numbers of physical comorbidities; OMHE: Numbers of mental health visit in the last year; OMHLOS: LOS of other mental disorders in the last year; OTHMD: Other physician to population ratio; PCHO: Psychologist to population ratio; PDLOS: LOS of PTSD in the last year; PHCOS: Severity of physical comorbidity; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PROP: Property crime rates; PSYMD: Psychiatrist to population ratio; SA: Substance-abuse-related crime rates; PTSDE: Numbers of PTSD visit in the last year; RAPE: Rape crime rates; SCPER: Percentage of service-connected disability; SOC: Social worker to population ratio; SOCNW: Size of a social network; WEP: Weapon violation crime rates.

Appendix 14 (continued). Intercorrelations among 1998 Study Variables, White (Pearson's Correlation)

Label	PCHO	BED	AGE	SOCNW	DIST	AC_INX	MEAN	SCPER	MHCOS	NPHCO
PCHO	1.000									
BED	0.531**	1.000								
AGE	0.002	0.025	1.000							
SOCNW	0.013	-0.037	-0.049	1.000						
DIST	0.178**	0.088**	0.038	0.034	1.000					
AC_INX	0.035	0.137**	0.068*	-0.021	0.471**	1.000				
MEAN	-0.008	0.014	0.046	-0.198**	0.012	0.037	1.000			
SCPER	-0.107**	-0.048	0.124**	-0.365**	-0.064*	-0.023	0.198**	1.000		
MHCOS	-0.018	-0.002	-0.025	0.023	0.122**	0.037	-0.065*	-0.060	1.000	
NPHCO	-0.015	-0.034	0.351**	-0.049	0.043	0.087**	0.056	0.117**	-0.045	1.000
OMHE	0.024	-0.003	0.048	-0.047	0.173**	0.231**	0.103**	0.140**	0.014	0.072*
PHE	0.004	-0.042	0.248**	-0.092**	0.184**	0.265**	0.153**	0.223**	-0.032	0.257**
PTSDE	-0.087*	-0.091**	-0.015	-0.013	0.019	0.005	0.050	0.143**	-0.091**	0.042
PDLOS	-0.029	0.001	-0.080*	-0.088**	-0.112**	-0.085**	0.073*	0.171**	-0.073*	-0.045
OMHLOS	0.027	0.027	-0.053	-0.001	0.059	0.040	0.035	-0.108**	0.096**	-0.083**
PHLOS	-0.008	-0.014	0.131**	-0.042	0.117**	0.149**	0.069*	0.041	-0.006	0.157**
PNVAO	-0.021	0.034	0.003	-0.038	-0.068*	0.083**	0.055	0.109**	0.005	0.069*
LNVAO	-0.033	-0.014	-0.053	-0.027	-0.021	0.020	-0.021	0.046	0.031	-0.034
PNVAI	0.019	0.002	0.089**	-0.034	-0.017	0.037	0.026	0.052	0.003	0.029

Note: AC_INX: Resource sharing index; AGE: Age; BED: Hospital bed to population ratio; DIST: Distance to admitted VAMC; LNVAO: Numbers of non-VA outpatient visit after index admission; MEAN: Low-income status; MHCOS: Severity of mental comorbidity; NMHCO: Numbers of mental comorbidities; NPHCO: Numbers of physical comorbidities; OMHLOS: LOS of other mental disorders in the last year; PCHO: Psychologist to population ratio; PDLOS: LOS of PTSD in the last year; PHCOS: Severity of physical comorbidity; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PTSDE: Numbers of PTSD visit in the last year; SCPER: Percentage of service-connected disability; SOCNW: Size of a social network.

Appendix 14 (continued). Intercorrelations among 1998 Study Variables, White (Pearson's Correlation)

Label	OMHE	PHE	PTSDE	PDLOS	OMHLOS	PHLOS	PNVAO	LNVAO	PNVAI
OMHE	1.000								
PHE	0.582**	1.000							
PTSDE	0.322**	0.234**	1.000						
PDLOS	0.198**	0.133**	0.228**	1.000					
OMHLOS	0.279**	0.127**	0.023	0.064*	1.000				
PHLOS	0.137**	0.389**	0.023	0.020	0.045	1.000			
PNVAO	0.027	0.094**	-0.018	0.036	0.008	0.037	1.000		
LNVAO	0.016	0.016	-0.042	0.050	-0.013	0.027	0.106**	1.000	
PNVAI	-0.029	0.023	-0.086**	-0.019	-0.008	0.033	0.018	-0.022	1.000

Note: LNVAO: Numbers of non-VA outpatient visit after index admission; OMHE: Numbers of mental health visit in the last year; OMHLOS: LOS of other mental disorders in the last year; PDLOS: LOS of PTSD in the last year; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PTSDE: Numbers of PTSD visit in the last year.

Appendix 15. Intercorrelations among 1998 Study Variables, Non-community (Pearson's Correlation)

Label	AFMED	AFMEN	AFPTSD	AFSOC	RAPE	MUR	ASLT	WEP	SA	PSYMD
AFMED	1.000									
AFMEN	0.727**	1.000								
AFPTSD	0.476**	0.542**	1.000							
AFSOC	0.549**	0.598**	0.329**	1.000						
RAPE	0.054	0.054	-0.037	-0.001	1.000					
MUR	0.131**	0.090	0.033	0.057	0.464**	1.000				
ASLT	0.031	0.016	0.039	-0.051	0.568**	0.493**	1.000			
WEP	0.277**	0.220**	0.084	0.159**	0.375**	0.449**	0.297**	1.000		
SA	0.136**	0.102*	0.012	0.122*	0.288**	0.103*	0.066	0.510**	1.000	
PSYMD	-0.026	-0.006	0.023	-0.013	0.425**	0.311**	0.399**	0.192**	0.226**	1.000
PCHO	-0.032	-0.066	-0.114**	-0.096*	0.325**	0.145**	0.165**	0.200**	0.153**	0.269**
BED	-0.068	-0.069	-0.066	-0.086	0.307**	0.255**	0.322**	0.206**	0.196**	0.496**
AGE	-0.026	-0.069	-0.019	-0.087	-0.054	-0.018	0.052	-0.078	-0.094	-0.051
SOCNW	0.034	0.039	-0.014	-0.004	0.036	0.138**	0.057	0.060	0.013	-0.037
DIST	0.223**	0.186**	0.019	0.226**	0.159**	0.163**	-0.096*	0.512**	0.290**	0.087
AC_INX	0.297**	0.245**	0.157**	0.175**	0.071	0.173**	-0.059	0.493**	0.209**	0.004
MEAN	0.011	-0.023	0.004	0.030	-0.051	-0.099*	-0.063	0.037	-0.007	-0.066
SCPER	-0.070	-0.094	0.065	-0.140**	-0.041	-0.069	0.063	-0.168**	-0.182**	0.031
MHCOS	-0.033	-0.061	-0.117**	0.022	0.085	0.085	-0.044	0.237**	0.128**	-0.045
NPHCO	0.037	-0.023	0.014	-0.007	0.034	0.045	0.060	-0.101*	-0.191**	-0.032
OMHE	0.307**	0.317**	0.290**	0.142**	0.057	0.072	0.055	0.228**	0.088	-0.018
PHE	0.335**	0.194**	0.214**	0.095	0.044	0.031	0.042	0.157**	0.075	-0.022
PTSDE	0.166**	0.130**	0.344**	-0.020	0.116*	0.086	0.095	0.091	0.076	0.088
PDLOS	0.007	0.095	0.115*	-0.031	-0.031	-0.144**	0.068	-0.130**	-0.092	-0.021
OMHLOS	0.016	0.002	-0.106*	0.012	0.105*	0.024	0.013	0.188**	0.129**	0.002
PHLOS	0.036	-0.009	-0.023	0.004	-0.026	0.035	0.018	0.053	-0.003	-0.067
PNVAO	-0.066	-0.002	-0.026	-0.037	-0.045	-0.004	-0.051	-0.052	-0.159**	-0.056
LNVAO	0.011	-0.014	0.074	0.030	-0.073	-0.026	-0.081	-0.106*	0.019	-0.048
PNVAI	-0.092	-0.090	-0.075	-0.073	0.013	-0.009	0.018	0.032	0.042	-0.032

Note: AC_INX: Resource sharing index; AFMED: Numbers of post-discharge medical visit; AFMEN: Numbers of post-discharge mental health visit; AFPTSD: Numbers of post-discharge PTSD visit; AFSOC: Numbers of post-discharge social work visit; AGE: Age; ASLT: Aggressive assault crime rate; BED: Hospital bed to population ratio; DIST: Reciprocal of the distance to admitted VAMC; LNVAO: Numbers of non-VA outpatient visit after index admission; MEAN: Low-income status; MHCOS: Severity of mental comorbidity; MUR: Murder crime rates; NMHCO: Numbers of mental comorbidities; NPHCO: Numbers of physical comorbidities; OMHE: Numbers of mental health visit in the last year; OMHLOS: LOS of other mental disorders in the last year; OTHMD: Other physician to population ratio; PCHO: Psychologist to population ratio; PDLOS: LOS of PTSD in the last year; PHCOS: Severity of physical comorbidity; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PROP: Property crime rates; PSYMD: Psychiatrist to population ratio; SA: Substance-abuse-related crime rates; PTSDE: Numbers of PTSD visit in the last year; RAPE: Rape crime rates; SCPER: Percentage of service-connected disability; SOC: Social worker to population ratio; SOCNW: Size of a social network; WEP: Weapon violation crime rates.

Appendix 15 (continued). Intercorrelations among 1998 Study Variables, Non-community (Pearson's Correlation)

Label	PCHO	BED9	AGE	SOCNW	DIST	AC_INX	MEAN	SCPER	MHCOS	NPHCO
PCHO	1.000									
BED	0.517**	1.000								
AGE	-0.055	0.021	1.000							
SOCNW	0.021	-0.035	-0.021	1.000						
DIST	0.066	0.019	-0.036	0.080	1.000					
AC_INX	-0.064	0.051	0.033	0.070	0.616**	1.000				
MEAN	0.001	-0.016	0.033	-0.235**	-0.053	0.030	1.000			
SCPER	-0.054	0.018	0.194**	-0.307**	-0.246**	-0.123*	0.215**	1.000		
MHCOS	0.075	0.004	-0.107*	-0.025	0.229**	0.082	-0.100*	-0.160**	1.000	
NPHCO	0.022	-0.035	0.254**	-0.049	-0.082	-0.048	0.001	0.131**	-0.099*	1.000
OMHE	-0.028	-0.061	-0.004	-0.041	0.175**	0.289**	0.099*	0.031	0.028	-0.029
PHE	-0.037	-0.058	0.157**	-0.079	0.150**	0.232**	0.073	0.110*	-0.015	0.133**
PTSDE	-0.047	-0.063	0.008	-0.033	0.040	0.148**	0.067	0.140**	-0.041	0.046
PDLOS	-0.032	0.019	-0.018	-0.053	-0.242**	-0.087	0.084	0.205**	-0.171**	0.011
OMHLOS	0.015	-0.047	-0.138**	-0.018	0.232**	0.103*	-0.040	-0.128**	0.148**	-0.133**
PHLOS	-0.085	-0.053	0.172**	-0.082	0.095	0.121*	0.063	0.003	-0.004	0.074
PNVAO	-0.043	-0.018	0.045	-0.001	-0.083	-0.044	0.063	0.095	0.025	0.144**
LNVAO	-0.032	-0.007	-0.019	-0.044	-0.058	-0.018	0.025	0.074	-0.006	0.010
PNVAI	-0.005	-0.003	0.157**	-0.050	-0.019	-0.047	0.029	0.086	0.056	0.098*

Note: AC_INX: Resource sharing index; AGE: Age; BED: Hospital bed to population ratio; DIST: Distance to admitted VAMC; LNVAO: Numbers of non-VA outpatient visit after index admission; MEAN: Low-income status; MHCOS: Severity of mental comorbidity; NMHCO: Numbers of mental comorbidities; NPHCO: Numbers of physical comorbidities; OMHLOS: LOS of other mental disorders in the last year; PCHO: Psychologist to population ratio; PDLOS: LOS of PTSD in the last year; PHCOS: Severity of physical comorbidity; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PTSDE: Numbers of PTSD visit in the last year; SCPER: Percentage of service-connected disability; SOCNW: Size of a social network.

Appendix 15 (continued). Intercorrelations among 1998 Study Variables, Non-community (Pearson's Correlation)

Label	OMHE	PHE	PTSDE	PDLOS	OMHLOS	PHLOS	PNVAO	LNVAO	PNVAI
OMHE	1.000								
PHE	0.687**	1.000							
PTSDE	0.446**	0.323**	1.000						
PDLOS	0.205**	0.219**	0.227**	1.000					
OMHLOS	0.282**	0.246**	0.005	-0.069	1.000				
PHLOS	0.119*	0.300**	0.042	0.019	0.115*	1.000			
PNVAO	0.038	0.033	0.043	0.075	-0.010	0.004	1.000		
LNVAO	-0.015	0.006	-0.016	0.064	-0.015	-0.043	0.021	1.000	
PNVAI	-0.046	0.004	-0.074	-0.041	-0.029	0.064	0.064	-0.019	1.000

Note: LNVAO: Numbers of non-VA outpatient visit after index admission; OMHE: Numbers of mental health visit in the last year; OMHLOS: LOS of other mental disorders in the last year; PDLOS: LOS of PTSD in the last year; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PTSDE: Numbers of PTSD visit in the last year.

Appendix 16. Intercorrelations among 1998 Study Variables, Community (Pearson's Correlation)

Label	AFMED	AFMEN	AFPTSD	AFSOC	RAPE	MUR	ASLT	WEP	SA	PSYMD
AFMED	1.000									
AFMEN	0.474**	1.000								
AFPTSD	0.201**	0.226**	1.000							
AFSOC	0.252**	0.308**	0.199**	1.000						
RAPE	-0.113**	-0.026	-0.073*	-0.016	1.000					
MUR	-0.049	0.049	-0.061*	0.041	0.427**	1.000				
ASLT	-0.124**	-0.040	-0.067*	-0.082**	0.623**	0.438**	1.000			
WEP	0.047	0.070*	0.010	0.066*	0.351**	0.411**	0.245**	1.000		
SA	0.038	0.047	0.021	0.017	0.236**	0.126**	0.084**	0.594**	1.000	
PSYMD	0.011	0.052	-0.028	0.073*	0.346**	0.256**	0.273**	0.302**	0.321**	1.000
PCHO	-0.009	0.002	-0.120**	0.015	0.372**	0.182**	0.249**	0.332**	0.222**	0.430**
BED	0.048	0.024	-0.071*	0.041	0.339**	0.295**	0.317**	0.401**	0.360**	0.528**
AGE	0.149**	-0.058	-0.004	0.042	-0.083	-0.031	-0.053	-0.089**	-0.086**	-0.095**
SOCNW	-0.045	0.071*	-0.042	-0.021	0.005	-0.013	-0.003	-0.030	-0.016	-0.033
DIST	0.123**	0.108**	0.016	0.072*	0.107**	0.145**	-0.113**	0.244**	0.179**	0.296**
AC_INX	0.174**	0.105**	0.033	0.144**	-0.179**	-0.098**	-0.355**	0.201**	0.156**	0.036
MEAN	0.073*	-0.012	-0.036	0.002	0.027	0.016	0.007	-0.052	-0.038	0.007
SCPER	0.070*	-0.096**	0.034	0.002	-0.064*	-0.056	-0.075*	-0.049	-0.061*	-0.058
MHCOS	0.003	0.049	-0.080**	0.023	-0.014	0.019	-0.024	0.014	0.005	-0.030
NPHCO	0.218**	-0.034	0.029	-0.022	-0.042	-0.084**	-0.049	-0.083**	-0.055	-0.063*
OMHE	0.192**	0.341**	0.056	0.067*	-0.029	-0.013	-0.094**	0.085**	0.096**	0.037
PHE	0.388**	0.111**	0.065*	0.110**	-0.095**	-0.066*	-0.198**	0.055	0.049	-0.010
PTSDE	0.062*	0.011	0.424**	0.069*	-0.038	-0.014	-0.038	0.033	0.041	-0.032
PDLOS	-0.021	0.011	0.130**	0.025	0.092**	0.065*	0.043	0.081**	0.088**	0.014
OMHLOS	-0.036	0.041	-0.058	-0.007	0.025	0.049	0.010	0.070*	0.049	0.058
PHLOS	0.150**	-0.034	-0.032	-0.012	-0.084**	-0.018	-0.077*	-0.037	-0.011	0.036
PNVAO	0.005	-0.056	-0.060*	-0.004	-0.089**	-0.039	-0.077*	0.023	-0.034	-0.031
LNVAO	0.005	-0.006	-0.011	-0.021	-0.037	-0.020	0.002	0.014	-0.040	-0.007
PNVAI	0.002	-0.034	-0.074*	0.059	-0.028	0.009	-0.025	-0.006	-0.035	-0.039

Note: AC_INX: Resource sharing index; AFMED: Numbers of post-discharge medical visit; AFMEN: Numbers of post-discharge mental health visit; AFPTSD: Numbers of post-discharge PTSD visit; AFSOC: Numbers of post-discharge social work visit; AGE: Age; ASLT: Aggressive assault crime rate; BED: Hospital bed to population ratio; DIST: Reciprocal of the distance to admitted VAMC; LNVAO: Numbers of non-VA outpatient visit after index admission; MEAN: Low-income status; MHCOS: Severity of mental comorbidity; MUR: Murder crime rates; NMHCO: Numbers of mental comorbidities; NPHCO: Numbers of physical comorbidities; OMHE: Numbers of mental health visit in the last year; OMHLOS: LOS of other mental disorders in the last year; OTHMD: Other physician to population ratio; PCHO: Psychologist to population ratio; PDLOS: LOS of PTSD in the last year; PHCOS: Severity of physical comorbidity; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PROP: Property crime rates; PSYMD: Psychiatrist to population ratio; SA: Substance-abuse-related crime rates; PTSDE: Numbers of PTSD visit in the last year; RAPE: Rape crime rates; SCPER: Percentage of service-connected disability; SOC: Social worker to population ratio; SOCNW: Size of a social network; WEP: Weapon violation crime rates.

Appendix 16 (continued). Intercorrelations among 1998 Study Variables, Community (Pearson's Correlation)

Label	PCHO	BED	AGE	SOCNW	DIST	AC_INX	MEAN	SCPER	MHCOS	NPHCO
PCHO	1.000									
BED	0.582**	1.000								
AGE	-0.012	0.010	1.000							
SOCNW	-0.020	-0.030	-0.055	1.000						
DIST	0.140**	0.123**	-0.047	0.002	1.000					
AC_INX	-0.011	0.159**	-0.001	-0.034	0.450**	1.000				
MEAN	0.029	0.038	0.046	-0.202**	0.039	0.014	1.000			
SCPER	-0.077*	-0.043	0.127**	-0.390**	-0.009	0.006	0.187**	1.000		
MHCOS	-0.039	-0.015	-0.020	0.021	0.087	0.028	-0.010	-0.017	1.000	
NPHCO	-0.017	-0.001	0.354**	-0.048	-0.043	0.024	0.043	0.093**	-0.068*	1.000
OMHE	0.040	0.039	0.007	-0.013	0.183**	0.195**	0.103**	0.119**	0.025	0.039
PHE	-0.022	-0.016	0.181**	-0.094**	0.166**	0.249**	0.157**	0.231**	-0.004	0.220**
PTSDE	-0.098**	-0.070*	0.012	-0.029	0.025	0.015	0.053	0.100**	-0.112**	0.050
PDLOS	-0.007	-0.009	-0.066*	-0.067*	0.067*	0.004	0.068*	0.160**	-0.030	-0.020
OMHLOS	0.055	0.058	-0.025	0.008	0.056	0.066*	0.047	-0.049	0.054	-0.064*
PHLOS	-0.028	-0.012	0.112**	-0.059	0.070*	0.094**	0.053	0.062*	-0.025	0.161**
PNVAO	-0.036	0.025	0.015	-0.045	-0.055	0.110**	0.025	0.120**	0.022	0.030
LNVAO	-0.023	-0.011	-0.036	-0.022	-0.029	0.005	-0.077*	0.037	0.026	-0.044
PNVAI	0.002	-0.008	0.039	-0.028	-0.019	0.050	0.022	0.027	-0.011	0.008

Note: AC_INX: Resource sharing index; AGE: Age; BED: Hospital bed to population ratio; DIST: Distance to admitted VAMC; LNVAO: Numbers of non-VA outpatient visit after index admission; MEAN: Low-income status; MHCOS: Severity of mental comorbidity; NMHCO: Numbers of mental comorbidities; NPHCO: Numbers of physical comorbidities; OMHLOS: LOS of other mental disorders in the last year; PCHO: Psychologist to population ratio; PDLOS: LOS of PTSD in the last year; PHCOS: Severity of physical comorbidity; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PTSDE: Numbers of PTSD visit in the last year; SCPER: Percentage of service-connected disability; SOCNW: Size of a social network.

Appendix 16 (continued). Intercorrelations among 1998 Study Variables, Community (Pearson's Correlation)

Label	OMHE	PHE	PTSDE	PDLOS	OMHLOS	PHLOS	PNVAO	LNVAO	PNVAI
OMHE	1.000								
PHE	0.554**	1.000							
PTSDE	0.306**	0.241**	1.000						
PDLOS	0.254**	0.189**	0.312**	1.000					
OMHLOS	0.280**	0.135**	0.002	0.116**	1.000				
PHLOS	0.101**	0.378**	0.008	0.022	0.046	1.000			
PNVAO	0.007	0.114**	-0.038	-0.021	0.005	0.024	1.000		
LNVAO	0.008	0.002	-0.037	0.019	-0.005	0.040	0.148**	1.000	
PNVAI	-0.008	0.041	-0.049	0.008	0.002	0.048	-0.008	-0.015	1.000

Note: LNVAO: Numbers of non-VA outpatient visit after index admission; OMHE: Numbers of mental health visit in the last year; OMHLOS: LOS of other mental disorders in the last year; PDLOS: LOS of PTSD in the last year; PHE: Numbers of medical visit in the last year; PHLOS: LOS of medical problems in the last year; PNVAI: LOS in non-VA facilities before index admission; PNVAO: Numbers of non-VA outpatient visit before index admission; PTSDE: Numbers of PTSD visit in the last year.

Appendix 17. Standardized Path Coefficient for Post-discharge Ambulatory Care, All Veterans in1994 (n = 1420) and 1998 (n = 1517), County-level

Exogenous Construct (Variable)		Endogenous Construct
		PDAC
1994		
SD		0.123**
SA		0.117**
	R^2	**0.042**
		Chi-square: 185.465 Degrees of freedom (d.f.): 22 Chi-square/d.f.: 8.430 GOF: 0.972 AGOF: 0.943 RMSEA: 0.072 HOELTER: 260
1998		
SD		0.160**
	R^2	**0.026**
		Chi-square: 40.98 Degrees of freedom (d.f.): 16 Chi-square/d.f.: 2.561 GOF: 0.993 AGOF: 0.985 RMSEA: 0.032 HOELTER: 973

Note: **: $p < 0.01$; AGOF: Adjusted goodness-of-fit index; GOF: Goodness-of-fit index; HOELTER: Hoelter's critical N; PDAC: Post-discharge ambulatory care; RMSEA: Root mean square error of approximation; SA: Substance-abuse-related crime rates; SD: Social disintegration.

Appendix 18. Standardized Path Coefficient for Post-discharge Ambulatory Care in Male Veterans in 1994(n = 1391) and 1998 (n = 1455), County-level

Exogenous Construct (Variable)	**Endogenous Construct**
	PDAC
1994	
SD	0.133**
SA	0.107**
R^2	**0.043**
	Chi-square: 179.748 Degrees of freedom (d.f.): 22 Chi-square/d.f.: 8.170 GOF: 0.973 AGOF: 0.944 RMSEA: 0.072 HOELTER: 263
1998	
SD	0.162**
PNVAI	-0.068*
R^2	**0.031**
	Chi-square: 51.580 Degrees of freedom (d.f.): 22 Chi-square/d.f.: 2.345 GOF: 0.992 AGOF: 0.984 RMSEA: 0.030 HOELTER: 957

Note: *: $p < 0.05$; **: $p < 0.01$; AGOF: Adjusted goodness-of-fit index; GOF: Goodness-of-fit index; HOELTER: Hoelter's critical N; PDAC: Post-discharge ambulatory care; PNVAI: Non-VA LOS before the index admission; RMSEA: Root mean square error of approximation; SA: Substance-abuse-related crime rates; SD: Social disintegration.

Appendix 19. Standardized Path Coefficient for Post-discharge Ambulatory Care in Non-white (n = 445) and White Veterans (n =975) in1994, County-level

Exogenous Construct (Variable)	Endogenous Construct
	PDAC
Non-white	
SD	-0.125*
R^2	**0.016**
White	
SD	0.183**
SA	0.119**
R^2	**0.072**

Chi-square: 154.703
Degrees of freedom (d.f.): 40
Chi-square/d.f.: 3.868
GOF: 0.976
AGOF: 0.952
RMSEA: 0.045
HOELTER: 513

Note: *: $p < 0.05$ **: $p < 0.01$; AGOF: Adjusted goodness-of-fit index; GOF: Goodness-of-fit index; HOELTER: Hoelter's critical N; PDAC: Post-discharge ambulatory care; RMSEA: Root mean square error of approximation; SA: Substance-abuse-related crime rates; SD: Social disintegration.

Appendix 20. Standardized Path Coefficient for Post-discharge Ambulatory Care for Veterans with Different Discharge Placement in 1994, County-level

Exogenous Construct (Variable)	**Endogenous Construct**
	PDAC
Non-community (n =174)	
PNVAI	0.204**
R^2	**0.041**
Community (n =1246)	
SD	0.107**
SA	0.189**
R^2	**0.044**

Chi-square: 169.931
Degrees of freedom (d.f.): 27
Chi-square/d.f.: 6.294
GOF: 0.973
AGOF: 0.940
RMSEA: 0.061
HOELTER: 336

Note: **: $p < 0.01$; AGOF: Adjusted goodness-of-fit index; GOF: Goodness-of-fit index; HOELTER: Hoelter's critical N; PDAC: Post-discharge ambulatory care; PNVAI: Non-VA length of stay before index admission; RMSEA: Root mean square error of approximation; SA: Substance-abuse-related crime rates; SD: Social disintegration.

Appendix 21. Standardized Path Coefficient for Post-discharge Ambulatory Care in Non-white (N = 543) and White Veterans (N =974) in 1998, County-level

Exogenous Construct (Variable)	**Endogenous Construct**
	PDAC
Non-white	
SD	0.136**
R^2	**0.018**
White	
SD	0.175**
R^2	**0.030**

Chi-square: 58.123
Degrees of freedom (d.f.): 32
Chi-square/d.f.: 1.816
GOF: 0.990
AGOF: 0.979
RMSEA: 0.023
HOELTER: 1206

Note: **: $p < 0.01$; AGOF: Adjusted goodness-of-fit index; GOF: Goodness-of-fit index; HOELTER: Hoelter's critical N; PDAC: Post-discharge ambulatory care; RMSEA: Root mean square error of approximation; SD: Social disintegration.

Appendix 22. Standardized Path Coefficient for Post-discharge Ambulatory Care in Veterans with Different Discharge Placement in 1998, County-level

Exogenous Construct (Variable)	**Endogenous Construct**
	PDAC
Non-community (n = 416)	
HR	-0.179**
SD	0.311**
R^2	**0.099**
Community (n = 1101)	
SD	0.091*
R^2	**0.008**

Chi-square: 143.831
Degrees of freedom (d.f.): 52
Chi-square/d.f.: 2.766
GOF: 0.979
AGOF: 0.960
RMSEA: 0.034
HOELTER: 737

Note: *: $p < 0.01$; **: $p < 0.01$; AGOF: Adjusted goodness-of-fit index; HR: Adequacy of health resources; GOF: Goodness-of-fit index; HOELTER: Hoelter's critical N; PDAC: Post-discharge ambulatory care; PNVAI: Non-VA length of stay before index admission; RMSEA: Root mean square error of approximation; SD: Social disintegration.

Appendix 23. The Results of Multiple Group Analysis

Structural Equation Modeling for Male PTSD Veterans

Table A-1 reveals the results of SEM for male veterans. Similarly to the results of SEM for all veterans, POU was the most predictive factor influencing PDAC. A substitution effect was revealed between PIU and PDAC. For 1994, 23.7% of the variance in PDAC was explained by the model, and it was 13.7% in 1998.

Structural Equation Modeling for Non-white and White PTSD Veterans, 1994

Table A-2 presents the results for the full model of multiple group analysis of SEM. POU was found to be the most influential factor. The model explained 14.7% of the variation in PDAC for non-white PTSD veterans, and 28.4% of that for the whites. A prohibitive effect of barriers to access to care was found in the non-whites group. The control variable, non-VA LOS before the index admission (PNVAI), was found to be positively influencing PDAC in the non-white group. However, SA had a positive effect on PDAC for the white group. A well-fitted model was found, as indicated by the model fit indices.

Table A-1. Standardized Path Coefficients for Post-discharge Ambulatory Care in Male Veterans in 1994 (n = 1391) and 1998 (n =1455)

Exogenous Construct (Variable)	**Endogenous Construct**		
	SOCNW	NPHCO	PDAC
1994			
SA			0.142**
AGE		0.256**	
SOCNW			0.124**
AC1			0.135**
NPHCO			0.064*
POU	-0.134**	0.116**	0.415**
PIU			-0.144*
R^2		**0.236**	
			Chi-square: 276.721
			Degrees of freedom (d.f.): 72
			Chi-square/d.f.: 3.427
			GOF: 0.979
			AGOF: 0.959
			RMSEA: 0.042
			HOELTER: 523
1998			
SD			0.083**
AC1			0.103**
AC2			-0.103**
POU			0.313**
OMHLOS			-0.104**
PNVAI			-0.058*
R^2		**0.137**	
			Chi-square: 412.918
			Degrees of freedom (d.f.): 93
			Chi-square/d.f.: 4.440
			GOF: 0.968
			AGOF: 0.947
			RMSEA: 0.049
			HOELTER: 411

Note: *: $p< 0.05$; **: $p < 0.01$; AC1: Enhancement of access to care; AGE: Age; AGOF: Adjusted goodness-of-fit index; GOF: Goodnes-of-fit index; HOELTER: Hoelter's critical N; NPHCO: The number of medical comorbidities; PDAC: Post-discharge ambulatory care; PIU: Prior use of inpatient services; POU: Prior use of outpatient services; RMSEA: Root mean square error of approximation; SOCNW: Social network.

Table A-2. Standardized Path Coefficients for Post-discharge Ambulatory Care in Non-white (n=445) and White Veterans (n=975), 1994

Exogenous Construct (Variable)	**Endogenous Construct (Variable)**				
	AC1	AC2	POU	SOCNW	PDAC
Non-white					
AGE		0.199**			
SOCNW		-0.265**			
AC1					0.163**
AC2	-0.153**				-0.152**
MHCOS	0.102*				
POU	0.199**	0.246**			0.300**
PIU			0.209*		
PNVAI					0.099*
R^2			**0.147**		
White					
SA					0.130**
SOCNW					0.123**
AC1					0.119**
AC2	-0.203**			-0.323**	
MHCOS	0.112**			0.078**	
POU	0.187**				0.432**
PIU	0.256**		0.570**		
R^2			**0.284**		

Chi-square: 549.873
Degrees of freedom (d.f.): 209
Chi-square/d.f.: 2.631
GOF: 0.958
AGOF: 0.935
RMSEA: 0.034
HOELTER: 630

Note: *: $p < 0.05$; **: $p < 0.01$; AC1: Enhancement of access to care; AC2: Barriers to access to care; AGE: Age; AGOF: Adjusted goodness-of-fit; GOF: Goodness-of-fit; HOELTER: Hoelter's critical N; MHCOS: Severity of mental comorbidity; PDAC: Post-discharge ambulatory care; PIU: Prior use of inpatient services; PNVAI: Non-VA length of stay before index admission; POU: Prior use of outpatient services; RMSAE: Root mean square error of approximation; SA: Substance-abuse-related crime rates; SOCNW: Social network.

Structural Equation Modeling for PTSD Veterans with Different Discharge Placements, 1994

Table A-3 illustrates the results of multiple group analysis of discharge placement. In 1994, 1,246 PTSD veterans were discharged to the community, 104 to institution, and 70 left VAMCs against medical advice (AMA). The sample sizes for the group to institution and AMA group were too small to form independent groups; therefore, they were combined as one group, non-community group.

Enhancement of access to care (AC1) was the most important factor for the non-community group. The severity index of mental comorbidity (MHCOS) had a negative effect on PDAC for this group of veterans. The control variable, non-VA LOS before the index admission, was found to be positively influencing PDAC in the non-community group. The model explained 26.0% of the variance in PDAC for the non-community group.

POU emerged as the most predictive factor for the community group in seeking PDAC. SA was the only county-level factor affecting PDAC for this group of veterans. The substitution effect of PIU and PDAC was found only in the community group. The model fit indices showed that the data fitted the proposed model very well.

Table A-3. Standardized Path Coefficients for Post-discharge Ambulatory Care for Veterans with Different Discharge Placements, 1994

Exogenous construct (Variable)	**Endogenous Construct (Variable)**			
	AC1	POU	SOCNW	PDAC
Non-community				
SOCNW				0.286**
AC1			-0.152*	0.367**
AC2	-0.184*		-0.267**	
MHCOS				-0.140*
POU	0.206**			
PNVAI				0.229**
R^2		**0.260**		
Community				
SA				0.149**
SOCNW				0.087**
AC1				0.089**
AC2	-0.103**		-0.325**	
MHCOS	0.154**		0.077**	
POU	0.288**			0.568**
PIU		0.627**		-0.195*
R^2		**0.296**		

Chi-square: 538.459
Degrees of freedom (d.f.): 185
Chi-square/d.f.: 2.911
GOF: 0.959
AGOF: 0.935
RMSEA: 0.037
HOELTER: 575

Note: *: $p < 0.05$; **: $p < 0.01$; AC1: Enhancement of access to care; AC2: Barriers to access to care; AGOF: Adjusted goodness-of-fit; GOF: Goodness-of-fit; HOELTER: Hoelter's critical N; MHCOS: Severity of mental comorbidity; PDAC: Post-discharge ambulatory care; PIU: Prior use of inpatient services; PNVAI: Non-VA length of stay before index admission; POU: Prior use of outpatient services; RMSAE: Root mean square error of approximation; SA: Substance-abuse-related crime rates; SOCNW: Social network.

Structural Equation Modeling for Non-white and White PTSD Veterans, 1998

Table A-4 shows the results of the full model for non-whites (n = 533) and whites (n = 974) in pursuing PDAC. For both groups of veterans, POU was the most predictive factor affecting PDAC. The negative effects of barriers to access to care were found in both groups. The substitution effect of PDLOS was found in the non-white group. For white veterans, PHLOS and OMHLOS were able to reduce PDAC. The number of non-VA outpatient visits before the index admission was able to reduce PDAC for white veterans. The model explained 10.2% of the variation in PDAC seeking for the non-white group. However, it explained 28.2% of the variance for the white veterans. This is a well fitted model, as indicated by the model fit indices.

Structural Equation Modeling for PTSD Veterans with Different Discharge Placements, 1998

In 1998, there were 1,101 PTSD veterans discharged to the community, 344 discharged to institutions, and 72 who left VAMCs against medical advice (AMA). The institution group and the AMA group were combined as a non-community group, since the number for AMA group is too small to be analyzed.

Table A-5 illustrates the results of the full model for veterans discharged to different settings. For both groups, POU was the most important predictor in seeking PDAC services. HR, AC2, and OMHLOS were able to reduce PDAC utilization in the non-

Table A-4. Standardized Path Coefficients for Post-discharge Ambulatory Care in Non-white (n =543) and White Veterans (n =974), 1998

Exogenous Construct (Variable)	**Endogenous Construct (Variable)**			
Non-white				
	AC1	AC2	POU	PDAC
AGE		0.136**		
SOCNW		-0.359**		
AC1				0.184**
AC2				-0.098*
POU	0.261**			0.204**
PHLOS			0.194**	
PDLOS	-0.113*	0.155**	0.358**	-0.116*
OMHLOS	0.102*		0.271**	
R^2		**0.102**		
White				
SD				0.094**
AGE		0.097**		
SOCNW		-0.342**		
AC2				-0.141**
POU		0.169**		0.561**
PHLOS			0.188**	-0.135**
PDLOS		0.120**	0.212**	
OMHLOS		-0.161**	0.270**	-0.167**
PNVAO				-0.073*
R^2		**0.282**		

Chi-square: 721.369
Degrees of freedom (d.f.): 202
Chi-square/d.f.: 3.571
GOF: 0.952
AGOF: 0.923
RMSEA: 0.041
HOELTER: 493

Note: *: $p < 0.05$; **: $p < 0.01$; AC1: Enhancement of access to care; AC2: Barriers to access to care; AGE: Age; AGOF: Adjusted goodness-of-fit; GOF: Goodness-of-fit; HOELTER: Hoelter's critical N; OMHLOS: Length of stay for other mental conditions in the last year; PDAC: Post-discharge ambulatory care; PDLOS: Length of stay for PTSD in the last year; PHLOS: Length of stay for medical conditions in the last year; PNVAO: the number of non-VA outpatient visits before index admission; POU: Prior use of outpatient services; RMSAE: Root mean square error of approximation; SD: Social disintegration; SOCNW: Social network.

Table A-5. Standardized Path Coefficients for Post-discharge Ambulatory Care in Veterans with Different Discharge Placements, 1998

Exogenous Construct (Variable)	Endogenous Construct (Variable)							
	AC1	AC2	MHCOS	NPHCO	POU	OMHLOS	PDLOS	PDAC
Non-community								
HR								-0.144*
SD								0.269**
AGE			-0.230**					
SOCNW		-0.333**						
AC1			0.318**					
AC2			0.745**					-0.117*
MHCOS		-0.790**						-0.118*
POU								0.363**
OMHLOS			0.122*		0.304**			-0.164**
PDLOS			-0.244**		0.272**			
PHLOS					0.140**	0.115*		
R^2					**0.212**			
Community								
AGE				0.317**				
AC1				-0.060*				0.066*
MHCOS	0.088**							
NPHCO								0.128**
POU	0.188**			0.163**				0.392**
OMHLOS				-0.084**	0.125**		0.936@	-0.085**
PDLOS					0.206**	-0.920**		-0.103**
PHLOS				0.072*	0.374**			-
R^2					**0.194**			

Chi-square: 973.039
Degrees of freedom (d.f.): 284
Chi-square/d.f.: 3.246
GOF: 0.933
AGOF: 0.901
RMSEA: 0.040
HOELTER: 506

Note: *: $p < 0.05$; **: $p < 0.01$; @: Constrained; AC1: Enhancement of access to care; AC2 Barriers to access to care; AGE: Age; AGOF: Adjusted goodness-of-fit; GOF: Goodness-of-fit; HOELTER: Hoelter's critical N; HR: Adequacy of health resources; MHCOS: Severity of mental comorbidity; NPHCO: The number of medical comorbidities; PDAC: Post-discharge ambulatory care; OMHLOS: Length of stay for other mental conditions in the last year; PDLOS: Length of stay for PTSD in the last year; ; PHLOS: Length of stay for medical conditions in the last years; POU: Prior use of outpatient services; RMSEA: Root mean square error of approximation; SD: Social disintegration; SOCNW: Social network.

community group. The model explained 21.2% of the variance in PDAC services utilization for veterans discharged to non-community settings.

Both OMHLOS and PDLOS were able to reduce the use of PDAC services for veterans discharged to the community. The model explained 19.4% of the variation in PDAC utilization for this group of veterans.

Appendix 24. Results of Hypothesis Testing of Multiple Group for Post-discharge Ambulatory Care in 1994 and 1998

Hypothesis	1994					1998				
	Male	Non-white	White	Non-community	Community	Male	Non-White	White	Non-community	Community
H1a (SD)	(+)		(+)		(+)	(+)		(+)	(+)	
H2a (HR)									(-)	
H3a (AGE)										
H4a (SOCNW)	(+)		(+)	(+)	(+)					
H5a (Access)	(+)	Mix	(+)	(+)	(+)	Mix	Mix	(-)	(-)	(+)
H6a (Comorbidity)	(+)			(-)					(-)	(+)
H7a (MEN)	Mix	(+)	(+)		Mix	Mix	Mix	Mix	Mix	Mix
H8a (MED)	Mix	(+)	(+)		Mix	(+)	(+)	Mix	(+)	(+)

Note: Access: Access to care; AGE: Age; Comorbidity: Severity of comorbidity; HR: Adequacy of Health resources; MED: Prior physical health services utilization; MEN: Prior mental health services utilization; SD: Social disintegration; SOCNW: The size of the social network.

VITA

[redacted]